

PSYCHOLOGY

David G. Myers • C. Nathan DeWall • June Gruber

FOURTEENTH EDITION



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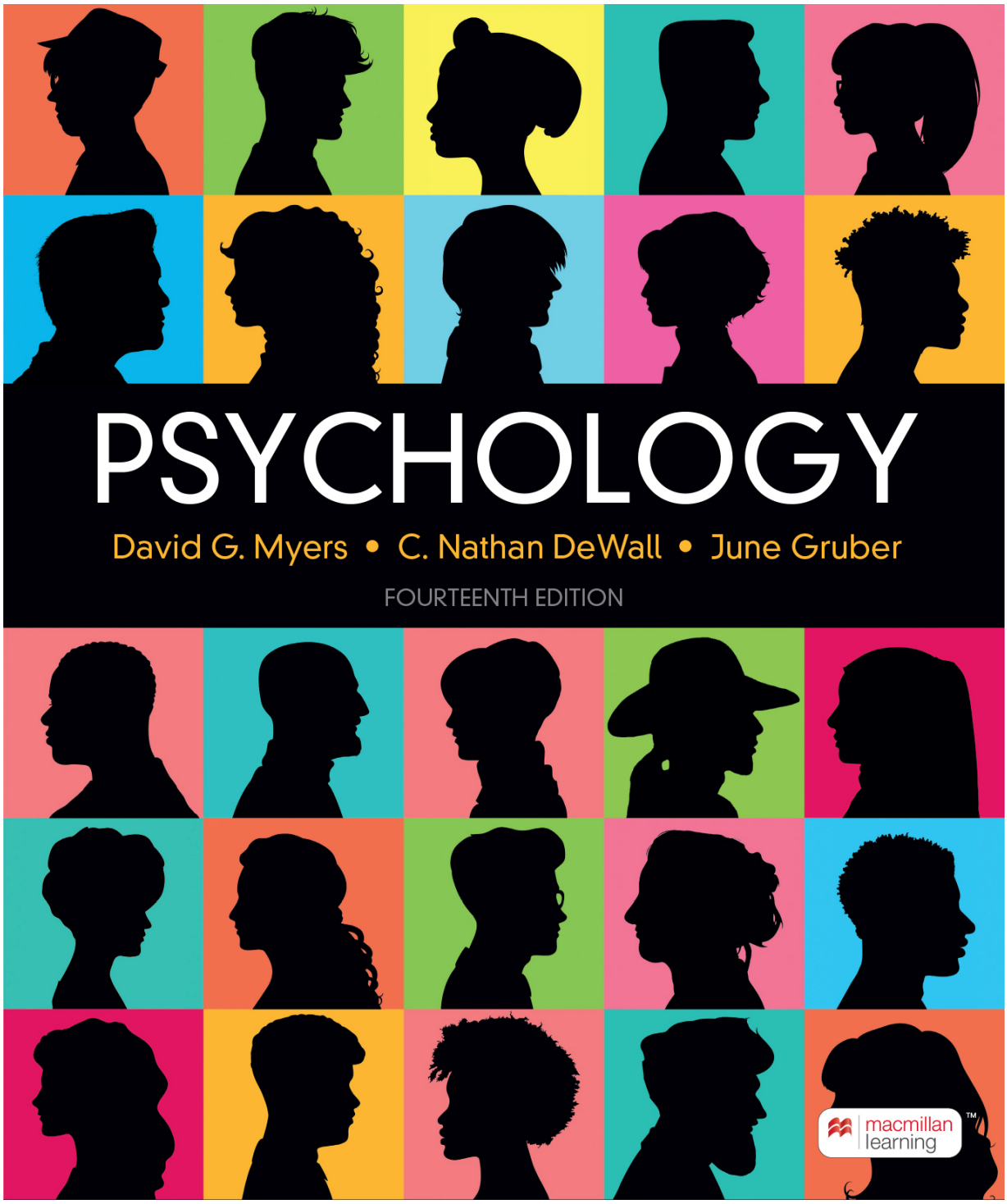
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Achieve for Psychology

Engaging Every Student. Supporting Every Instructor. Setting the New Standard for Teaching and Learning.

Macmillan Learning's Achieve for Psychology sets a whole new standard for integrating **assessments**, **activities**, and **analytics** into your teaching. Achieve brings together all of the high-quality features that instructors and students loved about our previous platform, LaunchPad: interactive e-book, LearningCurve adaptive quizzing and other assessments, immersive learning activities, and extensive instructor resources. This powerful platform also offers:

- A cleaner, more intuitive and **mobile-friendly** interface.
- **Powerful analytics** that track student engagement and performance.
- Self-regulated learning with **Goal-Setting and Reflection Surveys**.
- A fully integrated **iClicker** classroom response system, with questions available for each unit or the option to integrate your own.

- A **NEW Video Collection for Introductory Psychology**!

Our resources were **co-designed with instructors and students**, on a foundation of *years* of **learning research** and rigorous testing over multiple semesters. The result is superior content, organization, and functionality. Achieve's pre-built assignments engage students both *inside and outside of class*. And Macmillan Learning's Achieve is effective for students of *all levels* of motivation and preparedness, whether they are high achievers or need extra support.

Macmillan Learning offers **deep platform integration** of Achieve with all LMS providers, including Blackboard, Brightspace, Canvas, and Moodle. With integration, students can access course content and their grades through one sign-in. And you can pair Achieve with course tools from your LMS, such as discussion boards and chat and Gradebook functionality. LMS integration is also available with Inclusive Access. For more information, visit macmillanlearning.com/college/us/solutions/lms-integration or talk to your local sales representative.

Achieve was built with **accessibility** in mind. Macmillan Learning strives to create products that are usable by all learners and meet universally applied accessibility standards. In addition to addressing product compatibility with assistive technologies such as screen reader software, alternative keyboard devices, and voice recognition products, we are working to ensure that the content and platforms

we provide are fully accessible. For more information, visit macmillanlearning.com/college/us/our-story/accessibility.

Macmillan Learning's Achieve for Psychology: Assessments

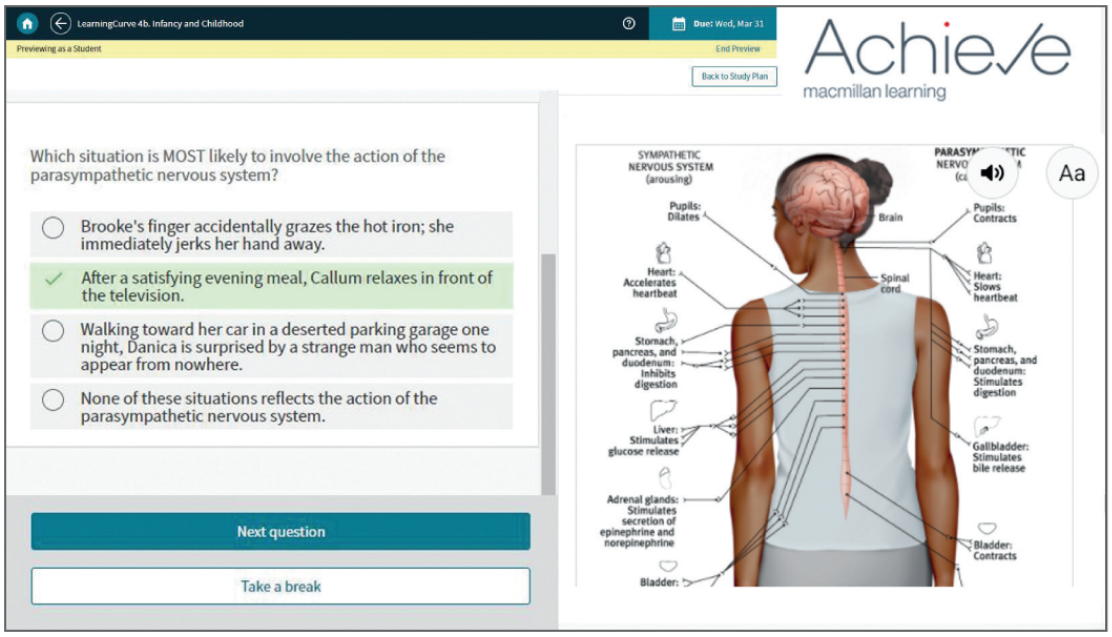
LearningCurve Adaptive Quizzing

Based on extensive learning and memory research, and proven effective for hundreds of thousands of students, LearningCurve focuses on the core concepts in every module, providing individualized question sets and feedback for correct and incorrect responses. The system adapts to each student's level of understanding, with follow-up quizzes targeting areas where the student needs improvement. Each question is tied to a learning objective and linked to the appropriate section of the e-book to encourage students to discover the right answer for themselves. LearningCurve has consistently been rated the #1 resource in our collection by instructors and students alike.

- LearningCurve's game-like quizzing promotes retrieval practice through its unique delivery of questions and its point system.
- Students with a firm grasp on the material get plenty of practice but proceed through the activity relatively quickly.
- Unprepared students are given more questions, requiring that they do what they should be doing anyway—practice some

more.

- You can monitor results for each student and the class as a whole, to identify areas that may need more coverage in lectures and assignments.



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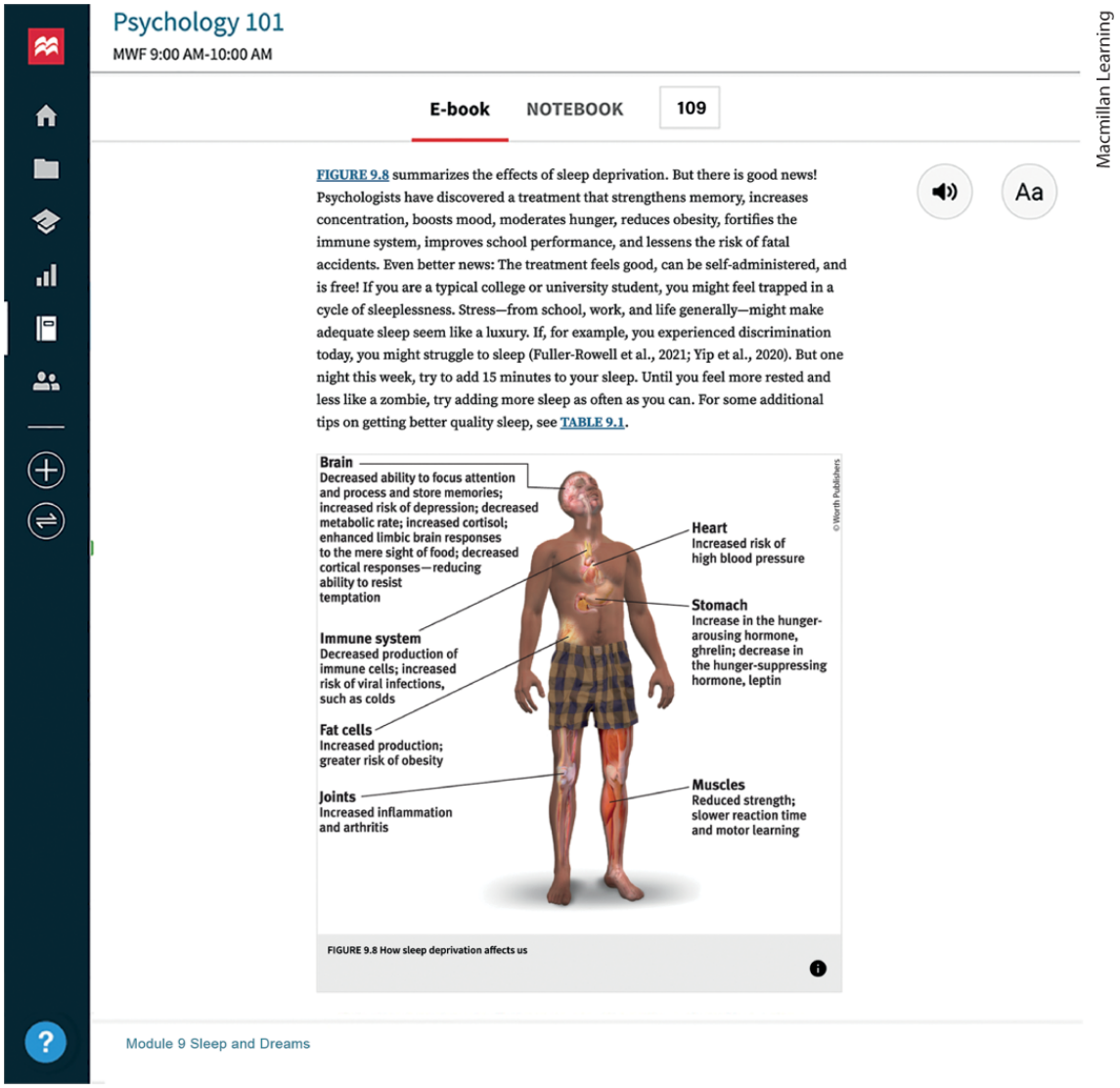
E-book

Macmillan Learning's e-book is an interactive version of the textbook that offers highlighting, bookmarking, and note-taking. Built-in, low-stakes self-assessments allow students to test their level of understanding along the way, and learn even more in the process thanks to the testing effect. Students can download the e-book to read offline, or to have it read aloud to them. Macmillan Learning's Achieve allows you to assign modules as homework.



Test Bank

Psychology, Fourteenth Edition, offers the gold standard Test Bank, with its own designated editor and thousands of questions meticulously checked against the updated content of the text. You can assign out-of-the-box exams or create your own by:

- Choosing from the 8,000 multiple-choice questions (plus additional essay questions) in our database.
- Filtering questions by type, topic, difficulty, and Bloom's level.
- Customizing multiple-choice questions.
- Integrating your own questions into the exam.

Exam/Quiz results report to a Gradebook that lets you monitor student progress individually and classwide.

Practice Quizzes

Practice Quizzes mirror the experience of a test, with questions that are similar but distinct from those in the Test Bank. You can use the quizzes as is or create your own, selecting questions by question type, topic, difficulty, and Bloom's level.

Macmillan Learning's Achieve for Psychology: Activities

Achieve is designed to support and encourage active learning by connecting engaging activities and reviews out of class with effective and approachable in-class activities, curated from a variety of active learning sources.

New! Video Collection for Introductory

Psychology

This collection of 120 new videos (bringing our total number of videos in Macmillan Learning's Achieve to over 200!) offers classic as well as current, in-demand clips from high-quality sources, along with original content to support *Psychology*, Fourteenth Edition.



PBS Newshour/BoClips

Accompanying assessments make these videos assignable, with results reporting to Achieve Gradebook. Faculty and student advisory boards advised on topic selection and were instrumental in helping us create this diverse and engaging set of clips. The collection includes coverage of loneliness and the brain, iGen, Covid and stress, Black Lives Matter/racial trauma, online dating, and issues faced by transgender youth. All videos are closed-captioned and found only in Achieve. Instructors can review detailed video

descriptions in the accompanying Faculty Guide. The video collection will be updated annually.

In addition, Garth Neufeld (Cascadia College) has created brief ***new student videos about APA's new Introductory Psychology Initiative's seven key themes***, along with an eighth video introducing the themes. These helpful resources may be found in the Welcome Unit in Macmillan Learning's Achieve, where they are accompanied by assessment so that they may be assigned and will report to the gradebook.

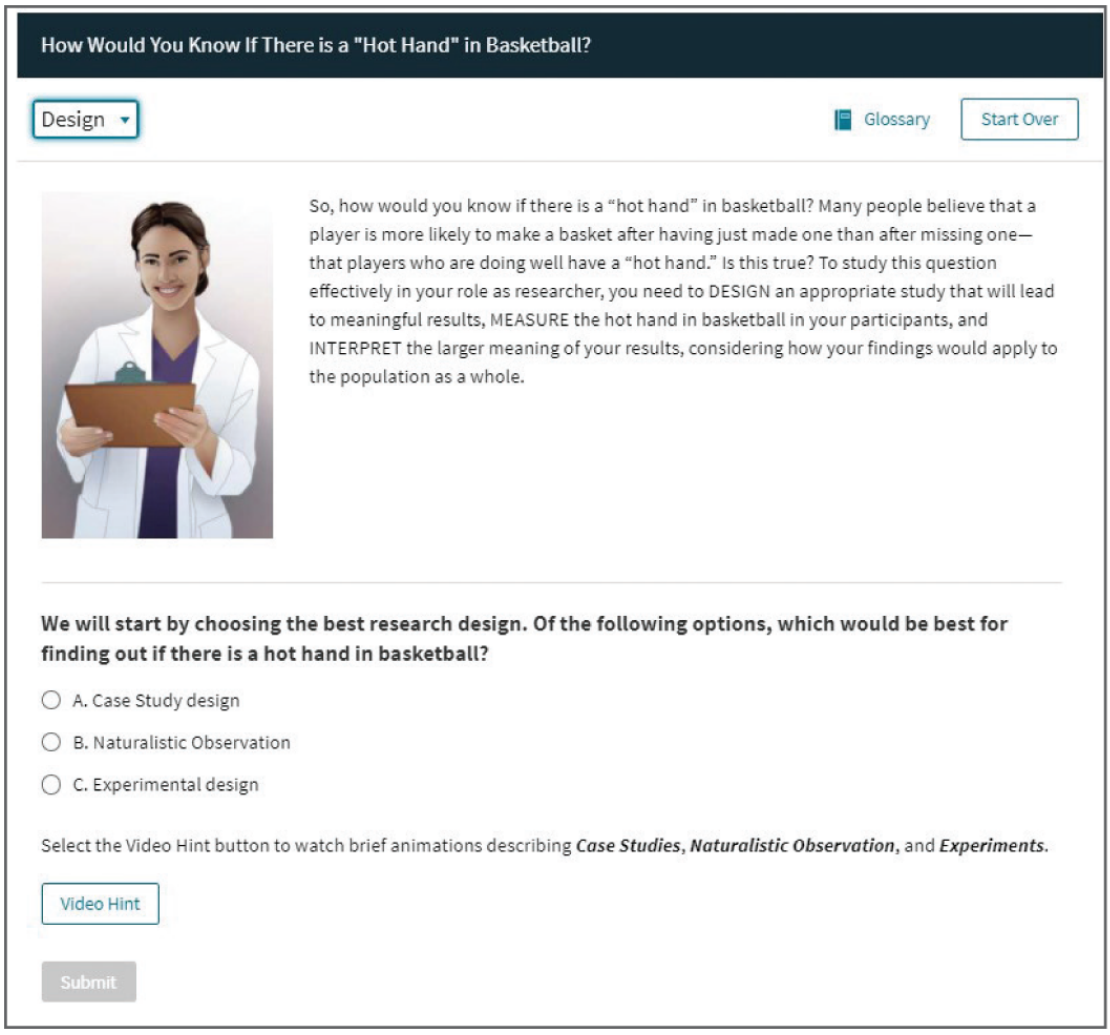
Immersive Learning Activities

With a focus on student engagement, these immersive learning activities invite students to apply what they are learning to their own lives, or to play the role of researcher—exploring experimental methods, analyzing data, and developing scientific literacy and critical thinking skills.

- "How Would You Know?" research activities for each group of modules allow students to play the role of researcher as they design and interpret studies. Students consider possible confounding factors and other issues that affect the interpretation of results. Students learn about how key decision points can alter the meaning and value of a psychological study, and they develop scientific literacy skills in the process. Topics include "How Would You Know If People Can Learn to Reduce

Anxiety?" and "How Would You Know If Schizophrenia Is Inherited?"

- In the "Assess Your Strengths" activities, students apply what they are learning from the text to their own lives and experiences by considering key "strengths." Each activity starts with a personalized video introduction from David Myers or Nathan DeWall. Students then assess themselves on the strength (critical thinking, quality of sleep, self-control, relationship strength, belonging, hope, and more) using scales developed by researchers. Next, students get tips for nurturing that strength in their own lives, and take a quiz to help solidify their learning. This edition includes a ***new*** activity, "How Healthy Is Your Emotional Ecosystem?" by new co-author, June Gruber (University of Colorado Boulder).
- "Thinking Critically About …" infographic activities for each group of modules teach and reinforce critical thinking skills.



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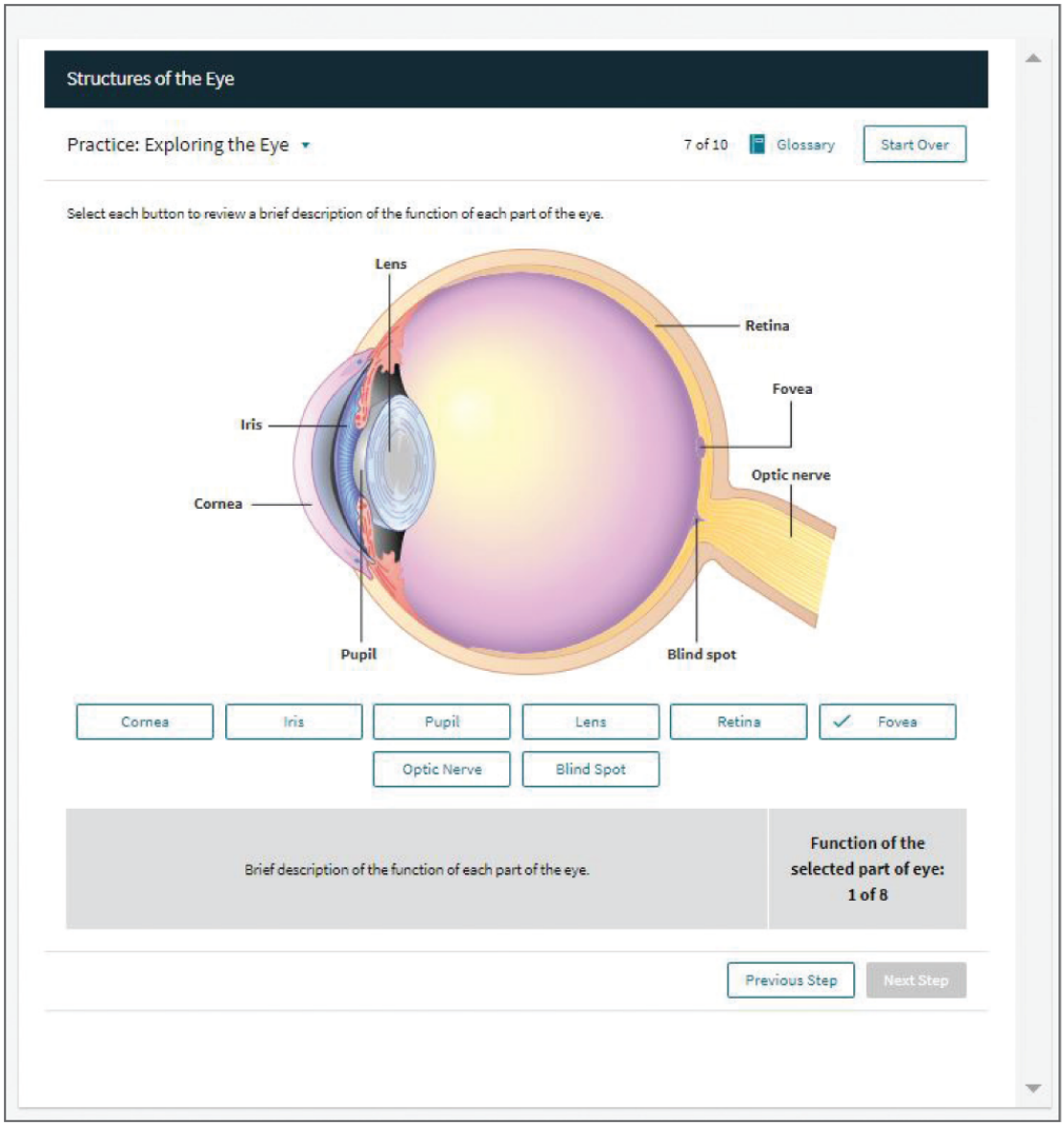
Concept Practice Tutorials

Macmillan Learning's Achieve includes dozens of these dynamic, interactive mini-tutorials that teach and reinforce the course's foundational ideas. Each of these brief activities (only 5 minutes to complete) addresses one or two key concepts in a consistent format: review, practice, quiz, and conclusion.



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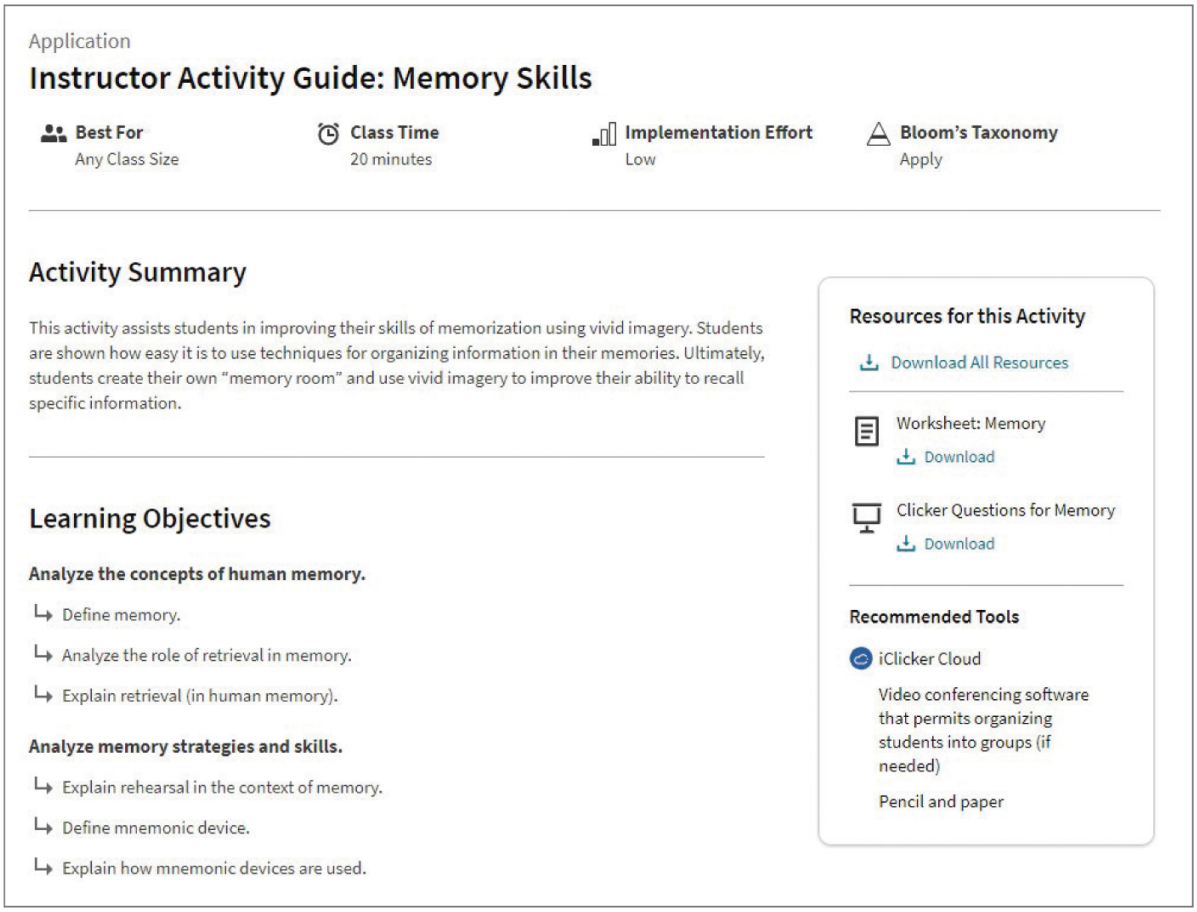
PsychSim6

PsychSim for Achieve redefines what's possible with interactive psychology simulations. With a new look, new format, and updates for accessibility, the PsychSim tutorials immerse students in the

world of psychological research, placing them in the role of scientist or subject in activities that highlight important concepts, processes, and experimental approaches.

Instructor Activity Guides

Instructor Activity Guides provide you with a structured plan for using Achieve's active learning opportunities in both face-to-face and remote learning courses. Each guide offers step-by-step instructions—from pre-class reflection to in-class engagement to post-class follow-up. The guides include suggestions for discussion questions, group work, presentations, and simulations, with estimated class time, implementation effort, and Bloom's taxonomy level for each activity. Myers and DeWall have created a new Instructor Activity Guide for each group of modules, showcasing some of their own favorite classroom activities.



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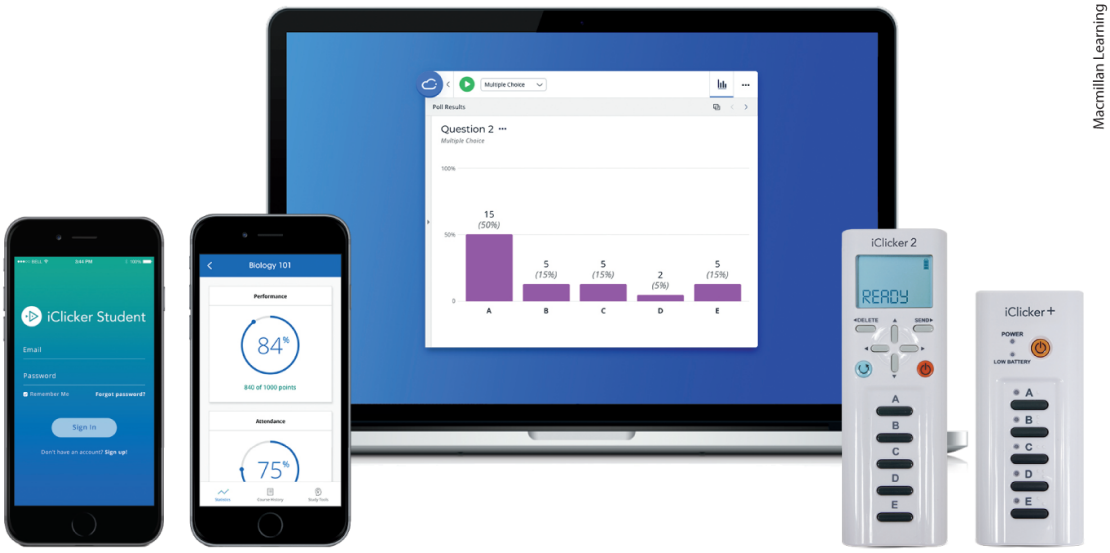
iClicker Classroom Response System

Achieve seamlessly integrates iClicker, Macmillan Learning's highly acclaimed classroom response system. iClicker can help make any classroom—in person or virtual—more lively, engaging, and productive.

- iClicker's attendance feature helps you make sure students are actually attending in-person classes.

- You can choose from flexible polling and quizzing options to engage students, check their understanding, and get their feedback in real time.
- iClicker allows students to participate using laptops, mobile devices, or in-class remotes.
- You can easily integrate your existing slides and polling questions—there is no need to re-enter them.
- You can take advantage of the questions in our Instructor Activity Guides, and our module-specific questions within Macmillan Learning's Achieve to improve the opportunities for all students to be active in class.



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Macmillan Learning's Achieve for

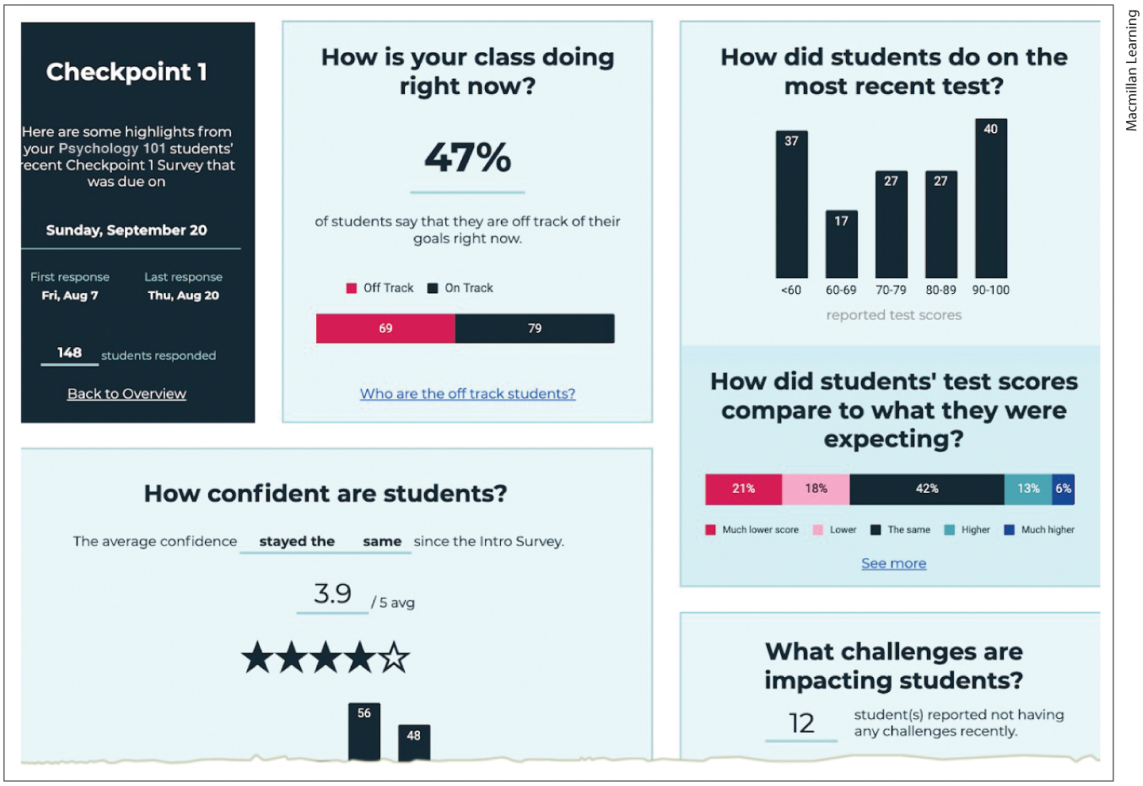
Psychology: Analytics

Learning Objectives, Reports, and Insights

Content in Achieve is tagged to specific Learning Objectives. Reporting within Achieve helps students see how they are performing against objectives, and it helps you determine if any student, group of students, or the class as a whole needs extra help in specific areas. This enables more efficient and effective interventions.

Macmillan Learning's Achieve provides reports on student activities, assignments, and assessments at the course level, unit level, subunit level, and individual student level, so you can identify trouble spots and adjust your efforts accordingly. Within the Reports function, the Insights section offers snapshots with high-level data on student performance and behavior, to answer such questions as:

- What are the top Learning Objectives to review in this unit?
- What are the top assignments to review?
- What is the range of performance on a particular assignment?
- How many students aren't logging in?



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Goal-Setting and Reflection surveys help students plan and direct their learning, and provide instructors with an unprecedented view into students' metacognition:

- The **Intro Survey** asks students to consider their goals for the class, providing a powerful source of intrinsic motivation. Students must then consider how they will manage their time and use learning strategies to achieve their plan.
- **Checkpoint surveys** ask students to monitor and assess their progress, and prompt them to make changes as necessary.
- **Each completed survey generates a report** for the instructor that reveals how the class is progressing—going well beyond the

course grades.

These tools help students develop control over their learning and foster a growth mindset to build long-lasting academic success.

Additional Instructor Resources in Macmillan Learning's Achieve: All in One Place

Instructor's Resource Manual

We consulted with national award-winning teacher Elizabeth Hammer (Xavier University) to improve the content and organization of our Instructor's Resource Manual, available as downloadable Word files. Engage your students with this abundance of active learning opportunities, including a "Diversity in Psychology: Spotlight on Women" collection of 17 activities created by Salena Brody (University of Texas, Dallas).

Image Slides and Tables

Presentation slides feature module illustrations and tables and can be used as is or customized to fit your needs. Alt text for images is available upon request via WebAccessibility@Macmillan.com.

Lecture Slides

Accessible, downloadable presentation slides provide support for key concepts and themes from the text, and can be used as is or customized to fit your needs.

Macmillan Learning's Achieve Read & Practice

Achieve Read & Practice marries Macmillan Learning's mobile-accessible e-book with the acclaimed LearningCurve adaptive quizzing. It is an easy-to-use yet exceptionally powerful teaching and learning option that streamlines the process of increasing student engagement and understanding, and reduces cost. If students struggle with a particular topic, they are encouraged to re-read the material and answer a few short additional questions. The gradebook provides analytics for student performance individually and for the whole class, by group of modules, by module, and by topic, helping instructors prepare for class and one-on-one discussions. Instructors can assign reading simply, and students can complete assignments on any device. See MacmillanLearning.com/ReadandPractice.

Customer Support

Our Achieve Client Success Team—dedicated platform experts—provides collaboration, software expertise, and consulting to tailor each course to fit your instructional goals and student needs. Start with a demo at a time that works for you to learn more about how to set up your customized course. Talk to your sales representative or visit MacmillanLearning.com for more information.

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Psychology

FOURTEENTH EDITION

David G. Myers

Hope College

Holland, Michigan

C. Nathan DeWall

University of Kentucky

Lexington, Kentucky

June Gruber

University of Colorado Boulder

Boulder, Colorado

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With gratitude for his enabling educational publishing at its creative best—supporting author-editor teamwork and a prosocial sense of mission

[ND] To Jean and Susan Rudolph

Loving in-laws and role models of patience, kindness, and integrity

[JG] To Ansel and Silvan Gruber Saucedo

For all you bring to my life, to the end of the universe and back

About the Authors



Photographer Steven Herppich, courtesy of Hope College Public Affairs and Marketing

David Myers received his B.A. in chemistry from Whitworth University, and his psychology Ph.D. from the University of Iowa. He has spent his career at Michigan's Hope College, where he has taught dozens of introductory psychology sections. Hope College students have invited him to be their commencement speaker and voted him "outstanding professor." His research and writings have been recognized by the Gordon Allport Intergroup Relations Prize, an Honored Scientist award from the Federation of Associations in Behavioral & Brain Sciences, an Award for Distinguished Service on Behalf of Social-Personality Psychology, a Presidential Citation from APA Division 2, election as an American Association for the Advancement of Science Fellow, and three honorary doctorates.

With support from National Science Foundation grants, Myers' scientific articles have appeared in three dozen scientific periodicals, including *Science, American Scientist, Psychological Science,* and *American Psychologist*. In addition to his scholarly and textbook writing, he digests psychological science for the general public. His writings have appeared in four dozen magazines, from *Today's Education* to *Scientific American*. He also has authored six general audience books, including, in 2022, *How Do We Know Ourselves? Curiosities and Marvels of the Human Mind*. And he blogs about psychology and life at TalkPsych.com.

David Myers has chaired his city's Human Relations Commission, helped found a thriving assistance center for low-income families, and spoken to hundreds of college, community, and professional groups worldwide.

Drawing on his experience of hearing loss, which now includes a cochlear implant, he also has written articles and a book (*A Quiet World*) about hearing loss, and he is advocating a transformation in U.S. assistive listening technology (see HearingLoop.org). For his leadership, he has received awards from the American Academy of Audiology, the hearing industry, and the Hearing Loss Association of America.

David and Carol Myers met and married while undergraduates, and have raised sons Peter and Andrew, and a daughter, Laura. They

have one grandchild, Allie (see p. 178).


Shirley Howell

Nathan DeWall is professor of psychology at the University of Kentucky. He received his bachelor's degree from St. Olaf College, a master's degree in social science from the University of Chicago, and a master's degree and Ph.D. in social psychology from Florida State University. DeWall received the College of Arts and Sciences Outstanding Teaching Award, which recognizes excellence in undergraduate and graduate teaching. The Association for Psychological Science identified DeWall as a "Rising Star" early in his career for "making significant contributions to the field of psychological science." He has been included in the top 1 percent of all cited scientists in psychology and psychiatry on the Institute for Scientific Information list, according to the Web of Science.

DeWall conducts research on close relationships, self-control, aggression, the psychology of religion, and intellectual humility. With funding from the National Institutes of Health, the National Science Foundation, and the John Templeton Foundation, he has

published 225 scientific articles and chapters. DeWall's research awards include the SAGE Young Scholars Award from the Foundation for Personality and Social Psychology, the Young Investigator Award from the International Society for Research on Aggression, and the Early Career Award from the International Society for Self and Identity. His research has been covered by numerous media and entertainment outlets, including Good Morning America, *The Wall Street Journal, Newsweek, The Atlantic Monthly, The New York Times, The Los Angeles Times, Harvard Business Review, USA Today,* National Public Radio, *The Guardian*, the BBC, and a Netflix documentary. He has lectured nationally and internationally, including in Hong Kong, China, the Netherlands, England, Greece, Hungary, Sweden, Australia, and France.

Nathan is happily married to Alice DeWall and is the proud father of Beverly "Bevy" and Ellis. He also enjoys taking care of the family dog, Artie. As an ultramarathon runner, he completed numerous races, including the Badwater 135 in 2017 (dubbed "the World's toughest foot race"). In his spare time now, he enjoys hiking, attending live concerts, setting up and maintaining aquariums, watching sports, and playing guitar and singing in local rock bands.



Molly Seeling

June Gruber is an associate professor of psychology and neuroscience at the University of Colorado Boulder. She was previously a faculty member at Yale University. She received her B.A. in psychology, and her Ph.D. in clinical psychology from the University of California Berkeley. Gruber has published over 100 articles and chapters and has edited two books — *The Oxford Handbook of Positive Emotion* and *Psychopathology and Positive Emotion: Integrating the Light Sides and Dark Sides* with Judith Moskowitz. Her research has received several honors, including the Association for Psychological Science's Rising Star Award, the Janet Taylor Spence Award for Transformative Early Career Contributions, the Society for Research in Psychopathology's Early Career Award, the NARSAD Young Investigator Award, and Yale University's Arthur Greer Memorial Prize for Outstanding Junior Faculty. Gruber has served as an Associate Editor and Interim Editor-in-Chief for *Perspectives on Psychological Science* and is currently an Associate Editor at *Emotion*.

Gruber directs the Positive Emotion and Psychopathology Laboratory, where she studies the links between positive emotions and mental health, including the "dark side" of happiness. Gruber co-led a field-wide call to action in response to the mental health crisis sparked by Covid-19 (Gruber et al., 2021).

Gruber's passion for teaching psychology and training future generations of scholars extends beyond the classroom. She has created freely available interview series and courses for the general public, including a Coursera #TalkMentalIllness course, Experts in Emotion Interview Series at Yale University, and an online course in Human Emotion. Gruber has also co-written a column for young scientists in ScienceCareers.org (from the journal *Science*) and is currently writing for *Teaching Current Directions in Psychological Science* (along with Myers and DeWall). Her teaching efforts have received several awards, including the Faculty Assembly Excellence in Teaching and Pedagogy Award, the UROP Outstanding Faculty Mentor Award, and the Cogswell Award for Inspirational Instruction at the University of Colorado Boulder. Gruber is invested in supporting and elevating the careers of underrepresented women in the sciences. She leads workshops, publishes papers, and gives talks to raise awareness about gender disparities in the field and to chart a proactive path forward.

Gruber enjoys spending quiet days in the Colorado mountains with her two sons, Ansel and Silvan, and her husband, Raul, whom she

met as an undergraduate psychology major. She enjoys taking hikes with her dogs Buddy and Eddy, making art projects with her children, traveling, and basking in the nostalgia of 80s music.

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Instructor Preface

APA Introductory Psychology Initiative, and Learning Goals and Outcomes for the Psychology Major
What Should I Know About the NEW Fourteenth Edition?
Myers' Eight Guiding Principles
In Appreciation

PSYCHOLOGY IS FASCINATING, and so relevant to our everyday lives. Psychology's insights enable students to be more successful in their courses, more tuned-in friends and partners, more effective co-workers, wiser parents, and engaged community citizens. With this new edition, we hope to help students think more like psychological scientists, and to arm them with the critical-thinking skills they need to think smart and challenge misinformation in our post-truth world. We also hope to make the *teaching* of psychology easier and more enjoyable for you, the instructor. Our integrated resources in *Macmillan Learning's Achieve* aim to support your class preparation, and to bring your students to class better prepared. These resources include:

- ***133 new introductory psychology videos.***
- our new "Skills for Student Success" activity.
- new student Goal-Setting and Reflection Surveys and other built-in analytics.
- my [DM] 5 new assignable *How Do We Know Ourselves?* essays (excerpted from my new general audience book), accompanied by assessment.
- the lauded LearningCurve adaptive quizzing.
- a heavily updated and improved Instructor's Resource Manual.

- our immersive learning activities ("How Would You Know?" research activities, including my [ND] new activity on social media; "Assess Your Strengths" self-assessment activities, including my [JG] new activities on healthy emotional ecosystems and on experiences of awe; and "Thinking Critically About" critical-thinking activities).

In this edition, we have decided to combine our "chapter" and "modular" formats. This offers all those using the text the opportunity to more easily assign carefully segmented portions of a chapter (modules), or to assign whole chapters if they prefer. Each module is a stand-alone teaching/learning unit that does not depend on other modules for student understanding, which facilitates flexible use. All of Macmillan Learning's Achieve resources are matched to the numbered modules, yet you still have the opportunity to use "Chapter Practice Quizzes" and to create whole chapter tests if you opt to teach all of the modules in a chapter.

From its first edition, this text has focused on teaching ***critical thinking,*** and helping students understand that psychology is a ***science,*** and that ***research*** underlies psychological discoveries. We've expanded that focus in this new edition. (See p. viii to learn more about the Myers/DeWall/Gruber critical-thinking story.) This new edition offers 1427 research citations dated 2019–2022, making these ***the most up-to-date introductory psychology course resources available.*** With so many exciting new findings, and every module updated with current new examples and ideas, students will see the importance and value of psychological research, and how psychology can help them make sense of the world around them. For example, we discuss new research on how the Covid-19 pandemic has affected our need to belong (What Drives Us modules), the social responsibility norm and prejudice (Social Psychology modules), and suicidal behavior (Psychological Disorders modules), and we offer several statistical examples related to the pandemic

(Thinking Critically With Psychological Science modules) and cultural variations in Covid effects (Nature, Nurture, and Human Diversity modules).

APA Introductory Psychology Initiative, and Learning Goals and Outcomes for the Psychology Major

The American Psychological Association (APA) released the final results of its Introductory Psychology Initiative (IPI) in August 2021, in hopes of improving "the quality of the introductory psychology experience" (APA.org/Ed/Precollege/Undergrad/Introductory-Psychology-Initiative). The APA IPI ***Student Learning Outcomes for Introductory Psychology*** consist of three outcomes related to "Psychology Content," four outcomes related to "Scientific Thinking," and seven "Integrative Themes."

The IPI charges students to "Identify basic concepts and research findings" (Psychology Content) and to "Solve problems using psychological methods" (Scientific Thinking).

The IPI encourages instructors to incorporate and assess the ***seven Integrative Themes*** throughout the course to help students (A) adapt their thinking in response to empirical evidence; (B) recognize general principles but individual differences; (C) acknowledge biological, psychological, and social-cultural influences; (D) respect diversity, equity, and inclusion; (E) be aware of perceptual and thinking errors; (F) apply psychology's principles to improve their own lives and communities; and (G) value psychology's ethical principles. To help students understand and apply these key themes, Garth Neufeld (Cascadia College) has created a brief video about each theme, along with an introductory video about the APA IPI's Integrative Themes. These helpful resources may be found in Macmillan Learning's Achieve, where they are

accompanied by assessment so that they may be assigned and will report to the gradebook.

The IPI recommends choosing course content using the ***pillar model*** (APA, 2014; Gurung et al., 2016)—and covering at least two topics from each pillar (**FIGURE 1**).

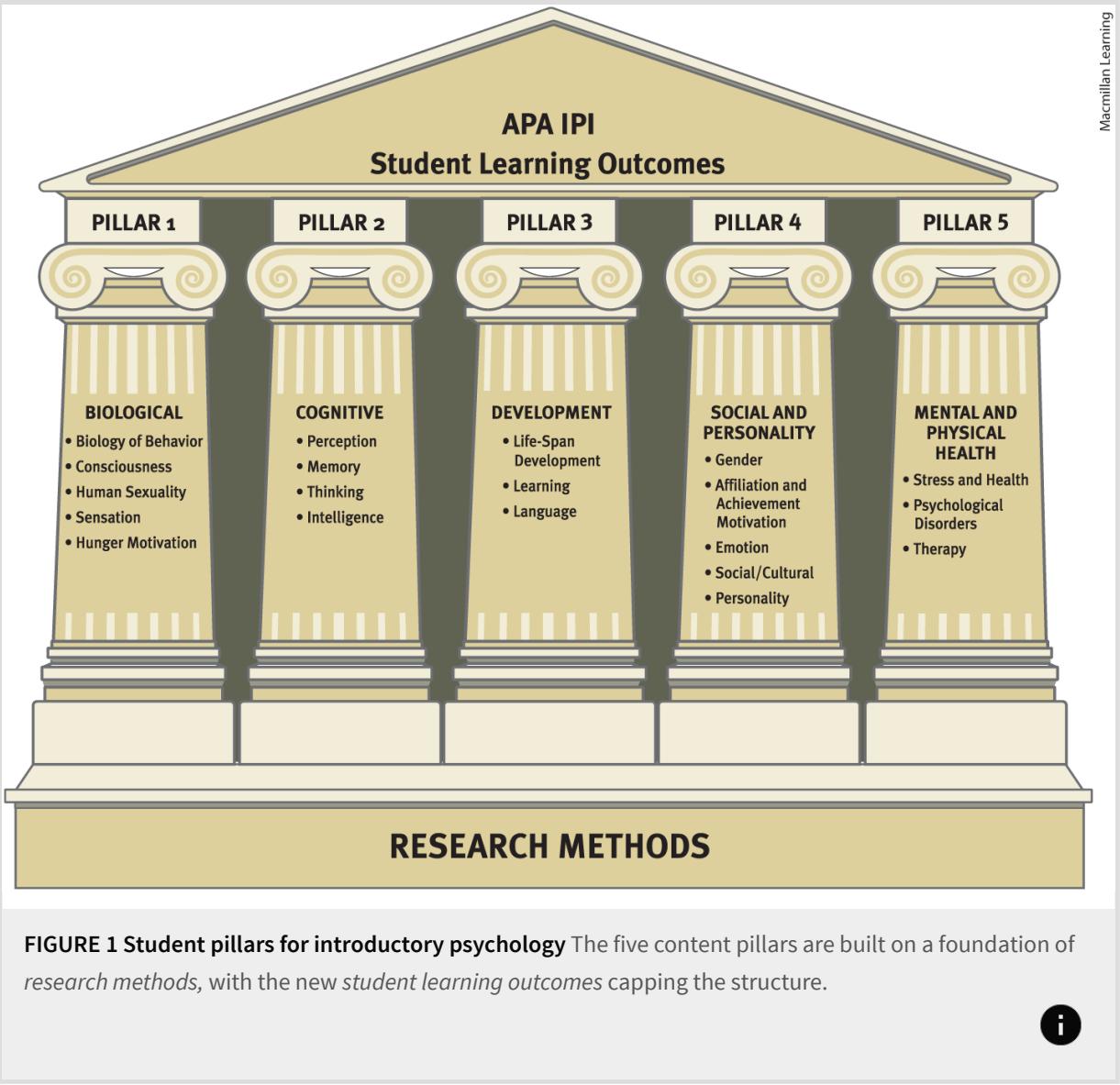

FIGURE 1 Student pillars for introductory psychology The five content pillars are built on a foundation of *research methods,* with the new *student learning outcomes* capping the structure.

Psychology, Fourteenth Edition, and its resources offer a perfect match for those interested in following these new guidelines, with full text coverage of relevant content, and abundant student and classroom activities and assessment opportunities (see **TABLES 1** and **2**).

TABLE 1 *Psychology,* Fourteenth Edition, Corresponds to APA IPI Student Learning Outcomes

APA IPI Student Learning Outcomes	***Psychology,* Fourteenth Edition, Coverage**
Psychology Content: Identify basic concepts and research findings	
1.1 Define and explain basic psychological concepts.	*Psychology,* 14th Edition, offers a compelling and complete survey of the field, including all of the "Sample Concepts or Ideas" outlined in Table 2.
1.2 Interpret research findings related to psychological concepts.	• The reality that psychology is a science and that research supplies our understandings of psychology's concepts is emphasized throughout the text. See Table 6 at the end of this Preface. • In addition, David Myers regularly blogs at TalkPsych.com, where he shares the most exciting new psychological science discoveries, how the field is adapting in response, and how psychology helps explain the rapidly changing world around us.
1.3. Apply psychological principles to personal growth and other aspects of everyday life.	• Since the first edition of the text, one of the "eight guiding principles" has been "to provide applications of principles." The authors strive throughout to make psychology meaningful and memorable to students by showing how it relates to their lives. • For numerous examples, see *Psychology* coverage listed in Table 2 for Integrative Theme F.
Scientific Thinking: Solve problems using psychological methods	
2.1 Describe the advantages and limitations of research strategies.	• *Psychology* Module 2 details the main research designs, and offers a section that addresses "How would you know which research design to use?"

2.2. Evaluate, design, or conduct psychological research.	• "How Would You Know?" ***research activities*** for each chapter in Macmillan Learning's Achieve allow students to play the role of researcher as they design and interpret studies. Students consider possible confounding factors and other issues that affect interpretation of results. Students learn about how key decision points can alter the meaning and value of a psychological study, and they develop scientific literacy skills in the process. Topics include "How Would You Know If People Can Learn to Reduce Anxiety?" and "How Would You Know If Schizophrenia Is Inherited?" • ***New research-oriented iClicker questions,*** based on research presented in the text, are available for each chapter, helping build student understanding of research design and interpretation.
2.3 Draw logical and objective conclusions about behavior and mental processes from empirical evidence.	• There are ***"Thinking Critically About …" infographics,*** with associated activities in Macmillan Learning's Achieve, for every chapter to guide students to consider available empirical evidence before drawing conclusions. Topics include parenting styles, gender bias, sexual aggression, effects of violence-viewing, lie detection, and introversion. • Module 27 outlines the obstacles to effective decision making, judgment, and problem solving, including confirmation bias, fixation, mental set, representativeness and availability heuristics, overconfidence, belief perseverance, and framing.
2.4. Examine how psychological science can be used to counter unsubstantiated statements, opinions, or beliefs.	• "To teach critical thinking" has been the first of the "eight guiding principles" that have guided Myers' work on this text since the first edition, and in the editions that have followed with Nathan DeWall and now June Gruber. • Table 6 at the end of this Preface outlines the critical-thinking coverage and in-depth stories of psychology's process of scientific inquiry. • Module 2 offers a section on "Psychological Science in a Post-Truth World," which is accompanied by Myers' tutorial animation "Thinking Critically in Our Post-Truth World" in Macmillan Learning's Achieve.

TABLE 2 *Psychology,* Fourteenth Edition, Corresponds to APA IPI *Integrative Themes*

APA's Seven "Integrative Themes"	**APA's "Sample Concepts or Ideas"**	***Psychology,* Fourteenth Edition Coverage**
A. Psychological science relies on empirical evidence, and adapts as new data develop.	• Experimental methods • Statistics • Memory models • Subliminal perception • Therapy interventions	• The reality that psychology is a science and that research matters is emphasized throughout the text. See Table 6 at the end of this Preface. • In addition, David Myers regularly blogs at TalkPsych.com, where he shares the most exciting new psychological science discoveries, how the field is adapting in response, and how psychology helps explain the rapidly changing world around us.
B. Psychology explains general principles that govern behavior while recognizing individual differences.	• Intelligence • Resilience • Personality testing • Supertasters • Synesthesia	• Since the first edition of this text, one of Myers' Eight Guiding Principles has been ***"to convey respect for human unity and diversity."*** Readers will learn about human kinship in our shared biology and need for affiliation; our shared mechanisms for learning and remembering, emotional expression, and the stress response; and our shared vulnerability to perceptual and thinking errors. Yet they will learn much about our individual diversity—in development and aptitudes, temperament and characteristics, sexual orientation and gender identity, attitudes and motivations, disorders and health—and about cultural and other group variations.
C. Psychological, biological, social, and cultural factors influence behavior and mental processes.	• Psychological disorders • Aging • Health and wellness • Attachment • Personality theories	• The ***biopsychosocial approach*** is introduced in Module 1 and carried through the rest of the book, with regular narrative reflections on the biological, psychological, and social-cultural factors influencing our understanding of behavior and mental processes. The text includes flow charts outlining the biopsychosocial influences on key topics, including development, aging, disordered drug use, learning, sexual motivation, aggressive

		behavior, personality, and psychological disorders.
D. Psychology values diversity, promotes equity, and fosters inclusion in pursuit of a more just society.	• Racial and cultural identity • Stereotypes • Racism • Biases • Prejudice, implicit and explicit • Emotion regulation	• This text fully reflects psychology's diversity, equity, and inclusion values. The authors make no assumptions about the race/ethnicity, culture, gender identity, sexual orientation, relationship or family status, age, economic background, and cognitive or physical ability of their readers. Students of all kinds will see themselves represented in examples and illustrations throughout these resources. And the authors include important topics related to justice, including in discussions of moral development, prejudice, intelligence test bias, and legal system bias. June Gruber has added a new section on Emotion Regulation in Module 40, and a new activity in Macmillan Learning's Achieve—Assess Your Strengths: How Healthy Is Your Emotional Ecosystem?
E. Our perceptions and biases filter our experiences of the world through an imperfect personal lens.	• Perceptual illusions • Schemas • Cognitive errors • Self-serving bias • Ingroup bias	• The Module 18 discussion of "Processing Sensations and Perceptions" outlines the impressive strengths and numerous weaknesses in our ability to detect and interpret incoming stimuli. Other coverage of our "imperfect personal lens" includes: cognitive errors (Module 27), ingroup bias (Module 43), and self-serving bias (Module 47).
F. Applying psychological principles can change our lives, organizations, and communities in positive ways.	• Psychotherapy • Study skills • Coping • Conflict resolution • Behavioral change	• This edition has an improved student preface—***Student Success: How to Apply Psychology to Live Your Best Life.*** This preface offers brief discussions of "Thinking Critically and Scientifically," "Self-Control and Self-Improvement," "Time Management and Study Tips," "Social Life," and "Finding Meaning and Pursuing Goals." • ***"Ask Yourself"*** questions appear throughout each module to help students apply what they are learning to improve their own lives. This

		helps make the material more meaningful and memorable. • ***Self-applications*** are built into the narrative throughout the text. Examples include: "Use Psychology to Become a Stronger Person—and a Better Student" (Module 1), tips on "How to Improve Your Sleep" (Module 9), goal-setting to "Change Your Own Behavior" (Module 22), "Goal-Setting" strategies (Module 35), "Improving Memory" (Module 26), ways to "boost the creative process" (Module 27), building a "Growth Mindset" (Module 31), "Tips for Healthy Eating" (Module 33), "Connecting and Social Networking" (Module 35), "Evidence-Based Suggestions for a Happier Life" (Module 38), guidance for coping with stress (Module 40), "How to Be Persuasive" (Module 41), "Cognitive Therapy Techniques" (Module 54), "When should a person seek therapy and what should people look for when selecting a therapist?" (Module 55), "Therapeutic Lifestyle Change" (Module 56), and tips for finding "flow" (Appendix C). • In the ***"Assess Your Strengths" activities*** in Macmillan Learning's Achieve, students apply what they are learning from the text to their own lives and experiences by considering key "strengths." Students assess themselves on the strength (critical thinking, quality of sleep, self-control, relationship strength, and more), then get guidance for nurturing that strength in their own lives. • The value of ***community psychology*** and preventive mental health work is discussed in Module 1, Module 56, and Appendix B. Related discussions include: the social toxicity of extreme income inequality (Module 38), the importance of community communication (Module 44), and the relationship of income levels and community empowerment (or lack thereof) to mental disorders (Module 48).

G. Ethical principles guide psychology research and practice.	• Beneficence (do good) and nonmaleficence (do no harm) • Fidelity and responsibility • Integrity • Justice • Respect for people's rights and dignity	• Module 2 includes discussions of "Psychology's Research Ethics," "Ensuring Scientific Integrity," "Studying and Protecting Animals," "Studying and Protecting Humans," and "Values in Psychology." • Module 55 has a main section on "Ethical Principles in Psychotherapy."

In addition, **APA's 2023 Learning Goals and Outcomes** from the *APA Guidelines for the Undergraduate Psychology Major 3.0* (still in draft form at the time of this text's publication) were designed to gauge progress in students graduating with psychology majors. The new guidelines offer "Foundation Indicators" for students completing an intro course, and "Baccalaureate Indicators" for those completing a major. Many psychology departments have used these goals and outcomes in previous versions to help establish benchmarks for departmental assessment purposes. **TABLE 3** outlines the way *Psychology,* Fourteenth Edition, can help you and your department address the Foundation Indicators for APA's Learning Goals and Outcomes 3.0. There is a detailed APA Correlation Guide in Achieve's Instructor Resources for this fourteenth edition.

TABLE 3 *Psychology,* Fourteenth Edition, Corresponds to APA Learning Goals 3.0[1]

Relevant Feature from *Psychology,* Fourteenth Edition	APA Learning Goals				
	Content Knowledge and Applications	Scientific Inquiry and Critical Thinking	Values in Psychological Science	Communication, Psychological Literacy, and Technology Skills	Personal a Professior Developm

Text content	•	•	•	•	•
Student Success preface and Skills for Student Success activity in Macmillan Learning's Achieve	•	•	•	•	•
Myers/DeWall/Gruber's focus on research and critical thinking	•	•	•		
"Thinking Critically About …" infographics and their Achieve activities	•	•	•		
"Learning Objective Questions" previewing main sections	•	•			
"Retrieval Practice" self-tests throughout	•	•	•		
"Ask Yourself" questions integrated throughout	•	•	•	•	•
"Try this" style activities integrated throughout the text and Achieve resources	•	•		•	•
"Module Test" self-tests	•	•		•	
"Psychology at Work" (Appendix C)	•	•	•	•	•
"The Story of Psychology" timeline	•		•		•

(Appendix A)					
"Career Fields in Psychology" (Appendix B) with "Pursuing a Psychology Career" in Achieve	•		•		•
LearningCurve adaptive quizzing	•	•	•	•	•
IRM activities, including Spotlight on Women activities, and Diversity in Psychology activities	•	•	•	•	•
"Assess Your Strengths" activities in Achieve	•	•	•	•	•
"How Would You Know?" research activities in Achieve	•	•	•	•	•
New research-oriented iClicker questions	•	•	•		

1. Information for this table is from the draft form of the APA's Learning Goals and Outcomes 3.0 that was available at the time of this text's publication.

What Should I Know About the NEW Fourteenth Edition?

In addition to our thorough, line-by-line updating of every module, and our ongoing efforts to *make no assumptions* about student readers' gender identity, sexual orientation, culture, relationship or family status, age, economic or

educational background, and physical or cognitive ability, we offer much that is new or noteworthy in this fourteenth edition.

1. **Over 1400 research citations dated 2019–2022.** Our ongoing scrutiny of dozens of scientific periodicals and science news sources, enhanced by commissioned reviews, enables integrating our field's most important, thought-provoking, and student-relevant new discoveries. Part of the pleasure that sustains this work is learning something new every day! Ask your Macmillan Sales Representative for a module-by-module list of significant Content Changes. See also #5 in this list, "More support for teaching that psychology is a science, and that critical thinking and research matter!"
2. **Macmillan Learning's Achieve for Psychology!** See the section at the beginning of the text for more information about these engaging digital resources, including 133 fresh new videos, our new "Skills for Student Success" activity, a revised and thoroughly updated Instructor's Resource Manual, and new research-oriented iClicker questions (contributed by Jennifer Zwolinski, University of San Diego) that test student understanding of effective research design, the component parts of key research that's presented in the text, and the implications of research results. Macmillan Learning's Achieve also retains the best from our previous teaching and learning platform: LearningCurve adaptive quizzing, "How Would You Know?" research activities, "Assess Your Strengths" self-assessment activities (including a new activity, "How Healthy Is Your Emotional Ecosystem?" by June Gruber), "Thinking Critically About …" infographic activities, the popular PsychSim tutorials, and Concept Practice tutorials.
3. **Continuously improving diversity, equity, and inclusion.** Since this text's first edition, one of its Eight Guiding Principles has been "To convey respect for human unity and diversity." A lot has changed in the field of psychology since the last edition was written, especially in the fast-moving

subfields of cultural diversity, human sexuality, and gender psychology, and in the language we use to refer to varying groups of people. We sought extra reviews from experts and instructors, and we made extensive updates to this coverage in the text and in the language used in all of our text and assessment materials. With a growth mindset, we seek ongoing conversation and constant improvement.

In Modules 13 and 34, and throughout these resources, we've worked to be appropriately inclusive and fully up-to-date in our presentation of gender, gender identity, and sexual orientation—representing the abundance of current research in these areas, but also encompassing the lived experiences of many people. Our improved photo and illustration program, and our updated examples and stories, help all students see themselves in this book and its resources. (See **TABLE 4** The Psychology of Gender, Gender Identity, and Sexuality, and **TABLE 5**, The Psychology of Culture, Ethnicity, and Race at the end of this Preface.)

4. **A broad global perspective for our worldwide student audience.** We continue to offer a *world-based psychology for our worldwide student readership*. Thus, we continually search the world for research findings and text and photo examples, conscious that readers may be in Melbourne, Montreal, or Memphis. Although we reside in the United States, we have traveled abroad regularly and maintain contact with colleagues in Canada (including one of our editors), Australia, Brazil, Britain, China, Hong Kong, and many other places. And we glean research from worldwide psychology and psychiatry periodicals. As a result, each new edition offers a world-based perspective, and includes research from around the world.

As global citizens, U.S. students, too, benefit from information and examples that internationalize their world-consciousness. And if psychology seeks to explain human behavior (not just American or Canadian or Australian behavior), the broader the scope of studies presented, the more accurate is our

picture of this world's people. We hope to expose all students to the world beyond their own culture, and we continue to welcome input and suggestions from all readers.

The results of this effort to internationalize include dozens of Canadian examples and dozens more from other countries. Some of these examples are, by themselves, trivial. Yet by the book's end these examples accumulate, we hope, to a significant exposure to Canadian and worldwide culture and science. Mindful of the book's worldwide readership in a dozen languages, we also seek to avoid peculiarly American examples and to specify the country (rather than assume the United States) when mentioning national data.

5. **More support for teaching that psychology is a science, and that critical thinking and research matter!** "To teach critical thinking" has been the first of the Eight Guiding Principles that have guided our work on this text since the first edition. Chapter 1 takes a critical-thinking approach to introducing students to psychology's research methods and the idea that *psychology is a science*. Critical thinking is a key term on p. 4 and is encouraged throughout the text and its resources. For example, we offer "Thinking Critically About …" infographics in each chapter, with accompanying activities in Macmillan Learning's Achieve. See **TABLE 6**, Critical Thinking and Scientific Inquiry, at the end of this Preface for a deeper list of coverage. Throughout the text and its Achieve resources, students are encouraged to *think critically,* by examining sources and evidence, and to *consider other voices and ideas,* by being open to diverse perspectives.

The most important task for us as your authors is to report the current state of psychology, including each subdiscipline's latest research insights. The end-of-book ***References*** section highlights the 1427 citations from 2019–2022 in blue. With thousands of studies published each year, it takes a daily effort to keep up

with all that is happening in our exciting field. In winnowing new research findings, we consider:

- *Reliability:* Does either replication or the inherent scale of the finding make it trustworthy?
- *Importance:* Is this, for psychology, a significant new finding? And is this something an educated person needs to know?
- *Clarity:* Is this something our readers could understand and remember?

The new findings met these high standards for inclusion. Each confirms key concepts or informs the way we present them. The remaining thousands of reference citations include important classic studies that have formed the structure of our discipline.

We all want students to walk away with the most accurate, current understandings of psychology to apply in their own lives and work. Having the latest research engages students so much more effectively. Here are three examples of new research areas—from just the last few years—that are important for students' understanding of psychological science and its application in their lives.

A. *People often spurn those with differing worldviews, yet the recent scientific evidence we share in this new edition demonstrates value in embracing diverse perspectives:*
    - Lower racial prejudice is linked with better personal health in that region (Michaels et al., 2022; see Module 39, Stress and Illness).
    - Children raised with competent, secure, and nurturing care can flourish regardless of parents' gender and sexual orientation (Calzo et al., 2019; see Module 15, Infancy and Childhood).
    - People who are transgender have a more positive therapeutic experience when therapists affirm them (Bettergarcia & Israel, 2018;

see Module 55, Evaluating Psychotherapies).
    - Social media communication often occurs in an ideological vacuum, in which we surround ourselves with mostly like-minded individuals and become susceptible to misinformation (Hills, 2019; see Module 42, Social Influence).

B. *Social media use has soared, and the new research we present in Module 2, Research Strategies, and Module 35, Affiliation and Achievement, explores correlational, longitudinal, and experimental studies of its possible effects, such as on increasing depression and suicidal thoughts in teen girls.*

C. *Psychedelic drugs are being studied as possible safe and effective methods to treat various psychological disorders, such as depressive disorders, posttraumatic stress disorder, and substance-related and addictive disorders (see Module 56: The Biomedical Therapies and Preventing Psychological Disorders).*

Other new, student-relevant research explores

- navigating our "post-truth" world,
- understanding how gene–environment interactions affect us,
- distinguishing substance use from abuse,
- weighing parent/peer influences on our development,
- appreciating our unique sensory and perceptual windows on the world,
- figuring out how to learn and remember most effectively,
- successfully connecting socially with others to build our health and well-being,
- enjoying micro-friendships with those we encounter in our day-to-day lives,
- understanding gender identity and sexual orientation,
- learning about our hunger and sexual motivations,
- coping with stress and determining how to thrive,
- regulating our emotions effectively so that we can live our best life,
- recognizing inborn personality variations,

- dealing with the challenges of mental illness,
- appreciating neurodiversity (including those with autism spectrum disorder, and those experiencing ADHD, a specific learning disorder, or brain injury),
- finding hope in psychological and biomedical therapies, and
- seeking "flow" in our daily lives and work.

6. **Improved Student Preface—Skills for Student Success: How to Apply Psychology to Live Your Best Life—With a NEW Student Success Activity in Macmillan Learning's Achieve.** When we ask our teaching colleagues to share the most important lessons they wish to impart to students, they often tell us they want to teach students to think critically, and to apply psychology to their own lives so that they can live better and be more successful. This brief Student Success preface, and its interactive component in Achieve, preview relevant resources in the text and in Achieve, and help get students on the right path with sections on
   - Thinking Critically and Scientifically,
   - Self-Control and Self-Improvement,
   - Time Management and Study Tips,
   - Social Life, and
   - Finding Meaning and Pursuing Goals.

In addition, students will find opportunities to *improve their everyday life* throughout the text by using evidence-based principles to boost their relationships, academic success, stress management, and so much more.

7. **Improved, easier-to-use Instructor's Resource Manual.** We consulted with national award-winning teacher Elizabeth Hammer (Xavier University) to radically improve the content and organization of our Instructor's Resource Manual, which offers an abundance of active learning opportunities to engage your students. The IRM includes a "Diversity in Psychology: Spotlight on Women" collection of 17 activities,

as well as two new activities on diversity in psychology for use with the Timeline (Appendix A), all created by Salena Brody (University of Texas, Dallas).

8. **This text offers excellent neuroscience coverage and DSM-5-TR updates, and it maps almost exactly to the MCAT Behavioral Sciences section, making it perfect for nursing and premed students.** We have continued to improve our strong neuroscience, behavior genetics, and evolutionary psychology coverage in this new edition, reflecting the dynamic nature of these subfields. See **TABLE 7** and **TABLE 8** at the end of this Preface for a list of topics covered. This new edition also contains updated terminology and diagnostic criteria to match the *new DSM-5-TR* (2022).

Psychology maps well onto the new MCAT's psychology section. Since 2015, the MCAT has devoted 25 percent of its questions to the "Psychological, Social, and Biological Foundations of Behavior." The new section's topics match up almost exactly with the topics in this text. See **TABLE 9** at the end of this Preface for a sample. There is a complete pairing of the new MCAT psychology topics with this book's contents in the Instructor's Resources in Macmillan Learning's Achieve.

9. **You won't find better service and support anywhere.** The Macmillan Learning representatives who market and sell these resources, help set up instructors' courses, and in many other ways service instructor and student course needs, are the best in the business. Many of these folks have become personal friends. We've been grateful to be working with a family-owned publisher that has been so supportive of our teaching mission and has encouraged us to create the best teaching and learning materials.
10. **This text is inclusive of all students.** We have written *Psychology* with the diversity of student readers in mind:

- *Gender:* Extensive coverage of gender development, changing gender roles, and gender identity.
- *Culture:* No assumptions about readers' cultural backgrounds or experiences.
- *Economic background:* No references to backyards, summer camp, vacations.
- *Education:* No assumptions about past or current learning environments.
- *Physical and cognitive abilities:* No assumptions about full vision, hearing, movement, or other abilities.
- *Life experiences:* Our writing has a multicultural, global perspective, and our stories and examples represent diverse groups.
- *Relationship or family status:* Examples and ideas are made relevant for all students, whether they have children or are still living at home, are married or cohabiting or single; and with no assumptions about sexual orientation or gender identity.

11. **This text offers abundant EVERYDAY LIFE applications.** Throughout this text, we relate the findings of psychology's research to the real world. This edition includes:
    - "Ask Yourself" questions throughout each module, helping students make the concepts more meaningful (and memorable), and apply psychology to improve their own lives. These questions can also be used as group discussion topics.
    - "Assess Your Strengths" personal self-assessments in Macmillan Learning's Achieve, allowing students to actively apply key principles to their own experiences and develop their strengths.
    - fun side notes and quotes throughout the text, applying psychology's findings to sports, literature, world religions, music, business, and more.

- an emphasis throughout the text on critical thinking in everyday life, including Module 3, "Statistical Reasoning in Everyday Life," helping students to become more informed consumers and everyday thinkers.

12. **The study system follows best practices from learning and memory research.** This text's learning system harnesses the *testing effect,* which documents the benefits of actively retrieving information through regular testing (**FIGURE 2**). Thus, our LearningCurve adaptive quizzing program provides a personalized study plan. In the text, each module offers **Retrieval Practice** questions interspersed throughout (**FIGURE 3**). Creating these *desirable difficulties* for students along the way optimizes the testing effect, as does *immediate feedback* via answers that are available for checking.

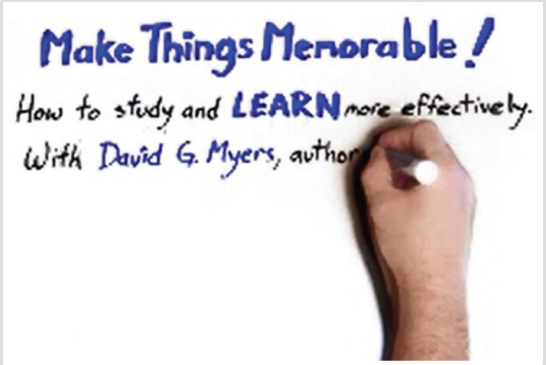

FIGURE2 How to learn and remember For my [DM's] 5-minute animated guide to more effective studying, visit tinyurl.com/HowToRemember.

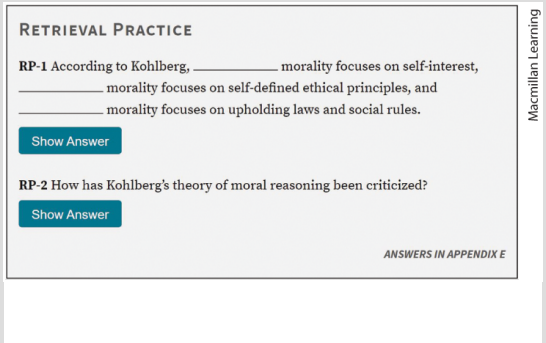

FIGURE 3 Sample Retrieval Practice feature



In addition, each module begins with a numbered question that establishes a **learning objective** and directs student reading. The Module Review section repeats these questions as a further self-testing opportunity (with answers available to check). The Module Review section also offers a self-test on the **Terms and Concepts to Remember,** and **Module Test** questions in multiple formats to promote optimal retention.

Myers' Eight Guiding Principles

We have retained the goals—the guiding principles—that have animated my [DM's] text since the first edition:

Facilitating the Learning Experience

1. **To teach critical thinking** By presenting research as intellectual detective work, we model a scientific mindset. Students will discover how critical thinking can help them evaluate competing ideas and popular claims—from vaccine myths and memory construction to group differences in intelligence and alternative therapies. Our "Thinking Critically About" infographic features, and the accompanying activities in Macmillan Learning's Achieve, help engage students in this learning. (See Table 6 at the end of this Preface for more about critical thinking in this text.)
2. **To provide applications of principles** Throughout the narrative, illustrations, and other Achieve resources we relate psychology's findings to real-world applications. We make psychology meaningful to students by showing how it relates to their lives—their lifespan development, their search for relationships and happiness, their understanding of negative

forces, such as prejudice, and so much more. The "Ask Yourself" questions throughout each module, and our "Assess Your Strengths" activities in Macmillan Learning's Achieve invite students to apply important concepts to their own lives, and to learn ways to develop key personal strengths. (See **TABLE 10**, Positive Psychology, for more about how we encourage understanding of happiness and human strengths, and see the Student Preface—Skills for Student Success: How to Apply Psychology to Live Your Best Life.)

TABLE 10 Positive Psychology

Coverage of *positive psychology* topics can be found in the following modules:	
Topic	**Module**
Altruism/compassion	1, 11, 23, 38, 40, 41, 44, 46, 47, 49, 50, 56
Coping	2, 13, 14, 15, 17, 20, 21, 35, 38, 39, 40, 45, 48, 54, 55, 56
Courage	38, 42, 43, 46, 52
Creativity	2, 8, 9, 13, 24, 27, 28, 29, 30, 35, 38, 40, 42, 45, 46, 50, App. C
Emotional intelligence	29, 31
Empathy	13, 16, 20, 23, 37, 42, 43, 44, 46, 48, 54, 55
Flow	38, 47, App. C
Forgiveness	13, 38
Gratitude	36, 38, 46
Happiness/life satisfaction	1, 2, 9, 10, 11, 14, 15, 16, 17, 25, 27, 29, 34, 35, 38, 39, 40, 44, 46, 47, App. C
Humility	1, 13, 46, 47
Humor	38, 40

Integrity	16, 17, 38
Justice	14, 16, 40, 48, 55
Leadership	13, 14, 23, 30, 35, 38, 39, 40, 42, 43, 46, 47, App. C
Love	2, 13, 14, 15, 16, 17, 20, 23, 26, 32, 34, 35, 37, 40, 41, 43, 44, 46
Morality	12, 13, 14, 15, 16, 23, 27, 28, 36, 41, 48
Optimism	15, 38, 40, 46, 50, 54
Personal control	13, 35, 38, 40, 42
Resilience	11, 13, 15, 16, 17, 31, 38, 39, 49, 55
Self-awareness	7, 15, 29, 46, 47, 54
Self-control	15, 16, 21, 22, 38, 40, 47, 54
Self-discipline	14, 16, 30, 31, 35, 40
Self-efficacy	47, 55
Self-esteem	15, 16, 17, 28, 32, 35, 39, 47, 48, 54, App. C
Spirituality	10, 16, 38, 39, 40, 46, 49, 56
Toughness (also grit)	15, 29, 31, 35
Wisdom	1, 13, 15, 27, 30, 38, 46

3. **To reinforce learning at every step** Everyday examples and thought-provoking questions encourage students to process the material actively. Self-testing opportunities throughout the text and Macmillan Learning's Achieve resources help students learn and retain important concepts and terminology.

Demonstrating the Science of Psychology

4. **To show the process of inquiry** We try to show students not just the outcome of research, but how the research process works, often by putting them in the role of experimenter or participant in classic studies. We introduce research stories as mysteries that unravel as one clue after another falls into place. Our "How Would You Know?" activities in Macmillan Learning's Achieve allow students to play the role of researcher in thinking about research questions and how they may be studied effectively.
5. **To be as up-to-date as possible** While retaining psychology's classic studies and concepts, we also present the most important recent developments. In this edition, 1427 new references are dated 2019–2022. Likewise, new photos and new everyday examples are drawn from today's world.
6. **To put facts in the service of concepts** Our intention is not to overwhelm students with facts, but to reveal psychology's major concepts—to teach students how to think, and to offer psychological ideas worth thinking about. Learning Objective Questions and Retrieval Practice questions throughout each module help students focus on the most important concepts. Concept Practice activities and PsychSim tutorials in Macmillan Learning's Achieve help ensure student understanding of key points.

Promoting Big Ideas and Broadened Horizons

7. **To enhance comprehension by providing continuity** Many modules have a significant issue or theme that links subtopics and ties the module together. The Learning modules convey the idea that bold thinkers can serve as intellectual pioneers. The Thinking and Language modules raise the issue of human rationality and irrationality. The Psychological Disorders modules convey empathy for, and understanding of, troubled

lives. Other threads, such as cognitive neuroscience, dual processing, and individual and group diversity, weave throughout the whole book, and students hear a consistent voice.

8. **To convey respect for human unity and diversity** Throughout the book, readers will see evidence of human kinship in our shared biology—our common mechanisms of seeing and learning, hungering and feeling, loving and hating. They will also better understand our diversity—our individual diversity in development and aptitudes, temperament and personality, and disorder and health; and our cultural diversity in attitudes and expressive styles, child raising and care for older family members, and life priorities and experiences.

In Appreciation

Aided by input from thousands of instructors and students over the years, this has become a better, more effective, more accurate book than three authors alone (these authors at least) could write. Our indebtedness continues to the innumerable researchers who have been so willing to share their time and talent to help us accurately report their research, and to the hundreds of instructors who have taken the time to offer feedback.

With this new edition, we are happy to introduce our new co-author, June Gruber (University of Colorado Boulder). We [DM and ND] admire June's dedication to rigorous research, her extensive collaborations with fellow scholars, and her passion for sharing psychological science with students and the wider world. We look forward to working together in the years ahead!

We also appreciate Salena Brody's (University of Texas, Dallas) careful work on our Psychology Timeline (Appendix A), including her added entries relating to the contributions of women and people of color, and the new Diversity in

Psychology: Focus on Women activities she created for the Instructor's Resource Manual.

Our gratitude extends to the colleagues who contributed criticism, corrections, and creative ideas related to the content, pedagogy, and format of this new edition and its resources. For their expertise and encouragement, and the gift of their time to the teaching of psychology, we thank the reviewers and consultants listed here:

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Anna Garr and Karissa Venne expertly coordinated creation of the media and assessment resources. Danielle Slevens and Betty Probert thoughtfully and carefully edited the Test Bank, LearningCurve, and Practice Quiz questions. Talia Green provided invaluable support in commissioning and organizing the multitude of reviews; coordinating our development and production schedules; completing diversity, equity, and inclusion audits of our content; and providing other editorial guidance. Robin Fadool and Cheryl DuBois worked together to create the lovely photo program.

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To achieve our goal of supporting the teaching of psychology, these resources not only must be authored, reviewed, edited, and produced, but also made available to teachers of psychology, with effective guidance and professional and friendly servicing close at hand. For their exceptional success in doing all this, our author team is grateful to Macmillan Learning's professional sales and marketing team. We are especially grateful to Executive Marketing Manager Kate Nurre, and Learning Solutions Specialists Justin Navarro and Emily White for tirelessly working to inform our teaching colleagues of our efforts to assist their teaching, and for the joy of working with them.

At Hope College, I [DM] was supported by the amazing Kathryn Brownson, who researched countless bits of information, assembled the bibliography, and edited and proofed every page. Kathryn is a knowledgeable and sensitive adviser on many matters.

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We [DM and ND] have enjoyed beginning our collaboration with June Gruber, and also our ongoing work with each other on this our twelfth co-authored book. In addition to our work together on the textbook, we contribute to the monthly "Teaching Current Directions in Psychological Science" column in the *APS Observer* (tinyurl.com/MyersDeWall). I [DM] also blog at TalkPsych.com, where I share exciting new findings, everyday applications, and observations on all things psychology.

Finally, our gratitude extends to the many students and instructors who have written to offer suggestions, or just an encouraging word. It is for them, and those about to begin their study of psychology, that we have done our best to introduce the field we love.

***

The day this book was released was the day we started gathering information and ideas for the next update. Your input will influence how this book continues to evolve. So, please, do share your thoughts.



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TABLE 4 The Psychology of Gender, Gender Identity, and Sexuality

Coverage of the *psychology of gender, gender identity, and sexuality* can be found in the following modules:
Absolute thresholds, M.18 Academic achievement, M.31 Adolescent sexual development, M.13 Adulthood, physical changes, M.17 Aggression, M.13, M.43 father absence and, M.43 pornography and, M.43 sexual, M.10, M.13 testosterone and, M.43 Alcohol use sexual aggression/disinhibition and, M.10 sexual response expectations and, M.10 the brain and, M.10 women's heightened risk, M.10

Alcohol use disorder, M.10, M.13, M.50
Altruism, M.44
Androgyny, M.13
Anger, M.37, M.39
Anorexia nervosa, M.52
Antisocial personality disorder, M.52
Anxiety, M.50
    physically stronger men have less, M.49
Asexuality, M.34
Attention-deficit/hyperactivity disorder (ADHD), M.13, M.53
Autism spectrum disorder, M.13, M.53
Beauty ideals, M.44
Binary gender identity, M.13, M.34
Body image, M.52
Brain differences, M.13
Bystander effect, M.44
CEOs, number of, M.13
Cohabitation and marriage, M.17
Color vision, M.19
Conscientiousness, M.31
Contraceptive use, teens, M.34
Covid-19 loss of jobs, women, M.13
Death of partner, M.17
Dehumanization of unattractive women, M.44
Depression
    Covid-19 pandemic and, M.50
    early menopause and, M.17
    higher vulnerability of women and girls, M.50
    obesity and, M.33
    rumination and, M.50
    sexual aggression and, M.13, M.50
    sexual harassment and, M.50
    sexual hook-ups and, M.2
    substance use and, M.10
    teenage girls and, M.16, M.50
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    job candidates, M.43
    scientific research positions, M.43
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Domestic violence/abuse, M.13, M.23, M.41, M.43
Dream content, M.9

Dual parenting, M.15
Eating disorders, M.13, M.52
    substance use and, M.10
Emerging adulthood milestones, M.16
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    anger, M.37
    conversations with parents and, M.37
    expressiveness, M.13, M.37
    gender, emotion, and nonverbal behavior, M.37
    identification of as masculine or feminine, M.37
Empathy, M.37, M.53
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    sex selection principle, M.12
External stimuli, M.11
Faith factor and longevity, M.40
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Father care, M.13, M.15
Father presence
    lower pregnancy rates and, M.34
    managing stress and, M.15
    sexual restraint and, M.15, M.34
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    Oedipus/Electra complexes, M.45
    of gender identity development, M.45
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    "penis envy," M.45
    sexual abuse, M.45
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    biological influences on, M.13
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    communication and, M.13
    defined, M.13
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    development, M.13
    discrimination, M.13

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Gender bias
intelligence and, M.31, M.43
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Leadership, transformational, App. C
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Can Memories of Childhood Sexual Abuse Be Repressed and Then Recovered?, M.26
Correlation and Causation, M.2

Cross-Sectional and Longitudinal Studies, M.30
Do We Use Only 10 Percent of Our Brain?, M.6
Gender Bias in the Workplace, M.13
How to Be Persuasive, M.41
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Parenting Styles—Too Hard, Too Soft, Too Uncaring, and Just Right?, M.15
Sexual Aggression, M.13
Stress and Health, M.39
Subliminal Stimulation and Subliminal Persuasion, M.18
The Challenges of Obesity and Weight Control, M.33
The Effects of Viewing Media Violence, M.23
The Fear Factor, M.27
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The Stigma of Introversion, M.46
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Tolerance and Addiction, M.10

Critical Examinations of Pop Psychology:

Can hypnosis be therapeutic? Alleviate pain?, M.20
Critiquing the evolutionary perspective, M.12
Do other species have language?, M.28
Do violent video games teach social scripts for violence?, M.43
Do we use only 10 percent of our brain?, M.6
How much credit or blame do parents deserve?, M.13
Is Freud credible?, M.45
Is psychotherapy effective?, M.55
Is repression a myth?, M.45
Is there extrasensory perception?, M.20
Near-death experiences, M.10
Perceiving order in random events, M.2
Sensory restriction, M.19
The need for psychological science, M.2

Thinking Critically With Psychological Science:

“Critical thinking” introduced as a key term, M.1
Choosing the right research design, M.2
Correlation and causation, M.2
Describing data, M.3
Exploring cause and effect, M.2

Independent and dependent variables, M.2
Making inferences, M.3
Psychological science in a post-truth world, M.2
Random assignment, M.2
Regression toward the mean, M.2
Statistical reasoning, M.3
The evolutionary perspective on human sexuality, M.12
The limits of intuition and common sense, M.2
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Scientific Detective Stories:

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Do prenatal viral infections increase the risk of schizophrenia?, M.51
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Girls' social media use and risk of depression and self-harm, M.2
How a child's mind develops, M.15
How are memories constructed?, M.24
How can hypnosis provide pain relief?, M.20
How do we see in color?, M.19
How do we store memories in our brain?, M.25
How does stress contribute to heart disease?, M.39
How is social support linked with health?, M.40
Is our happiness independent of others?, M.38
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Must bad events cause long-term unhappiness?, M.38
Natural endorphins discovery, M.4
Our divided brain, M.7
Parallel processing, M.19
Self-esteem versus self-serving bias, M.47
Twin and adoption studies, M.11
What affects our sleep patterns, and why do we sleep?, M.9
What causes depressive disorders and bipolar disorders?, M.50
What determines sexual orientation?, M.34
What is happiness?, M.38
What makes us happy?, M.38
When are we happiest?, M.38
Why do people fail to help in emergencies?, M.44
Why do we feel hunger?, M.33

Why we dream, M.9

TABLE 7 Neuroscience

In addition to the coverage found in Modules 4–7, *neuroscience* can be found in the following modules:

Abuse, M.15, M.21, M.45
RDoC framework, dimensional approach to, M.48
Aggression, M.43
Aging
physical exercise and, M.17
the brain and, M.17
Aha! moment, M.27
Alcohol effects on brain and sexual activity, M.34
Alzheimer's disease, M.4, M.9, M.17, M.24, M.25, M.24, M.40
Animal cognition, M.27
Antisocial personality disorder, M.50, M.52
Anxiety-related disorders, M.49
GABA and, M.49
Attention-deficit/hyperactivity disorder (ADHD), M.53
Autism spectrum disorder (ASD), M.53
Biological psychology, M.1, M.4
Biomedical therapies, M.56
Biopsychosocial approach, M.1
to aggression, M.43
to aging, M.17
to Alzheimer's, M.17, M.25
to disordered drug use, M.10
to dreams, M.9
to learning, M.23
to pain, M.20
to psychological disorders, M.48
to therapeutic lifestyle change, M.56
Bipolar disorders, M.50
creativity and, M.50
Brain damage, M.2, M.5, M.6, M.19, M.8, M.24, M.25, M.29, M.48
Brain development
experience and, M.13, M.15
in adolescence, M.16

in infancy and childhood, M.15
maturation, M.13
neuroplasticity, M.13
pruning and brain development, M.15, M.16, M.20
sleep and, M.9
Brain imaging, M.4, M.5, M.6, M.7, M.10, M.16, M.17, M.20, M.23, M.24, M.25, M.27, M.28, M.33, M.49, M.50, M.51, M.52, M.56
Cognitive neuroscience, M.1, M.8, M.25, M.26
Cultural neuroscience, M.4
Depression, M.50
brain structure and, M.50
neurotransmitter levels and, M.50
nutritional effects, M.50
Dissociative identity disorder, M.52
Dreams, M.9
Drives and incentives, M.32
Drug use and the brain
adolescent brain development and, M.10
alcohol, M.10
cocaine, M.10
Ecstasy, M.10
marijuana, M.10
methamphetamine, M.10
nicotine, M.10
vulnerability due to brain differences, M.10
Dual processing, M.8, M.16, M.19, M.20
Electroconvulsive therapy, M.25, M.56
Emotion
brain region *(insula),* M.36
cognition, M.36
memory, M.25
Exercise, M.38
Experience, brain modification and, M.13
Fear-learning, M.21, M.49
fearlessness, M.49
Frequent head trauma risks, M.6, M.48
Functional connectivity, M.6
Gene–environment interaction, M.9, M.12, M.31
Hallucinations, M.9
hallucinogens and, M.6, M.10
near-death experiences and, M.10

phantom sensations and, M.20
psychological disorders and, M.48
schizophrenia and, M.2, M.51, M.56
sleep and, M.9
Hunger, M.33
Infant brains attuned to differences, M.43
Insight, M.7, M.27
Intelligence
creativity and, M.27
growth mindset and, M.31
Interventions for child poverty, brain change and, M.4
Language and the brain, M.28
deafness and, M.28
thinking in images, M.28
Learning, M.13, M.25
Limbic system and brain reward center, M.6
Meditation, M.8, M.40
Memory
Alzheimer's disease, M.24
emotional, M.25
episodic, M.25
sleep and, M.9
storage, M.25
synaptic changes and, M.25
Mindfulness and the brain, M.40
Mirror neurons, M.23
Multiple sclerosis, M.4
Near-death experience, M.10
Neuroadaptation, M.10
Neurocognitive disorders/Alzheimer's disease, M.17, M.20, M.24, M.25, M.40
Neurodevelopmental disorders, M.53
Neurodiversity, App. C
Neurogenesis, M.7, M.17, M.40, M.56
Neuroplasticity, M.1, M.4, M.7
aging and, M.17
experience and, M.13
memory and, M.24
new learning and, M.24
response to damage, M.7
Neuroscience perspective, defined, M.1
Neurostimulation therapies, M.56

Neurotransmitters, M.4
acetylcholine, M.4
aggression and, M.43
anxiety-related disorders and, M.49
bipolar disorders, M.50
carbohydrates and, M.33
child abuse and, M.15
depression, major and, M.50
dopamine, M.4, M.6, M.10, M.32, M.46, M.51, M.52, M.56
drives/incentives, and, M.32
drugs and, M.4, M.10, M.56
endorphins, M.4, M.10, M.20, M.40, M.56
exercise and, M.40
functions of, M.4
GABA (gamma-aminobutyric acid), M.4, M.49
genes and, M.49
glutamate, M.4, M.25, M.49
gut microbes and, M.50
levels in depression, M.50
memory and, M.25
norepinephrine, M.4, M.10, M.36, M.39, M.40, M.50, M.56
schizophrenia and, M.51
serotonin, M.4, M.10, M.15, M.25, M.33, M.40, M.43, M.49, M.50
taste and, M.20
Nicotine, M.49
Observational learning and brain imaging, M.23
Orgasm, M.34
Ostracism, M.35
Pain, M.20
controlling pain, M.20
experienced and imagined pain, M.20, M.23
phantom limb pain, M.20
Parallel processing, M.19, M.24
Parkinson’s disease, M.4, M.56
Perception
brain damage and, M.19
color vision, M.19
feature detection, M.19
fusiform face area, M.19
supercell clusters, M.19
transduction, M.18

visual information processing, M.19
Perceptual organization, M.19
Personality
Big Five and, M.46
brain imaging and, M.46
temperament, M.46
Phantom limb sensations, M.20
Priming, in subliminal perception, M.18
Psychological disorders
antisocial personality disorder, M.50, M.52
anxiety-related disorders, M.49
attention-deficit/hyperactivity disorder, M.53
autism spectrum disorder, M.53
bipolar disorders, M.50
depression, M.50
dissociative identity disorder, M.52
schizophrenia, M.51
Psychoneuroimmunology, M.39
Psychosurgery, M.56
Reward centers in the brain, M.6, M.10, M.34, M.35
Right-left differences in the intact brain, M.7
Schizophrenia, M.51
Sensation
body position and movement, M.20
cochlear implants, M.20
deafness, M.20
hearing, M.20
phantom sensations, M.6, M.7, M.20
restored vision, M.19
sensory interaction, M.20
smell, M.20
synesthesia, M.20
taste, M.20
touch, M.20
vision, M.19
Sexual development, prenatal, M.13
Sexual orientation, M.34
Sleep
brain waves and sleep stages, M.9
cognitive development and, M.9
deprivation, M.9

dreams, M.9
gene–environment interaction, M.9
measuring brain-wave activity, M.9
melatonin, M.9
memory and, M.9
microsleep, M.9
recuperation during, M.9
REM sleep, M.9
suprachiasmatic nucleus, M.9
Smell and emotion, M.20
Social support, M.40
Splitting the brain, M.7
Stress, M.39
“Synapse” etymology, M.4
Teenage brain, M.16
Trauma, M.15
Unconscious mind, M.45

TABLE 8 Behavior Genetics and Evolutionary Psychology

Behavior genetics **is covered in the following modules:**

Abuse, M.11, M.13, M.15, M.16, M.49, M.52
Adaptability, M.6
ADHD, M.15, M.53
Adoption studies, M.10, M.11, M.31, M.52
Aggression, M.23, M.43
intergenerational transmission of, M.23
Antisocial personality disorder, M.52
Anxiety-related disorders, M.49
Autism spectrum disorder, M.53
Behavior genetics perspective, M.1, M.11
Biological psychology perspective, M.1
Bipolar disorders, M.11, M.50
Brain plasticity, M.4
Bullying, M.15
Continuity and stages, M.14
Depressive disorders and bipolar disorders, M.11, M.50
Deprivation, severe, M.15
Depth perception, M.19

Development, M.13, M.14
Drives and incentives, M.32
Drug use, M.10
Eating disorders, M.52
Empathy, M.37
Epigenetics, M.1, M.11, M.14, M.15, M.31, M.34, M.45, M.48, M.49, M.50, M.51
Gene–environment interaction, M.11
Genome-wide association studies, M.11
Happiness, M.38
Heritability, M.31
Human genome research, M.50
Hunger and taste preference, M.33
Intelligence, genetic and environmental influences, M.31
Learning, M.23
Love, M.17
Motor development, M.15
Nature–nurture, M.1, M.4, M.14, M.15, M.19, M.28, M.29, M.30, M.31
Obesity and weight control, M.33
Optimism, M.40
Pain, M.20
Parenting styles, M.15
Perceptual interpretation, M.19
Personality disorders, M.52
Personality traits, M.45
Posttraumatic stress disorder, M.49
Poverty, M.15
Psychological disorders
    ADHD, M.15, M.53
    antisocial personality disorder, M.52
    anxiety-related disorders, M.49
    biopsychosocial approach to, M.48
    depressed thinking, M.50
    depressive disorders and bipolar disorders, M.11, M.50
    human genome research, M.50
    eating disorders, M.52
    personality disorders, M.52
    posttraumatic stress disorder, M.49
    schizophrenia, M.31, M.51
Reward deficiency syndrome, M.6
Schizophrenia, M.31, M.51
Sexual orientation, M.1, M.31, M.34

Sexuality, M.34
Sleep patterns, M.9
Smell, M.20
Stress, M.39
benefits of exercise, M.40
Suicide and epigenetic marks, M.48
Traits, gay-straight differences, M.34
Trauma, M.15
Twin studies, M.1, M.10, M.11, M.15, M.17, M.31, M.32, M.34, M.39, M.43, M.46, M.49, M.50, M.51, M.52, M.53
See also Modules 11–13, Nature, Nurture, and Human Diversity.

The *evolutionary perspective* is covered in the following modules:

Adaptation, M.1, M.4, M.6, M.9, M.11, M.12, M.13, M.14, M.15, M.20, M.21, M.23, M.25, M.27, M.29, M.32, M.33, M.36, M.38, M.39, M.44
Anger, M.38
Anxiety-related disorders, M.49
Biological predispositions, classical/operant conditioning and, M.23
Brain organization, prenatal, M.13
Classical conditioning, M.23
Cognitive development, M.15
Darwin, Charles, M.1, M.12, M.19, M.23, M.37, M.49
Emotion, effects of facial expressions, M.37
Emotional expression, M.37
Empathy, M.37
Evolutionary psychology, M.1, M.12, M.31
critiques of, M.12
Exercise, M.40
Fear, M.27, M.49
Feature detection, M.19
Fight or flight, M.36
Gender development, M.13
Gene–environment interactions, M.1, M.9, M.12, M.15, M.31, M.48
Hearing, M.20
Heritability, M.11
Hunger and taste preference, M.33
Instinctive drift, M.23
Instincts, M.32
Intelligence, M.11, M.31
Love, M.17

companionate, M.44
Math and spatial ability, M.31
Mating preferences, M.12
Memory, adaptive, M.25
Natural selection, M.1, M.2, M.11, M.13, M.14, M.23, M.49
Nature–nurture, M.1, M.4, M.11, M.13, M.14, M.15, M.19, M.24, M.28, M.29, M.30, M.31, M.37, M.38, M.48, M.50, M.51
Need to belong, M.35
Newborns' abilities, M.14
Obesity, M.33
Overconfidence, M.27
Perceptual adaptation, M.19
Physical attractiveness, M.12
Predicting individual differences, M.11
Prejudice, M.43
Psychological disorders, M.48, M.49
Puberty, onset of, M.13
Reflexes, newborn, M.14
Sexual orientation, M.34
Sexuality, M.12, M.13
Sleep, M.9
Smell, M.20
Stress, M.39
Taste, M.20
taste preference, M.33
Temperament, M.11
Therapeutic lifestyle change, M.56
Traits, M.11
Twin and adoption studies, M.11
Universal dispositions, M.45
Variation over time, M.13
See also Modules 4–7, The Biology of Mind, and Modules 11–13, Nature, Nurture, and Human Diversity.

TABLE 9 Sample MCAT Correlation With *Psychology,* Fourteenth Edition

From MCAT 2015 Content Category 6C: Responding to the world	*Psychology,* Fourteenth Edition, Correlations	Module

Emotion	Emotion: Arousal, Behavior, and Cognition; Embodied Emotion; Expressed and Experienced Emotion	36, 37, 38
Three components of emotion (i.e., cognitive, physiological, behavioral)	Emotion: Arousal, Behavior, and Cognition	36
Universal emotions (e.g., fear, anger, happiness, surprise, joy, disgust, and sadness)	Culture and Emotional Expression—including the universal emotions	37, 38
	Basic emotions (fear, anger, interest, surprise, joy, disgust, sadness)	38
Adaptive role of emotion	Emotion as the body's adaptive response	36, 38
	Emotions and the Autonomic Nervous System	36
Theories of emotion		
James-Lange theory	James-Lange Theory: Arousal Comes Before Emotion	36
Cannon-Bard theory	Cannon-Bard Theory: Arousal and Emotion Occur Simultaneously	36
Schachter-Singer theory	Schachter-Singer Two-Factor Theory: Arousal + Label = Emotion	36
Zajonc; LeDoux; Lazarus	Zajonc, LeDoux, and Lazarus: Does Cognition Always Precede Emotion?	36
The role of biological processes in perceiving emotion	Emotions and the Autonomic Nervous System	36

Skills for Student Success: How to Apply Psychology to Live Your Best Life

- Thinking Critically and Scientifically
- Self-Control and Self-Improvement
- Time Management and Study Tips
- Social Life
- Finding Meaning and Pursuing Goals

As you will see in the modules to come, some things—including our temperament, body type, sexual orientation, and personality traits—are mostly beyond our power to change. In such ways it's better to accept than to fight who we are. In other ways, we can change and become the person we aspire to be. In this brief Preface, we will consider five ways we can use psychology to build ***skills for success,*** and live our best life (with more on each of these topics in the modules to come):

- thinking critically when forming judgments and making decisions,
- attending to self-control and self-improvement,
- managing our time and study,

- enjoying a satisfying social life, and
- finding meaning while pursuing goals.

Thinking Critically and Scientifically

To live your best life, you will need to learn to think critically—guidance for which you will find in every module of this book. You will need to base your hopes, your fears, and your decisions on a foundation of truth, and to understand the importance of scientific thinking and the careful research that underlies all of what we will be presenting. Alas, misinformation spreads readily. Many people fear terrorism, mass shootings, and air travel more than the vastly greater threats they face from in-home guns and car travel. In the United States, 2 in 3 people have, year after year, perceived crime as rising—even while, until 2020, it was dramatically falling (Gallup, 2021). And "how many of the world's 1-year-old children have been vaccinated against some disease"—20, 50, or 80 percent? In most countries, more than 4 in 5 people guess 20 or 50 percent, when the truth is 88 percent (Rosling et al., 2018).

Not only does it help us individually to know the truth about what threatens and benefits us, it also helps us collectively. Democracy presumes our wisdom. When we voters grasp truth—when facts prevail over false news—we can support sensible policies and elect benevolent leaders.

Misinformation comes from various sources:

- Some people or organizations aim to deceive us in order to sell a product or to undermine a political opponent.
- Sensationalized news can be misleading—vivid images of horrific shootings or plane crashes may lead us to disproportionately fear some dangers too much, and others too little.
- If we interact only with people, websites, and news sources that reflect our way of thinking, we will confirm rather than challenge our presumptions.
- We have a natural "truth bias," an inclination to believe what others say, especially when it is repeated.

Fortunately, ignorance of our ignorance can be remedied by education. And that brings you to this book and its resources, which offer psychology's contribution to critical thinking. To learn how we can protect ourselves against errors and biases that may hack our brain, and to better understand the importance of current, scientific research and the careful procedures it follows, read on. You will also want to explore the "How Would You Know?" research activities in Macmillan Learning's Achieve, which give you a hands-on opportunity to experience the value of research from the inside out. And check out my [DM's] tutorial animation, "Thinking Critically in Our Post-Truth World," in Macmillan Learning's Achieve and at tinyurl.com/PostTruthMyers.

With a mix of open-minded curiosity and evidence-seeking questioning, we can better sift falsehood from fact. And we can live

smarter and more flourishing lives.

Self-Control and Self-Improvement

We can apply our smart thinking to all aspects of living our best life, including appropriate self-care. Family, work, and school commitments can make it difficult to find time to achieve our goals, sustain our health, and have fun. But to care for others, we first need to care for ourselves.

Self-Control

Success starts with self-control—the ability to restrain impulses and delay short-term gratification for greater long-term rewards. What's your level of self-control? On a scale from 1 (not at all like me) to 5 (very much like me), indicate how much each of the following statements reflects how you typically are (Tangney et al., 2004):

1. _____ I am good at resisting temptation.
2. _____ I have a hard time breaking bad habits.
3. _____ I am lazy.
4. _____ I say inappropriate things.
5. _____ I do certain things that are bad for me, if they are fun.
6. _____ I refuse things that are bad for me.
7. _____ I wish I had more self-discipline.
8. _____ People would say that I have iron self-discipline.

9. _____ Pleasure and fun sometimes keep me from getting work done.
10. _____ I have trouble concentrating.
11. _____ I am able to work effectively toward long-term goals.
12. _____ Sometimes I can't stop myself from doing something, even if I know it is wrong.
13. _____ I often act without thinking through all the alternatives.

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To tally your total score:

- Reverse your rating for items 2, 3, 4, 5, 7, 9, 10, 12, and 13 (1 = 5, 2 = 4, 3 = 3, 4 = 2, 5 = 1).
- Now add your ratings to establish your total score.
- Total scores range from 13 to 65, with higher scores indicating more self-control. The average score was 39 in two studies of college students (Tangney et al., 2004).

To improve your self-control, watch my [ND's] video, "Self-Control—Our Greatest Inner Strength," available in Macmillan Learning's Achieve and at tinyurl.com/DeWallSelf-Control.

An important component of self-control, as we will see in Module 37, is *emotion regulation*. We do have some control over our emotions' intensity and duration (Gross et al., 2011). Healthy

emotion regulation enables greater happiness, better life satisfaction, closer social relationships, and less depression and anxiety (Aldao et al., 2010; Gross, 1998). Embracing a diversity of emotions helps. We are healthier when we let ourselves feel our natural negative and positive emotions rather than pressuring ourselves to be happy all the time. (See Quoidbach et al., 2014 and emodiversity.org.)

Self-Improvement

Here are some other smart tips for improving your self-care:

- ***Set and announce your goals.*** Specific and realistic goals—such as "draft that paper by next Friday"—direct attention, promote effort, and motivate persistence. To make yourself accountable, announce your goal to friends or family.
- ***Develop an action plan.*** Specify how you will progress toward your goal. People who flesh out goals with detailed plans become more focused, and are more likely to finish on time. Fantasizing your ultimate success (a great paper turned in on time, a good course grade, a sports victory) helps. But imagining the step-by-step details helps more.
- ***Form beneficial habits.*** Is there some behavior, such as exercising, that you would like to make automatic? Make yourself do it every day for 2 months and you will have transformed a hard-to-do behavior into a must-do habit.

- ***Plan for a full night's sleep.*** Work commitments, family stresses, and other challenges can interfere with sleep. Screen time and social time can also intrude. The first step in changing your sleep routine starts with a question, "Do I want to increase my happiness, energy, focus, and health?" If so, try to find a way to give your body more of the sleep it craves. (See Module 9 for tips on how to improve sleep hygiene.)
- ***Create a supportive environment.*** It's easier to eat healthy when you don't have junk food around. At meals, control portion size by using smaller plates and bowls. To focus on a project, remove distractions. At night, stash your phone so you can sleep undisturbed. Engage with friends who bring out the best rather than the worst in you.
- ***Control substance use.*** Many psychoactive drugs, such as nicotine, are highly addictive and can readily hijack our daily lives, long-term goals, and good health. Although some drugs, such as caffeine, may be safely consumed in moderation, many others will seriously disrupt our best life unless avoided entirely. (More on this in Module 10.)
- ***Make time for exercise.*** Frequent aerobic exercise is a great time investment. Even in small amounts, aerobic exercise boosts health, increases energy, lifts mood, improves memory, and calms anxiety.
- ***Incorporate mindfulness meditation.*** Practicing mindfulness can help you manage your stress and regulate your emotions more healthfully.

- ***Build coping skills and a healthy lifestyle.*** Strengthening our resilience and managing our emotions help us cope with stress. We can also boost our mental health with lifestyle changes—daily practices that mark flourishing lives. For more information, see Module 40, and also "Thinking Critically About: Therapeutic Lifestyle Change" in Module 56.

Time Management and Study Tips

Some students fail. Some survive. And some thrive. So, what choices can you make to thrive?

You can start by making a plan for how you will manage your time and maximize your learning. As legendary basketball coach John Wooden said in 1977, "When you fail to prepare, you're preparing to fail."

It may seem as if there are not enough hours in the week to get everything done. It may be that you are not using your time as efficiently as you could. To assess your current time management and study skills, complete the survey below.

Time Management Assessment Questionnaire

Rate the following items: ***Always*** (2 points), ***Sometimes*** (1 point), or ***Never*** (0 points).

1. _____ I do things in order of priority.
2. _____ I accomplish what needs to be done during the day.
3. _____ I always get assignments done on time.
4. _____ I feel I use my time effectively.
5. _____ I tackle difficult or unpleasant tasks without procrastinating.
6. I force myself to make time for planning.
7. _____ I prepare a daily or weekly “to do” list.
8. _____ I am able to meet deadlines without rushing at the last minute.
9. _____ I keep up-to-date on my reading and homework assignments.
10. _____ I prevent interruptions from distracting me from high priority tasks.
11. _____ I avoid spending too much time on trivial matters.
12. _____ I spend enough time on academic matters.
13. _____ I plan time to relax and be with family/friends in my weekly schedule.

14. _____ I have a weekly schedule on which I record fixed commitments, such as classes and work hours.
15. _____ I try to do the most important tasks during my most energetic periods of the day.
16. _____ I make constructive use of down time (commuting, waiting in line, etc.).
17. _____ I periodically re-assess my activities in relation to my goals.
18. _____ I have discontinued any wasteful or unprofitable activities or routines.
19. _____ I maintain control over my electronic device (phone, computer) time to avoid interruptions.
20. _____ I judge myself by accomplishment of tasks rather than by amount of activity or "busy-ness."
21. _____ I have a clear idea of what I want to accomplish during this course and this term.
22. _____ I am satisfied with the way I use my time.

Information from Wayne State University (2013): Advising-Time Management Questionnaire.

Scoring the Assessment: Give yourself 2 points for "Always," 1 point for "Sometimes," and 0 points for "Never." Then add up the total number of points to assess your current time management skills.

39–44 points: You have excellent time management skills.

24–38 points: You manage your time fairly well but should carefully consider the tips that follow to increase your skill.

0–23 points: Improving your time management skills will be a huge factor in your success in college and beyond.

We can all use a reminder of best practices. Here are a few tips.

Manage Your Time

Your time is your most precious resource. Managing your time requires intentionally planning when you will progress toward your goals. Start by carefully tracking your time use for a week—including all personal, school, and work time—and watching for patterns and opportunities. (We [DM, ND, and JG] have each done this and were surprised by how much time we were wasting!) Next, create a "time budget" that allows you to enjoy life, be energized, and complete your study, work, and family tasks. Plan time for recreation and friends; social media; sleep, eating, and personal care; class time and study; and any employment or home obligations. Determine precisely when you will do each, by creating weekly and daily schedules that make guilt-free space for each activity. To become the person you wish to be, live intentionally, day by day.

Manage Your Mental Energy

Some tasks are mentally demanding. Plan your day to make space for such tasks when you have the most energy. Allow time to rest and recover before engaging the next demanding task. By tracking your mental energy, you will know when to spend it and when to save it.

Play Offense

Car troubles, family problems, and work challenges happen. Sometimes we have to play “defense” against life’s demands and problems, leaving us stressed and short of our goals. The solution: When possible, play “offense” against your environment. Rather than just letting the day happen to you, start each day with a plan. Control how you spend your time. Establishing routines and making decisions in advance conserves energy by reducing daily decision making. If you know you are going to study 2 hours in the morning before class, you won’t waste time weighing what to do.



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Time for success Making a realistic, day-to-day schedule will allow you time for what you need to do as well as time for what you want to do.

Study Smart

To remember what you read, use the SQ3R (Survey, Question, Read, Retrieve, Review) system: Survey the module organization. Identify Questions your reading should answer. Read actively, seeking answers. Retrieve and rehearse key ideas. Finally, Review the module's organization and concepts.

Those last two "R's" are especially important: You will retain information best through repeated self-testing and rehearsal of previously studied material. Getting immediate feedback makes this testing effect even stronger. That's the idea behind our effective

online adaptive quizzing system, LearningCurve, and the frequent self-testing opportunities throughout this text.

Distributing your study time, rather than cramming, will also help. Establishing a schedule, and sticking to it, will spread the load out across the term. For more information, see "Use Psychology to Become a Stronger Person—and a Better Student" in Module 1 and "Improving Memory" in Module 26, and view my [DM's] 5-minute animation at tinyurl.com/HowToRemember.

Social Life

Living your best life requires social support. Here are some tips for forming and maintaining healthy, supportive relationships:

- ***Prioritize people.*** We humans are social animals. We need to belong. We are happier and healthier when supported by, and giving support to, our friends. So, make the effort to make friends, such as by joining a club, sports team, or fellowship group. Get to know your instructors. And do not take your friends and loved ones for granted. Attend to them. Affirm them. Share your daily experiences and feelings with them.
- ***Embrace diversity.*** Celebrate rather than fear differences among individuals and groups. Realize that how you see the world is based on everything that makes you unique, including your age, background, culture, ethnicity, gender identity, and sexual orientation. These individual experiences may produce

perspectives—conscious or unconscious—that filter how you perceive and act toward others. Surround yourself with diverse others, listen rather than lecture, and have compassion for those with whom you disagree.

- ***Enjoy social media and your phone without letting them control you.*** Use social media and your phone to stay connected with friends and family, but without hijacking your time and other priorities. And when posting on social media, remember that someday a potential employer may be Googling your name.
- ***Support a speak-up culture rather than a call-out culture.*** To disagree is to be human. You will disagree with others, and others will disagree with you. Indeed, we often learn by exploring these other perspectives. (This is why it is so important for psychological scientists to practice humility.) When you disagree, avoid calling out others (publicly shaming them). Instead, speak up: Approach the person and explain your disagreement without blaming them. We have a natural tendency to explain others' behaviors based on their personality traits ("He's a selfish jerk") rather than their situation ("He's sleep-deprived and stressed"). To resist this tendency, take the other person's perspective.
- ***It's time to be the adult in the room.*** As we grow up, we pass through different stages of development. Most adolescents seek social acceptance while still depending on family. The transition into adulthood requires becoming more independent. As adults, we need to own our goals, attitudes,

values, and beliefs, and to make our own decisions and solve our own problems.



Mariusz Szczawinski/Alamy Stock Photo

Social success Nurturing relationships is an important part of a successful life. Make time and energy for important others, and you will have better physical and psychological health.

Finding Meaning and Pursuing Goals

To have meaning is to have a life filled with purpose, coherence, and significance. Most people want a meaningful life, but they report feeling unfulfilled in some area of their life. They may not be fully engaged in their work. Or they may feel stuck in a daily routine that brings money without meaning. To live your best life, take the following steps to promote meaning and pursue goals:

- ***Imagine your possible self.*** Who is the person you wish to be? Define who you hope to be and what you aim to achieve. With that vision in mind, you can then lay out specific goals and strategies that will take you where you want to go.
- ***Live your dream daily.*** Here's a good rule for success: Whatever you hope to achieve, do something toward that every day. Do you want to be kinder, more educated, more assertive? Then, every day, do a kind act, learn something new, or practice asserting yourself. Although many days you may accomplish less than you'd hoped, even small daily steps toward a goal can, over time, take you to your destination—transforming your possible self into your actual self.
- ***Adopt a "growth mindset."*** It's surprisingly powerful to believe that our abilities are changeable through energy and effort. Some things we should accept, but many things we have the power to change. If you see your math or writing or speaking ability as like a muscle—something that gets stronger with training and practice—you will, in fact, develop more skill. Your mindset matters. (More on this in Module 35.)
- ***Find your calling.*** No need to rush it. Most students change their vocational plans along the way, and you likely will, too. But notice what sorts of activities absorb you and make time fly. Is it being with people? Working with your hands? Solving problems with your mind? Watch for work and activities that will enable you to do what you love and to love what you do, and pursue those paths.

* * *

Throughout this book you will encounter additional pointers to a flourishing life: counting your blessings, expressing gratitude, finding flow, acting happy, training your willpower, becoming mindful, opting for optimism, and more. In such ways, you can not only survive, you can thrive. Don't be too hard on yourself if you experience setbacks. If you try to do a little better each day, you can, over time, accomplish goals that might seem impossible at the outset. Seek, as Reinhold Niebuhr advised, the serenity to accept things you cannot change, but also feel empowered to change the things you can.

CHAPTER 1

Thinking Critically With Psychological Science (Modules 1–3)



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MODULE 1 The History and Scope of Psychology

Psychology Is a Science

THINKING CRITICALLY ABOUT: The Scientific Attitude

Critical Thinking
Psychological Science Is Born
Psychological Science Matures
Contemporary Psychology
Use Psychology to Become a Stronger Person—and a Better Student
MODULE 2 Research Strategies: How Psychologists Ask and Answer Questions
The Need for Psychological Science
Psychological Science in a Post-Truth World
The Scientific Method
THINKING CRITICALLY ABOUT: Correlation and Causation
Psychology's Research Ethics
MODULE 3 Statistical Reasoning in Everyday Life
Statistical Literacy
Descriptive Statistics
Inferential Statistics

Astronomer Owen Gingerich has described the human brain as "by far the most complex physical object known to us in the entire cosmos" (2006, p. 29). On the scale of outer space, we are less than a single grain of sand on all the oceans' beaches, and our lifetime lasts but a relative nanosecond. Yet there is nothing more awe inspiring than our own inner space. Our consciousness—our mind somehow arising from matter—remains a profound mystery. Our thinking, emotions, and actions (and their interplay with others' thinking, emotions, and actions) fascinate us.

Outer space staggers us with its enormity. But inner space enthralls us. Enter psychological science.

From news and media portrayals, you might think that psychologists offer counseling, analyze personality, dispense child-raising advice, examine crime scenes, and testify in court. Do they? *Yes*—and much more. Consider some of psychology's questions that you may wonder about:

- Have you ever worried about how to act among people of a different cultural tradition, gender identity, or sexual orientation, or among people with differing abilities? *How are we alike as members of the human family? How do we differ?*
- Have you ever vowed to *never* react as one of your biological parents would—but find yourself doing so anyway—and then wondered how much of your personality you inherited? *To what extent do genes predispose our individual differences in personality? How do home and community environments shape us?*
- Have you ever awakened from a nightmare and wondered why you had such a crazy dream? *Why do we dream? Why is sleep so important?*
- Have you ever played peekaboo with a 6-month-old and wondered why the baby finds your disappearing/reappearing act so delightful? *What do babies perceive and think?*
- Have you ever wondered what fosters school and work success? *Does inborn intelligence explain why some people get richer, think*

more creatively, or relate more sensitively? Or does gritty effort, and a belief in the power of persistence, matter more?

- Have you ever become depressed or anxious and wondered when, or if, it will pass? *What affects our emotional well-being? What's the line between feeling "off" and a psychological disorder?*

As we will see in Modules 1 and 2, psychology is a science that seeks to answer such questions about us all—how and why we think, feel, and act as we do.

MODULE 1: The History and Scope of Psychology

Once upon a time, on a planet in our neighborhood of the universe, there came to be people. Soon thereafter, these creatures became intensely interested in themselves and in one another: "Who are we? What produces our thoughts? Our feelings? Our actions? And how are we to understand and interact with those around us?"

Psychology Is a Science

Learning Objective Question LOQ 1-1

How is psychology a science?

Underlying all science is, first, a passion for exploring and understanding without misleading or being misled. Some questions *(Is there life after death?)* are beyond science. Answering them in any way requires a leap of faith. With many other ideas *(Can some people demonstrate extrasensory perception [ESP]?),* the proof is in the pudding. We can let the facts speak for themselves.

To assist your learning, numbered *Learning Objective Questions* appear at the beginning of major sections. You can test your understanding by trying to answer the question before, and then again after, you read the section.

Magician James Randi used an **empirical approach** when testing those claiming to see glowing auras around people's bodies:

Randi: Do you see an aura around my head?
Aura seer: Yes, indeed.
Randi: Can you still see the aura if I put this magazine in front of my face?
Aura seer: Of course.
Randi: Then if I were to step behind a wall barely taller than I am, you could determine my location from the aura visible above my head, right?

Randi once told me [DM] that no aura seer had yet agreed to take this simple test.

Throughout the text, the most important concepts are boldfaced, with definitions immediately available (and in the Glossary at the end of the book).

No matter how sensible-seeming or how wild an idea, the smart thinker asks: *Does it work?* When put to the test, do the data support its

predictions? Subjected to scrutiny, crazy-sounding ideas sometimes find support.

More often, science becomes society's garbage disposal. It sends crazy-sounding ideas to the waste heap, atop previous claims of miracle cancer cures and out-of-body travels into centuries past. To sift reality from fantasy and fact from fiction therefore requires a *scientific attitude:* being skeptical but not cynical, open-minded but not gullible. When ideas compete, careful testing can reveal which ones best fit the facts. Do some people have a psychic power to predict an unexpected catastrophe? Is *electroconvulsive therapy* (delivering an electric shock to the brain) an effective treatment for severe depression? As we will see, putting such claims to the test has led psychological scientists to answer *No* to the first question and *Yes* to the second.

Putting a scientific attitude into practice requires not only curiosity and skepticism but also *humility*—awareness of our vulnerability to error and an openness to new perspectives. What matters is not my opinion or yours, but the truths revealed by our questioning and testing. If people or other animals don't behave as our ideas predict, then so much the worse for our ideas—and so much the better for scientific progress. One of psychology's early mottos expressed this humble attitude: "The rat is always right." (See Thinking Critically About: The Scientific Attitude.)

LOQ 1-2

What are the three key elements of the scientific attitude, and how do they support scientific inquiry?



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Throughout the book, information sources are cited in parentheses, with researchers' names and the date the research was published. For example, see "(Erlandsson et al., 2018)". Every citation can be found in the end-of-book References section, with complete documentation that follows American Psychological Association (APA) style.

Humility predicts helpfulness and realistic academic confidence (Erlandsson et al., 2018). One nine-country study asked 40,000 teens which of 16 math concepts were familiar to them. The teens didn't realize that the researchers had inserted three fake terms: "proper number," "subjective scaling," and "declarative fraction." Those who arrogantly claimed to know the nonexistent concepts were often men from advantaged backgrounds (Jerrim et al., 2019). *The point to remember:* Knowing what we *don't* know enables generosity and intellectual humility, which in turn supports a healthy democracy. "Democratic citizenship," notes psychologist Fathali Moghaddam (2019), begins by "accepting that 'I could be wrong,' 'I must critically question everything' … and 'I must revise my opinions as the evidence requires.'"

Ask Yourself

Were you surprised to learn that psychology is a science? How would you explain that now if someone asked you about it?

Critical Thinking

LOQ 1-3

How does critical thinking feed a scientific attitude, and smarter thinking for everyday life?

The scientific attitude—curiosity + skepticism + humility—prepares us to think smarter. This smart thinking, called **critical thinking**, examines assumptions, appraises the source, discerns hidden biases, evaluates evidence, and assesses conclusions. When reading a research report, an online opinion, or a news story, critical thinkers ask questions: *How do they know that? What is this person's agenda? Is the conclusion based on anecdote, or evidence? Does the evidence justify a cause-effect conclusion? What alternative explanations are possible?*

> From a tongue-in-cheek Twitter feed: **"The problem with quotes on the internet is that you never know if they're true."** — Abraham Lincoln

Critical thinkers wince when people make factual claims based on their gut: "I *feel like* climate change is [or isn't] happening." "I *feel like* self-driving cars are more [or less] dangerous." "I *feel like* I'm safe from Covid here." Such beliefs (commonly mislabeled as feelings) may or may not be true. Critical thinkers realize that they might be wrong. Sometimes, the best evidence confirms our beliefs. Other times it beckons us to a different way of thinking. Cynics sometimes seem

smart, yet most demonstrate less cognitive ability and academic competence than average (Stavrova & Ehlebracht, 2019). To believe everything—or to reject everything—is to be a fool. Critical thinking, informed by science, helps check our biases. Consider: Does climate change threaten our future, and, if so, is it human-caused? Some climate-action advocates have interpreted record flooding as proof of climate change. Some climate-change skeptics have perceived a single colder-than-average winter as discounting global warming. Rather than having their understanding of climate change swayed by local weather examples, critical thinkers say, "Show me the evidence." Over time, is the Earth actually warming? Are the polar ice caps melting? Are vegetation patterns changing? Are extreme weather events becoming more frequent? And is human activity emitting atmospheric CO_2 that would lead us to expect such changes?

When contemplating such issues, critical thinkers will also consider the credibility of sources. They will look at the evidence *(Do the facts support them, or are they just makin' stuff up?)*. They will recognize multiple perspectives. And they will expose themselves to news sources that challenge their preconceived ideas.

Some religious people may view critical thinking and scientific inquiry, including psychology's, as a threat. Yet many leaders of the scientific revolution, including Copernicus and Newton, were deeply religious people. U.S. astronomer Carl Sagan (1979) noted,

> My deeply held belief is that if a god anything like the traditional sort exists, our curiosity and intelligence are provided by such a god. We would be

> unappreciative of those gifts … if we suppressed our passion to explore the universe and ourselves.

Critical inquiry can surprise us. Some examples from psychological science: Massive losses of brain tissue early in life may have minimal long-term effects (see Module 6). Within days, newborns can recognize their mother's odor (see Module 15). After brain damage, a person may be able to learn new skills yet be unaware of such learning (see Module 25). People of differing ages, genders, and abilities report roughly comparable levels of personal happiness (see Module 38). Depression touches many people, but most recover (see Module 50).

Other modules also illustrate how critical inquiry sometimes debunks popular presumptions, by checking intuitive fiction with empirical fact: Sleepwalkers are *not* acting out their dreams (see Module 9). Our past experiences are *not* all recorded verbatim in our brain. With brain stimulation or hypnosis, one *cannot* merely replay and relive long-buried or repressed memories (see Module 26). Opposites tend *not* to attract (see Module 44). Most people do *not* suffer from unrealistically low self-esteem, and high self-esteem is *not* all good (see Module 47). In these instances and many more, what psychological scientists have learned is not what is widely believed.

Psychology's critical inquiry can also identify effective policies. To deter crime, should we invest money in lengthening prison sentences, or should we increase the likelihood of arrest? To help people recover from a trauma, should counselors help them relive it, or not? To

increase voting, should we tell people about the low turnout problem, or emphasize that their peers are voting? What matters is not what we "feel" is true, but what *is* true. When put to critical thinking's test—and contrary to common practice—the second option in each case wins (Shafir, 2013). Thinking critically can—and sometimes does—change the world.

Critical thinking can also change us, by helping us assess popular applications of psychology. Looking at a self-help blog, we can consider the author's expertise and goals. We can ask: Are the suggestions based on evidence or anecdote? And how might the author's personal values and agenda affect the advice? If you defer to guidance about how to live—how to raise children, how to achieve self-fulfillment, how to respond to sexual feelings, how to get ahead at work—you are accepting value-laden advice. A science of behavior and mental processes can help us reach our goals. But it cannot decide which goals are worth pursuing. Psychological scientists teach, but they do not preach.

Study Tip: Memory research reveals a *testing effect:* We retain information much better if we actively retrieve it by self-testing and rehearsing. (More on this at the end of this module.) To bolster your learning and memory, take advantage of the *Retrieval Practice* opportunities you'll find throughout this text—with answers for checking in Appendix E, or a click away in the e-book.

Retrieval Practice

RP-1 Describe what's involved in critical thinking.

ANSWERS IN APPENDIX E

Psychological Science Is Born

LOQ 1-4

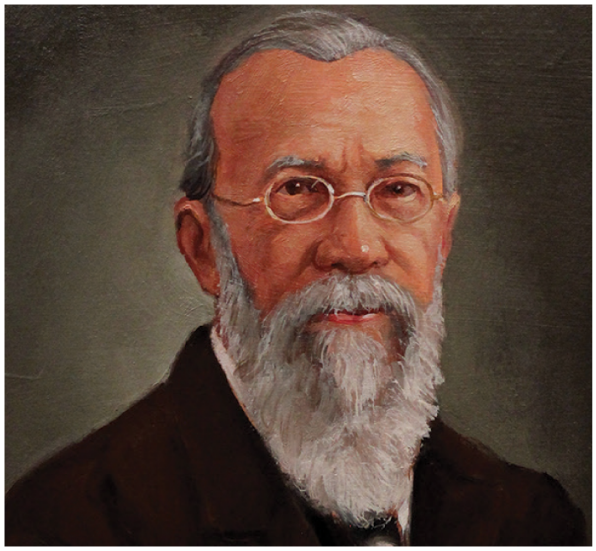
What were some important milestones in psychology's early history?

To be human is to be curious about ourselves and the world around us. Before 300 B.C.E., the Greek naturalist and philosopher Aristotle theorized about learning and memory, motivation and emotion, perception and personality. Today we chuckle at some of his guesses, such as his suggestion that a meal makes us sleepy by causing gas and heat to collect around the supposed source of our personality, the heart. But credit Aristotle with asking the right questions.

Psychology's First Laboratory

Philosophers' thinking about thinking continued until the birth of psychology's first laboratory. On a December day in 1879, in a small, third-floor room at Germany's University of Leipzig, two graduate students helped an austere, middle-aged professor, Wilhelm Wundt,

create an experimental apparatus. Their machine measured how long it took for people to press a telegraph key after hearing a ball hit a platform (Hunt, 1993). Curiously, people responded in about one-tenth of a second when asked to press the key as soon as the sound occurred —and in about two-tenths of a second when asked to press the key as soon as they were consciously aware of perceiving the sound. (To be aware of one's awareness takes a little longer.) Wundt wanted to measure "atoms of the mind"—the fastest and simplest mental processes.



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Wilhelm Wundt (1832–1920) Wundt established the first psychology laboratory at the University of Leipzig, Germany.

Psychology's First Schools of Thought

Before long, this new science of psychology became organized into different branches, or schools of thought, each promoted by

pioneering thinkers. Two early schools were **structuralism** and **functionalism**.

Structuralism

Much as chemists developed the periodic table to classify chemical elements, so psychologist Edward Bradford Titchener aimed to classify and understand elements of the mind's structure (structuralism). He engaged people in self-reflective *introspection* (looking inward), training them to report elements of their experience as they looked at a rose, listened to a metronome, smelled a scent, or tasted a substance. What were their immediate sensations, their images, their feelings? And how did these relate to one another? Alas, structuralism's technique of introspection proved somewhat unreliable. It required smart, verbal people, and its results varied from person to person and experience to experience. As introspection waned, so did structuralism. Hoping to assemble the mind's structure from simple elements was rather like trying to understand a smartphone by examining its disconnected parts.



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Edward Bradford Titchener (1867–1927)
Titchener used introspection to search for the mind's structural elements.

Functionalism

Philosopher-psychologist William James sought to go beyond labeling our inner thoughts and feelings by considering their evolved *functions* (functionalism). Smelling is what the nose does; thinking is what the brain does. But *why* do the nose and brain do these things? Under the influence of evolutionary theorist Charles Darwin, James assumed that thinking, like smelling, developed because it was *adaptive*—it helped our ancestors survive and reproduce. Consciousness serves a function. It enables us to consider our past, adjust to our present, and plan our future. To explore the mind's adaptive functions, James studied emotions, memories, willpower, habits, and moment-to-moment *stream of consciousness* thinking.

James' writings moved the publisher Henry Holt to offer James a contract for a textbook on the new science of psychology. James agreed and began work in 1878, with an apology for requesting two years to finish his writing. The text proved an unexpected chore and actually took him 12 years. (Why are we authors not surprised?) More than a century later, people still read the resulting *Principles of Psychology* (1890) and marvel at the brilliance and elegance with which James introduced psychology to the educated public.

Psychology's First Women

James' legacy stems from his Harvard mentoring as well as from his writing. In 1890—thirty years before U.S. women had the right to vote—he admitted Mary Whiton Calkins into his graduate seminar over the objections of Harvard's president (Scarborough & Furumoto, 1987). When Calkins joined, the other students (all men) dropped out. So, James tutored her alone. Later, she finished all of Harvard's Ph.D. requirements, outscoring all the male students on the qualifying exams. Alas, Harvard denied her the degree she had earned, offering her instead a doctorate from Radcliffe College, its undergraduate "sister" school for women. Calkins resisted the unequal treatment and refused the degree. She nevertheless went on to become a distinguished memory researcher and, in 1905, the first female president of the American Psychological Association (APA).





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William James (1842–1910) and Mary Whiton Calkins (1863–1930) James was a legendary teacher-writer who authored an important psychology text. He mentored Calkins, a memory researcher who would become the first female president of the American Psychological Association.

The honor of being the first official female psychology Ph.D. later fell to Margaret Floy Washburn, who also wrote an influential book, *The Animal Mind.* In 1921, Washburn became the second female APA president (Fragaszy, 2021). But Washburn's gender barred doors for her, too. Although her thesis was the first foreign study Wundt published in his psychology journal, she could not join the all-male organization of experimental psychologists founded by Titchener, her own graduate adviser (Johnson, 1997). What a different world from the recent past: Between 1997 and 2021, more than half of the elected presidents of the science-focused Association for Psychological Science (APS) were women. In the United States, Canada, and Europe, women now earn most psychology doctorates. Nevertheless, a gender gap persists in publishing psychological research in top journals, promotion to senior professorships, and salary (Gruber et al., 2021).



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Margaret Floy Washburn (1871–1939) The first woman to receive a psychology Ph.D., Washburn synthesized animal behavior research in *The Animal Mind* (1908).



(a)



(b)

Top: 1964 meeting of the Society of Experimental Psychologists in Berkeley, California. Reprinted by permission of the Society of Experimental Psychologists. http://www.sepsych.org/1964.php; bottom: Gordon B. Moskowitz, professor in Lehigh's Department of Psychology

Psychology's increasing diversity At this 1964 meeting of the Society of Experimental Psychologists (a), Eleanor Gibson was easy to spot among the many male members, all in a sea of White faces. By contrast, women are now 61 percent of APS members, including 75 percent of its psychology student affiliates, as is clear in this recent photo of APS graduate students (b). People of color have made enormous contributions to the field (see, for example, coverage of Mamie Phipps Clark and Kenneth Clark in the Chapter 1 modules), and psychology's diversity continues to grow—with one-third of recent psychology doctorates earned by people of color (APA, 2021). For more on the history of these changes, see Appendix A, the Story of Psychology: A Timeline.

Ask Yourself

How do you think psychology might change in the future as more women, and others from historically excluded groups, contribute their ideas to the field?

Retrieval Practice

RP-2 What event defined the start of scientific psychology?

RP-3 Why did introspection fail as a method for understanding how the mind works?

RP-4 The school of _____ used introspection to define the mind's makeup; _____ focused on how mental processes enable us to adapt, survive, and flourish.

ANSWERS IN APPENDIX E

Psychological Science Matures

LOQ 1-5

How did behaviorism, Freudian psychology, and humanistic psychology further the development of psychological science?

Many early psychologists shared English essayist C. S. Lewis's view that "there is one thing, and only one in the whole universe which we know more about than we could learn from external observation." That one thing, Lewis said, is ourselves. "We have, so to speak, inside

information" (1960, pp. 18–19). Wundt and Titchener focused on inner sensations, images, and feelings. James also engaged in introspective examination of the stream of consciousness and of emotion, hoping to understand how they help humans survive and thrive. For these and other early pioneers, *psychology* was defined as "the science of mental life."

Behaviorism

In the 1920s, provocative U.S. psychologists began to challenge the definition of psychology as the "science of mental life." John B. Watson and, later, B. F. Skinner dismissed introspection and redefined *psychology* as "the scientific study of observable behavior." After all, they said, science is rooted in observation: What you cannot observe and measure, you cannot scientifically study. You cannot observe a sensation, a feeling, or a thought, but you *can* observe and record people's *behavior* as they are *conditioned*—as they respond to and learn in different situations. Many agreed, and **behaviorism** was increasingly influential well into the 1960s (Braat et al., 2020).





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John B. Watson (1878–1958) and Rosalie Rayner (1898–1935) Working with Rayner, Watson championed psychology as the scientific study of behavior. In a controversial study on a baby who became famous as "Little Albert," he and Rayner showed that fear could be learned. (More about this in the Learning modules.)



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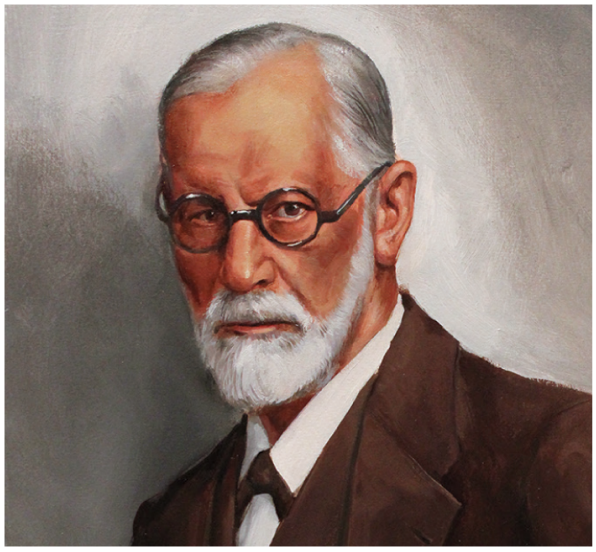
B. F. Skinner (1904–1990) This leading behaviorist rejected introspection and studied how consequences shape behavior.

Freudian (Psychoanalytic) Psychology

Another major force in psychology's development was Sigmund Freud's *psychoanalytic psychology,* which emphasized the ways our unconscious mind and childhood experiences affect our behavior. (In other modules, we'll look more closely at Freud's ideas, including his theory of personality, and his views on unconscious sexual conflicts and the mind's defenses against its own wishes and impulses.)



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Sigmund Freud (1856–1939) The controversial ideas of this famed personality theorist and therapist have influenced humanity's self-understanding.

Humanistic Psychology

As the behaviorists had rejected the early twentieth-century definition of *psychology,* other groups rejected the behaviorist definition. In the 1960s, **humanistic psychologists,** led by Carl Rogers and Abraham

Maslow, found both behaviorism and Freudian psychology too limiting. Rather than focusing on conditioned responses or childhood memories, the humanistic psychologists focused on our growth potential, our needs for love and acceptance, and the environments that nurture or limit personal growth.

Retrieval Practice

RP-5 From the 1920s until the 1960s, the two major forces in psychology were _____ and _____ psychology.

ANSWERS IN APPENDIX E

Contemporary Psychology

LOQ 1-6

How has contemporary psychology focused on cognition, on biology and experience, on culture and gender, and on human flourishing?

Simultaneous with humanistic psychology's emergence, psychologists in the 1960s pioneered a *cognitive revolution,* which led the field back to its early interest in how our mind processes and retains information. **Cognitive psychology** today continues its scientific exploration of how we perceive, process, and remember information, and of how thinking and emotion interact in anxiety, depression, and other disorders. The marriage of cognitive psychology (mind science)

and neuroscience (brain science) gave birth to **cognitive neuroscience.** This specialty, with researchers in many disciplines, studies the brain activity underlying mental activity.

Today's psychology builds on the work of many earlier scientists and schools of thought. To encompass psychology's concern with observable behavior *and* with inner thoughts and feelings, we now define **psychology** as the *science of behavior and mental processes.* Let's unpack this definition. *Behavior* is anything an organism *does*—any action we can observe and record. Yelling, smiling, blinking, sweating, talking, tweeting, and questionnaire marking are all observable behaviors. *Mental processes* are our internal, subjective experiences—our sensations, perceptions, dreams, thoughts, beliefs, and feelings.

The key word in today's definition of psychology is *science.* Psychology is less a set of findings than a way of asking and answering questions. Our aim, then, is not merely to report results but also to show you how psychologists play their game. You will see how researchers evaluate conflicting opinions and ideas. And you will learn how all of us, whether scientists or simply curious people, can think harder and smarter when experiencing and explaining the events of our lives.

Psychology—the science of behavior and mental processes—has roots in many disciplines and countries. The young science of psychology developed from the more established fields of philosophy and biology. Wundt was a German philosopher and a physiologist. James was an

American philosopher. Freud was an Austrian physician. Ivan Pavlov (Learning modules), who pioneered the study of learning, was a Russian physiologist. Jean Piaget (Developing Through the Life Span modules), the last century's most influential scientific observer of children, was a Swiss biologist.

Like those pioneers, today's estimated 1+ million psychologists are citizens of many lands (Zoma & Gielen, 2015). The International Union of Psychological Science has 89 member nations, from Albania to Zimbabwe. In China, the first university psychology department was established in 1978; by 2016 there were 270 (Zhang, 2016). Psychology is both *growing* and *globalizing*. The story of psychology is being written in many places, with interests ranging from the study of nerve cell activity to the study of international conflicts. Contemporary psychology, shaped by many forces, is particularly influenced by our understanding of biology and experience, culture and gender, and human flourishing.

Ask Yourself

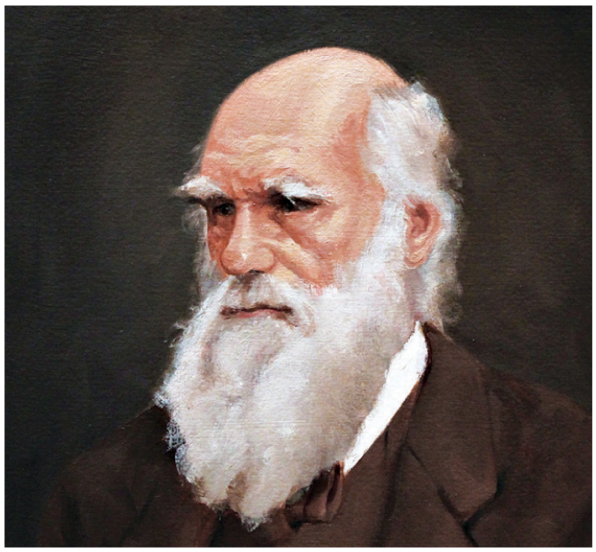
How would you have defined *psychology* before taking this class?

Evolutionary Psychology and Behavior Genetics

Are our human traits inherited, or do they develop through experience? This has been psychology's biggest and most persistent issue. But the debate over the **nature–nurture issue** is ancient. The Greek philosopher Plato (428–348 B.C.E.) assumed that we inherit character and intelligence and that certain ideas are inborn. Aristotle (384–322 B.C.E.) countered that there is nothing in the mind that does not first come in from the external world through the senses.

In the 1600s, European philosophers rekindled the debate. John Locke argued that the mind is a blank slate on which experience writes. René Descartes disagreed, believing that some ideas are innate. Descartes' views gained support from a curious naturalist two centuries later. In 1831, an indifferent student but ardent collector of beetles, mollusks, and shells decided not to become a priest and instead set sail on a historic round-the-world journey. The 22-year-old voyager, Charles Darwin, pondered the incredible species variation he encountered, including tortoises on one island that differed from those on nearby islands. Darwin's *On the Origin of Species* (1859) explained this diversity by proposing the evolutionary process of **natural selection:** From among chance variations, nature selects traits that best enable an organism to survive and reproduce in a specific environment. Darwin's principle of natural selection—what philosopher Daniel Dennett (1996) has called "the single best idea anyone has ever had"—is still with us 160+ years later as biology's

organizing principle. Evolution also has become an important principle for twenty-first-century psychology. This would surely have pleased Darwin, who believed his theory explained not only animal structures (such as a polar bear's white coat) but also animal behaviors (such as human mating and emotional expressions).



Macmillan Learning

Charles Darwin (1809–1882) Darwin argued that natural selection shapes behaviors as well as bodies.

The nature–nurture issue recurs throughout this text as today's psychologists explore the relative contributions of biology and experience. They ask, for example: How are we humans *alike* because of our shared biology and evolutionary history? That's the focus of **evolutionary psychology**. And how do we individually *differ* because of our differing genes and environments? That's the focus of **behavior genetics**.



Left: rubberball/Getty Images; right: © Tony Freeman/PhotoEdit

A nature-made nature–nurture experiment Identical twins have the same genes. This makes them ideal participants in studies designed to shed light on hereditary and environmental influences on personality, intelligence, and other traits. Fraternal twins have different genes but often share a similar environment. Twin studies provide a wealth of findings—described in other modules—showing the importance of both nature and nurture.

We can, for example, ask: Are gender differences biologically predisposed or socially constructed? Is children's grammar mostly innate or formed by experience? How are intelligence and personality differences influenced by heredity and by environment? Are sexual behaviors more "pushed" by inner biology or "pulled" by external incentives? Should we treat psychological disorders—depression, for example—as disorders of the brain, disorders of thought, or both?

Repeatedly we will see that in contemporary science, the nature–nurture tension dissolves: *Nurture works on what nature provides.* In other modules, you'll learn about *epigenetics*—how experience can influence genetic expression. And you will see that our species has been graced with the tremendous biological gift of *neuroplasticity*—the brain's enormous capacity to learn and adapt. Moreover, every

psychological event (every thought, every emotion) is simultaneously a biological event. Thus, depression can be both a brain disorder *and* a thought disorder.

Ask Yourself

Think of one of your own traits. (For example, are you a planner or a procrastinator—do you usually complete assignments on time, or late? Are you more an extravert or introvert—do you become energized by social interactions, or recharge by spending time alone?) How do you think that trait was influenced by nature and nurture?

Retrieval Practice

RP-6 How did the cognitive revolution affect the field of psychology?

RP-7 What is natural selection?

RP-8 What is contemporary psychology's position on the nature–nurture issue?

ANSWERS IN APPENDIX E

Cross-Cultural and Gender Psychology

Participants in many studies have come from the WEIRD (*We*stern, *I*ndustrial, *R*ich, and *D*emocratic) cultures—so named because they represent a mere fraction of the people on our planet (Henrich, 2020). As we will see time and again, **culture**—shared ideas and behaviors that one generation passes on to the next—matters. Our culture

shapes our standards of promptness and frankness, our attitudes toward relationships, our tendency to be casual or formal, our willingness to make eye contact, our hand gestures, and much, much more. By studying people from around the world, today's researchers have observed our individual and cultural differences—in personality, in expressiveness, in attitudes and beliefs.





Left: Jane Barlow/Getty Images; right: Hemis/Alamy Stock Photo

Culture and kissing Kissing crosses cultures. Yet how we do it varies. Imagine yourself kissing someone on the lips. Do you tilt your head right or left? In Western cultures, where people read from left to right, about two-thirds of couples kiss right, as in Prince Harry and Duchess Meghan's wedding kiss and Auguste Rodin's sculpture, *The Kiss.* In one study, 77 percent of Hebrew- and Arabic-language right-to-left readers kissed tilting left (Shaki, 2013).

It is also true, however, that our shared biological heritage unites us as a universal human family. The same underlying processes guide people everywhere. Some examples:

- People diagnosed with *specific learning disorder* (formerly called dyslexia) exhibit the same brain malfunction, whether they are Italian, French, or British (Paulesu et al., 2001).
- Variation in languages may impede communication across cultures. Yet all languages share deep principles of grammar, and people from different corners of the world can communicate with a smile or a frown.
- People in different cultures vary in feelings of loneliness (Lykes & Kemmelmeier, 2014). But across cultures, loneliness is magnified by shyness and low self-esteem (Jones et al., 1985; Rokach et al., 2002).

> **"All people are the same; only their habits differ."** — Confucius, 551–479 B.C.E.

We are each in certain respects like all others, like some others, and like no other. Studying people from all cultures helps us discern our similarities and our differences, our human kinship and our diversity.

You will see throughout this book that our *gender identity*—our sense of being male, female, neither, or some combination of male and female—also matters, as does our biologically influenced *sex*. Today's researchers report gender differences in what we dream, in how we express and detect emotions, and in our risk for alcohol use disorder, depression, and eating disorders. Gender differences fascinate us, and studying them is potentially beneficial. For example, many researchers have observed that women carry on conversations more

readily to build relationships, while men talk more to give information and advice (Tannen, 2001). Understanding these differences can help us prevent conflicts and misunderstandings in everyday interactions.

But again, psychologically as well as biologically, we are overwhelmingly similar. We learn to walk at about the same age. We experience the same sensations of light and sound. We remember vivid emotional events and forget mundane details. We feel the same pangs of hunger, desire, and fear. We exhibit similar overall intelligence and well-being.

The point to remember: Even when specific attitudes and behaviors vary by gender or across cultures, as they often do, the underlying processes are much the same.

Positive Psychology

Psychology's first hundred years often focused on understanding and treating troubles, such as abuse and anxiety, depression and disease, prejudice and poverty. Much of today's psychology continues the exploration of such challenges. Without slighting the need to repair damage and cure disease, Martin Seligman and others (2002, 2016) have called for more research on *human flourishing*—on understanding and developing the emotions and traits that help us to thrive. These psychologists call their approach **positive psychology**. They believe that happiness is a by-product of a pleasant, engaged, and meaningful life. Thus, positive psychology uses scientific methods

to explore the building of a "good life" that engages our skills, and a "meaningful life" that points beyond ourselves.

Psychology's Three Main Levels of Analysis

LOQ 1-7

How do psychologists use the biopsychosocial approach, and how can it help us understand our diverse world?

We all share a biologically rooted human nature. Yet many psychological and social-cultural influences fine-tune our assumptions, values, and behavior. We differ individually by gender identity, physical ability, and sexual orientation. And each of us is a complex system that is part of a larger social system—family, ethnic group, culture, and *socioeconomic* status (combines education, income, and occupation). The **biopsychosocial approach** integrates these three **levels of analysis—**the biological, psychological, and social-cultural.

Consider horrific school shootings. Do they occur because the shooters have brain disorders or genetic tendencies that predispose them to violence? Because they have observed brutality in the media or played violent video games? Because they live in a gun-toting society? The biopsychosocial approach enables psychologists to move beyond labels ("school shooter") and to consider the interconnected factors that may lead to violent acts (Pryor, 2019) (**FIGURE 1.1**).

Clinical psychologists use this approach to help people with mental disorders (Teachman et al., 2019).

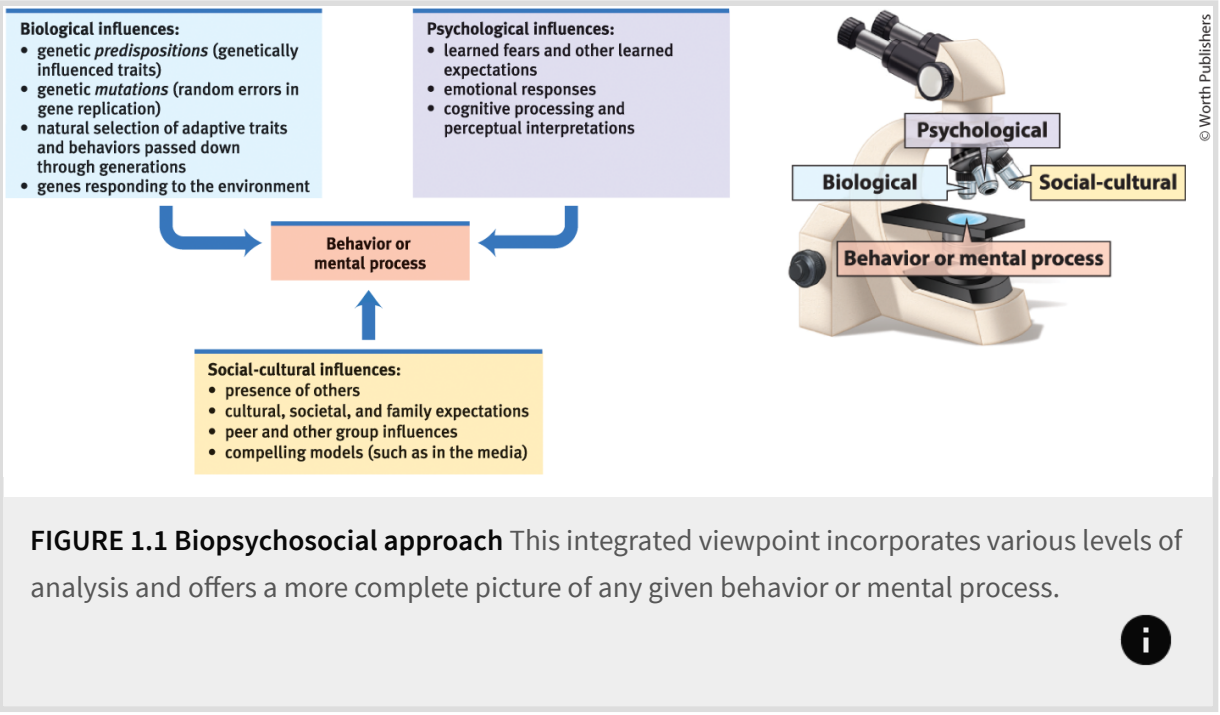


FIGURE 1.1 Biopsychosocial approach This integrated viewpoint incorporates various levels of analysis and offers a more complete picture of any given behavior or mental process.

Each level of analysis offers a perspective for looking at a behavior or mental process, yet each by itself is incomplete. Each perspective described in TABLE 1.1 asks different questions and has its limits, but together they complement one another. Consider, for example, how they shed light on anger. Someone working from

- ***a neuroscience perspective*** might study brain circuits that cause us to be red in the face and "hot under the collar."
- ***an evolutionary perspective*** might analyze how anger facilitated the survival of our ancestors' genes.
- ***a behavior genetics perspective*** might study how heredity and experience influence our individual differences in temperament.

- ***a psychodynamic perspective*** might view an outburst as an outlet for unconscious hostility.
- ***a behavioral perspective*** might attempt to determine what triggers aggressive acts.
- ***a cognitive perspective*** might study how our interpretation of a situation affects our anger and how our anger affects our thinking.
- ***a social-cultural perspective*** might explore how expressions of anger vary across cultural contexts.

TABLE 1.1 Psychology's Theoretical Perspectives

Perspective	Focus	Sample Questions	Examples of Subfields Using This Perspective
Neuroscience	How the body and brain enable emotions, memories, and sensory experiences	How do pain messages travel from the hand to the brain? How is blood chemistry linked with moods and motives?	Biological; cognitive; clinical
Evolutionary	How the natural selection of traits has promoted the survival of genes	How does evolution influence behavior tendencies?	Biological; developmental; social
Behavior genetics	How our genes and our environment influence our individual differences	To what extent are psychological traits, such as intelligence, personality, sexual orientation, and vulnerability to depression,	Personality; developmental; legal/forensic

		products of our genes? Of our environment?	
Psychodynamic	How behavior springs from unconscious drives and conflicts	How can someone's personality traits and disorders be explained by unfulfilled wishes and childhood traumas?	Clinical; counseling; personality
Behavioral	How we learn observable responses	How do we learn to fear particular objects or situations? What is the most effective way to alter our behavior, say, to stop smoking?	Clinical; counseling; industrial-organizational
Cognitive	How we encode, process, store, and retrieve information	How do we use information in remembering? Reasoning? Solving problems?	Cognitive neuroscience; clinical; counseling; industrial-organizational
Social-cultural	How behavior and thinking vary across situations and cultures	How are we affected by the people around us, and by our surrounding culture?	Developmental; social; clinical; counseling

The point to remember: Like two-dimensional views of a three-dimensional object, each of psychology's perspectives is helpful. But each by itself fails to reveal the whole picture.

Ask Yourself

Which of psychology's theoretical perspectives do you find most interesting? Why?

Retrieval Practice

RP-9 What advantage do we gain by using the biopsychosocial approach in studying psychological events?

RP-10 The _____-_____ perspective in psychology focuses on how behavior and thought differ from situation to situation and from culture to culture, while the _____ perspective emphasizes observation of how we respond to and learn in different situations.

ANSWERS IN APPENDIX E

Psychology's Subfields

LOQ 1-8

What are psychology's main subfields?

Picturing a chemist at work, you may envision a laboratory scientist surrounded by test tubes and high-tech equipment. Picture a psychologist at work, and you would be right to envision

- a white-coated scientist probing a rat's brain.

- an intelligence researcher measuring how quickly an infant shows boredom by looking away from a familiar picture.
- an executive evaluating a new diversity and inclusion training program for employees.
- a researcher at a computer analyzing "big data" from social media status updates, online searches, or digital traces of people's behavior.
- a therapist actively listening to an anxious client's thoughts.
- an academic studying another culture and collecting data on variations in human values and behaviors.
- a teacher or writer sharing the joy of psychology with others.



J.B. Handelsman/Cartoon Stock

"I'm a social scientist, Michael. That means I can't explain electricity or anything like that, but if you ever want to know about people I'm your man."

The cluster of subfields we call psychology is a meeting ground for different disciplines. Thus, it's a perfect home for those with wide-ranging interests. In its diverse activities, from biological experimentation to cultural comparisons, the tribe of psychology is united by a common quest: *describing and explaining behavior and the mind underlying it*.

Some psychologists conduct **basic research** that builds psychology's knowledge base. We will meet a wide variety of such researchers, including *biological psychologists* exploring the links between body and mind; *developmental psychologists* studying our changing abilities from womb to tomb; *cognitive psychologists* experimenting with how we perceive, think, and solve problems; *personality psychologists* investigating our persistent traits; and *social psychologists* exploring how we view and affect one another.

These and other psychologists also may conduct **applied research**, tackling practical problems. *Industrial-organizational psychologists,* for example, use psychology's concepts and methods in the workplace to help organizations and companies select and train employees, boost morale and productivity, design products, and implement systems.

Psychology is a science, but it is also a profession that helps people have healthier relationships, overcome feelings of anxiety or depression, and raise thriving children. *Counseling psychology* and *clinical psychology* grew out of different historical traditions. Early counseling psychologists offered job skills guidance, whereas clinical

psychologists worked alongside psychiatrists to assess and provide psychotherapy to people in the first psychology clinics. Today's counseling psychologists and clinical psychologists have a lot in common. **Counseling psychologists** help people to cope with challenges and crises (including academic, vocational, and relationship issues) and assist those with psychological disorders to improve their personal and social functioning. **Clinical psychologists** focus on assessing and treating people with mental, emotional, and behavior disorders. Both counseling and clinical psychologists administer and interpret tests, provide therapy and advice to people with all levels of psychological difficulties, and undergo licensing exams. They sometimes also conduct basic and applied research. By contrast, **psychiatrists,** who also may provide psychotherapy, are medical doctors licensed to prescribe drugs and otherwise treat physical causes of psychological disorders.



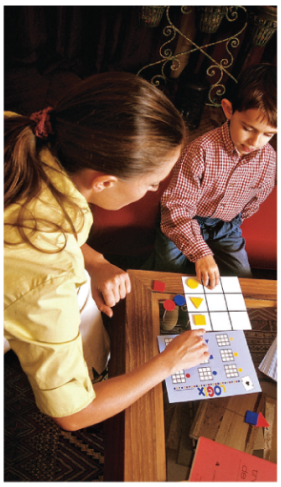
Dean Hanson/Albuquerque Journal/ZUMA Wire/Alamy Stock Photo

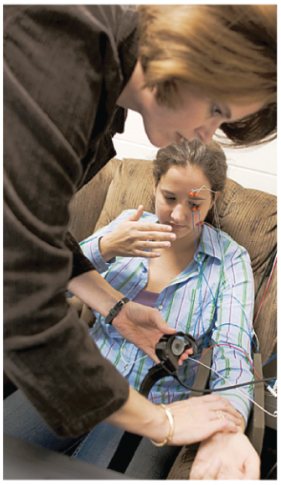
Psychology in court *Forensic psychologists* apply psychology's principles and methods in the criminal justice system. They may assess witness credibility or testify in court about a defendant's state of mind and future risk. This forensic psychologist testified that the defendant, who at age 15 showed no remorse after killing his parents and three younger siblings, has a *personality disorder.*

Rather than seeking to change people to fit their environment, **community psychologists** work to create social and physical environments that are healthy for all (Bradshaw et al., 2009; Trickett, 2009). To prevent bullying, for example, they might consider ways to improve the culture of a school and neighborhood, and how to increase bystander intervention (Polanin et al., 2012).

With perspectives ranging from the biological to the social, and with settings ranging from the laboratory to the clinic to the office,

psychology relates to many fields. Psychologists teach in medical schools, business schools, law schools, and theological seminaries. They work in hospitals, factories, and corporate offices. And they engage in interdisciplinary studies, such as psychobiography (the study of the lives and personalities of public figures), psycholinguistics (the study of language and thinking), and psychoceramics (the study of crackpots).[1]







Left: LAURENT/GLUCK/AGE Fotostock; center: Hope College Public Relations; right: Scott J. Ferrell/Getty Images

Psychology: A science and a profession Psychologists experiment with, observe, test, and help modify behavior. Here we see psychologists testing a child, measuring emotion-related physiology, and doing face-to-face therapy.

Ask Yourself

When you signed up for this course, what did you know about different psychology specialties?

Psychology also influences culture. Knowledge transforms us. Learning about the solar system and the germ theory of disease alters the way people think and act. Learning about psychology's findings also changes people: They less often judge psychological disorders as moral failings, treatable by punishment and ostracism. They less often regard and treat women as men's mental inferiors. They less often view and raise children as ignorant, willful beasts in need of taming. "In each case," noted Morton Hunt (1990, p. 206), "knowledge has modified attitudes, and, through them, behavior." Once aware of psychology's well-researched ideas—about how body and mind connect, how a child's mind grows, how we construct our perceptions, how we learn and remember, how people across the world are alike (and different)—your mind may never again be the same.

> **"The mind, once stretched by a new idea, never returns to its original dimensions."** — Ralph Waldo Emerson, 1803–1882

But bear in mind psychology's limits. Don't expect it to answer the ultimate questions, such as those posed by Russian novelist Leo Tolstoy (1904): "Why should I live? Why should I do anything? Is there in life any purpose which the inevitable death that awaits me does not undo and destroy?"

Although many of life's significant questions are beyond psychology, some very important ones are illuminated by even a first psychology course. Through painstaking research, psychologists have gained

insights into brain and mind, dreams and memories, depression and joy. Even the unanswered questions can renew our sense of mystery about things we do not yet understand. Moreover, your study of psychology can help teach you how to ask and answer important questions—how to think critically as you evaluate competing ideas and claims.

> **"I have uttered what I did not understand, things too wonderful for me."** — Job 42:3

Psychology deepens our appreciation for how we humans perceive, think, feel, and act. By so doing, it can enrich our lives and enlarge our vision. Through this book we hope to help guide you toward that end. As activist and Nobel Peace Prize winner Malala Yousafzai said, "One teacher, one book, one pen can change the world."

Retrieval Practice

RP-11 Match the specialty (i through iii) with the description (a through c).

i. Clinical psychology	a. works to create social and physical environments that are healthy for all
ii. Psychiatry	b. studies, assesses, and treats people with psychological disorders but usually does not provide medical therapy
iii. Community	c. is a branch of medicine dealing with psychological disorders

psychology	

ANSWERS IN APPENDIX E

Use Psychology to Become a Stronger Person—and a Better Student

LOQ 1-9

How can psychological principles help you learn, remember, and thrive?

Psychology is not just about understanding others; it is also about understanding ourselves. It is only through such learning that we can be—and show to the world—our best selves. Throughout this text, we will offer evidence-based suggestions that you can use to live a happy, effective, flourishing life, including the following:

- ***Manage your time to get a full night's sleep***. Unlike sleep-deprived people, who live with fatigue and gloomy moods, well-rested people live with greater energy, happiness, and productivity.
- ***Make space for exercise***. Aerobic activity not only increases health and energy, it also is an effective remedy for mild to moderate depression and anxiety.
- ***Set long-term goals, with daily aims***. Successful people take time each day to work toward their goals, such as exercising or

sleeping more, or eating more healthfully. Over time, they often find that their daily practice becomes a habit.

- ***Have a growth mindset.*** Rather than seeing their abilities as fixed, successful people view their mental abilities as like a muscle—something that grows stronger with effortful use.
- ***Prioritize relationships***. We humans are social animals. We flourish when connected in close relationships. We are both happier and healthier when supported by (and when supporting) caring friends.

Psychology's research also shows how we can learn and retain information. Many students assume that the way to cement new learning is to reread. What helps more—and what this book therefore encourages—is *repeated self-testing and rehearsal* of previously studied material. Memory researchers Henry Roediger and Jeffrey Karpicke (2006) call this phenomenon the **testing effect.** (It is also sometimes called the *retrieval practice effect* or *test-enhanced learning*.) They note that "testing is a powerful means of improving learning, not just assessing it." In one study, English-speaking students who had been tested repeatedly recalled the meaning of 20 previously learned Lithuanian words better than did students who had spent the same time restudying the words (Ariel & Karpicke, 2018). Repetitive testing's rewards also make it reinforcing: Students who used repetitive testing once found that it helped, and then used it later when learning new material.

Many other studies, including in college classrooms, confirm that *frequent quizzing and self-testing boosts students' retention* (Yang et al., 2021).

> **"If you read a piece of text through twenty times, you will not learn it by heart so easily as if you read it ten times while attempting to recite it from time to time and consulting the text when your memory fails."** — Francis Bacon, *Novum Organum,* 1620

As explained in the Memory modules, to thoroughly understand information you must *actively process it.* One digest of 225 studies showed that students engaged in active learning showed the highest examination performance in science, technology, engineering, and mathematics (the STEM fields) (Freeman et al., 2014). Active learning is particularly useful at reducing achievement gaps between underrepresented (low income, marginalized culture) and overrepresented (high income, dominant culture) STEM students (Theobald et al., 2020). So, don't treat your mind like your stomach, something to be filled passively. Instead, treat it more like a muscle that grows stronger with exercise. Countless experiments reveal that people learn and remember best when they put material in their own words, rehearse it, and then retrieve and review it again.

The **SQ3R** study method incorporates these principles (McDaniel et al., 2009; Robinson, 1970). *SQ3R* is an acronym for its five steps: *S*urvey, *Q*uestion, *R*ead, *R*etrieve[2], *R*eview.

To study a module, first *survey,* taking a bird's-eye view. Scan each module's headings, and notice the organization.

Before you read each main section, try to answer its numbered Learning Objective *Question* (for this section: "How can psychological principles help you learn, remember, and thrive?"). Researchers have found that we retain information better after generating our own questions (Ebersbach et al., 2020; Roediger & Finn, 2010). Those who test their understanding *before* reading, and discover what they don't yet know, will learn and remember better.

Then *read,* actively searching for the answer to the Learning Objective Question (LOQ). At each sitting, read only as much of the module (usually a single main section) as you can absorb without tiring. Read actively and critically. Ask questions. Take notes. Make the ideas your own: How does what you've read relate to your own life? Does it support or challenge your assumptions? How convincing is the evidence? (Our Ask Yourself questions throughout each module will help you engage personally with the material.) Write out what you know. "Writing is often a tool for learning," say researchers (Arnold et al., 2017).

Having read a section, *retrieve* its main ideas: "Active retrieval promotes meaningful learning," says Karpicke (2012). So *test yourself.* This will not only help you figure out what you know, the testing itself will help you learn and retain the information more effectively. Even better, test yourself repeatedly. To facilitate this, we offer periodic

Retrieval Practice questions throughout each module (for example, the questions at the end of this section). After answering these questions for yourself, you can "show" the answer to check your understanding (or check the answers in Appendix E) and reread the material as needed.

Finally, *review:* Read over any notes you have taken, again with an eye on the module's organization, and quickly review the whole module. Write or say what a concept is before rereading to check your understanding. The end-of-module *Review* is set up as an additional self-test, with the collected Learning Objective Questions, key terms, and Module Test questions.

Survey, question, read, retrieve, review. Four additional study tips may further boost your learning:

Distribute your study time. One of psychology's oldest findings is that *spaced practice* promotes better retention than *massed practice*. You'll remember material better if you space your time over several study periods—perhaps 1 hour a day, 6 days a week—rather than cram it into one week-long or all-night study blitz. For example, rather than trying to read an entire module in a single sitting, read just one main section and then turn to something else. *Interleaving* (mixing) your study of psychology with your study of other subjects boosts long-term retention and protects against overconfidence (Kornell & Bjork, 2008; Taylor & Rohrer, 2010).

Spacing your study sessions requires a disciplined approach to managing your time. For more tips on time management, see the Student Preface—Student Success: How to Apply Psychology to Live Your Best Life—at the beginning of this text.

Learn to think critically. Both inside and outside of this course, critical thinking—smart thinking—is a key to wisdom. Whether you are reading or conversing, note people's assumptions and values. What perspective or bias underlies an argument? Evaluate evidence. Is it anecdotal? Or is it based on informative experiments? Assess conclusions. Are there alternative explanations?

Process class information actively. Listen for the main ideas and sub-ideas of a lecture. *Write them down.* Ask questions during and after class. In class, as in your private study, process the information actively and you will understand and retain it better. As psychologist William James urged a century ago, "No reception without reaction, no impression without … expression." Make the information your own. Engage with the Ask Yourself questions to relate what you read to your own life. Tell someone else about it. (As any teacher will confirm, to teach is to remember.)

Also, take notes *by hand.* Handwritten notes, in your own words, typically engage more active processing, with better retention, than does verbatim note taking on laptops (Mueller & Oppenheimer, 2014).

Overlearn. Psychology tells us that overlearning improves retention. We tend to overestimate how much we know. You may understand a module as you read it, but that feeling of familiarity can be deceptively comforting. By using all of the self-testing opportunities in the text and in Achieve, you can test your knowledge and *overlearn* in the process.

Memory experts Elizabeth Bjork and Robert Bjork (2011) offer simple, scientifically supported advice for how to improve your retention and your grades:

> Spend less time on the input side and more time on the output side, such as summarizing what you have read from memory or getting together with friends and asking each other questions. Any activities that involve testing yourself—that is, activities that require you to retrieve or generate information, rather than just representing information to yourself—will make your learning both more durable and flexible. (p. 63)



More learning tips To learn more about the testing effect and the SQ3R method, watch the ***Video: Make Things Memorable*** at tinyurl.com/HowToRemember.

Ask Yourself

Of all of these helpful principles, which ones seem most relevant and important for improving your own life and studies? How will you add them to your usual routines?

Retrieval Practice

RP-12 The _____ _____ describes the enhanced memory that results from repeated retrieval (as in self-testing) rather than from simple rereading of new information.

RP-13 What does the acronym *SQ3R* stand for?

ANSWERS IN APPENDIX E

REVIEW

Module 1: The History and Scope of Psychology

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the

answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 1-1: How is psychology a science?

LOQ 1-2: What are the three key elements of the scientific attitude, and how do they support scientific inquiry?

LOQ 1-3: How does critical thinking feed a scientific attitude, and smarter thinking for everyday life?

LOQ 1-4: What were some important milestones in psychology's early history?

LOQ 1-5: How did behaviorism, Freudian psychology, and humanistic psychology further the development of psychological science?

LOQ 1-6: How has contemporary psychology focused on cognition, on biology and experience, on culture and gender, and on human flourishing?

LOQ 1-7: How do psychologists use the biopsychosocial approach, and how can it help us understand our diverse world?

LOQ 1-8: What are psychology's main subfields?

LOQ 1-9: How can psychological principles help you learn, remember, and thrive?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

empirical approach
critical thinking
structuralism
functionalism
behaviorism
humanistic psychology
cognitive psychology
cognitive neuroscience
psychology
nature–nurture issue
natural selection
evolutionary psychology
behavior genetics
culture
positive psychology
biopsychosocial approach
levels of analysis
basic research
applied research
counseling psychology
clinical psychology
psychiatry

community psychology
testing effect
SQ3R

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. How can critical thinking help you evaluate claims in the media, even if you're not a scientific expert on the issue?

2. In 1879, in psychology's first experiment, _____ _____ and his students measured the time lag between hearing a ball hit a platform and pressing a key.

3. William James would be considered a(n) _____. Wilhelm Wundt and Edward Titchener would be considered _____.
   a. functionalist; structuralists
   b. structuralist; functionalists
   c. evolutionary theorist; structuralists
   d. functionalist; evolutionary theorists

4. In the early twentieth century, _____ redefined psychology as "the science of observable behavior."
   a. John B. Watson
   b. Abraham Maslow
   c. William James
   d. Sigmund Freud

5. Nature is to nurture as
   a. personality is to intelligence.
   b. biology is to experience.
   c. intelligence is to biology.
   d. psychological traits are to behaviors.

6. "Nurture works on what nature provides." Describe what this means, using your own words.

7. Which of the following is true regarding gender differences and similarities?
   a. Gender differences outweigh any similarities.
   b. Despite some gender differences, the underlying processes of human behavior are the same.
   c. Gender similarities and differences both depend more on biology than on environment.
   d. Gender differences are so numerous that it is difficult to make meaningful comparisons.

8. Martin Seligman and other researchers who explore various aspects of human flourishing refer to their field of study as _____ _____.

9. A psychologist treating emotionally troubled adolescents at a local mental health agency is most likely to be a(n)
   a. research psychologist.
   b. psychiatrist.
   c. industrial-organizational psychologist.
   d. clinical psychologist.

10. A mental health professional with a medical degree who can prescribe medication is a _____.

11. A psychologist conducting basic research to expand psychology's knowledge base may
   a. design a computer screen with limited glare and assess the effect on computer operators' eyes after a day's work.
   b. treat older people who experience depression.
   c. observe 3- and 6-year-olds solving puzzles and analyze differences in their abilities.
   d. interview children with behavioral problems and suggest treatments.

MODULE 2: Research Strategies: How Psychologists Ask and Answer Questions

Hoping to satisfy their curiosity about people and to relieve their own woes, millions turn to "psychology." They read advice columns aimed at helping people cope with their problems, overcome their addictions, and save their marriages. They watch "celebrity psychics" demonstrate their supposed powers. They attend stop-smoking hypnosis seminars. They play online games, hoping to strengthen their brain. They immerse themselves in self-help books, websites, and lectures that promise to teach the path to love, the road to personal happiness, and the "hacks," or shortcuts, to success.

Others, intrigued by claims of psychological truth, wonder: How—and how much—does parenting shape children's personalities and abilities? Are first-born children more driven to achieve? Do dreams have deep meaning? Do we sometimes remember events that never happened? Does psychotherapy heal?

In working with such questions, the science of psychology does more than speculate. To separate uninformed opinions from examined conclusions, psychologists use the *scientific method* to conduct

research. Let's consider how psychology's researchers do their science.

The Need for Psychological Science

Learning Objective Question LOQ 2-1

How does our everyday thinking sometimes lead us to a wrong conclusion?

Some people suppose that psychology is mere common sense—documenting and dressing in jargon what people already know: "You get paid for using fancy methods to tell me what everyone knows?"

Indeed, our intuition is often right. As the baseball great Yogi Berra (1925–2015) once said, "You can observe a lot by watching." (We also have Berra to thank for other gems, such as "Nobody goes there anymore—it's too crowded," and "If the people don't want to come out to the ballpark, nobody's gonna stop 'em.") Because we're all behavior watchers, it would be surprising if many of psychology's findings had *not* been foreseen. Many people believe that love breeds happiness, for example, and they are right (we have what researchers call a deep "need to belong").

But sometimes what seems like common sense, informed by countless casual observations, is wrong. In other modules, we will see how research has overturned popular ideas—that familiarity breeds contempt, that dreams predict the future, and that most of us use only

10 percent of our brain. We will also see how research has surprised us with discoveries about how the brain's chemical messengers control our moods and memories, about other animals' abilities, and about the relationship between social media use and depression.

Other things seem like commonsense truth only because we so often hear them repeated. Mere repetition of statements—whether true or false—makes them easier to process and remember, and thus more true-seeming (Dechêne et al., 2010; Fazio et al., 2015). Easy-to-remember misconceptions ("Bundle up before you go outside, or you will catch a cold!") can therefore overwhelm hard truths. This power of familiar, hard-to-erase falsehoods is a lesson well known to political manipulators and kept in mind by critical thinkers.

Three common flaws in commonsense thinking—*hindsight bias, overconfidence,* and *perceiving order in random events*—illustrate how, as novelist Madeleine L'Engle (1973) observed, "The naked intellect is an extraordinarily inaccurate instrument."

Did We Know It All Along? Hindsight Bias

Consider how easy it is to draw the bull's-eye *after* the arrow strikes. After the stock market drops, people say it was "due for a correction." After an athletic match, we credit the coach if a "gutsy play" wins the game and criticize the same "stupid play" if it doesn't. After a war or an election, its outcome usually seems obvious. Although history may therefore seem like a series of inevitable events, the actual future is

seldom foreseen. No one's diary recorded, "Today the Hundred Years' War began."

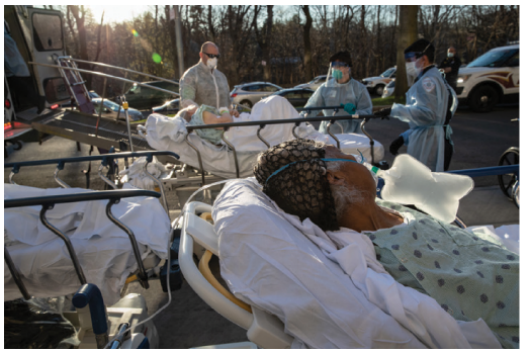
This **hindsight bias** is easy to demonstrate by giving half the members of a group some purported psychological finding and giving the other half an opposite result. Tell the first group, for example: "Psychologists have found that separation weakens romantic attraction. As the saying goes, 'Out of sight, out of mind.'" Ask them to imagine why this might be true. Most people can, and after hearing an explanation, nearly all will then view this true finding as unsurprising.

Tell the second group the opposite: "Psychologists have found that separation strengthens romantic attraction. As the saying goes, 'Absence makes the heart grow fonder.'" People given this untrue result can also easily imagine it, and most will also see it as unsurprising. When opposite findings both seem like common sense, there is a problem.

Such errors in people's recollections and explanations show why we need psychological research. It's not that common sense is usually wrong. Rather, common sense describes, after the fact, what *has* happened better than it predicts what *will* happen.

> **"In life as in history the unexpected lies waiting, grinning from around corners. Only with hindsight are we wise about cause and effect."** — Author Penelope Lively, *Moon Tiger*

More than 800 scholarly papers have shown hindsight bias in people young and old from around the world (Roese & Vohs, 2012). As physicist Niels Bohr reportedly jested, "Prediction is very difficult, especially if it's about the future."





Left: John Moore/Getty Images; right: Mostafa Bassim/Anadolu Agency/Getty Images

Hindsight bias As the Covid-19 pandemic began spreading in early 2020, some countries' leaders told their people not to panic over "a measly cold," assured their people that the virus was "very well under control," and encouraged people to continue to "live life as usual." In hindsight, such misjudgments cost many lives. Likewise, after the 2021 mob assault on the U.S. Capitol, it was, in hindsight, obvious that security officials should have anticipated the attack.

Overconfidence

We humans tend to think we know more than we do. Asked how sure we are of our answers to factual questions *(Is Boston north or south of Paris?)*, we tend to be more confident than correct.[3] And our confidence often drives us to quick—rather than correct—thinking (Rahnev et al., 2020). Consider these three anagrams, shown beside their solutions (from Goranson, 1978):

WREAT → WATER
ETRYN → ENTRY
GRABE → BARGE

About how many seconds do you think it would have taken you to unscramble each of these? Did hindsight influence you? Knowing the answers tends to make us overconfident. (Surely, the solution would take only 10 seconds or so?) In reality, the average problem solver spends 3 minutes, as you also might, given a similar anagram without the solution: OCHSA.[4]

Fun anagram solutions from Wordsmith (wordsmith.org):
Snooze alarms = Alas! No more z's
Dormitory = dirty room
Slot machines = cash lost in 'em

Are we any better at predicting social behavior? Psychologist Philip Tetlock (1998, 2005) collected more than 27,000 expert predictions of world events, such as whether Quebec would separate from Canada. His repeated finding: These predictions, which experts made with 80 percent confidence on average, were right less than 40 percent of the time.

Overconfidence in history: **"Not within a thousand years will man ever fly."** — Wilbur Wright, in 1901, 2 years before he and his brother, Orville, made the first powered flight

"Computers in the future may weigh no more than 1.5 tons." — *Popular Mechanics*, 1949

"They couldn't hit an elephant at this distance." — General John Sedgwick just before being killed during a U.S. Civil War battle, 1864

"No woman in my time will be prime minister." — Margaret Thatcher, 1969 (British Prime Minister, 1979–1990)

Ask Yourself

Do you have a hard time believing you may be overconfident? Could overconfidence be at work in that self-assessment? How might reading this section about overconfidence help reduce your tendency to be overconfident?

Retrieval Practice

RP-1 Why, after friends start dating, do we often feel that we *knew* they were meant to be together?

ANSWERS IN APPENDIX E

Perceiving Order in Random Events

We're born with an eagerness to make sense of our world. People see a face on the Moon, hear Satanic messages in music, or perceive the Virgin Mary's image on a grilled cheese sandwich. Even in random data, we often find patterns, because—here's a curious fact of life—

random sequences often don't look random (Falk et al., 2009; Nickerson, 2002, 2005). Flip a coin 50 times and you may be surprised at the streaks of heads and tails—much like supposed "hot" and "cold" streaks in basketball shooting and baseball hitting. In actual random sequences, patterns and streaks (such as repeating digits) occur more often than people expect (Oskarsson et al., 2009). That also makes it hard for people to generate random-like sequences. When embezzlers try to simulate random digits when specifying how much to steal, their nonrandom patterns can alert fraud experts (Poundstone, 2014).

> **"The really unusual day would be one where nothing unusual happens."** — Statistician Persi Diaconis (2002)

Why are we so prone to pattern-seeking? For most people, a random, unpredictable world is unsettling (Tullett et al., 2015). Making sense of our world relieves stress and helps us get on with daily living (Ma et al., 2017).

Some happenings, such as winning a lottery twice, seem so extraordinary that we find it difficult to conceive an ordinary, chance-related explanation. "But with a large enough sample," say statisticians, "any outrageous thing is likely to happen" (Diaconis & Mosteller, 1989). An event that happens to but 1 in 1 billion people every day occurs about 7 times a day, more than 2500 times a year.

The point to remember: Our commonsense thinking is flawed due to three powerful tendencies: hindsight bias, overconfidence, and our tendency to perceive patterns in random events. But scientific inquiry can help us sift reality from illusion.

Psychological Science in a Post-Truth World

LOQ 2-2

Why are we so vulnerable to believing untruths?

In 2017, the Oxford English Dictionary's word of the year was *post-truth*—describing a modern culture where people's emotions and personal beliefs often override their acceptance of objective facts.

Consider three examples of such "truth decay" (widely shared misinformation):

Belief: *The U.S. crime rate is rising.* Nearly every year since 1993, most U.S. adults have told Gallup that there is more crime "than there was a year ago" (Gallup, 2021).

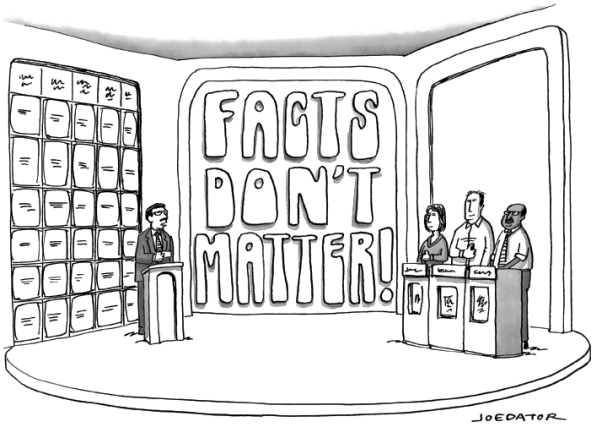
Fact: For several decades, both violent and property crime rates have been *falling.* Between 1993 and 2019, the U.S. violent crime rate dropped 49 percent (Gramlich, 2020).

Belief: *Crime is common among immigrants* (McCarthy, 2017). Memorable incidents feed this narrative. Stories of an immigrant murdering, burglarizing, or lying spread through social networks and news outlets. Such fears are commonplace not only in North America, but also in Europe and Australia (Esses, 2021).

Fact: Most immigrants are *not* criminals. Compared with native-born Americans, immigrants are 44 percent *less* likely to be imprisoned (CATO, 2017; Flagg, 2018, 2019). The same has been true in Italy, the United Kingdom, and elsewhere (Di Carlo et al., 2018).

Belief: *Many people have died soon after receiving a Covid-19 vaccine.*

Fact: This statement is true, but not meaningful. With millions of people dying each year, some of those inevitably will die after receiving a vaccine, even though the vaccine itself (as of mid-2021) had caused no deaths (Rizzo, 2021).



Joe Dator/Cartoon Stock

"I'm sorry, Jeannie, your answer was correct, but Kevin shouted his incorrect answer over yours, so he gets the points."

In the United States, political party bias has distorted people's thinking. Extremely liberal and extremely conservative Americans

both, with similar self-confidence, view their beliefs as superior (Harris & Van Bavel, 2021). Among single-and-looking U.S. Democrats, 71 percent said that they would not date someone who voted for Donald Trump, while 47 percent of Republicans would not date someone who voted for Hillary Clinton (Pew, 2020). When rating candidates for college scholarships, both Democrats and Republicans discriminate against those from the other party (Iyengar & Westwood, 2015). Extremely liberal people and extremely conservative people also show an equally rigid mindset and use the same amount of negative and angry language—they only differ in the issues they support (Frimer et al., 2019; Zmigrod et al., 2020). So, no American can smugly think "Yes, but bias doesn't apply to *me*." Bias goes both ways.

U.S. Democrats and Republicans share concerns about failures to separate fact from fiction. In 2021, President Joe Biden (2021) warned that favoring one's political beliefs rather than scientific research "undermines the welfare of the Nation, contributes to systemic inequities and injustices, and violates the trust that the public places in government to best serve its collective interests." Republican Senator Mitt Romney (2021) similarly expressed concern about false news, urging politicians to show people respect "by telling them the truth." Any agreement across partisan divides requires first a shared understanding of the essential facts.

So why do post-truth-era people so often, in the words of psychologist Tom Gilovich (1991), "know what isn't so?"

False news Some misinformation gets fed to us intentionally. It's "lies in the guise of news" (Kristof, 2017). In the 2016 U.S. election cycle, 6 percent of all Twitter-enabled news consumption was false news (Grinberg et al., 2019). In the United States and United Kingdom, exposure to false news related to Covid-19 vaccines was dangerous, reducing people's intention to accept a Covid vaccine (Loomba et al., 2021). And made-up news is catchy. In one analysis of 126,000 stories tweeted by 3 million people, falsehoods—especially false political news—"diffused significantly farther, faster, deeper, and more broadly than the truth" (Vosoughi et al., 2018). Amid this sea of misinformation, we should remember Britain's scientific academy, the British Royal Society's, motto: *nullius in verba* (take nobody's word for it). The good news is that most people can tell the difference between high-quality and low-quality information sources (Pennycook & Rand, 2019). When encouraged to use slow, deliberate thinking rather than to go with their gut, people better discern fiction from fact (Bago et al., 2020).

Repetition In experiments, statements become more believable when they are repeated (De keersmaecker et al., 2020). From childhood onward, what we hear over and over—perhaps a made-up smear of a political opponent—becomes familiar, gets remembered, and comes to seem true and worth sharing (Effron & Raj, 2020; Fazio & Sherry, 2020).

Availability of powerful examples In the media, "if it bleeds it leads." Gruesome violence—a horrific murder, a mass killing, a plane crash—gets reported, with vivid images that color our judgments.

No wonder Americans grossly overestimate their risk of being victimized by crime, terror, and plane crashes.

Group identity and the echo chamber of the like-minded Our social identities matter. Feeling good about our groups helps us feel good about ourselves. On social media we tend to friend and follow people who think as we do (Cinelli et al., 2021; see **FIGURE 2.1**). We often prefer news sources that affirm our views and demonize news sources that do not. And we often live among like-minded neighbors (Brown & Enos, 2021).

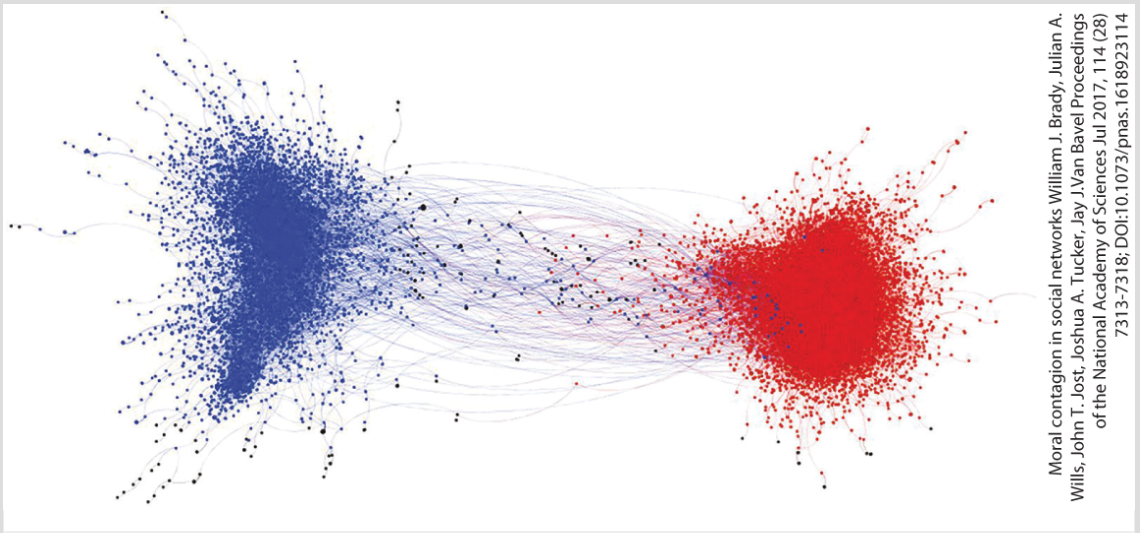


FIGURE 2.1 The meeting of like minds On social media, most people discuss contentious issues with like-minded others. In this graph of politically charged Twitter activity, each node represents a user who sent a message; each line represents a user who retweeted something. As we can see, users overwhelmingly sent messages to, and retweeted messages from, those who shared their liberal (blue) or conservative (red) ideology (Brady et al., 2017).

The good news is that we can build a real-truth world by embracing a scientific mindset. Mindful of our own biases, we can listen and learn.

Confronted with an opposing view, we can discuss before we dismiss. And with a mix of curiosity, skepticism, and humility, we can adopt the spirit of critical thinking: *To accept everything is to be gullible; to deny everything is to be a cynic.*



Marty Bucella/Cartoon Stock

"The best way we can transcend ideology is to teach our students, regardless of their majors, to think like scientists." — Psychologist (and Yale University President) Peter Salovey, "Knowledge Can Be Power," 2018

"We have … become sloppier than ever: Tweet first, research later. Post first, rescind later. Guess first, confirm later." — Luvvie Ajayi, *I'm Judging You: The Do-Better Manual,* 2016

The Scientific Method

The foundation of all science is a scientific attitude that combines *curiosity, skepticism,* and *humility.* Psychologists arm their scientific attitude with the *scientific method*—a self-correcting process for evaluating ideas with observation and analysis. Psychological science welcomes hunches and plausible-sounding theories. And it puts them to the test. If a theory works—if the data support its predictions—so much the better for that theory. If the predictions fail, the theory gets revised or rejected. When researchers submit their work to a scientific journal, **peer reviewers**—other scientists who are experts—evaluate a study's theory, originality, and accuracy. The journal editor then uses the peer reviews to decide whether the research deserves publication.

Constructing Theories

LOQ 2-3

How do theories advance psychological science?

In everyday conversation, we often use *theory* to mean "mere hunch." Someone might, for example, discount evolution as "only a theory"—as if it were mere speculation. In science, a **theory** explains behaviors or events by offering ideas that organize observations. By using deeper principles to organize isolated facts, a theory summarizes and simplifies. As we connect the observed dots, a coherent picture emerges.

A theory of how sleep affects memory, for example, helps us organize countless sleep-related observations into a short list of principles. Imagine that we observe over and over that people with good sleep habits tend to answer questions correctly in class and do well at test time. We might therefore theorize that sleep improves memory. So far, so good: Our principle neatly summarizes a list of observations about the effects of a good night's sleep.

Yet no matter how reasonable a theory may sound—and it does seem reasonable to suggest that sleep boosts memory—we must put it to the test. A good theory produces testable *predictions,* called **hypotheses.** Such predictions specify which results would support the theory and which results would disconfirm it. To test our theory about sleep effects on memory, we might hypothesize that when sleep deprived, people will remember less from the day before. To test that hypothesis, we might assess how well people remember course materials they studied either before a good night's sleep or before a shortened night's sleep (**FIGURE 2.2**). The results will either support our theory or lead us to revise or reject it.

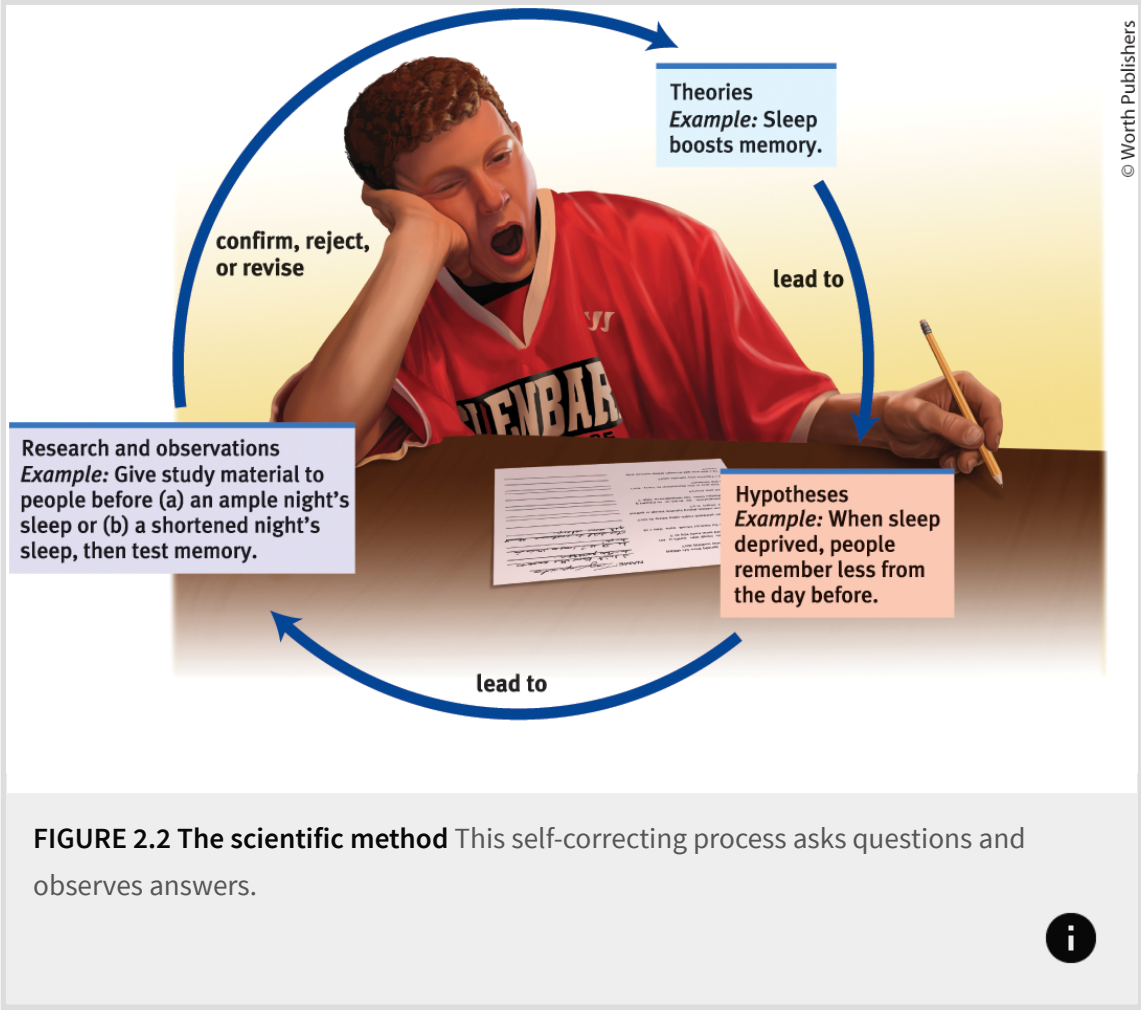


FIGURE 2.2 The scientific method This self-correcting process asks questions and observes answers.

Our theories can bias our observations. Having theorized that better memory springs from more sleep, we may see what we expect: We may perceive sleep-deprived people's answers as less accurate. The urge to see what we expect is strong, both inside and outside the laboratory, as when people's views of climate change influence their interpretation of local weather events.

In the end, our theory will be useful if it (1) *organizes* observations and (2) implies *predictions* that anyone can use to check the theory or to derive practical applications. (Does people's sleep predict their

retention?) Eventually, our research may (3) stimulate further research that leads to a revised theory that better organizes and predicts.

As a check on their own biases, psychologists report their research with precise, measurable **operational definitions** of research procedures and concepts. *Sleep deprived,* for example, may be defined as "at least 2 hours less" than the person's natural sleep. (Likewise, a study of "aggression" may observe how many pins you stab into a doll that represents a lab partner, or a study of "helping" may record dollars donated.) By using carefully worded statements, others can **replicate** (repeat) the original observations with different participants, materials, and circumstances. If they get similar results, confidence in the finding's reliability grows. The first study of hindsight bias, for example, aroused psychologists' curiosity. Now, after many successful replications with differing people and questions, we feel sure of the phenomenon's power. Replication is confirmation.

Replication is an essential part of good science. Over the span of a decade, psychologists attempted to replicate 307 studies. They were able to reproduce similar results 64 percent of the time (Nosek et al., 2022). Replication failures often occur when samples are small, so psychologists increasingly study large samples (Blake & Gangestad, 2020; Sassenberg & Ditrich, 2019). A bigger sample = a more replicable result.

Today's psychological research is benefiting from more replications, more rigorous research methods, and more sharing of research data and tips on how best to analyze it (Agrawal et al., 2020; Dougherty et al., 2018; Smaldino & McElreath, 2016). Professional societies and crowdsourced projects create communities of psychological scientists who work together to improve their research methods and practices (Landy et al., 2020). More and more psychologists also use **preregistration** to publicly communicate their planned study design, hypotheses, data collection, and analyses (Nosek et al., 2018). This openness and transparency also prevents later modifications, such as changing the hypotheses to fit the data. Rather than pressuring researchers to publish only the results that support their predictions, preregistration encourages psychologists to openly report all of their results—even when that means failing to replicate earlier findings (Kristal et al., 2020). There is still a place for *exploratory research:* Investigators gather data and seek patterns that inspire theories, which can then be tested with *confirmatory research* (with preregistered hypotheses and preplanned analyses).

Psychological science also harnesses the power of *meta-analysis* (a statistical procedure for analyzing the results of multiple studies to reach an overall conclusion). Researchers use this procedure to statistically summarize a body of scientific evidence. By combining the results of many studies, researchers avoid the problem of small samples and can get a broader understanding of what they are studying. Replications, collaborations, preregistrations, explorations,

and meta-analyses are all enabling "Psychology's Renaissance" of improved scientific practices (Nelson et al., 2018).

> **"Failure to replicate is not a bug; it is a feature. It is what leads us along the path —the wonderfully twisty path—of scientific discovery."** — Lisa Feldman Barrett, "Psychology Is Not in Crisis," 2015

As we will see next, we can test our hypotheses and refine our theories using *descriptive* methods (which describe behaviors, often through case studies, surveys, or naturalistic observations), *correlational* methods (which associate different variables), and *experimental* methods (which manipulate variables to discover their effects). To think critically about popular psychology claims, we need to understand these methods and know what conclusions they allow.

Retrieval Practice

RP-2 What does a good theory do?

RP-3 Why is replication important?

ANSWERS IN APPENDIX E

Description

LOQ 2-4

How do psychologists use case studies, naturalistic observations, and surveys to observe and describe behavior, and why is random sampling important?

The starting point of any science is description. In everyday life, we all observe and describe people, often drawing conclusions about why they think, feel, and act as they do. Psychologists do much the same, though more objectively and systematically, through

- ***case studies*** (in-depth analyses of individuals or groups),
- ***naturalistic observations*** (recording the natural behavior of many individuals), and
- ***surveys*** *and interviews* (asking people questions).

The Case Study

Among the oldest research methods, the **case study** examines one individual or group in depth in the hope of revealing things true of us all. Some examples:

- ***Brain damage***. Much of our early knowledge about the brain came from case studies of individuals who suffered particular impairments after damage to a certain brain region.
- ***Children's minds***. Pioneering developmental psychologist Jean Piaget taught us about children's thinking after carefully

observing and questioning only a few children.

- ***Animal intelligence***. Studies of various animals, including a few chimpanzees, have revealed their capacity for understanding and language.



Skye Hohmann/Alamy Stock Photo

Freud and Little Hans Sigmund Freud's case study of 5-year-old Hans' extreme fear of horses led Freud to his theory of childhood sexuality. He conjectured that Hans felt unconscious desire for his mother, feared castration by his rival father, and then transferred this fear into his phobia about being bitten by a horse. Today's psychological science discounts Freud's theory of childhood sexuality but does agree that much of the human mind operates outside our conscious awareness. (More on this in the Personality modules.)

Intensive case studies are sometimes very revealing, and they often suggest directions for further study. But atypical individual cases may mislead us. Both in our everyday lives and in science, unrepresentative information can lead to mistaken judgments and

false conclusions. Indeed, anytime a researcher mentions a finding *(Smokers die younger: 95 percent of men over 85 are nonsmokers)* someone is sure to offer a contradictory anecdote *(Well, I have an uncle who smoked two packs a day and lived to be 89!)*.

Dramatic stories and personal experiences (even psychological case examples) command our attention and are easily remembered. Journalists understand that and often begin their articles with compelling stories. Stories move us, but stories can mislead. Which of the following do you find more memorable? (1) "In one study of 1300 dream reports concerning a kidnapped child, only 5 percent correctly envisioned the child as dead" (Murray & Wheeler, 1937). (2) "I know a man who dreamed his sister was in a car accident, and two days later she died in a head-on collision!" Numbers can be numbing, but *the plural of anecdote is not evidence.* A single story of someone who supposedly changed from gay to straight is not evidence that sexual orientation is a choice. As psychologist Gordon Allport (1954, p. 9) said, "Given a thimbleful of [dramatic] facts we rush to make generalizations as large as a tub."

The point to remember: Individual cases can suggest fruitful ideas. What's true of all of us can be glimpsed in any one of us. But to find those general truths, we must employ other research methods.

Retrieval Practice

RP-4 We cannot assume that case studies always reveal general principles that apply to all of us. Why not?

ANSWERS IN APPENDIX E

Naturalistic Observation

A second descriptive method involves recording responses in natural environments. These **naturalistic observations** traditionally ranged from watching chimpanzee societies in the jungle, to videotaping and analyzing parent-child interactions in different cultures, to recording racial differences in students' self-seating patterns in a school lunchroom. Until recently, such naturalistic observation was mostly "small science"—possible to do with pen and paper rather than fancy equipment and a big budget (Provine, 2012). But today's digital technologies—thanks to "big data" harvested from phone apps, social media, online searches, and more—have transformed naturalistic observations into big science. Anonymously tapping into 15 million cell phones' GPS allowed scientists to track how often people in different geological regions obeyed stay-at-home orders and social distancing recommendations during the Covid-19 pandemic (Glanz et al., 2020). New technologies—wearable cameras and fitness sensors, and internet-connected smart-home sensors—offer increasing possibilities for people to allow accurate recording of their activity,

relationships, sleep, and stress (Nelson & Allen, 2018; Yokum et al., 2019).

The billions of people entering personal information online have also enabled big-data observations (without disclosing individual identities). One research team studied the ups and downs of human moods by counting positive and negative words in 504 million tweets from 84 countries (Golder & Macy, 2011). As **FIGURE 2.3** shows, people seemed happier on weekends, shortly after waking, and in the evenings. (Are late Saturday evenings often a happy time for you, too?) Another study found that negative emotion (especially anger-related) words in 148 million tweets from 1347 U.S. counties predicted the counties' heart disease rates *better* than smoking and obesity rates (Eichstaedt et al., 2015). Online searching enables people to learn about the world, and people's online searching enables researchers to learn about people. For example, the words people search and the questions they ask can gauge a region's level of racism and depression. But online searches also reveal our universal human likeness—as illustrated by the word *pregnant* being searched in conjunction with the same food cravings worldwide (Stephens-Davidowitz, 2017). Across the globe, we are kin beneath the skin.

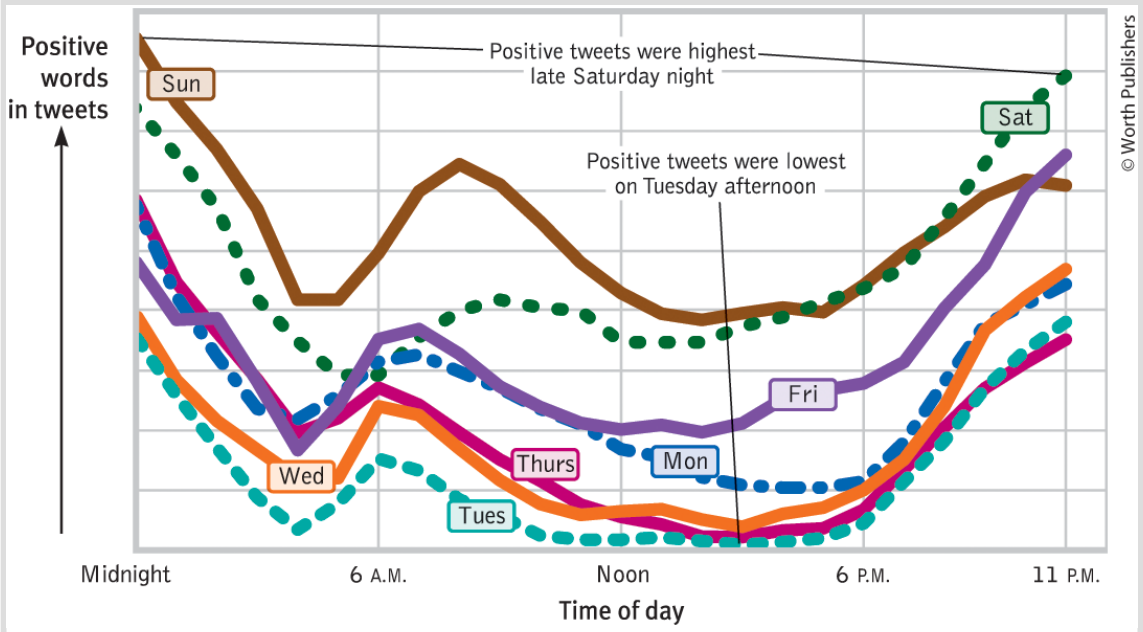


FIGURE 2.3 Twitter message moods, by time and by day This graph illustrates how researchers can use big data to study human behavior on a massive scale. It now is also possible to associate people's moods with, for example, their locations or with the weather, and to study the spread of ideas through social networks. (Data from Golder & Macy, 2011.)

Like the case study, naturalistic observation does not *explain* behavior. It *describes* it. Nevertheless, descriptions can be revealing. We once thought, for example, that only humans use tools. Then naturalistic observation revealed that chimpanzees sometimes insert a stick in a termite mound and withdraw it, eating the stick's load of termites. Such unobtrusive naturalistic observations paved the way for later studies of animal thinking, language, and emotion, which further expanded our understanding of our fellow animals. Thanks to researchers' observations, we know that chimpanzees and baboons use deception: Psychologists repeatedly saw one young baboon

pretending to have been attacked by another as a tactic to get its mother to drive the other baboon away from its food (Whiten & Byrne, 1988).



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A natural observer "Observations, made in the natural habitat," noted chimpanzee observer Jane Goodall (1998), "helped to show that the societies and behavior of animals are far more complex than previously supposed."

Naturalistic observations also illuminate human behavior. Here are two findings you might enjoy:

- ***A funny finding.*** We humans laugh 30 times more often in social situations than in solitary situations (Provine, 2001). (Have you noticed how seldom you laugh when alone?)
- ***Culture and the pace of life.*** Naturalistic observation also enabled Robert Levine and Ara Norenzayan (1999) to compare the pace of life—walking speed, the accuracy of public clocks, and so forth—in 31 countries. Their conclusion: Life is fastest paced in Japan and Western Europe, and slower-paced in economically less-developed countries.

Naturalistic observation offers interesting snapshots of everyday life, but it does so without controlling for all the factors that may influence behavior. It's one thing to observe the pace of life in various places, but another to understand what makes some people walk faster than others. Nevertheless, descriptions can be revealing: The starting point of any science is description.

Retrieval Practice

RP-5 What are the advantages and disadvantages of naturalistic observation?

ANSWERS IN APPENDIX E

The Survey

A **survey** looks at many cases, asking people to report their behavior or opinions. Questions about everything from sexual practices to

political opinions are put to the public. Here are some recent survey findings:

- Compared with young adults of an earlier generation (those born in the 1960s and 1970s), twice as many millennials born in the 1990s reported having no sexual partners since age 18 (Twenge, 2017). Today's less attached young adults are experiencing what one writer termed a "sex recession" (Julian, 2018).
- 1 in 2 people across 24 countries reported believing in the "existence of intelligent alien civilizations in the universe" (Lampert, 2017).
- 54 percent of all humans—some 4.1 billion people—say that religion is very important in their lives (Pew, 2019).

But asking questions is tricky. People may shade their answers in a socially desirable direction, such as by underreporting their cigarette consumption or overreporting their voting. And the answers often depend on how researchers' questions are worded and how respondents are chosen.

Wording Effects

Even small changes in the order or wording of questions can make a big difference (**TABLE 2.1**). When U.S. White evangelical Christians were asked whether (1) "Humans have evolved over time" or (2) "Humans have existed in their present form since the beginning of time," only 32 percent expressed a belief in evolution (Funk, 2019). But when asked whether (1) "Humans have evolved over time due to

processes such as natural selection; God or a higher power had no part in this process"; (2) "Humans have evolved over time due to processes that were guided or allowed by God or a higher power"; or (3) "Humans have existed in their present form since the beginning of time," more than twice as many—68 percent—expressed a belief in evolution. Because wording is such a delicate matter, critical thinkers will reflect on how the phrasing of a question might affect people's expressed opinions.

TABLE 2.1 Survey Wording Effects

Garners More Approval	Garners Less Approval
"aid to those in need"	"welfare"
"undocumented workers"	"illegal aliens"
"gun safety laws"	"gun control laws"
"revenue enhancers"	"taxes"
"enhanced interrogation"	"torture"

Random Sampling

In everyday thinking, we tend to generalize from samples we observe, especially vivid cases. An administrator who reads (a) a statistical summary of an instructor's student evaluations and (b) the vivid comments of two irate students may be influenced as much by the biased sample of two unhappy students as by the many favorable evaluations in the statistical summary. The temptation to succumb to

the *sampling bias*—to generalize from a few vivid but unrepresentative cases—is nearly irresistible.

So how do you obtain a *representative sample?* Say you want to learn how students at your college or university feel about online learning. It's often not possible to survey the whole group. How then could you choose a group that would represent the total student body? Typically, you would seek a **random sample,** in which every person in the entire **population** has an equal chance of being included in the sample group. You might number the names in the school's student roster and use a random-number generator to pick your survey participants. (Sending each student a questionnaire wouldn't work because the conscientious people who returned it would not be a random sample.) Large representative samples are better than small ones, but a smaller representative sample of 100 is better than a larger unrepresentative sample of 500. You cannot compensate for an unrepresentative sample by simply adding more people.

Political pollsters sample voters in national election surveys just this way. Without random sampling, large samples—such as from "opt-in" website polls—often give misleading results. But by using some 1500 randomly sampled people, drawn from all areas of a country, polls can provide a reasonably accurate snapshot of the nation's opinions. In today's world, however, with so many people not answering phones, doorknocks, and emails, getting this random sample is a challenge.

Given polling's margin of error and last-minute voter swings, political polls are good but imperfect estimates of likely outcomes. Immediately before the 2016 U.S. presidential election, popular polling analysis website FiveThirtyEight.com gave candidate Hillary Clinton an estimated 71 percent chance of winning. When Donald Trump was then elected, many regarded the prediction as a failure. But consider: When a prediction model estimates a 71 percent chance for one candidate, that candidate should *lose* nearly one third of the time. (Imagine a weather forecast that predicts a 70 percent chance of rain. If it then *always* rained, that would be a flawed forecast.) One analysis of 30,000 general election political predictions in 45 countries between 1942 and 2017 summed it up: Contrary to popular belief, polls are pretty accurate (Jennings & Wlezien, 2018).

> With very large samples, estimates become quite reliable. The letter *E* is estimated to represent 12.7 percent of the letters in written English. *E,* in fact, is 12.3 percent of the 925,141 letters in Melville's *Moby-Dick,* 12.4 percent of the 586,747 letters in Dickens' *A Tale of Two Cities,* and 12.1 percent of the 3,901,021 letters in 12 of Mark Twain's works (*Chance News,* 1997).

The point to remember: Before accepting survey findings, think critically. Consider the sample. The best basis for generalizing is from a representative, random *sample*.

Retrieval Practice

RP-6 What is an unrepresentative sample, and how do researchers avoid it?

ANSWERS IN APPENDIX E

Correlation

LOQ 2-5

What does it mean when we say two things are correlated, and what are positive and negative correlations?

Describing behavior is the first step toward predicting it. Naturalistic observation and surveys often show us that one trait or behavior tends to coincide with another. In such cases, we say the two **correlate**. A statistical measure (the **correlation coefficient**) helps us figure out the direction and strength of the relationship. Knowing how much aptitude test scores *correlate* with school success tells us how well the scores *predict* school success.

A *positive correlation* (above 0 to +1.00) indicates a *direct* relationship, meaning that two things increase together or decrease together. For example, height and weight are positively correlated.

A *negative correlation* (below 0 to −1.00) indicates an *inverse* relationship: As one thing increases, the other decreases. Negative correlations could go as low as −1.00, which means that, like people on opposite ends of a teeter-totter, one set of scores goes down precisely as the other goes up. An example: In the fall of 2020, U.S. states' rate of mask use correlated negatively ($r = -.85$) with reported Covid-19 symptoms (CovidCast, 2020).

A coefficient near zero is a weak correlation, indicating little or no relationship.

Throughout this book, we often ask how strongly two **variables** are related: How closely related are the personality test scores for identical twins? How well do intelligence test scores predict career achievement? Do people's depression levels predict their anxiety?

In such cases, **scatterplots** can be very revealing. Each dot in a scatterplot represents the values of two variables. The three scatterplots in **FIGURE 2.4** illustrate the range of possible correlations from a perfect positive to a perfect negative. (Perfect correlations rarely occur in the real world.) A correlation is positive if two sets of scores, such as for height and weight, tend to rise or fall together.

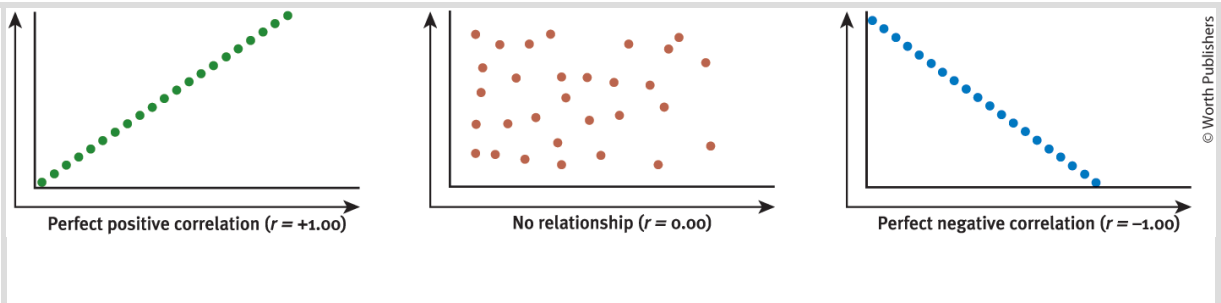


FIGURE 2.4 Scatterplots, showing patterns of correlation Correlations—abbreviated *r*—can range from +1.00 (scores for one variable increase in direct proportion to scores for another), to 0.00 (no relationship), to −1.00 (scores for one variable decrease precisely as scores for the other rise).



A negative correlation isn't "bad." It simply means two sets of scores relate inversely, one set going up as the other goes down. The correlation between people's height and the distance from their head to the ceiling is strongly (perfectly, in fact) negative. Saying that a correlation is "negative" also says nothing about its strength.

Statistics can reveal what we might miss with casual observation. To demonstrate, consider the responses of 2291 Czech and Slovakian volunteers who rated, on a 1 to 7 scale, their *fear* and *disgust* related to each of 24 animals (Polák et al., 2020). With all the relevant data right in front of you (TABLE 2.2), can you tell whether the correlation between participants' fear and their disgust is positive, negative, or close to zero?

TABLE 2.2 People's Fear and Disgust Responses to Various Animals

Animal	Average Fear	Average Disgust
Ant	2.12	2.26
Bat	2.11	2.01
Bull	3.84	1.62

Cat	1.24	1.17
Cockroach	3.10	4.16
Dog	2.25	1.20
Fish	1.15	1.38
Frog	1.84	2.48
Snake	3.32	2.47
Horse	1.82	1.11
Lizard	1.46	1.46
Louse	3.58	4.83
Maggot	2.90	4.49
Mouse	1.62	1.78
Panda	1.57	1.17
Pigeon	1.48	2.01
Rat	2.11	2.25
Rooster	1.78	1.34
Roundworm	3.49	4.79
Snail	1.15	1.69
Spider	4.39	4.47

Tapeworm	3.60	4.83
Viper	4.34	2.83
Wasp	3.42	2.84

When comparing the columns in Table 2.2, you might not detect much of a relationship between fear and disgust. In fact, the correlation in this example is positive ($r = +.72$), as we can see if we display the data as a scatterplot (**FIGURE 2.5**).

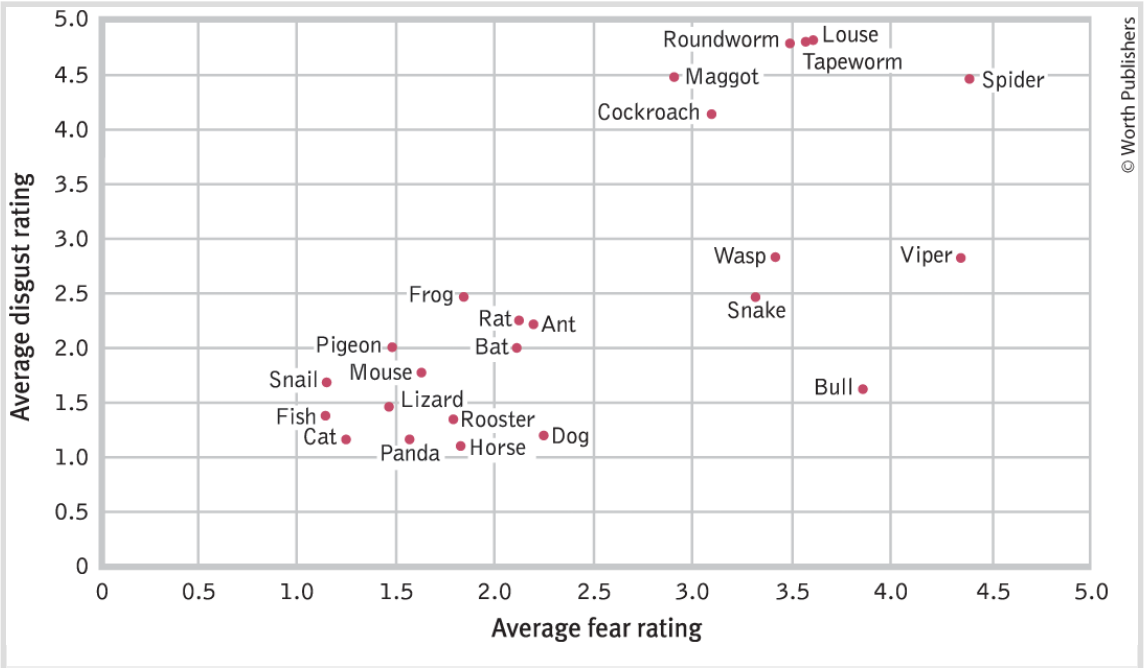


FIGURE 2.5 Scatterplot for fear and disgust felt toward 24 animals This display of average self-reported fear and disgust (each represented by a data point) reveals an upward slope, indicating a positive correlation. The considerable scatter of the data indicates the correlation is much lower than +1.00.

If we don't easily recognize a strong relationship when data are presented systematically, as in Table 2.2, how much less likely are we to notice them in everyday life? To see what is right in front of us, we sometimes need statistical illumination. We can easily see evidence of gender discrimination when given statistically summarized information about job level, seniority, performance, gender, and salary. But we often see no discrimination when the same information dribbles in, case by case (Twiss et al., 1989). Single events or individuals catch our attention, especially if we want to see (or deny) bias. In contrast, statistics calculate patterns by counting every case equally.

The point to remember: Unlike experiments, correlation coefficients tell us nothing about cause and effect. But they can help us see the world more clearly by revealing the extent to which two things relate.

Retrieval Practice

RP-7 Indicate whether each association is a positive correlation or a negative correlation.

1. The more husbands viewed internet pornography, the worse their marital relationships (Muusses et al., 2015). _____
2. The more time teen girls spend absorbed with online social media, the more at risk they are for depression and suicidal thoughts (Kelly et al., 2019; Twenge & Campbell, 2019). _____
3. The longer children were breast-fed, the greater their later academic achievement (Horwood & Fergusson, 1998). _____
4. The more leafy vegetables older adults eat, the less their mental decline over the ensuing 5 years (Morris et al., 2018). _____

ANSWERS IN APPENDIX E

Illusory Correlations and Regression Toward the Mean

LOQ 2-6

What are *illusory correlations,* and what is *regression toward the mean?*

Correlations make clear the relationships we might otherwise miss; they also keep us from falsely assuming a relationship where there is none. When we believe there is a relationship between two things, we are likely to notice and recall instances that confirm our belief. If we believe that dreams forecast actual events, we may notice and recall confirming instances more than disconfirming instances. The result is an **illusory correlation**.

Illusory correlations can feed an illusion of control—that we can personally influence chance events. Gamblers, remembering past lucky rolls, may come to believe they influenced the roll of the dice by throwing gently for low numbers and hard for high numbers. We also struggle to separate fact from fiction due to a statistical phenomenon called **regression toward the mean**. Extreme results, such as an exceptionally low exam score, are caused by unfortunate combinations—exam topic, question difficulty, sleep deprivation, the weather. The same combination likely won't occur on the next exam, raising the probability of a higher score. Simply said, extraordinary

happenings tend to be followed by more ordinary ones. Unusually high or low grades will usually regress toward students' average grades. And a team's unusually poor performance in one game will usually improve in the next.

Failure to recognize regression can lead to superstitious thinking. After berating a team for poorer-than-usual performance, a coach may—when the team regresses to more typical play—think the scolding actually worked. After lavishing praise for an exceptionally fine performance, the coach may be disappointed when a team's behavior migrates back toward its average. Ironically, then, regression toward the average can mislead us into feeling rewarded after criticizing others ("That criticism really made them work harder!") and feeling punished after praising them ("All those compliments made them slack off!") (Tversky & Kahneman, 1974).

> **"Once you become sensitized to it, you see regression everywhere."** — Psychologist Daniel Kahneman (1985)

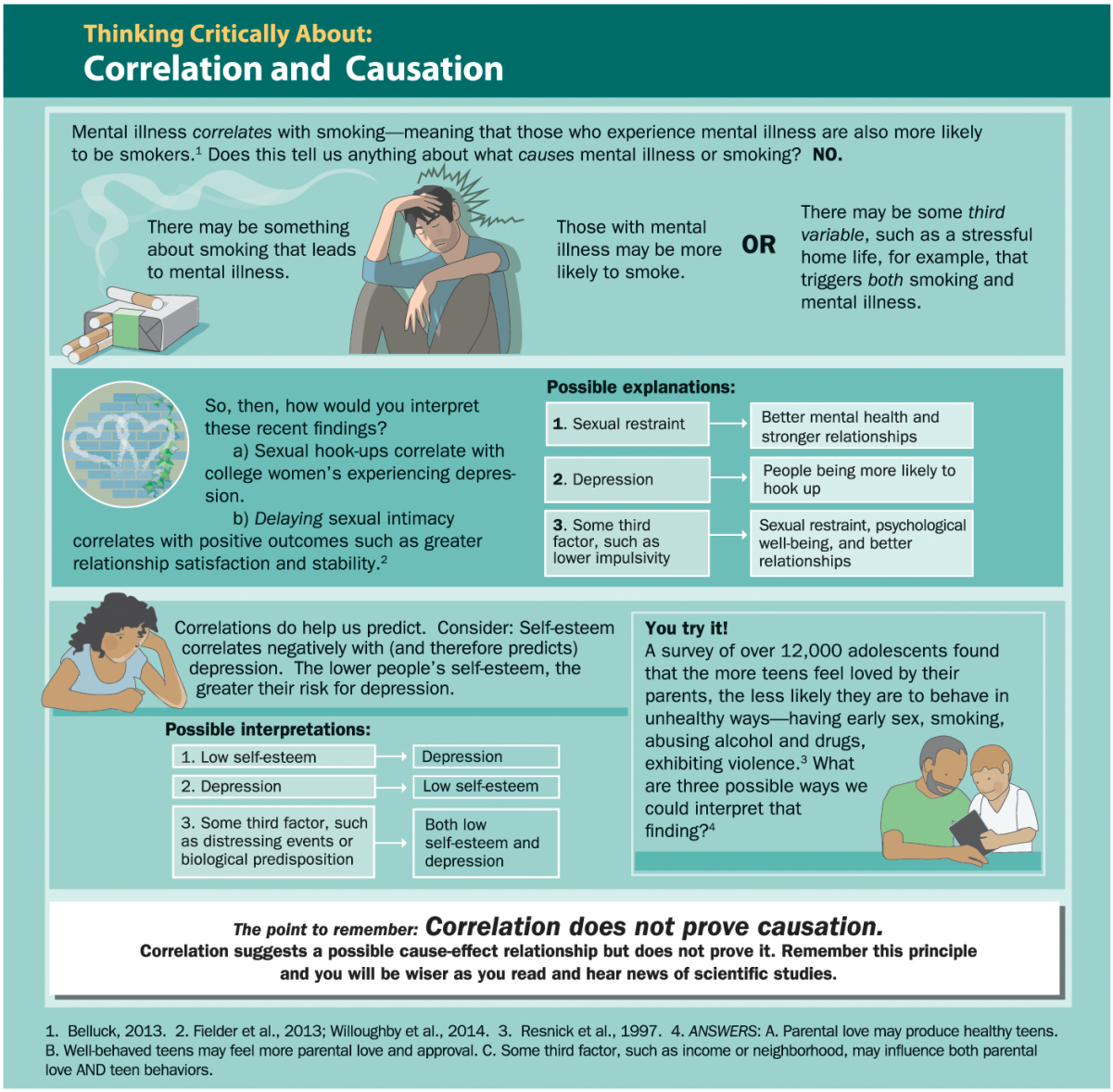
The point to remember: When a fluctuating behavior returns to average, fancy explanations for why it does so are often wrong. Regression toward the mean is probably at work.

Moreover, although correlational research helpfully reveals relationships, it does not explain them. If teen social media use correlates with (predicts) teen risk of depression, that may—or may

not—indicate that social media use affects depression risk. Other explanations are possible (see Thinking Critically About: Correlation and Causation).

LOQ 2-7

Why do correlations enable prediction but not cause-effect explanation?



Retrieval Practice

RP-8 You hear the school basketball coach telling her friend that she rescued her team's winning streak by yelling at the players after an unusually bad first half. What is another explanation of why the team's performance improved?

RP-9 Length of marriage positively correlates with hair loss in men. Does this mean that marriage causes men to lose their hair (or that balding men make better husbands)?



Nancy Brown/The Image Bank/Getty Images

ANSWERS IN APPENDIX E

Experimentation

LOQ 2-8

What are the characteristics of experimentation that make it possible to isolate cause and effect?

Happy are they, remarked the Roman poet Virgil, "who have been able to perceive the causes of things." How might psychologists sleuth out the causes in correlational studies, such as the small correlation between teen girls' social media use and their risk of depression and self-harm (Olgers & Jensen, 2020)?

Experimental Manipulation

Our sleuthing starts with three plain facts:

1. Beginning in 2010, worldwide smart phone and social media use mushroomed.
2. Simultaneously, Canadian, American, and British teen girls' rates of depression, anxiety, self-harm, and suicide also mushroomed (Mercado et al., 2017; Morgan, 2017; Statistics Canada, 2016).
3. Moving beyond simple correlations, in seven of nine *longitudinal* (over time) studies, teens' current social media use predicted future mental health issues (Haidt & Twenge, 2021; Zhou et al., 2020).

What do such findings mean? Is there a cause-effect connection, perhaps above a certain amount of screen time? Should parents limit their children's screen time? Even big correlational data from a million teens couldn't tell us. To identify cause and effect, researchers must **experiment.** Experiments enable researchers to isolate the effects of one or more variables by (1) *manipulating the variables of interest* and (2) *holding constant ("controlling") other variables.* To do so, they often create an **experimental group**, in which people receive the

treatment (such as reduced screen time), and a contrasting **control group** in which they do not.

To minimize any preexisting differences between the two groups, experimenters **randomly assign** people to each condition. Random assignment—whether with a random-number generator or by the flip of a coin—effectively equalizes the two groups. If one-third of the volunteers for an experiment can wiggle their ears, then about one-third of the people in each group will be ear wigglers. So, too, with age, intelligence, attitudes, and other characteristics, which will be similar in the experimental and control groups. Thus, if the groups differ at the experiment's end, we can surmise that the treatment had an effect. (Note the difference between random *sampling*—which creates a representative survey sample—and random *assignment,* which equalizes the experimental and control groups.)

So, what do *experiments* reveal about the relationship between girls' social media use and their risk of depression and self-harm? One experiment identified nearly 1700 people who agreed to deactivate their Facebook account for 4 weeks (Allcott et al., 2020). Compared with people in the control group, those randomly assigned to the deactivation group spent more time watching TV and socializing with friends and family—and they reported lower depression, and greater happiness and satisfaction with their lives (and less postexperiment Facebook use). Less Facebook time meant a happier life.

The debate over the effects of prolonged social media use is ongoing. For now, most researchers agree that unlimited teen social media use poses a modest mental health risk. With more large correlational and longitudinal studies, and more experiments, researchers will refine this tentative conclusion.

The point to remember: Correlational studies, which uncover naturally occurring relationships, are complemented by experiments, which manipulate a variable to determine its effect.

Procedures and the Placebo Effect

Consider, then, how we might assess therapeutic interventions. Our tendency to seek new remedies when we are ill or emotionally down can produce misleading testimonies. If three days into a cold we start taking zinc tablets and find our cold symptoms lessening, we may credit the pills rather than the cold naturally subsiding. In the 1700s, bloodletting *seemed* effective. When the patient actually survived, this "treatment" was credited for the recovery. When patients didn't survive, the practitioner inferred the disease was too advanced to be reversed. So, whether or not a remedy is truly effective, enthusiastic users will probably endorse it. To determine its effect, we must control for other variables.

And that is precisely how new drugs and new methods of psychological therapy are evaluated (more on this in the Therapy modules). Investigators randomly assign participants in these studies to research groups. One group receives a pseudotreatment—an inert

placebo (perhaps a pill with no drug in it). The other group receives a treatment, such as an antidepressant medication. (You can think of the placebo versus the actual drug as "trick or treatment.") The participants are often *blind* (uninformed) about what treatment, if any, they are receiving. If the study is using a **double-blind procedure**, neither the participants nor those who administer the drug and collect the data will know which group is receiving the treatment.

In double-blind studies, researchers check a treatment's actual effects apart from the participants' and the staff's belief in its healing powers. Just *thinking* you are getting a treatment can boost your spirits, relax your body, and relieve your symptoms. This **placebo effect** is well documented in reducing pain, depression, anxiety, and auditory hallucinations in schizophrenia (Dollfus et al., 2016; Kirsch, 2010). Athletes have run faster when given a supposed performance-enhancing drug (McClung & Collins, 2007). Decaf-coffee drinkers have reported increased vigor and alertness when they thought their brew had caffeine in it (Dawkins et al., 2011). People have felt better after receiving a phony mood-enhancing drug (Michael et al., 2012). And the more expensive the placebo, the more "real" it seems to us—a fake pill that costs $2.50 worked better than one costing 10 cents (Waber et al., 2008). To know how effective a therapy really is, researchers must control for a possible placebo effect.



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Retrieval Practice

RP-10 What measures do researchers use to prevent the *placebo effect* from confusing their results?

ANSWERS IN APPENDIX E

Independent and Dependent Variables

Here is an even more potent example: The drug Viagra was approved for use after 21 clinical trials. One trial was an experiment in which researchers randomly assigned 329 men with erectile disorder to either an experimental group (Viagra takers) or a control group (placebo takers given an identical-looking pill). The procedure was

double-blind—neither the men taking the pills nor the person giving them knew what participants were receiving. The result: At peak doses, 69 percent of Viagra-assisted attempts at intercourse were successful, compared with 22 percent for men receiving the placebo (Goldstein et al., 1998). Follow-up experiments replicated Viagra's helpful effect (Fink et al., 2002). Viagra performed.

> A similar experiment on a drug approved to increase women's sexual arousal produced a result described as, um, anticlimactic—an additional "half of one satisfying sexual encounter a month" (Ness, 2016; Tavernise, 2016).

These simple experiments manipulated just one variable: the drug (Viagra versus no Viagra). We call this experimental variable the **independent variable** because we can vary it *independently* of other variables, such as the men's age, weight, and personality. Other variables that can potentially influence a study's results are called **confounding variables.** Random assignment controls for possible confounding variables.

Experiments examine the effect of one or more independent variables on some measurable behavior, called the **dependent variable** because it can vary *depending* on what occurs during the experiment. Both variables are given precise *operational definitions,* which specify the procedures that manipulate the independent variable (the exact drug dosage and timing in this study) or measure the dependent variable (the men's responses to questions about their sexual performance).

These definitions offer a level of precision that enables others to replicate the study. (See **FIGURE 2.6** for the Facebook experiment design.)

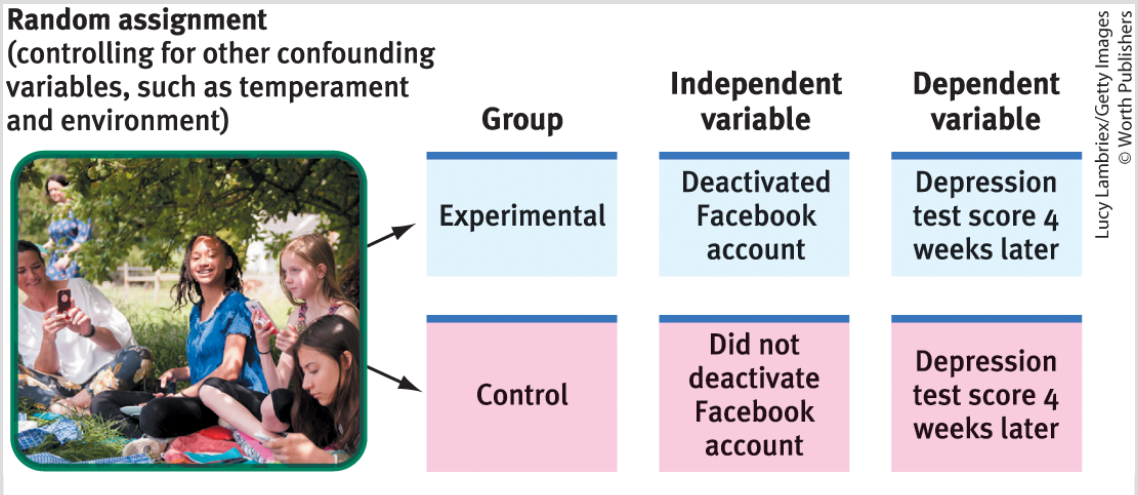


FIGURE 2.6 Experimentation To establish causation, psychologists control for confounding variables by randomly assigning some participants to an experimental group, others to a control group. Measuring the dependent variable (depression score) will determine the effect of the independent variable (social media exposure).

Let's pause to check your understanding using a simple psychology experiment: To test the effect of perceived ethnicity on the availability of rental housing, Adrian Carpusor and William Loges (2006) sent identically worded email inquiries to 1115 Los Angeles-area landlords. The researchers varied the sender's name and tracked the percentage of positive replies (invitations to view the apartment in person). "Patrick McDougall," "Said Al-Rahman," and "Tyrell Jackson" received, respectively, 89 percent, 66 percent, and 56 percent invitations. In this

experiment, what was the independent variable? The dependent variable?[5]

> **"[We must guard] against not just racial slurs, but … against the subtle impulse to call Johnny back for a job interview, but not Jamal."** — U.S. President Barack Obama, eulogy for state senator and church-shooting victim Clementa Pinckney, June 26, 2015

Experiments can also help us evaluate social programs. Do early childhood education programs boost impoverished children's chances for success? What are the effects of different antismoking campaigns? Do school sex-education programs reduce teen pregnancies? To answer such questions, we can experiment: If an intervention is welcomed but resources are scarce, we could use a lottery to randomly assign some people (or regions) to experience the new program and others to a control condition. If later the two groups differ, the intervention's effect will be supported (Passell, 1993).

Let's recap. A *variable* is anything that can vary (social media exposure, erectile function, landlord responses—anything within the bounds of what is feasible and ethical to measure). Experiments aim to *manipulate* an *independent* variable, *measure* a *dependent* variable, and *control confounding* variables. An experiment has at least two different conditions: an *experimental condition* and a *comparison* or *control condition. Random assignment* works to minimize preexisting differences between the groups before any treatment effects occur. In

this way, an experiment tests the effect of at least one independent variable (what we manipulate) on at least one dependent variable (the outcome we measure).

Retrieval Practice

RP-11 By using *random assignment,* researchers are able to control for _____ _____, which are other variables besides the independent variable(s) that may influence research results.

RP-12 Match the term on the left (i through iii) with the description on the right (a through c).

i. Double-blind procedure	a. helps researchers generalize from a small set of survey responses to a larger population
ii. Random sampling	b. helps minimize preexisting differences between experimental and control groups
iii. Random assignment	c. controls for the placebo effect; neither researchers nor participants know who receives the real treatment

RP-13 Why, when testing a new drug to control blood pressure, would we learn more about its effectiveness from giving it to half the participants in a group of 1000 than to all 1000 participants?

ANSWERS IN APPENDIX E

Research Design

LOQ 2-9

How would you know which research design to use?

Throughout this book, you will read about amazing psychological science discoveries. But how do psychological scientists choose research methods and design their studies in ways that provide meaningful results? Understanding how research is done—how testable questions are developed and studied—is key to appreciating all of psychology. TABLE 2.3 compares the features of psychology's main research methods. In other modules, you will read about other research designs, including *twin studies* and *cross-sectional* and *longitudinal research.*

TABLE 2.3 Comparing Research Methods

Research Method	Basic Purpose	How Conducted	What Is Manipulated	Weaknesses
Descriptive	To observe and record behavior	Do case studies, naturalistic observations, or surveys	Nothing	No control of variables; single cases may be misleading
Correlational	To detect naturally occurring relationships; to assess how well	Collect data on two or more variables; no manipulation	Nothing	Cannot specify cause and effect

	one variable predicts another			
Experimental	To explore cause and effect	Manipulate one or more variables; use random assignment	The independent variable(s)	Sometimes not feasible; results may not generalize to other contexts; not ethical to manipulate certain variables

In psychological research, no questions are off limits, except untestable (or unethical) ones: Does free will exist? Are people born evil? Is there an afterlife? Psychologists can't test those questions. But they *can* test whether free-will beliefs, aggressive personalities, and a belief in life after death influence how people think, feel, and act (Dechesne et al., 2003; Shariff et al., 2014; Webster et al., 2014).

Having chosen their question, psychologists then select the most appropriate research design—*experimental, correlational, case study, naturalistic observation, twin study, longitudinal,* or *cross-sectional*—and determine how to set it up most effectively. They consider how much money and time are available, ethical issues, and other limitations. For example, it wouldn't be ethical for a researcher studying child development to use the experimental method and randomly assign children to loving versus abusive homes.

Next, psychological scientists decide how to measure the behavior or mental process being studied. For example, researchers studying

aggressive behavior could measure participants' willingness to blast a stranger with supposed intense noise.

Researchers want to have confidence in their findings, so they carefully consider confounding variables—variables other than those being studied that may affect their interpretation of results.

Psychological research is a creative adventure. Researchers *design* each study, *measure* target behaviors, *interpret* results, and learn more about the fascinating world of behavior and mental processes along the way.

Ask yourself

If you could conduct a study on any psychological question, which question would you choose? How would you design the study?

Predicting Everyday Behavior

LOQ 2-10

How can simplified laboratory experiments help us understand general principles of behavior?

When you see or hear about psychological research, do you ever wonder whether people's behavior in the lab will predict their

behavior in everyday life? Does detecting the blink of a faint red light in a dark room say anything useful about flying an airplane at night? After viewing a violent, sexually explicit film, does a man's increased willingness to push buttons that he thinks will deliver a noise blast to a woman really say anything about whether viewing violent pornography makes a man more likely to abuse a woman?

Before you answer, consider: The experimenter *intends* the laboratory environment to be a simplified reality—one that simulates and controls important features of everyday life. Just as a wind tunnel lets airplane designers re-create airflow forces under controlled conditions, a laboratory experiment lets psychologists re-create psychological forces under controlled conditions. An experiment's purpose is not to re-create the exact behaviors of everyday life, but to test *theoretical principles* (Mook, 1983). In aggression studies, deciding whether to push a button that delivers a noise blast may not be the same as slapping someone in the face, but the principle is the same. *It is the resulting principles—not the specific findings—that help explain everyday behaviors.*

When psychologists apply laboratory research on aggression to actual violence, they are applying theoretical principles of aggressive behavior, principles they have refined through many experiments. Similarly, it is the principles of the visual system, developed from experiments in artificial settings (such as looking at red lights in the dark), that researchers apply to more complex behaviors such as night flying. And many investigations show that principles derived in the

laboratory do typically generalize to the everyday world (Mitchell, 2012).

The point to remember: Psychological science focuses less on specific behaviors than on revealing general principles that help explain many behaviors.

Psychology's Research Ethics

LOQ 2-11

Why do psychologists study animals, and what ethical research guidelines safeguard human and animal welfare? How do psychologists' values influence what they study and how they apply their results?

We have reflected on how a scientific approach can restrain biases. We have seen how case studies, naturalistic observations, and surveys help us describe behavior. We have also noted that correlational studies assess the association between two variables, showing how well one predicts another. We have examined the logic that underlies experiments, which use control conditions and random assignment of participants to isolate the causal effects of an independent variable on a dependent variable.

Yet even knowing this much, you may still be approaching psychology with a mixture of curiosity and apprehension. So, before we plunge in,

let's entertain some common questions about psychology's ethics and values.

Studying and Protecting Animals

Many psychologists study nonhuman animals because they find them fascinating. They want to understand how different species learn, think, and behave. Psychologists also study animals to learn about people. We humans are not *like* animals; we *are* animals, sharing a common biology. Animal experiments have therefore led to treatments for human diseases—insulin for diabetes, vaccines to prevent polio and rabies, transplants to replace defective organs.

> **"Rats are very similar to humans except that they are not stupid enough to purchase lottery tickets."** — Dave Barry, 2002

Humans are complex. But some of the same processes by which we learn are present in other animals, even sea slugs and honeybees. The simplicity of the sea slug's nervous system is precisely what makes it so revealing of the neural mechanisms of learning. Ditto for the honeybee, which resembles us humans in how it learns to cope with stress (Dinges et al., 2017).

Sharing such similarities, should we not respect our animal relatives? The animal protection movement protests the use of animals in psychological, biological, and medical research. "We cannot defend

our scientific work with animals on the basis of the similarities between them and ourselves and then defend it morally on the basis of differences," noted Roger Ulrich (1991). In U.S. national surveys, half of adults oppose and half favor "the use of animals in scientific research"—with support greater among those most informed about science (Strauss, 2018).

Out of this heated debate, two issues emerge. The basic one is whether it is right to place the well-being of humans above that of other animals. In experiments on stress and cancer, is it right that mice get tumors in the hope that people might not? Was it right that researchers exposed monkeys to a coronavirus in the search for a Covid-19 vaccine (Shandrashekar et al., 2020)? Humans slaughter for meat 80 billion animals a year (Ritchie & Roser, 2019). Is our use and consumption of other animals as natural as the behavior of carnivorous hawks, cats, and whales?

> **"Please do not forget those of us who suffer from incurable diseases or disabilities who hope for a cure through research that requires the use of animals."** — Psychologist Dennis Feeney (1987)

For those who give human life top priority, a second issue emerges: What safeguards should protect the well-being of animals in research? One survey of animal researchers gave an answer. Some 98 percent supported government regulations protecting primates, dogs, and cats, and 74 percent also supported regulations providing for the

humane care of rats and mice (Plous & Herzog, 2000). Many professional associations and funding agencies already have such guidelines. British Psychological Society (BPS) guidelines call for housing animals under reasonably natural living conditions, with companions for social animals (Lea, 2000). American Psychological Association (APA) guidelines state that researchers must provide "humane care and healthful conditions" and that testing should "minimize discomfort" (APA, 2012). The European Parliament also mandates standards for animal care and housing (Vogel, 2010). Most universities screen research proposals, often through an animal care ethics committee, and laboratories are regulated and inspected.

> **"The greatness of a nation can be judged by the way its animals are treated."** — Mahatma Gandhi, 1869–1948

Animals have themselves benefited from animal research. One Ohio team of research psychologists measured stress hormone levels in samples of millions of dogs brought each year to animal shelters. They devised handling and stroking methods to reduce stress and ease the dogs' transition to adoptive homes (Tuber et al., 1999). Other studies have helped improve care and management in animals' natural habitats. By revealing our behavioral kinship with animals and the remarkable intelligence of chimpanzees, gorillas, and other animals, experiments have also led to increased empathy and protection for them. At its best, a psychology concerned for humans and sensitive to animals serves the welfare of both.



MARY ALTAFFER/AP Photo

Animal research benefiting animals
Psychologists have helped zoos enrich animal environments—for example, by giving animals more choices to reduce the *learned helplessness* of captivity (Kurtycz, 2015; Weir, 2013). Thanks partly to research on the benefits of novelty, control, and stimulation, these gorillas are enjoying an improved quality of life in New York's Bronx Zoo.

Studying and Protecting Humans

What about human participants? Does the image of white-coated scientists seeming to deliver electric shocks trouble you? Actually, most psychological studies are free of such stress. Blinking lights, flashing words, and pleasant social interactions are more common.

Occasionally, researchers do temporarily stress or deceive people, but only when they believe it is essential to a justifiable end, such as understanding and controlling violent behavior or studying mood swings. Many experiments won't work if participants know everything

beforehand. (Wanting to be helpful, the participants might try to confirm the researcher's predictions.)

Some of psychology's famous experiments used stressful and deceptive methods that are considered unacceptable today. These early psychologists deprived baby monkeys of their mothers, conditioned human babies to burst into tears, and semistarved conscientious objectors. More to come on each of these in other modules.

Today's ethics codes, from the APA and Britain's BPS, urge researchers to (1) obtain potential participants' **informed consent** to take part, (2) protect participants from greater-than-usual harm and discomfort, (3) keep information about individual participants confidential, and (4) fully **debrief** people (explain the research afterward, including any temporary deception). To enforce these ethical standards, universities and research organizations have *Institutional Review Boards* that screen research proposals and safeguard "the rights, welfare and well-being of human research participants" (NIEHS, 2019).

Retrieval Practice

RP-14 How are animal and human research participants protected?

ANSWERS IN APPENDIX E

Ensuring Scientific Integrity

In science, as in everyday life, mistakes happen. When data get accidentally miscomputed or misreported, that's forgivable and correctable. What's not acceptable—and will get a scientist banished from the profession—is fraud. Leading scientists cite honesty as the most important scientific value, followed by curiosity and perseverance (*Nature,* 2016). The worldwide general public rates doctors and scientists as the most trusted professionals, followed by judges and members of the armed forces (Ipsos, 2019). To seek career advancement by plagiarizing another's words or ideas, or to make up data, is to risk finding one's career ended. This was the case when a Dutch psychologist fabricated data that made it into 58 research articles—fakery that was sniffed out by alert colleagues (Retraction Watch, 2015).

Fake science also has the potential to cause great harm. This happened in 1998 when a now-disbarred British physician published an article in the prestigious *Lancet,* reporting a dozen cases in which British children given the measles, mumps, and rubella (MMR) vaccine supposedly developed autism afterward. Other studies failed to reproduce the finding (replication matters!) (Hviid et al., 2019). An investigation revealed a fraud—with falsified data—and the journal retracted the report (Godlee, 2011). Alas, by then the widely publicized finding—"the most damaging medical hoax of the last 100 years" (Flaherty, 2011)—had produced an "anti-vax" movement and declining vaccination rates. Instead of following the typical path toward disease

elimination, U.S. measles rates in 2019 rose to their highest levels in 25 years (CDC, 2019; Graham et al., 2019). Unvaccinated children may suffer long-term harm or even death, as well as placing at risk those children too young to be fully vaccinated. Though the science was self-correcting, the damage lingers on. Today, the discredited Wakefield continues to urge people to avoid other vaccines, including those for Covid-19 (Jamison, 2020). (In September 2020, only one-third of Americans said they would get a Covid-19 vaccine as soon as they could [Elbeshbihi & King, 2020].) Nevertheless, the good news is that scientific scrutiny, complete with replication, can inform and protect us.

Values in Psychology

Values affect what we study, how we study it, and how we interpret results. Researchers' values influence choice of research topics. Should we study worker productivity or worker morale? Cultural differences or social injustice? Conformity or independence? Values can also color "the facts"—our observations and interpretations. Sometimes we see what we want or expect to see (**FIGURE 2.7**).

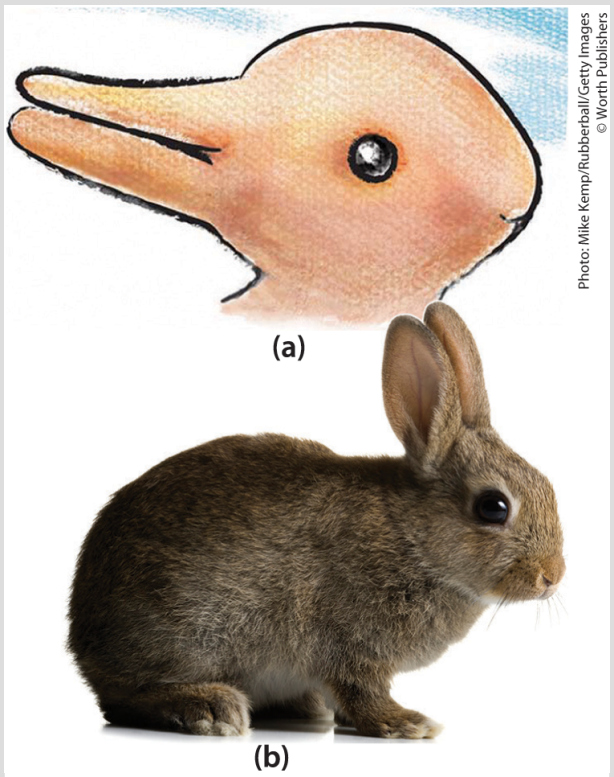


FIGURE 2.7 What do you see? Our expectations influence what we perceive in (a). Did you see a duck or a rabbit? Show some friends this image with the rabbit photo (b) covered up and see if they are more likely to perceive a duck. (Inspired by Shepard, 1990.)

Even the words we use to describe traits and tendencies can reflect our values. In psychology and in everyday speech, labels describe and labels evaluate: One person's *rigidity* is another's *consistency.* One person's *faith* is another's *fanaticism.* One person's *adultery* is another's *open marriage.* Our labeling someone as *firm* or *stubborn, careful* or *picky, discreet* or *secretive* reveals our own attitudes.

So, values inform psychological science—and psychological science has the power to persuade. This may lead some to feel distrustful: Is psychology dangerously powerful? Might it be used to manipulate people? Knowledge, like all power, can be used for good or evil. Nuclear power has been used to light up cities—and to demolish them. Persuasive power has been used to educate people—and to deceive them. Although psychology does have the power to deceive, its purpose is to enlighten. Every day, psychologists explore ways to enhance learning, creativity, and compassion. Psychology speaks to many of our world's great problems—extremist terrorism, political corruption, economic inequality, climate change, prejudice, refugee crises—all of which involve attitudes and behaviors. Psychology also speaks to our deepest longings—for love, for happiness, for meaning. Psychology cannot address all of life's great questions, but it speaks to some mighty important ones.







Left and middle: Macmillan Learning; right: Courtesy of and copyright The Gordon Parks Foundation

Psychology speaks In making its historic 1954 school desegregation decision, the U.S. Supreme Court cited the expert testimony and research of psychologists Mamie Phipps Clark and Kenneth Clark (1947). The Clarks reported that, when given a choice between Black and White dolls, most African American children chose the White doll, which indicated that they had likely absorbed and internalized anti-Black prejudice.

Ask yourself

What other questions or concerns do you have about psychology?

REVIEW

Module 2: Research Strategies: How Psychologists Ask and Answer Questions

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 2-1: How does our everyday thinking sometimes lead us to a wrong conclusion?

LOQ 2-2: Why are we so vulnerable to believing untruths?

LOQ 2-3: How do theories advance psychological science?

LOQ 2-4: How do psychologists use case studies, naturalistic observations, and surveys to observe and describe behavior, and why is random sampling important?

LOQ 2-5: What does it mean when we say two things are correlated, and what are positive and negative correlations?

LOQ 2-6: What are *illusory correlations,* and what is *regression toward the mean?*

LOQ 2-7: Why do correlations enable prediction but not cause-effect explanation?

LOQ 2-8: What are the characteristics of experimentation that make it possible to isolate cause and effect?

LOQ 2-9: How would you know which research design to use?

LOQ 2-10: How can simplified laboratory experiments help us understand general principles of behavior?

LOQ 2-11: Why do psychologists study animals, and what ethical research guidelines safeguard human and animal welfare? How do psychologists' values influence what they study and how they apply their results?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

hindsight bias
peer reviewers

theory
hypothesis
operational definition
replication
preregistration
case study
naturalistic observation
survey
random sample
population
correlation
correlation coefficient
variable
scatterplot
illusory correlation
regression toward the mean
experiment
experimental group
control group
random assignment
double-blind procedure
placebo [pluh-SEE-bo] effect
independent variable
confounding variable
dependent variable
informed consent
debriefing

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. _____ _____ refers to our tendency to perceive events as obvious or inevitable after the fact.

2. As scientists, psychologists
   a. keep their methods private so others will not repeat their research.
   b. assume the truth of articles published in leading scientific journals.
   c. reject evidence that competes with traditional findings.
   d. are willing to ask questions and to reject claims that cannot be verified by research.

3. A theory-based prediction is called a(n) _____.

4. Which of the following is NOT one of the *descriptive* methods psychologists use to observe and describe behavior?
   a. A case study
   b. Naturalistic observation
   c. Correlational research

d. A phone survey

5. For your survey, you need to establish a group of people who represent your country's entire adult population. To do this, you will need to question a _____ sample of the population.

6. A study finds that the more childbirth training classes women attend, the less pain medication they require during childbirth. This finding can be stated as a _____ (positive/negative) correlation.

7. A _____ provides a visual representation of the direction and the strength of a relationship between two variables.

8. In a _____ correlation, the scores rise and fall together; in a(n) _____ correlation, one score falls as the other rises.
   a. positive; negative
   b. positive; illusory
   c. negative; weak
   d. strong; weak

9. In a study, people who were afraid of cockroaches tended also to be disgusted by them. This suggests that the correlation between fear of and disgust for cockroaches is _____ (positive/negative).

10. How can regression toward the mean influence our interpretation of events?

11. Knowing that two events are correlated provides
    a. a basis for prediction.
    b. an explanation of why the events are related.
    c. proof that as one increases, the other also increases.
    d. an indication that an underlying third variable is at work.

12. Here are some recently reported correlations, with interpretations drawn by journalists. Knowing just these correlations, can you come up with other possible explanations for each of these?
    a. Alcohol use is associated with violence. (One interpretation: Drinking triggers or unleashes aggressive behavior.)
    b. Educated people live longer, on average, than less-educated people. (One interpretation: Education lengthens life and enhances health.)
    c. Teens engaged in team sports are less likely to use drugs, smoke, have sex, carry weapons, and eat junk food than are teens who do not engage in team sports. (One interpretation: Team sports encourage healthy living.)
    d. Adolescents who frequently see smoking in movies are more likely to smoke. (One interpretation: Movie stars' behavior influences impressionable teens.)

13. To explain behaviors and clarify cause and effect, psychologists use _____.

14. To test the effect of a new drug on depression, we randomly assign people to control and experimental groups. Those in the control group take a pill that contains no medication. This pill is a _____.

15. In a double-blind procedure,
    a. only the participants know whether they are in the control group or the experimental group.
    b. experimental and control group members will be carefully matched for age, sex, income, and education level.
    c. neither the participants nor the researchers know who is in the experimental group or control group.
    d. someone separate from the researcher will ask people to volunteer for the experimental group or the control group.

16. A researcher wants to determine whether noise level affects workers' blood pressure. In one group, the researcher varies the level of noise in the environment and records participants' blood pressure. In this experiment, the level of noise is the _____ _____.

17. The laboratory environment is designed to
    a. exactly recreate the events of everyday life.
    b. recreate psychological forces under controlled conditions.
    c. recreate psychological forces under random conditions.

d. minimize the use of animals and humans in psychological research.

18. In defending their experimental research with animals, psychologists have noted that
    a. animals' physiology and behavior can tell us much about our own.
    b. animal experimentation sometimes helps animals as well as humans.
    c. animals are fascinating creatures and worthy of study.
    d. all of these statements are correct.

MODULE 3: Statistical Reasoning in Everyday Life

For psychological scientists, **statistics** are important tools. Yet a basic ability to understand statistics can benefit *anyone*. To be an educated critical thinker is to apply simple statistical principles to everyday reasoning. And there's good news: To think smarter about data, we needn't memorize complicated formulas. We need merely to be statistically literate.

Statistical Literacy

Learning Objective Question LOQ 3-1

Why does statistical literacy matter?

"There are guys that've been vaccinated that have contracted Covid," exclaimed vaccine-shunning, Covid-infected Green Bay Packers quarterback Aaron Rodgers (2021a). "This idea that it's the pandemic of the unvaccinated, it's just a total lie" (2021b).

Rogers could have benefited from *statistical literacy*—understanding statistics and what they mean. Like many who refused to take the vaccine, Rodgers not only doubted the vaccine's effectiveness, he also

felt confident in his power to avoid the disease. But even among those who got the vaccine, many doubted its efficacy. Consider the irony, noted U.S. Surgeon General Vivek Murthy (2021): "Vaccinated people may overestimate their peril, just as unvaccinated people may underestimate it."

National surveys consistently revealed that those unvaccinated were, like Aaron Rodgers, *much* less likely to fear the virus (CBS, 2021; KFF, 2021; YouGov, 2021). You read that right: A slight majority of those who were protected by vaccination still feared the virus, while most of those unvaccinated did not fear it. Moreover, those who were unvaccinated—and thus at vastly greater risk of contracting, transmitting, and being seriously sickened by the virus—were also much *less* likely to protect themselves and others by wearing masks (Tyson et al., 2021).

The confusion over Covid's risks and the vaccines' protectiveness stemmed partly from a lack of statistical literacy. Many people simply did not comprehend this key finding: Of 74,000 participants in the clinical trials of five Covid vaccines, the number who were hospitalized or died of Covid was … zero (Leonhardt, 2021).

Translating statistical data into clear language is a challenge, and those who try sometimes mess up. For example, National Public Radio (2020) explained that, with a 50 percent effective vaccine, "If you vaccinate 100 people, 50 people will not get the disease." This implied that with a 95 percent effective vaccine, we have a 5 percent chance of

getting the disease. Actually, the news was much, much better: During the Pfizer/BioNTech clinical trial, for example, only 8 of 170 Covid cases (5 percent) were among vaccinated people, making the vaccine "95 percent effective." But that's 8 out of nearly 22,000—less than 1/10th of one percent—of the vaccinated clinical trial participants (none of whom got sick enough to be hospitalized). To assess vaccine effectiveness, it isn't enough to know simply what percent of sick or hospitalized people were vaccinated. We must also know what percent of the whole population is vaccinated (**FIGURE 3.1**). Moreover, for Covid-19, given that older people are at more risk—but also more likely to have been vaccinated—we would need to compare illness or death rates among vaccinated and unvaccinated people *of the same age*.

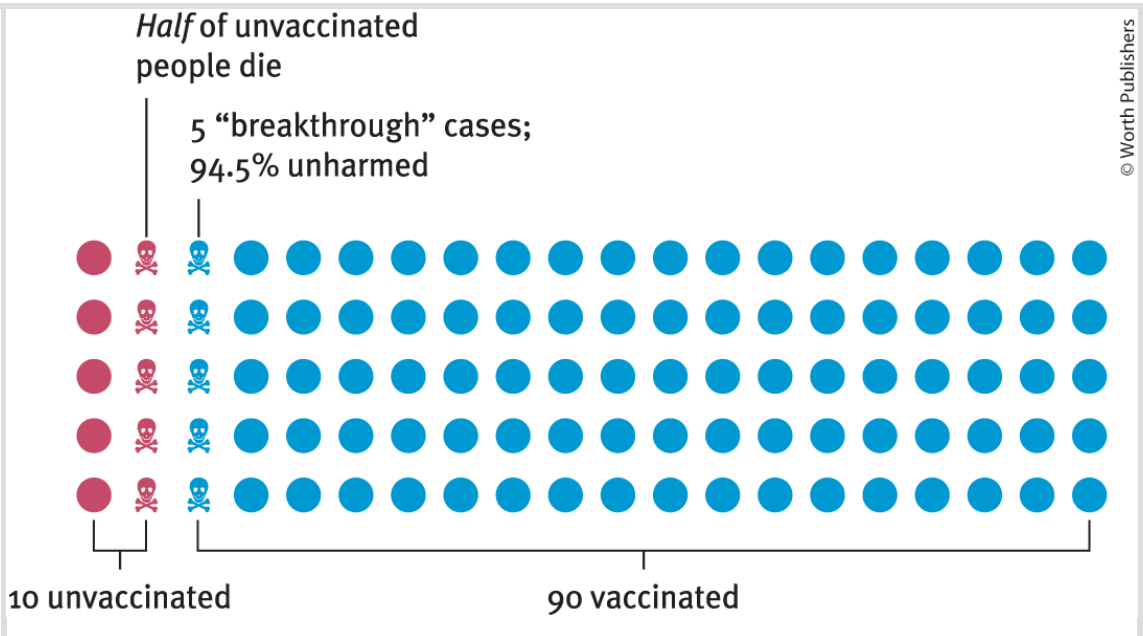


FIGURE 3.1 Statistical literacy for vaccines Imagine that you live in a town with a population of 100 people. Your local media announce that, among people dying of a pandemic virus, half were vaccinated. So, the vaccine was useless, concludes your neighbor, Bea Ware. But Bea fails to consider the *vaccination* base rate of 90 percent. The

death rate among the vaccinated is 5 of 90 (5.5 percent). The death rate among the *unvaccinated* is 5 of 10 (50 percent). That's 9 times as great![6] Statistically literate people consider not just simple numbers, but also *rates.*



We need to look beyond simple numbers, such as the mere number of "breakthrough" Covid cases (those that occur in the vaccinated). Failing to reason statistically can lead us to fear some health dangers too little, which contributed to more than 800,000 Americans dying of Covid by the end of 2021—more than died in all twentieth century U.S. wars combined.

A lack of statistical literacy can also lead us to fear other supposed health dangers *too much* (Gigerenzer, 2010). In the 1990s, the British press reported a study showing that women taking a particular contraceptive pill had a 100 percent increased risk of blood clots that could produce strokes. The story went viral, causing thousands of women to stop taking the pill. What happened as a result? A wave of unwanted pregnancies and an estimated 13,000 additional abortions (which, like other medical procedures, also are associated with increased blood-clot risk). Distracted by big, round numbers, few people focused on the study's actual findings: A 100 percent increased risk, indeed—but only from 1 in 7000 to 2 in 7000. Such false alarms underscore the need to think critically, to teach statistical reasoning, and to present statistical information more transparently.

Statistical misinformation also gets fed by off-the-top-of-the-head estimates. Someone throws out a big, round number. Others echo it, and before long the big, round number becomes public misinformation. Three examples:

- ***Ten percent of people are gay.*** Or is it 2 to 4 percent, as suggested by various national surveys?
- ***We ordinarily use only 10 percent of our brain.*** Or is it closer to 100 percent?
- ***To be healthy, walk 10,000 steps a day.*** Or will 8500 or 13,000 steps do the trick? How about swimming or jogging (Mull, 2019)?

If you find an attention-grabbing headline presented *without evidence* —that nationally there are 1 million teen pregnancies, 2 million homeless seniors, or 3 million alcohol-related motor vehicle accidents —you can be pretty sure that someone is estimating. If they want to emphasize the problem, they will be motivated to estimate high. If they want to minimize the problem, they will estimate low. *The point to remember:* Think critically when you encounter big, round, undocumented numbers.

When setting goals, we love big, round numbers. We're far more likely to want to lose 20 pounds than 19 or 21 pounds (or an even 10 kilograms rather than 9.07 kilograms). And U.S. high school students are more likely to retake the Scholastic Aptitude Test (SAT) if they score just below a round number, such as 1100, rather than just above (Pope & Simonsohn, 2011).

Descriptive Statistics

Once researchers have gathered their data, they may organize that data using **descriptive statistics**. One way to do this is to convert the data into a simple *bar graph,* as in **FIGURE 3.2**, which displays a distribution of different brands of trucks still on the road after a decade. When reading statistical graphs such as this one, take care. It's easy to design a graph to make a difference look big (Figure 3.2a) or small (Figure 3.2b). The secret lies in how you label the vertical scale (the *y-axis*).

The point to remember: Think smart. When interpreting graphs, consider the scale labels and note their *range.*

Ask Yourself

Think of a time when you used statistics to make a point—maybe in class, in a paper, or in a discussion with a friend or family member. Looking back, were the data you cited credible and accurate? How do you know?

Retrieval Practice

RP-1 A truck manufacturer offered Figure 3.2's graph (a)—with actual brand names included—to suggest the much greater durability of its trucks. What does graph (b) make clear about the varying durability, and how is this accomplished?

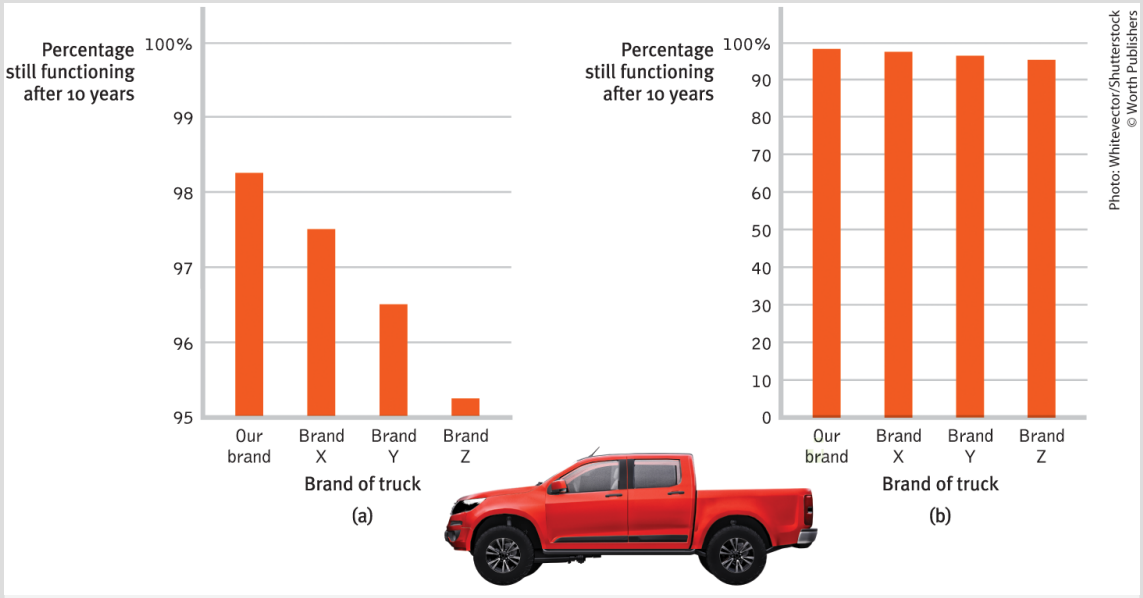


FIGURE 3.2 Read the scale labels

ANSWERS IN APPENDIX E

Measures of Central Tendency

LOQ 3-2

How do we describe data using three measures of central tendency?

The next step is to summarize the data using a *measure of central tendency*—a single score that represents a whole *distribution* of scores. The simplest measure is the **mode**, the most frequently occurring score or scores. (A *bimodal distribution* occurs when there are two most frequently occurring scores.) What is your favorite number? One

global survey found that the most frequently occurring response—the mode—was *seven* (Bellos, 2014). (Was that yours?) The most familiar measure is the **mean**, or arithmetic average—the total sum of all the scores divided by the number of scores. The midpoint—the 50th percentile—is the **median**. On a divided highway, the median is the middle. So, too, with data: If you arrange all the scores in order from the highest to the lowest, half will be above the median and half will be below it.



Measures of central tendency neatly summarize data. But consider what happens to the mean when a distribution is lopsided—when it's *skewed* by a few way-out scores. With income data, for example, the mode, median, and mean often tell very different stories (**FIGURE 3.3**). This happens because a few extreme incomes bias the mean. When Elon Musk (in 2022, the worlds' richest person) sits down in a small café, its average (mean) customer instantly becomes a billionaire. But median customer wealth remains unchanged.

Understanding this, you can see why, according to the 2020 U.S. Census, over 60 percent of U.S. households have "below average" income. The bottom half of earners receive much less than half of the total national income. So, most Americans make less than average (the mean). Mean and median tell different true stories. Think of it this way: Calling someone average is a mean thing.

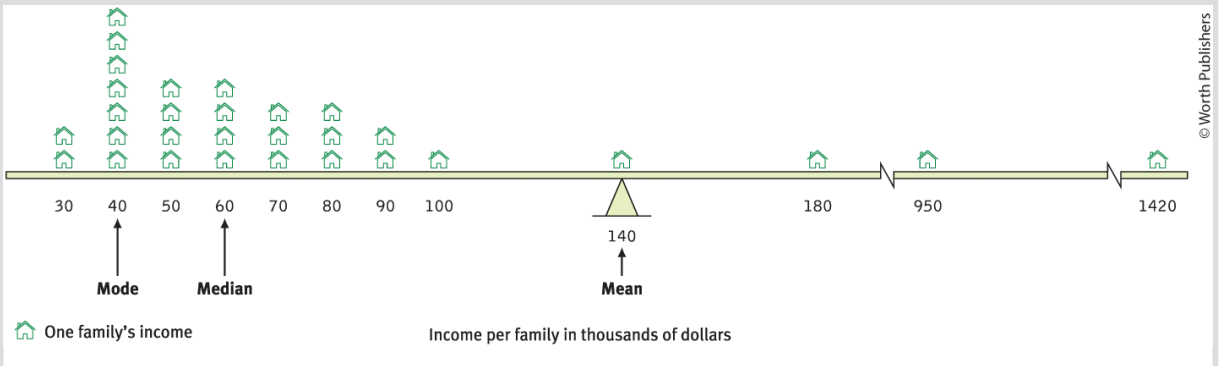


FIGURE 3.3 A skewed distribution This graphic representation of the distribution of a village's incomes illustrates the three measures of central tendency: mode, median, and mean. Note how just a few high incomes make the mean—the fulcrum point that balances the incomes above and below—deceptively high.

The point to remember: Always note which measure of central tendency is reported. If it is a mean, consider whether a few atypical scores could be distorting it.

The average person has one ovary and one testicle.

Measures of Variation

LOQ 3-3

What is the relative usefulness of the two measures of variation?

Knowing the value of an appropriate measure of central tendency can tell us a great deal. But the single number omits other information. It helps to know something about the amount of *variation* in the data—how similar or diverse the scores are. Averages derived from scores with low variability are more reliable than averages based on scores with high variability. Consider a basketball player who scored between 13 and 17 points in each of the season's first 10 games. Knowing this, we would be more confident that she would score near 15 points in her next game than if her scores had varied from 5 to 25 points.

The **range** of scores—the difference between the lowest and highest—provides only a crude estimate of variation. A couple of extreme scores in an otherwise similar group, such as the $950,000 and $1,420,000 incomes in Figure 3.3, will create a deceptively large range.

It's good to know the range of scores, but we often want to know how much scores vary in relation to a population's average. The **standard deviation** measures how much scores deviate (differ) from the mean. It better gauges whether scores are packed together or dispersed, because it uses information from each score. The standard deviation

is derived from a mathematical formula[7] that assembles information about how much individual scores differ from the mean, which can be very telling. Let's say test scores from Class A and Class B both have the same mean (75 percent correct), but very different standard deviations (5.0 for Class A and 15.0 for Class B). Have you ever had test experiences like that—where two-thirds of your classmates in one course score in the 70 to 80 percent range, with scores in another course more spread out (two-thirds between 60 and 90 percent)? The standard deviation, as well as the mean score, tell us about how each class is faring.

You can grasp the meaning of the standard deviation if you consider how scores naturally tend to be distributed. Large numbers of data—heights, intelligence scores, life expectancy (though not incomes)—often form a symmetrical, *bell-shaped* distribution. Most cases fall near the mean, and fewer cases fall near either extreme. This bell-shaped distribution is so typical that we call the curve it forms the **normal curve**.

As **FIGURE 3.4** shows, a useful property of the normal curve is that roughly 68 percent of the cases fall within one standard deviation on either side of the mean. About 95 percent of cases fall within two standard deviations. Thus, as Module 30 notes, about 68 percent of people taking an intelligence test will score within 15 points—either above or below—of 100. About 95 percent will score within ±30 points.

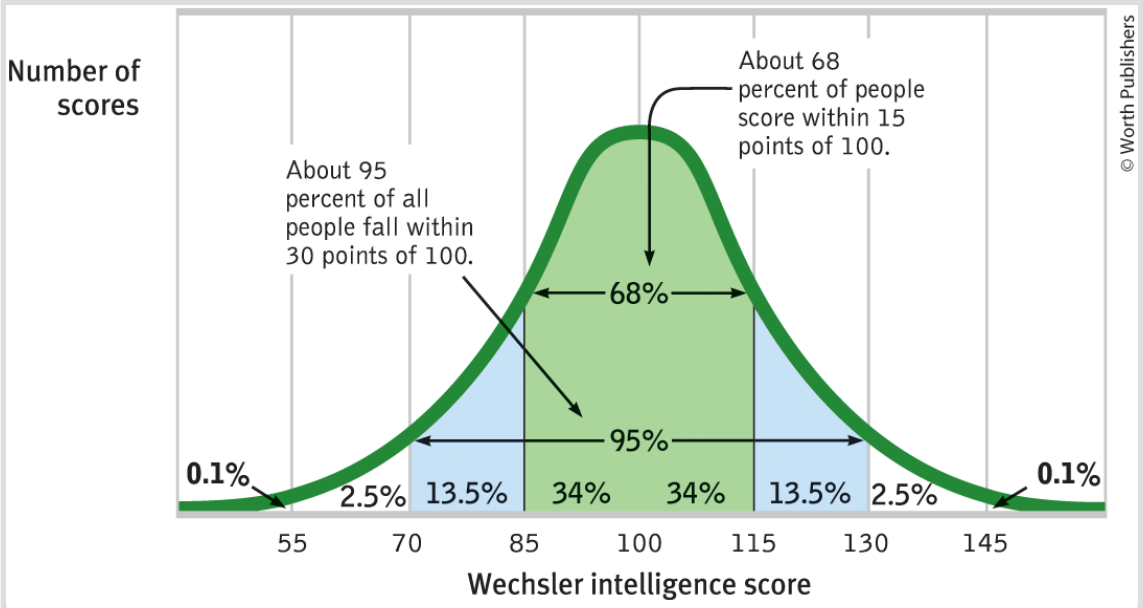


FIGURE 3.4 The normal curve Scores on aptitude tests tend to form a normal, or bell-shaped, curve. The most commonly used intelligence test, the Wechsler Adult Intelligence Scale, calls the average score 100.

Retrieval Practice

RP-2 The average of a distribution of scores is the _____. The score that shows up most often is the _____. The score right in the middle of a distribution (half the scores above it; half below) is the _____.

RP-3 We determine how much scores vary around the average in a way that includes information about the _____ of scores (difference between highest and lowest) by using the _____ _____ formula.

ANSWERS IN APPENDIX E

Inferential Statistics

LOQ 3-4

How do we know whether an observed difference can be generalized to other populations?

From moment to moment, people's behaviors may vary. Thus, one group's average score could conceivably differ from another group's average score not because of any real difference, but merely because of chance fluctuations in the people sampled. **Inferential statistics** use the results from a sample to inform us about a larger population (everybody in some group). When we infer that our sample's difference reflects a true population difference, we are saying the difference is **statistically significant**. When we conclude that our sample's difference is likely just a fluke, we're saying it's not statistically significant. (We will focus only on this part of inferential statistics.)

Significant Differences

Imagine a prospective student who visits two similar universities. At the first school, the student randomly samples two classes and finds that both instructors are witty and engaging. At the second school, the two sampled instructors seem dull and uninspiring. Should the student conclude that the first school's teachers are "great" and the second school's teachers are "bores"? You might respond that the

student should sample more classes—and you'd be right. It's possible that the populations of teachers at the two universities are equal. Just by chance, the student could have sampled two great (and two boring) teachers.

How confidently can we infer that some observed difference in a sample (such as a couple of teachers) reflects the larger population it comes from (all the teachers at the school)?

In deciding when it is safe to infer a population difference from a sample difference, we should keep three principles in mind:

1. ***Representative samples are better than biased (unrepresentative) samples.*** The best basis for generalizing is not from the exceptional and memorable cases one finds at the extremes but from a representative sample of cases. Research never randomly samples the whole human population. Thus, it pays to keep in mind what population a study has sampled.
2. ***Bigger samples are better than smaller ones.*** We know it but we ignore it: *Averages based on many cases are more reliable* than averages based on only a few. If you select a certain instructor's class based on conversations with three people, you can't conclude much. A set of 50 class evaluations will give you a better estimate of an instructor's performance. More (randomly sampled) cases make the sample's estimate more reliable. Larger samples also make for a more *replicable* study—one that will find a similar estimate the next time.

3. ***More estimates are better than fewer estimates.*** A study gives one brief peek at what's going on in the population. But the best thing to do is conduct multiple studies and combine all the estimates, using **meta-analysis.** Better to consider an entire forest of findings rather than focusing on a single study.

The point to remember: Smart thinkers are not overly impressed by a few anecdotes. Estimates based on a few unrepresentative cases are unreliable.



Let's consider another significant differences example. Say you sampled men's and women's scores on a laboratory test of aggression and found a gender difference. But samples can vary. So how likely is it that your observed gender difference was just a fluke?

Researchers use statistical testing to estimate the probability of the result occurring by chance. They begin with the assumption that no difference exists between groups, an assumption called the *null hypothesis.* Then, using statistics, they evaluate whether the observed

gender difference is so big that it's unlikely to fit the null hypothesis. If so, they reject the null hypothesis of no differences, and they say that the result is statistically significant. Such a large difference would support an *alternative hypothesis*—that the populations of men and women really do differ in aggression.

What factors determine statistical significance? When averages from two samples are each reliable measures of their respective populations (as when each is based on many observations that have low variability), then any difference between the two samples is more likely to be statistically significant. (For our example: The less the variability in women's and in men's aggression scores, and the more scores we observe, the more confidence we would have that our observed gender difference is real.) When the difference we estimate is *large,* it's also more likely to reflect a real difference in the population.

In short, when estimates are reliable and when the difference between them is relatively large, we're more likely to find that the difference is statistically significant. This means that the observed difference in the sample is probably more than just chance variation, so we reject the original null hypothesis of no existing differences.

In judging statistical significance, psychologists are conservative. They are like juries that must presume innocence until guilt is proven. Many psychological tests provide *p*-values, which indicate the probability of the result, given the null hypothesis. For most

psychologists, strong evidence that we can reject the null (no-difference) hypothesis occurs when the probability (*p*-value) of that result is very low. "Very low" is usually set at less than 5 percent ($p < .05$). When a sample's result would occur less than 5 percent of the time assuming the null hypothesis, we say it is significant.

When learning about research, you should remember that a "statistically significant" result may have little *practical significance.* Especially when a sample is very large, a result might be statistically significant but have a tiny *effect* size. One large study tested the intelligence of first-born and later-born individuals. Researchers revealed a statistically significant tendency for first-born individuals to have higher average scores than their later-born siblings (Rohrer et al., 2015; Zajonc & Markus, 1975). But the difference was only about 1.5 IQ points. There were 20,000 people in the study, so this difference was "significant," but it had little practical importance.

The point to remember: Statistical significance indicates the likelihood that the result would have happened by chance if the null hypothesis (of no difference) were true. But statistically significant is not the same as *important* or *strong*.

Ask Yourself

Can you think of a situation where you were fooled by a writer or speaker's attempts to persuade you with statistics? What have you learned in this module that will be most helpful in the future to avoid being misled?

Retrieval Practice

RP-4 Can you solve this puzzle?

The registrar's office at the University of Michigan has found that usually about 100 students in Arts and Sciences have perfect marks at the end of their first term. However, only about 10 to 15 students graduate with perfect marks. What do you think is the most likely explanation for the fact that there are more perfect marks after one term than at graduation (Jepson et al., 1983)?

RP-5 _____ statistics summarize data, while _____ statistics determine if data can be generalized to other populations.

ANSWERS IN APPENDIX E

REVIEW

Module 3: Statistical Reasoning in Everyday Life

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 3-1: Why does statistical literacy matter?

LOQ 3-2: How do we describe data using three measures of central tendency?

LOQ 3-3: What is the relative usefulness of the two measures of variation?

LOQ 3-4: How do we know whether an observed difference can be generalized to other populations?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

statistics
descriptive statistics
mode
mean
median
range
standard deviation
normal curve
inferential statistics
statistical significance
meta-analysis

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. Which of the three measures of central tendency is most easily distorted by a few very high or very low scores?
   a. The mode
   b. The mean
   c. The median
   d. They are all equally vulnerable to distortion from atypical scores.

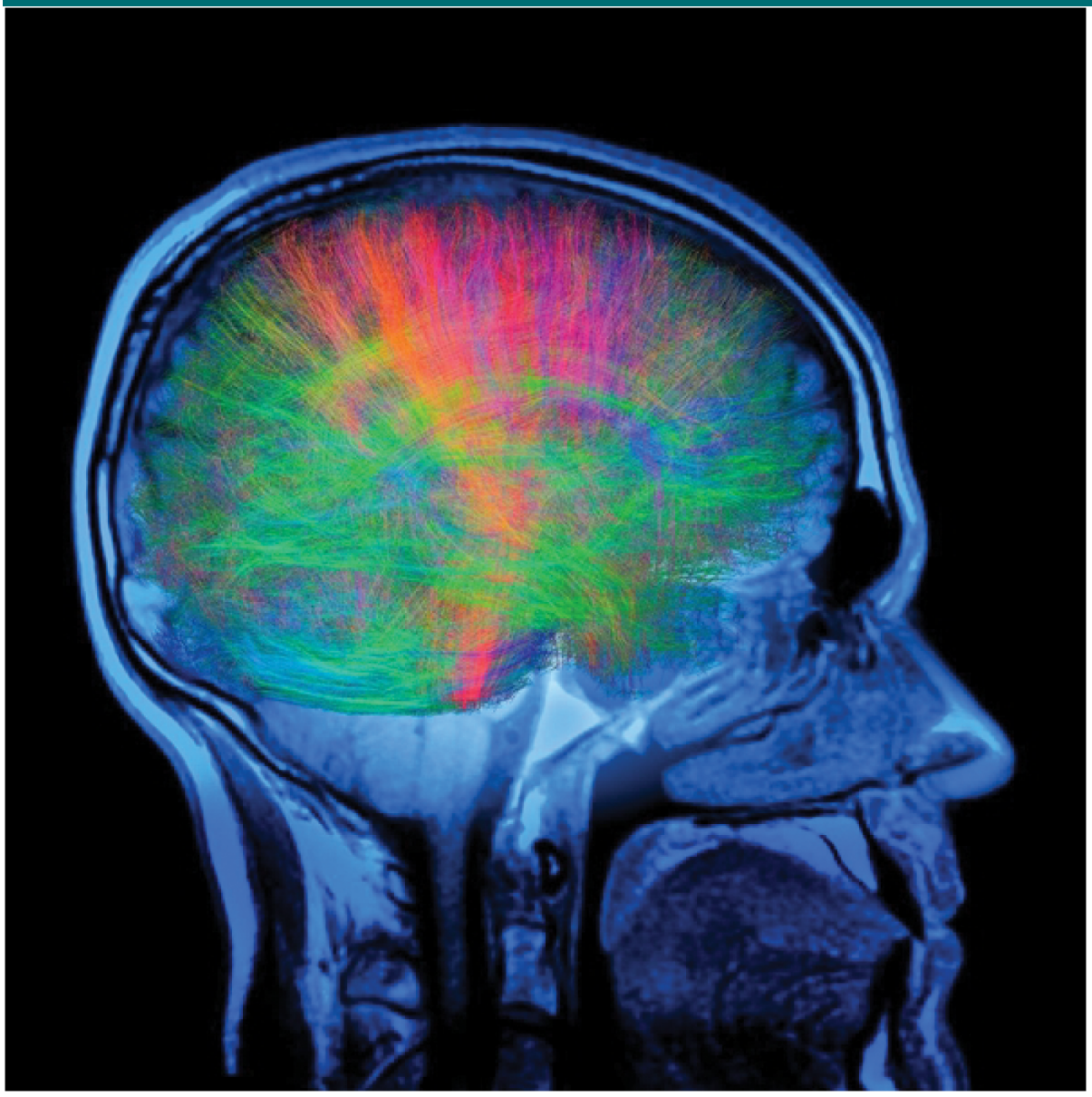
2. The standard deviation is the most useful measure of variation in a set of data because it tells us
   a. the difference between the highest and lowest scores in the set.
   b. the extent to which the sample being used deviates from the bigger population it represents.
   c. how much individual scores differ from the mode.
   d. how much individual scores differ from the mean.

3. Another name for a bell-shaped distribution, in which most scores fall near the middle and fewer scores fall at each extreme, is a _____ _____.

4. When sample averages are _____ and the difference between them is _____, we can say the difference is more likely to be statistically significant.
   a. reliable; large
   b. reliable; small
   c. due to chance; large
   d. due to chance; small

Chapter 2

The Biology of Mind (Modules 4–7)



ALFRED PASIEKA/Science Source

MODULE 4 Neural and Hormonal Systems

Biology, Behavior, and Mind

The Power of Neuroplasticity

Neural Communication
The Nervous System
The Endocrine System
MODULE 5 Tools of Discovery: Having Our Head Examined
MODULE 6 Brain Regions and Structures
The Brainstem
The Thalamus
The Reticular Formation
The Cerebellum
The Limbic System
The Cerebral Cortex
THINKING CRITICALLY ABOUT: Do We Use Only 10 Percent of Our Brain?
MODULE 7 Damage Responses and Brain Hemispheres
Responses to Damage
The Divided Brain

Wang Huanming, a man paralyzed from the neck down in a 2010 wrestling accident, made news when he volunteered to participate in an audacious medical venture: a head transplant. A transplant surgeon has offered to surgically transfer Wang's fully functioning head to a brain-dead person's still-functioning body (Tatlow, 2016).

Ignore for the moment the ethical issues of such an experiment, which some have called "reckless and ghastly" and part of the scientists' "ghoulish fantasies" (Illes & McDonald, 2017; Wolpe, 2018). Ignore the procedure's cost, estimated at up to $100 million (Hjelmgaard, 2019). And

ignore the seeming impossibility of precisely connecting the head-to-spinal-cord nerves. Imagine, just imagine, that the procedure could work. With the same brain and a new body, would Wang still be Wang? To whose home should he return? If the old Wang was a skilled guitarist, would the new Wang conceivably retain that skill—or would he have to train his new body to play? If he later fathered a child, whom should the birth certificate list as the parent?

Most of us twenty-first-century people (you, too?) presume that, even with a new body, Wang would still be Wang. We presume that our brain, designed by our genes and sculpted by our experiences, provides our identity and enables our mind. No brain, no mind.

We are, indeed, living brains, but more. We are bodies alive. No principle is more central to today's psychology, or to this book, than this: *Everything psychological is simultaneously biological.* Your every idea, every mood, every urge is also a biological happening. You love, laugh, and cry with your body. Thinking, feeling, or acting without a body would be like running without legs. Without your body—your genes, your nervous system, your hormones, your appearance—you truly would be nobody. Moreover, your body and your brain influence and are influenced by your experiences. Throughout this book, you will find many examples of the interplay between biology and psychology.

As you will also see throughout this book, we humans share the same basic biological design. Yet thanks to our individual genes, experiences, and cultural traditions and teachings, we differ from one another. Our

traits and behaviors arise from the interaction of nature and nurture. Our thoughts, feelings, and actions influence our blood pressure, hormones, and brain. As we wend our way from the cradle to the grave, our biology changes in response to our behaviors and environments.

In these Biology of Mind modules, we ask a profound question: How does matter make mind? To answer this question, we explore the mind's biology. We start small and build from the bottom up—from nerve cells up to the brain. But we'll also discuss how our behavior and environment can influence our biology from the top down. Life changes us. You've heard it before and will hear it again: *Nurture works on what nature provides.*

MODULE 4: Neural and Hormonal Systems

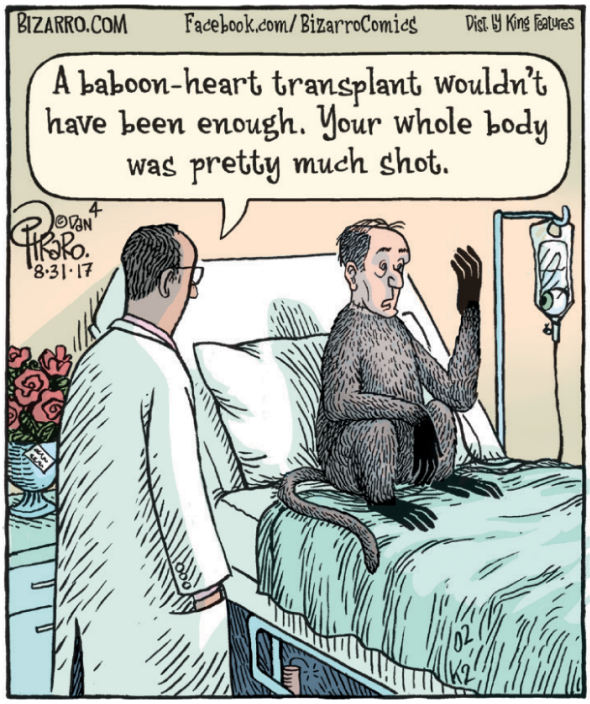
Let's begin by exploring why psychologists study biology and how their scientific discoveries have improved our understanding of how matter makes mind.

Biology, Behavior, and Mind

Learning Objective Question LOQ 4-1

Why are psychologists concerned with human biology?

Our understanding of the relationship between brain and mind has come a long way. The ancient Greek physician, Hippocrates, correctly located the mind in the brain. His contemporary, the philosopher Aristotle, believed the mind was in the heart, which pumps warmth and vitality to the body. The heart remains our symbol for love, but psychological science has long since taught us an important lesson: It's your brain, not your heart, that falls in love.



In the early 1800s, German physician Franz Gall proposed that *phrenology,* studying bumps on the skull, could reveal a person's mental abilities and character traits (**FIGURE 4.1**). At one point, Britain had 29 phrenological societies. Phrenologists also traveled North America to give skull readings (Dean, 2012; Hunt, 1993). Using a false name, writer Mark Twain put one famous phrenologist to the test. "He found a cavity [and] startled me by saying that that cavity represented the total absence of the sense of humor!" Three months later, Twain sat for a second reading, this time identifying himself. Now "the cavity was gone, and in its place was … the loftiest bump of humor he had ever encountered in his life-long experience!" (Lopez, 2002). The "science" of phrenology remains known today as a reminder of our need for critical thinking and scientific analysis. Phrenology did at least succeed in focusing attention on the

localization of function—the idea that various brain regions have particular functions.

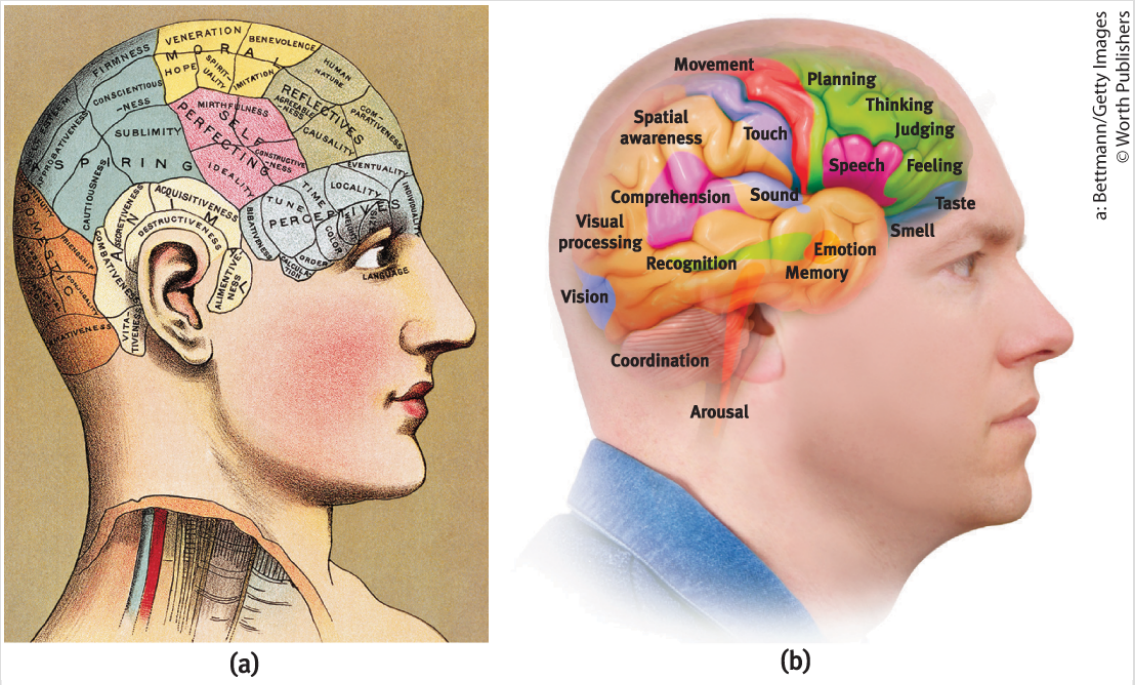


FIGURE 4.1 A wrongheaded theory (a) Despite initial acceptance of Franz Gall's speculations, bumps on the skull tell us nothing about the brain's underlying functions. Nevertheless, some of his assumptions have held true. Though they are not the functions Gall proposed, different parts of the brain do contribute to different aspects of behavior, as suggested in (b) (from *The Human Brain Book*), and as you will see throughout these Biology of Mind modules.

Today's psychologists live in a world that Gall could only dream about. **Biological psychologists** use advanced technologies to study the links between biological (genetic, neural, hormonal) processes and psychological processes. They and other researchers working from a biological perspective are announcing discoveries about the interplay

of our biology and our behavior and mind at an exhilarating pace. Within little more than the past century, researchers seeking to understand the biology of the mind have discovered that

- our experiences wire our adaptive brain.
- among the body's cells are nerve cells that conduct electricity and "talk" to one another by sending chemical messages across a tiny gap that separates them.
- specific brain systems serve specific functions (though not the functions Gall supposed).
- we integrate information processed in these different brain systems to construct our experience of sights and sounds, meanings and memories, pain and passion.
- our emotions, like our thoughts and memories, are supported by brain networks.

We have also realized that we are each a system composed of subsystems that are, in turn, composed of even smaller subsystems. Tiny cells organize to form body organs. These organs form larger systems for digestion, circulation, and information processing. And those systems are part of an even larger system—the person, who in turn is a part of a family, community, and culture. Thus, we are *biopsychosocial* systems (Engel, 1981). To understand our behavior, we need to study how these biological, psychological, and social-cultural systems work and interact, and how they form us over time. We are formed by ancient evolution, by our enduring cultures, by our daily experiences, by our fluctuating hormones, and by our immediate neural activity (Sapolsky, 2017).

Retrieval Practice

RP-1 What do phrenology and biological psychology have in common?

ANSWERS IN APPENDIX E

The Power of Neuroplasticity

LOQ 4-2

How do biology and experience together enable neuroplasticity?

Your brain is sculpted not only by your genes but also by your life. Under the surface of your awareness, your brain constantly changes, building new pathways as it adjusts to new experiences. This neural change is called **neuroplasticity**. Neuroplasticity is greatest early in life but continues over the life span (Lindenberger & Lövdén, 2019; Walasek et al., 2022).

To see neuroplasticity at work, consider London's taxi driver trainees. They spend years learning and remembering the city's 26,000 street locations and connections. For the half who pass the difficult final test, big rewards are in store: a better income and an enlarged hippocampus, one of the brain's memory centers that processes spatial memories. London's bus drivers, who navigate a smaller set of

roads, gain no similar neural rewards (Griesbauer et al., 2022; Maguire et al., 2000).



Skyler Williams/Touch The Top, Inc.

The mind's eye Erik Weihenmayer, who is completely blind, has rappelled into active volcanos and summited the tallest mountain peaks on every continent (Chesnutt, 2013; Valluzzo, 2021). To stay safe, he uses a guide and echolocation, the navigation method used by bats (Sulser et al., 2022). Blind echolocation engages the brain's visual centers—the same centers that sighted people use when looking at stimuli (Norman & Thaler, 2019). Weihenmayer's flexible brain transforms sound to help him "see."

We also see neuroplasticity in well-practiced pianists, who have a larger-than-usual auditory cortex area, a sound-processing region (Bavelier et al., 2000; Pantev et al., 1998). Practice likewise sculpts the brains of ballerinas, jugglers, and unicyclists (Draganski et al., 2004; Hänggi et al., 2010; Weber et al., 2019).

Your brain is a work in progress. The brain you were born with is not the brain you will die with. Even limited practice times may produce neural benefits. If you spend 45 minutes learning how to play the piano, as did participants in one study, you may grow your motor learning-related brain areas (Tavor et al., 2020). Mere minutes of word learning produce subtle brain changes (Vukovic et al., 2021). Remember that the next time you attend class!

Neuroplasticity underlies interventions aimed at reducing child poverty. In one experiment, families experiencing poverty with a newborn baby were randomly assigned to receive either large ($333) or small ($20) unconditional monthly cash transfers (Troller-Renfree et al., 2022). A year later, researchers examined how the children's brain activity adapted to these financial changes in their family environment. Compared with children whose families received small cash transfers, those whose families received large cash transfers showed more brain activity in regions associated with language, thinking, and social understanding.

Neuroplasticity is part of what makes humans exceptional (Gómez-Robles et al., 2015). Think of how much the world has changed over the past 50 years, and how much more it will change in the next 50. We can barely imagine a past without smartphones, or a future where most people use self-driving cars. Our neuroplasticity enables us, more than other species, to adapt to our rapidly changing world (Roberts & Stewart, 2018).

Cultural neuroscientists argue that experiencing different cultural traditions, beliefs, and rituals can create distinct behaviors and brain activation patterns (Gao et al., 2022; Pugh et al., 2022). For example, people in the United States and Mexico tend to value expressing positive emotions, while people in China view emotional expression more negatively (Ma et al., 2018; Rychlowska et al., 2015; Senft et al., 2021). Adapting to these different cultural norms helps explain why those in the United States and Mexico, compared with those in China, show more brain activation in emotion expression areas when viewing emotion-arousing photos (Hampton et al., 2021).



Luna Productions

Marian Diamond (1926–2017) Marian Diamond worked during an era when female scientists experienced tremendous discrimination. She overcame these biases and was among the first scientists to explore how experience changes the brain (Diamond et al., 1964). Her research, for example, showed how exposing rats to different environments produced changes in their brain structure (Diamond et al., 1966). Diamond also analyzed Albert Einstein's brain

after his death, which helped unlock the neural mechanics of his mind. Diamond noted, “The brain is a three-pound mass you can hold in your hand that can conceive of a universe a hundred billion light years across.”

Ask Yourself

What skills did you practice the most as a child—sports, music, cooking, video gaming? How do you think this affected your brain development? How will you continue to develop your brain with new learning and new skills?

Retrieval Practice

RP-2 How does learning a new skill affect the structure of our brain?

ANSWERS IN APPENDIX E

Neural Communication

For scientists, it is a happy fact of nature that the information systems of humans and other animals operate similarly—so much so that you could not distinguish between small samples of brain tissue from a human and a monkey. This similarity allows researchers to study much simpler animals, such as squids and sea slugs, to discover how our neural systems operate. It allows them to study other mammals’ brains to understand the organization of our own. Cars differ, but all

have accelerators, steering wheels, and brakes. A space alien could study any one of them and grasp the operating principles. Likewise, animals differ, yet their nervous systems operate similarly.

Neurons

LOQ 4-3

What are *neurons*, and how do they transmit information?

Our body's neural information system is complexity built from simplicity. Its building blocks are **neurons** or nerve cells. Throughout life, new neurons are born and unused neurons wither away (O'Leary et al., 2014; Shors, 2014). To fathom our thoughts and actions, our memories and moods, we must first understand how neurons work and communicate.

Neurons differ, but all are variations on the same theme (**FIGURE 4.2**). Each consists of a **cell body** and its branching fibers. The often bushy **dendrite** fibers receive and integrate information, conducting it toward the cell body (Poirazi & Papoutsi, 2020). From there, the cell's single lengthy **axon** fiber passes the message through its terminal branches to other neurons, muscles, or glands (**FIGURE 4.3**). Dendrites listen. Axons speak.

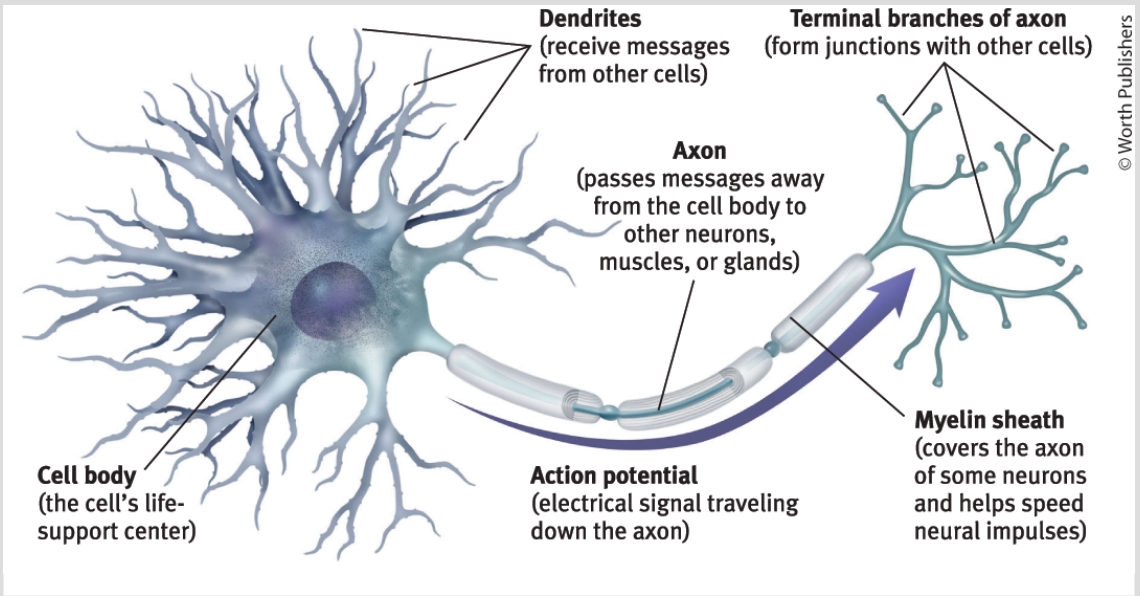


FIGURE 4.2 A motor neuron

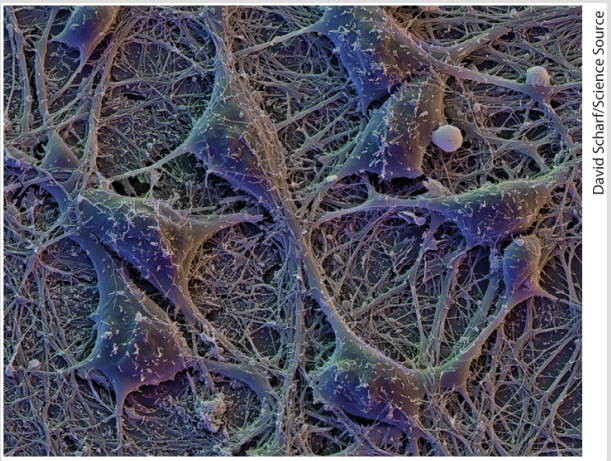


FIGURE 4.3 Neurons communicating Our billions of neurons exist in a vast and densely interconnected web. As part of a fascinating electrochemical communication process, one neuron's *terminal branches* send messages to neighboring dendrites.

Unlike the short dendrites, axons may be very long, projecting several feet through the body. A human neuron carrying orders from the brain to a leg muscle, for example, has a cell body and axon roughly on the scale of a basketball attached to a rope that's 4 miles (6.4 kilometers) long. Much as home electrical wire is insulated, some axons are encased in a **myelin sheath**, a layer of fatty tissue that insulates them and speeds their impulses. As myelin is laid down up to about age 25, neural efficiency, judgment, and self-control grow (Nakamura et al., 2018; Van Munster et al., 2015). If the myelin sheath degenerates, *multiple sclerosis* results. Communication to muscles and brain regions slows. The result: diminished muscle control and sometimes impaired cognition.



John Shearer/Getty Images

Managing multiple sclerosis Actor Selma Blair's multiple sclerosis results from a loss of the myelin sheath that insulates her motor axons and speeds their neural impulses. She has discussed her challenges openly, including difficulty speaking and walking with a cane. Researchers are exploring myelin repair therapies for people with multiple sclerosis (Hoojimans et al., 2019).

Supporting these billions of nerve cells are spidery **glial cells** ("glue cells"). Neurons are like queen bees; on their own they cannot feed or sheathe themselves. Glial cells are worker bees. They provide nutrients and insulating myelin, guide neural connections, and mop up *ions* and *neurotransmitters*. Glia also play a role in learning, thinking, and memory. By "chatting" with neurons, they participate in information transmission and memory (Fields, 2013; Martín et al., 2015).

In more complex animal brains, the proportion of glia to neurons increases. Marian Diamond and other researchers' postmortem analyses of Albert Einstein's brain did not find more or larger-than-usual neurons. They did, however, reveal a much greater concentration of glial cells than found in an average person's head (Diamond et al., 1985; Fields, 2004). Einstein's glial cells kept his brain abuzz with activity.

The Neural Impulse

Neurons transmit messages when stimulated by our senses or by neighboring neurons. A neuron sends a message by firing an impulse, called the **action potential**—a brief electrical charge that travels down its axon.

Depending on the type of fiber, a neural impulse travels at speeds ranging from a sluggish 2 miles (3 kilometers) per hour to more than 200 miles (320 kilometers) per hour. But even its top speed is 3 million times slower than that of electricity through a wire. We measure brain activity in milliseconds (thousandths of a second) and computer activity in nanoseconds (billionths of a second). Unlike a computer's nearly instantaneous reaction, your response to a sudden event, such as a child darting in front of your car, may take a quarter-second or more. Your brain is vastly more complex than a computer, but slower at executing simple responses. And if you were an elephant—whose round-trip message travel time from a yank on the tail to the brain and back to the tail is 100 times longer than that of a tiny shrew—your reflexes would be slower yet (More et al., 2010).

> **"I sing the body electric."** — Walt Whitman, "Children of Adam," 1855

Like batteries, neurons generate electricity from chemical events. The neuron's chemistry-to-electricity process exchanges ions (electrically charged atoms). The fluid outside an axon's membrane has mostly

positively charged sodium ions. A resting axon's fluid interior (which includes both large, negatively charged protein ions and smaller, positively charged potassium ions) has a mostly negative charge. Like a tightly guarded facility, the axon's surface is selective about what it allows through its gates. We say the axon's surface is *selectively permeable.* This positive-outside/negative-inside state is called the *resting potential.*

When a neuron fires, however, the security parameters change: The first section of the axon opens its gates, like a storm sewer cover flipping open, and positively charged sodium ions (attracted to the negative interior) flood in through the now-open channels (**FIGURE 4.4**). The loss of the inside/outside charge difference, called *depolarization,* causes the next section of axon channels to open, and then the next, like falling dominos. This temporary inflow of positive ions is the neural impulse—the action potential. Each neuron is itself a miniature decision-making device performing complex calculations as it receives signals from hundreds, even thousands, of other neurons. The mind boggles when imagining this electrochemical process repeating up to 100 or even 1000 times a second.

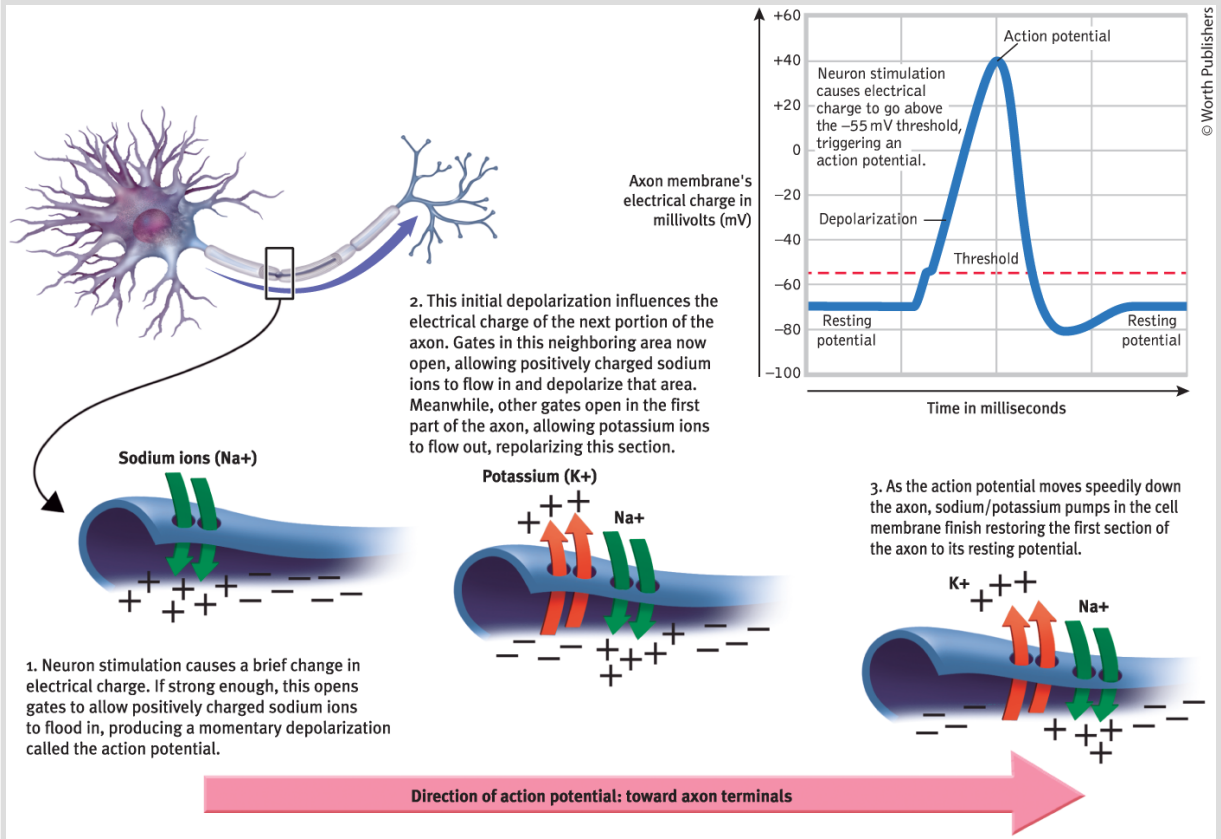


FIGURE 4.4 Action potential Bodily sensations and actions—detecting an ant crawling on your foot or kicking a soccer ball—happen when our neurons are stimulated enough that their membrane's electrical charge reaches a threshold (–55 mV in this example—see graph). This prompts each of those neurons to "fire" an impulse—an action potential—which travels down its axon (see numbered drawings) and transmits a message to other neurons, muscles, or glands.

Most neural signals are *excitatory,* somewhat like pushing a neuron's accelerator. Some are *inhibitory,* more like pushing its brake. If excitatory signals exceed the inhibitory signals by a minimum intensity, or **threshold** (see Figure 4.4), the combined signals trigger an action potential. (Think of it this way: If the excitatory party animals outvote the inhibitory party poopers, the party's on.) The

action potential then travels down the axon, which branches into junctions with hundreds or thousands of other neurons or with the body's muscles and glands.

> **"What one neuron tells another neuron is simply how much it is excited."** — Francis Crick, *The Astonishing Hypothesis,* 1994

Neurons need short breaks (a tiny fraction of an eyeblink). During a resting pause called the **refractory period**, subsequent action potentials cannot occur until the axon returns to its resting state. Then the neuron can fire again.

Increasing the stimulation above the threshold will not increase the neural impulse's intensity. The neuron's reaction is an **all-or-none response**: Like guns, neurons either fire or they don't. How, then, do we detect the intensity of a stimulus? How do we distinguish a gentle touch from a big hug? A strong stimulus can trigger *more* neurons to fire, and to fire more often. But it does not affect the action potential's strength or speed. Squeezing a trigger harder won't make a bullet go faster.

Ask Yourself

Does it surprise you to learn that your reaction time is slower than a computer's? Does this suggest which tasks might be more readily performed by computers?

Retrieval Practice

RP-3 When a neuron fires an action potential, the information travels through the axon, the dendrites, and the cell body, but not in that order. Place these three structures in the correct order.

RP-4 How does our nervous system allow us to experience the difference between a slap and a tap on the back?

ANSWERS IN APPENDIX E

How Neurons Communicate

LOQ 4-4

How do nerve cells communicate with other nerve cells?

Neurons interweave so intricately that even with a microscope, you would struggle to see where one neuron ends and another begins. Scientists once believed that the axon of one cell fused with the dendrites of another in an uninterrupted fabric. Then British physiologist Sir Charles Sherrington (1857–1952) noticed that neural impulses were taking an unexpectedly long time to travel a neural pathway. Inferring that there must be a brief interruption in the transmission, Sherrington drew on the Greek word *synaptein* (meaning "fasten together") when he defined the meeting point between neurons as a **synapse**.

> **"All information processing in the brain involves neurons 'talking to' each other at synapses."** — Neuroscientist Solomon H. Snyder (1984)

We now know that the axon terminal of one neuron is in fact separated from the receiving neuron by a tiny—less than a millionth of an inch wide—*synaptic gap* (or *synaptic cleft*). Spanish anatomist Santiago Ramón y Cajal (1852–1934) marveled at these near-unions of neurons, calling them "protoplasmic kisses." "Like elegant ladies air-kissing so as not to muss their makeup, dendrites and axons don't quite touch," noted poet Diane Ackerman (2004, p. 37). How do the neurons execute this protoplasmic kiss, sending information across the synaptic gap? The answer is one of the important scientific discoveries of our age.

When an action potential reaches the button-like terminals at an axon's end, it triggers the release of chemical messengers, called **neurotransmitters** (**FIGURE 4.5**). Within 1/10,000th of a second, the neurotransmitter molecules cross the synaptic gap and bind to receptor sites on the receiving neuron—as precisely as a key fits a lock. For an instant, the neurotransmitter unlocks tiny channels at the receiving site, and electrically charged atoms flow in, exciting or inhibiting the receiving neuron's readiness to fire. The excess neurotransmitters finally drift away, are broken down by enzymes, or are reabsorbed by the sending neuron—a process called **reuptake**. Some antidepressant medications partially block the reuptake of mood-enhancing neurotransmitters (**FIGURE 4.6**).

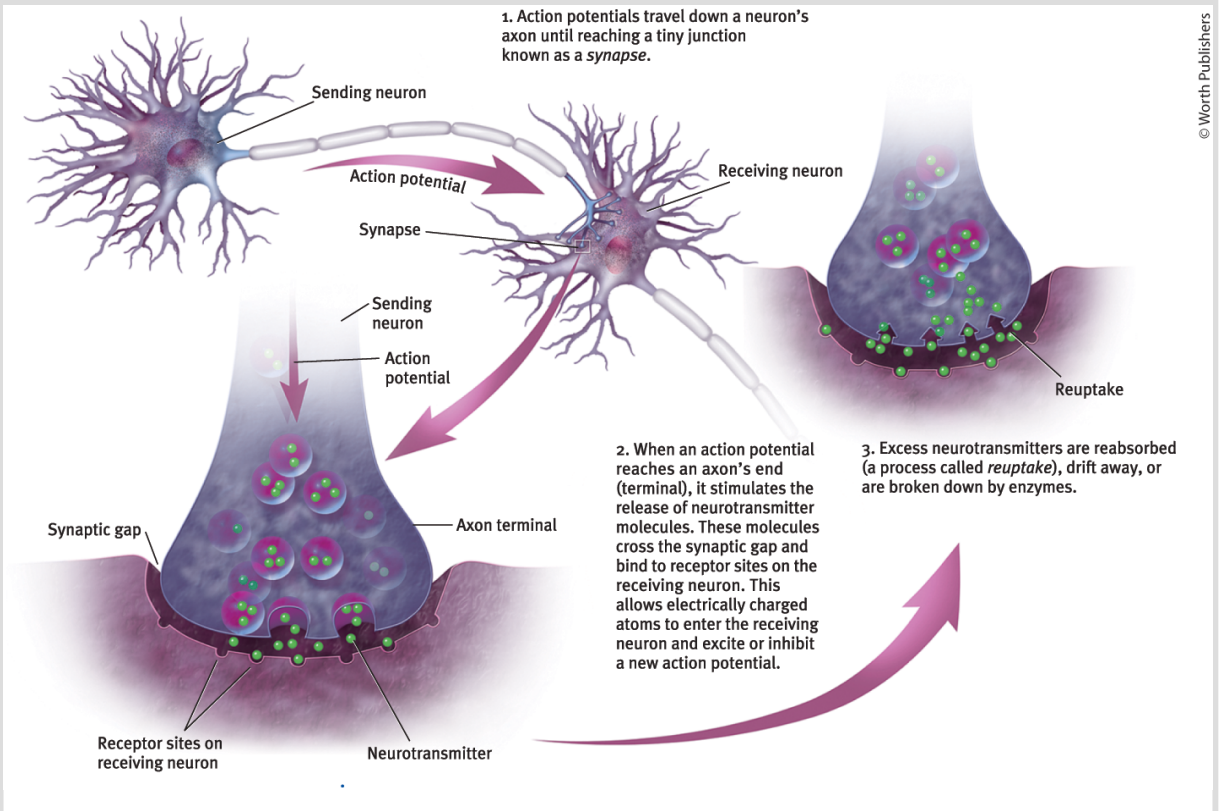


FIGURE 4.5 How neurons communicate

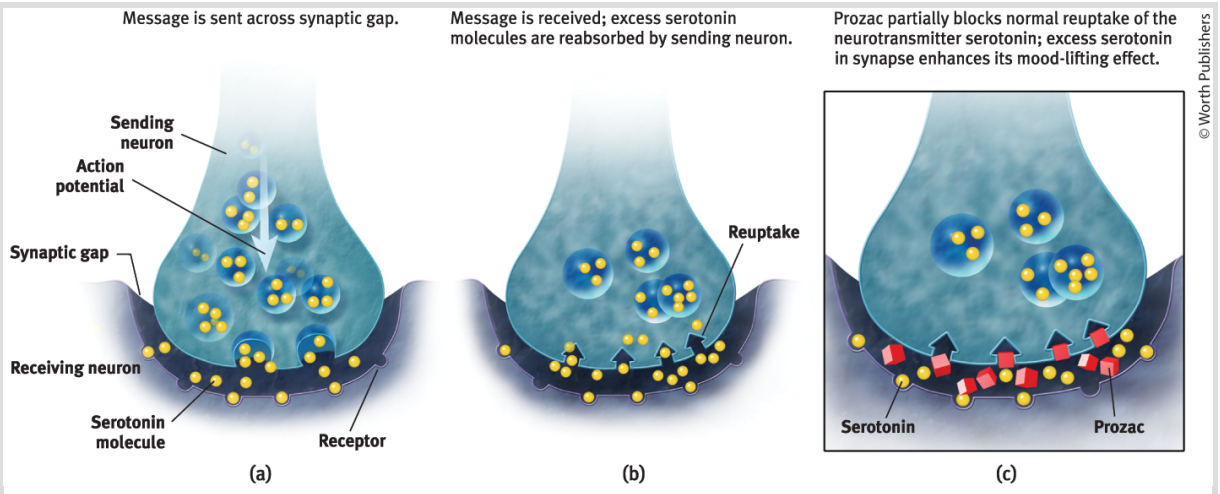


FIGURE 4.6 Biology of antidepressants Selective serotonin reuptake inhibitors (SSRIs) are popularly prescribed antidepressants. They are designed to relieve depression by partially

blocking the reuptake of the neurotransmitter serotonin. Shown here is the action of the SSRI Prozac.

Retrieval Practice

RP-5 What happens in the *synaptic gap?*

RP-6 What is *reuptake?* What two other things can happen to excess neurotransmitters after a neuron reacts?

ANSWERS IN APPENDIX E

How Neurotransmitters Influence Us

LOQ 4-5

How do neurotransmitters influence behavior, and how do drugs and other chemicals affect neurotransmission?

In their quest to understand neural communication, researchers have discovered several dozen neurotransmitters and as many new questions: Are certain neurotransmitters found only in specific places? How do neurotransmitters affect our moods, memories, and mental abilities? Can we boost or diminish these effects through drugs or diet?

> **"When it comes to the brain, if you want to see the action, follow the neurotransmitters."** — Neuroscientist Floyd Bloom (1993)

Other modules explore how neurotransmitters influence our hunger and thinking, depression and euphoria, addictions and therapy. In this module, we'll see how neurotransmitters affect our motions and emotions. A particular brain pathway may use only one or two neurotransmitters, such as serotonin and dopamine, and certain neurotransmitters affect specific behaviors and emotions (TABLE 4.1). But neurotransmitter systems don't operate in isolation; they interact, and their effects vary with the receptors they stimulate.

TABLE 4.1 Commonly Studied Neurotransmitters and Their Functions

Neurotransmitter	Function	Examples of Malfunctions
Acetylcholine (ACh)	Enables muscle action, learning, and memory	With Alzheimer's disease, ACh-producing neurons deteriorate.
Dopamine (DOH-puh-meen)	Influences movement, learning, attention, and emotion	Oversupply linked to schizophrenia. Undersupply linked to tremors and decreased mobility in Parkinson's disease.
Serotonin (ser-uh-TOH-nin)	Affects mood, hunger, sleep, and arousal	Undersupply linked to depression. Some drugs that raise serotonin levels are used to treat depression.
Norepinephrine	Helps control alertness and arousal	Undersupply can depress mood.

GABA (gamma-aminobutyric acid)	A major inhibitory neurotransmitter	Undersupply linked to seizures, tremors, and insomnia.
Glutamate (GLUE-tuh-mate)	A major excitatory neurotransmitter; involved in learning and memory	Oversupply can overstimulate the brain, producing migraines or seizures.
Endorphins	Neurotransmitters that influence the perception of pain or pleasure	Oversupply with opioid drugs can suppress the body's natural endorphin supply.



Dan MacMedan/Contour/Getty Images

Dependent upon dopamine The neurotransmitter dopamine helps us move, think, and feel. Too little dopamine may produce the tremors and loss of motor control of Parkinson's disease (Wang et al., 2022). More than 8.5 million people worldwide have Parkinson's disease, including musical artist and reality show actor Ozzy Osbourne, shown

here with the rest of *The Osbournes* (Ou et al., 2021).

One of the best-understood neurotransmitters, *acetylcholine (ACh),* plays a role in learning and memory. ACh also enables muscle action, by acting as the messenger at every junction between motor neurons (which carry information from the brain and spinal cord to the body's tissues) and skeletal muscles. When ACh is released to our muscle cell receptors, the muscle contracts. If ACh transmission is blocked, as happens during some kinds of anesthesia and with some poisons, the muscles cannot contract and we are paralyzed.

Candace Pert and Solomon Snyder (1973) made an exciting discovery about neurotransmitters when they attached a harmless radioactive tracer to morphine, an opioid drug that elevates mood and eases pain. As the researchers tracked the morphine in an animal's brain, they noticed it was binding to receptors in areas linked with mood and pain sensations. But why would the brain have these "opioid receptors"? Why would it have a chemical lock, unless it also had a key to open it?

Researchers soon confirmed that the brain does indeed produce its own naturally occurring opioids. Our body releases several neurotransmitter molecules similar to morphine in response to pain and vigorous exercise. These **endorphins** (short for *end*ogenous [produced within] m*orphin*e) help explain good feelings such as the "runner's high," the painkilling effects of acupuncture, and the indifference to pain in some severely injured people (Boecker et al.,

2008; Fuss et al., 2015). But once again, new knowledge led to new questions.

Ask Yourself

Can you recall a time, perhaps after a workout, when you felt the effects of endorphins? How would you describe those feelings?

Retrieval Practice

RP-7 Serotonin, dopamine, and endorphins are all chemical messengers called _____.

ANSWERS IN APPENDIX E

How Drugs and Other Chemicals Alter Neurotransmission

If natural endorphins lessen pain and boost mood, why not increase this effect by flooding the brain with artificial opioids, thereby intensifying the brain's own "feel-good" chemistry? Because it would disrupt the brain's chemical balancing act. When flooded with opioid drugs such as heroin, morphine, and fentanyl (a powerful synthetic opioid), the brain—to maintain its chemical balance—may stop producing its own natural opioids. When the drug is withdrawn, the brain may then be deprived of *any* form of opioid, causing intense

discomfort. For suppressing the body's own neurotransmitter production, nature charges a price.

Drugs and other chemicals affect brain chemistry. **Agonist** molecules *increase* a neurotransmitter's action. Some agonists may increase the production or release of neurotransmitters, or block reuptake in the synapse. Other agonists may be similar enough to a neurotransmitter to bind to its receptor and mimic its excitatory or inhibitory effects. Some opioid drugs, then, are agonists and produce a temporary "high" by amplifying normal sensations of arousal or pleasure.

Antagonists *decrease* a neurotransmitter's action by blocking production or release. An antagonist is enough like the natural neurotransmitter to occupy its receptor site and block its effect, but it is not similar enough to stimulate the receptor (rather like foreign coins that fit into, but won't operate, a vending machine). Botulin, a poison that can form in improperly canned food, causes paralysis by blocking ACh release. (Small injections of botulin—Botox—smooth wrinkles by paralyzing the underlying facial muscles.) Curare, a poison some South American Indigenous people have applied to hunting-dart tips, also occupies and blocks ACh receptor sites on muscles, producing paralysis in their prey.

Retrieval Practice

RP-8 Curare poisoning paralyzes animals by blocking ACh receptors involved in muscle movement. Morphine mimics endorphin actions. Which is an agonist, and

which is an antagonist?

ANSWERS IN APPENDIX E

The Nervous System

LOQ 4-6

What are the functions of the nervous system's main divisions, and what are the three main types of neurons?

Neurons communicating via neurotransmitters make up our body's **nervous system**, a communication network that takes in information from the world and the body's tissues, makes decisions, and sends back information and orders to the body's tissues (**FIGURE 4.7**).

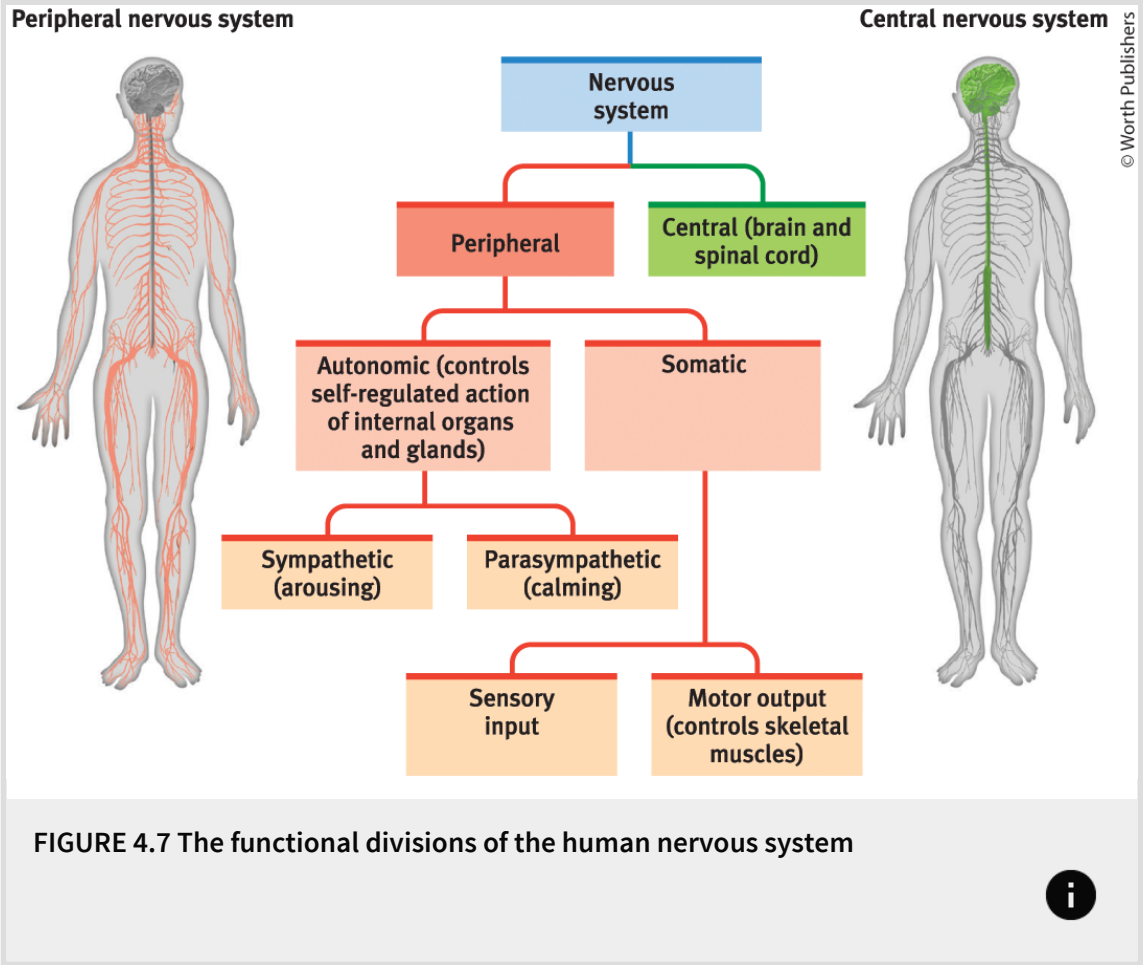


FIGURE 4.7 The functional divisions of the human nervous system

A quick overview: The brain and spinal cord form the **central nervous system (CNS)**, the body's decision maker. The **peripheral nervous system (PNS)** is responsible for gathering information and transmitting CNS decisions to our body parts. **Nerves**, electrical cables formed from bundles of axons, link the CNS with the body's sensory receptors, muscles, and glands. The optic nerve, for example, bundles a million axons into a single cable carrying the messages from the eye to the brain (Mason & Kandel, 1991).

Information travels in the nervous system through three types of neurons. **Sensory neurons** carry messages from the body's tissues

and sensory receptors inward (what biologists term *afferent*) to the brain and spinal cord for processing. **Motor neurons** (which are *efferent*) carry instructions from the central nervous system outward to the body's muscles and glands. Between the sensory input and motor output, information is processed via **interneurons.** Our complexity resides mostly in these interneurons. Our nervous system has a few million sensory neurons, a few million motor neurons, and billions and billions of interneurons.

The Peripheral Nervous System

Our peripheral nervous system has two components—somatic and autonomic. Our **somatic nervous system** enables voluntary control of our skeletal muscles. When your friend taps your shoulder, your somatic nervous system reports to your brain the current state of your skeletal muscles and carries instructions back, triggering your head to turn.

Our **autonomic nervous system (ANS)** controls our glands and our internal organ muscles. The ANS influences functions such as glandular activity, heartbeat, and digestion. (*Autonomic* means "self-regulating.") As with a self-driving car, we may consciously override the system, but it usually operates on its own (autonomously).

The autonomic nervous system's subdivisions serve two important functions (**FIGURE 4.8**). The **sympathetic nervous system** arouses and expends energy. Imagine an activity that alarms or challenges

you, such as a longed-for job interview. Your sympathetic nervous system accelerates your heartbeat, raises your blood pressure, slows your digestion, raises your blood sugar, and cools you with sweat, making you alert and ready for action. When the stress subsides after the interview, your **parasympathetic nervous system** will produce the opposite effects, conserving your energy as it decreases your heartbeat, lowers your blood sugar, and enables you to rest and digest. The sympathetic and parasympathetic nervous systems work together, as accelerator and brake, to keep us in a steady internal state called *homeostasis* (more on this in the "What Drives Us" modules).

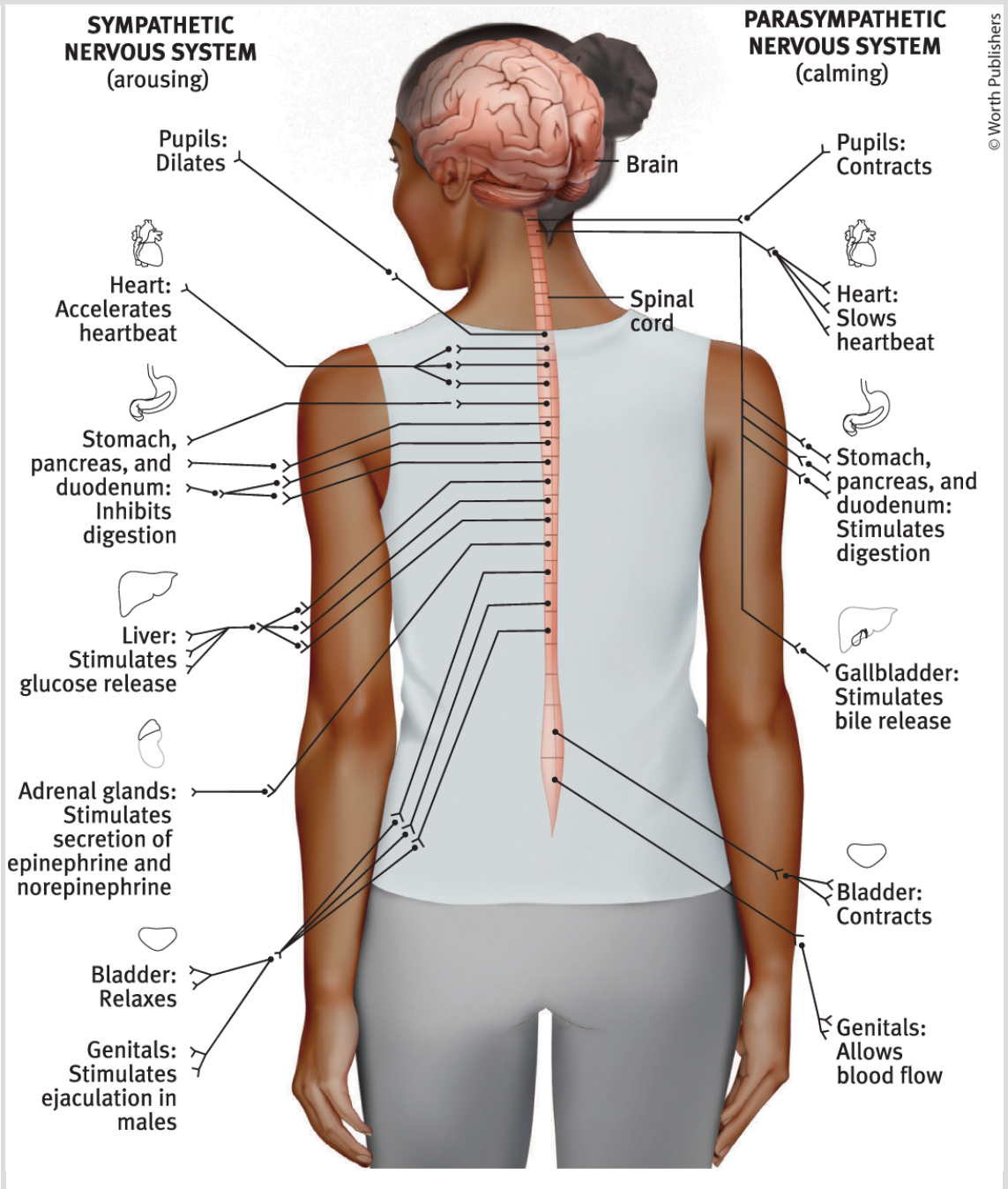


FIGURE 4.8 The dual functions of the autonomic nervous system The autonomic nervous system controls the more autonomous (or self-regulating) internal functions. Its sympathetic division arouses the body and expends energy. Its parasympathetic division calms the body and conserves energy, allowing routine maintenance activity. For example, sympathetic stimulation accelerates heartbeat, whereas parasympathetic stimulation slows it.

Several years ago, I [DM] experienced my ANS in action. Before sending me into an MRI machine for a shoulder scan, the technician asked if I had issues with claustrophobia. “No, I’m fine,” I assured her. Moments later, as I found myself on my back, stuck deep inside a coffin-sized box and unable to move, my sympathetic nervous system had a different idea. Claustrophobia overtook me. My heart began pounding, and I felt a desperate urge to escape. Just as I was about to cry out for release, I felt my calming parasympathetic nervous system kick in. My heart rate slowed and my body relaxed, though my arousal surged again before the 20-minute confinement ended. “You did well!” the technician said, unaware of my ANS roller-coaster ride.

Ask Yourself

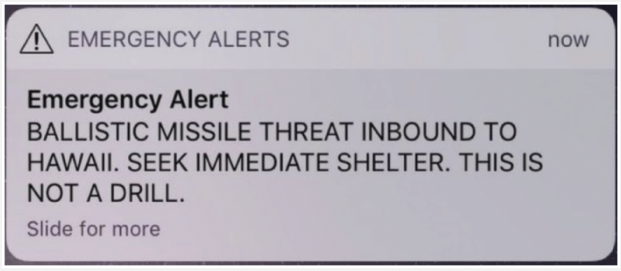
Think back to a stressful moment when you felt your sympathetic nervous system kick in. What was your body preparing you for? Were you able to sense your parasympathetic nervous system’s response when the challenge had passed?

Retrieval Practice

RP-9 Match the type of neuron (i–iii) to its description (a–c).

Type	Description

i. Motor neurons	a. Carry incoming messages from sensory receptors to the CNS.
ii. Sensory neurons	b. Communicate within the CNS and process information between incoming and outgoing messages.
iii. Interneurons	c. Carry outgoing messages from the CNS to muscles and glands.



Ballistic stress In 2018, Hawaiians received this terrifying alert, amid concerns about North Korean nuclear warheads. "We fully felt we were about to die," reported one panicked mother (Nagourney et al., 2018). Thirty-eight minutes later, the alert was declared a false alarm.

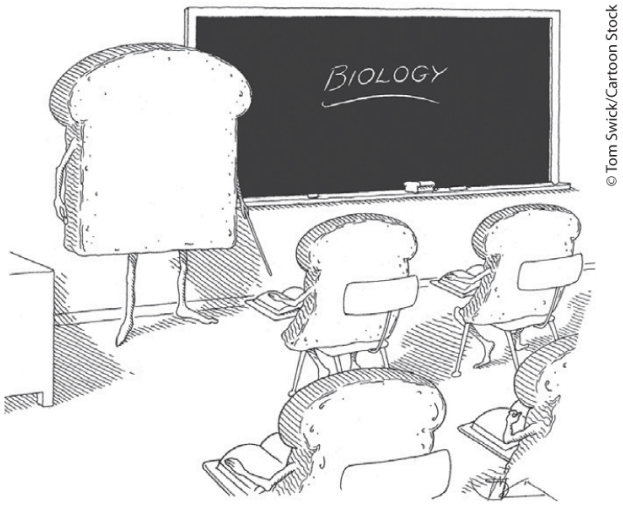
RP-10 How was the ANS involved in Hawaiians' terrified responses, and in calming their bodies once they realized it was a false alarm?

ANSWERS IN APPENDIX E

The Central Nervous System

From neurons "talking" to other neurons arises the complexity of the central nervous system's brain and spinal cord.

The brain enables our humanity—our thinking, feeling, and acting. Tens of billions of neurons, each communicating with thousands of other neurons, yield an ever-changing wiring web. By one estimate—projecting from neuron counts in small brain samples—our brain has some 128 billion neurons (Feldman Barrett, 2020). (Although that's a lot, the world's 10 richest people, as we write, each have more dollars than brain cells.)



© Tom Swick/Cartoon Stock

"The body is made up of millions and millions of crumbs."

Just as individual pixels combine to form a picture, the brain's individual neurons cluster into work groups called *neural networks.* To understand why, Stephen Kosslyn and Olivier Koenig (1992, p. 12) have invited us to "think about why cities exist; why don't people distribute themselves more evenly across the countryside?" Like people networking with people, neurons network with nearby neurons with which they can have short, fast connections; each layer's cells connect with various cells in the neural network's next layer. Learning—to play

the violin, speak a foreign language, or solve a math problem—occurs as experience strengthens connections. To paraphrase one neuropsychologist, neurons that fire together wire together (Hebb, 1949).

The other part of the CNS, the *spinal cord,* connects the peripheral nervous system and the brain. Ascending neural fibers send up sensory information, and descending fibers send back motor-control information. The neural pathways governing our **reflexes**, our automatic responses to stimuli, illustrate the spinal cord's work. A simple spinal reflex pathway is composed of a single sensory neuron and a single motor neuron. These often communicate through an interneuron. The knee-jerk reflex, for example, involves one such simple pathway. A headless warm body could do it.

Another neural circuit enables the pain reflex (**FIGURE 4.9**). When your finger touches a flame, neural activity (excited by the heat) travels via sensory neurons to interneurons in your spinal cord. These interneurons respond by activating motor neurons leading to the muscles in your arm. Because the simple pain-reflex pathway runs through the spinal cord and right back out, your hand jerks away from the candle's flame *before* your brain receives and responds to the information that causes you to feel pain. That's why it feels as if your hand jerks away not by your choice, but on its own.

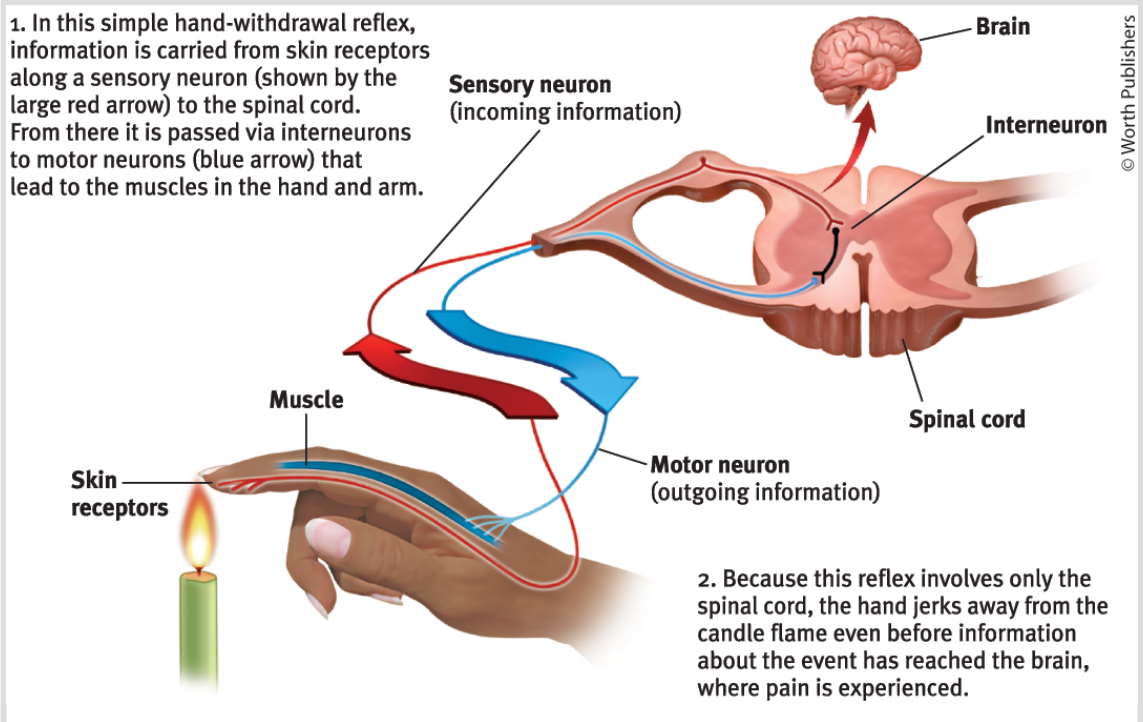


FIGURE 4.9 A simple reflex

Information travels to and from the brain by way of the spinal cord. Were the top of your spinal cord severed, you would not feel pain from your paralyzed body below. Nor would you feel pleasure. With your brain literally out of touch with your body, you would lose all sensation and voluntary movement in body regions with sensory and motor connections to the spinal cord below its point of injury. You would exhibit the knee-jerk reflex without feeling the tap. Men paralyzed below the waist may be capable of an erection (a simple reflex) if their genitals are stimulated (Gomes et al., 2017; Hess & Hough, 2012). Women who are similarly paralyzed may respond with vaginal lubrication. But, depending on where and how completely their spinal cord is severed, they may be genitally unresponsive to

erotic images and have no genital feelings (Kennedy & Over, 1990; Sipski et al., 1999). To produce bodily pain or pleasure, the sensory information must reach the brain.

> **"If the nervous system be cut off between the brain and other parts, the experiences of those other parts are nonexistent for the mind. The eye is blind, the ear deaf, the hand insensible and motionless."** — William James, *Principles of Psychology,* 1890

The Endocrine System

LOQ 4-7

How does the endocrine system transmit information and interact with the nervous system?

So far, we have focused on the body's speedy electrochemical information system. Interconnected with your nervous system is a second communication system, the **endocrine system** (**FIGURE 4.10**). The endocrine system contains glands and fat tissue that secrete another form of chemical messenger, **hormones.** Hormones travel through the bloodstream and affect other tissues, including the brain. When hormones act on the brain, they influence our interest in sex, food, and aggression.

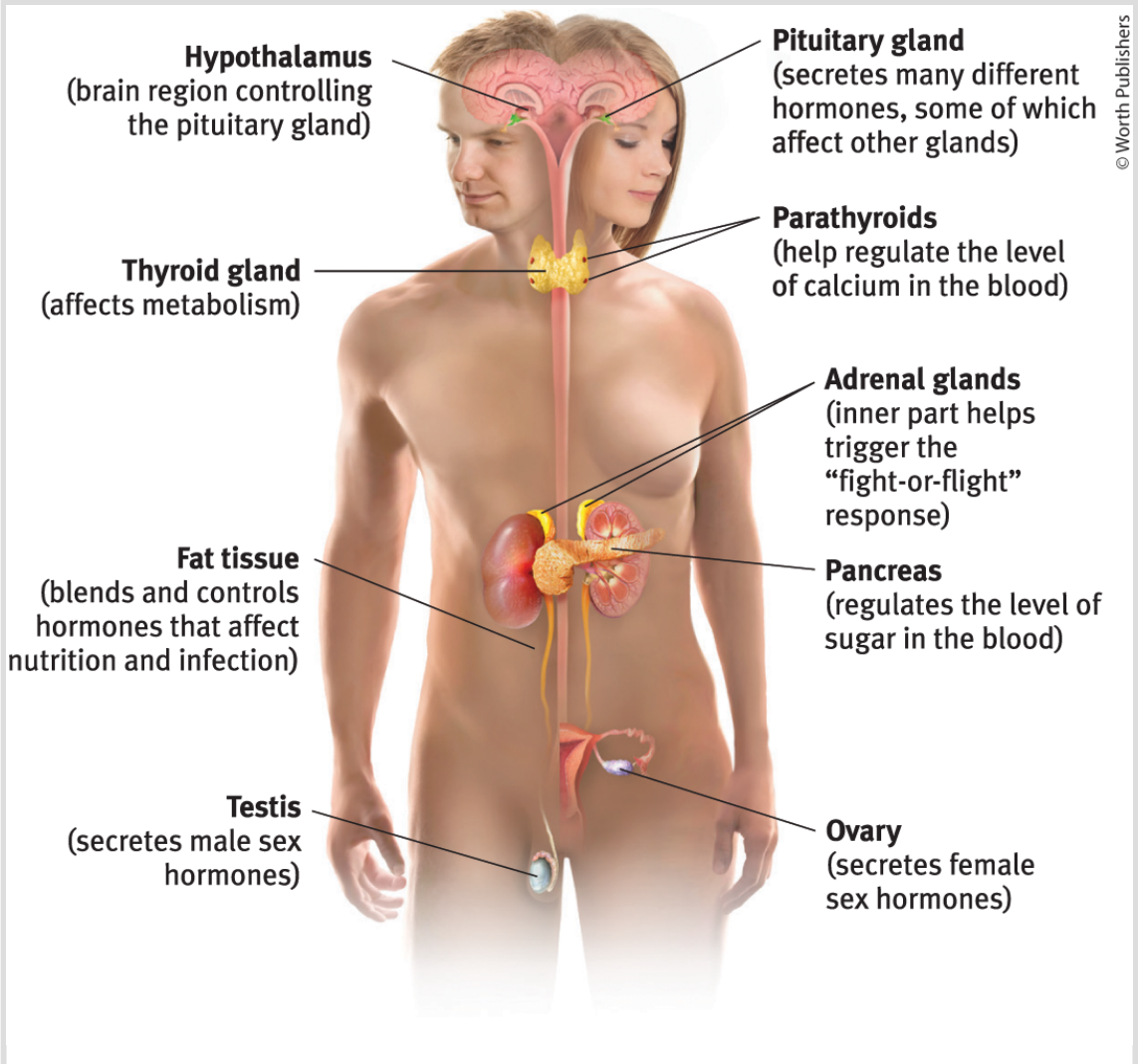


FIGURE 4.10 The endocrine system

Some hormones are chemically identical to neurotransmitters (the chemical messengers that diffuse across a synapse and excite or inhibit an adjacent neuron). The endocrine system and nervous system are therefore close relatives: Both produce molecules that act on receptors elsewhere. Like many relatives, they also differ. The speedier nervous system zips messages from eyes to brain to hand in a

fraction of a second. Endocrine messages trudge along in the bloodstream, taking several seconds or more to travel from the gland to the target tissue. If the nervous system transmits information with text-message speed, the endocrine system delivers an old-fashioned letter.

But slow and steady sometimes wins the race. Endocrine messages tend to outlast the effects of neural messages. Have you ever felt angry long after the cause of your angry feelings was resolved (say, your friend apologized for their rudeness)? You may have experienced an "endocrine hangover" from lingering emotion-related hormones. The persistence of emotions—even without conscious awareness of what caused them—was dramatically evident in one ingenious experiment. Brain-damaged patients unable to form new conscious memories watched a sad film and later a happy film. After each viewing, they did not consciously recall the films, but the sad or happy emotion persisted (Feinstein et al., 2010).

In a moment of danger, the ANS orders the **adrenal glands** on top of the kidneys to release *epinephrine* and *norepinephrine* (also called *adrenaline* and *noradrenaline*). These hormones increase heart rate, blood pressure, and blood sugar, providing a surge of energy to power our *fight-or-flight* response. When the emergency passes, the hormones—and the feelings—linger for a few moments before the parasympathetic system calms you.

The most influential endocrine gland is the **pituitary gland**, a pea-sized structure located in the core of the brain, where it is controlled by an adjacent brain area, the *hypothalamus* (more on that shortly). Among the hormones released by the pituitary is a growth hormone that stimulates physical development. Another is *oxytocin,* which enables orgasm, and, in women, labor contractions and (while nursing) milk flow. Oxytocin also aids social connection. For example, while bonding with their offspring through grooming, male baboons' oxytocin levels surge (Rincon et al., 2020). Children with autism spectrum disorder, who experience atypical social connections, have lower oxytocin levels than do their non-autistic peers (John & Jaeggi, 2021).

Pituitary secretions also direct other endocrine glands to release their hormones. The pituitary, then, is a *master gland* (whose own master is the hypothalamus). For example, under the brain's influence, the pituitary triggers your sex glands to release sex hormones. These in turn influence your brain and behavior (Goetz et al., 2014). So, too, with stress. A stressful event triggers your hypothalamus to instruct your pituitary to release a hormone that causes your adrenal glands to flood your body with *cortisol,* a stress hormone that increases blood sugar. Sustained stress also increases adolescents' and adults' risk for later depression (Kennis et al., 2020; Zajkowska et al., 2022). Stressed body → depressed mind.



Brittainy Newman/The New York Times/Redux Pictures

Prejudice causes stress Experiencing prejudice triggers the release of the stress hormone cortisol (Palmer-Bacon et al., 2020; Seaton & Zeiders, 2021). In 2020, Christian Cooper experienced prejudice and stress while bird-watching in New York's Central Park. After politely asking a White woman to leash her dog, the woman yelled at him and threatened to call the police and tell them that "an African American man is threatening my life" (Nir, 2020). A video of the stressful interaction went viral, attracting more than 40 million views in 2 days. The woman was later arrested on charges of filing a false police report.

This feedback system (brain → pituitary → other glands → hormones → body and brain) reveals the intimate connection of the nervous and endocrine systems. The nervous system directs endocrine secretions, which then affect the nervous system. Conducting and coordinating this whole electrochemical orchestra is that flexible maestro we call the brain.

Ask Yourself

Do you remember feeling the lingering emotional effects related to a hormonal response, such as anger or anxiety after a particularly upsetting event? How did it feel? How long did it last?

Retrieval Practice

RP-11 Why is the pituitary gland called the *master gland?*

RP-12 How are the nervous and endocrine systems alike, and how do they differ?

ANSWERS IN APPENDIX E

REVIEW

Module 4: Neural and Hormonal Systems

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 4-1: Why are psychologists concerned with human biology?

LOQ 4-2: How do biology and experience together enable neuroplasticity?

LOQ 4-3: What are *neurons,* and how do they transmit information?

LOQ 4-4: How do nerve cells communicate with other nerve cells?

LOQ 4-5: How do neurotransmitters influence behavior, and how do drugs and other chemicals affect neurotransmission?

LOQ 4-6: What are the functions of the nervous system's main divisions, and what are the three main types of neurons?

LOQ 4-7: How does the endocrine system transmit information and interact with the nervous system?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

biological psychology
neuroplasticity
neuron
cell body
dendrites
axon
myelin [MY-uh-lin] sheath
glial cells (glia)
action potential
threshold
refractory period
all-or-none response
synapse [SIN-aps]
neurotransmitters
reuptake
endorphins [en-DOR-fins]
agonist
antagonist
nervous system
central nervous system (CNS)
peripheral nervous system (PNS)
nerves

sensory (afferent) neurons
motor (efferent) neurons
interneurons
somatic nervous system
autonomic [aw-tuh-NAHM-ik] nervous system (ANS)
sympathetic nervous system
parasympathetic nervous system
reflex
endocrine [EN-duh-krin] system
hormones
adrenal [ah-DREEN-el] glands
pituitary gland

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. What do psychologists mean when they say the brain is "plastic"?

2. The neuron fiber that passes messages through its branches to other neurons or to muscles and glands is the _____.

3. The tiny space between the axon of one neuron and the dendrite or cell body of another is called the
   a. axon terminal.
   b. branching fiber.
   c. synaptic gap.
   d. threshold.

4. Regarding a neuron's response to stimulation, the intensity of the stimulus determines
   a. whether or not an impulse is generated.
   b. how fast an impulse is transmitted.
   c. how intense an impulse will be.
   d. whether reuptake will occur.

5. In a sending neuron, when an action potential reaches an axon terminal, the impulse triggers the release of chemical messengers called _____.

6. Endorphins are released in the brain in response to
   a. morphine or heroin.
   b. pain or vigorous exercise.
   c. the all-or-none response.
   d. all of the above.

7. The autonomic nervous system controls internal functions, such as heart rate and glandular activity. The word *autonomic* means
   a. calming.
   b. voluntary.

c. self-regulating.
d. arousing.

8. The sympathetic nervous system arouses us for action and the parasympathetic nervous system calms us down. Together, the two systems make up the _____ nervous system.

9. The neurons of the spinal cord are part of the _____ nervous system.

10. The most influential endocrine gland, known as the *master gland,* is the
    a. pituitary.
    b. hypothalamus.
    c. thyroid.
    d. pancreas.

11. The _____ _____ secrete(s) epinephrine and norepinephrine, helping to arouse the body during times of stress.

MODULE 5: Tools of Discovery: Having Our Head Examined

LOQ 5-1

How do neuroscientists study the brain's connections to behavior and mind?

When you think *about* your brain, you're thinking *with* your brain—by releasing billions of neurotransmitter molecules across trillions of synapses. The effect of hormones on experiences such as love reminds us that we would not be of the same mind if we were a bodiless brain. Nevertheless, brain, behavior, and cognition are an integrated whole. But precisely where and how are the mind's functions tied to the brain? Let's consider how scientists explore such questions.

> **"I am a brain, Watson. The rest of me is a mere appendix."** — Sherlock Holmes, in Arthur Conan Doyle's "The Adventure of the Mazarin Stone," 1921

For most of human history, scientists had no tools high-powered yet gentle enough to reveal a living brain's activity. Early case studies helped localize some brain functions. Damage to one side of the brain often caused numbness or paralysis on the body's opposite side,

suggesting that the body's right side is wired to the brain's left side, and vice versa. Damage to the back of the brain disrupted vision, and to the left-front part of the brain produced speech difficulties. Gradually, these early explorers were mapping the brain.

Now the human brain has invented new ways to study itself. A new generation of neural mapmakers is charting the known universe's most amazing organ. Scientists can selectively **lesion** (destroy) tiny clusters of normal or defective brain cells, observing any effect on brain function. In the laboratory, such studies have revealed, for example, that damage to one area of the hypothalamus in a rat's brain reduces eating, to the point of starvation, whereas damage in another area produces overeating.

Today's neuroscientists can *stimulate* various brain parts—electrically, chemically, or magnetically—and note the effect. Depending on the stimulated brain part, people may—to name a few examples—giggle, hear voices, turn their head, feel themselves falling, or have an out-of-body experience (Selimbeyoglu & Parvizi, 2010).

Scientists can even snoop on the messages of individual neurons. With tips small enough to detect the electrical pulse in a single neuron, modern microelectrodes can, for example, now detect exactly where the information goes in a rat's brain when someone tickles its belly (Ishiyama & Brecht, 2017). Promising new tools include *optogenetics,* a technique that allows neuroscientists to control the activity of individual neurons (Boyden, 2014). By programming

neurons to become receptive to light, researchers can examine the biological basis of sensations, fear, depression, and substance use disorders (Dygalo & Shishkina, 2019; Firsov, 2019; Juarez et al., 2019; Nikitin et al., 2019).

Researchers can also eavesdrop on the chatter of billions of neurons. Right now, your mental activity is emitting telltale electrical, metabolic, and magnetic signals that would enable neuroscientists to observe your brain at work. Electrical activity in your brain's billions of neurons sweeps in regular waves across its surface. An **EEG (electroencephalogram)** is an amplified readout of such waves. Researchers record the brain waves through a shower-cap-like hat that is filled with electrodes covered with a conductive gel. Studying an EEG of the brain's activity is like studying a blender's motor by listening to its hum. With no direct access to the brain, researchers present a stimulus repeatedly and have a computer filter out brain activity unrelated to the stimulus. What remains is the electrical wave evoked by the stimulus.

A related technique is **MEG (magnetoencephalography)**. To isolate the brain's magnetic fields, researchers create special rooms that cancel out other magnetic signals, such as the Earth's magnetic field. Participants sit underneath a head coil that resembles a hair salon hairdryer. While participants complete activities, tens of thousands of neurons create electrical pulses, which in turn create magnetic fields. The speed and strength of the magnetic fields enable researchers to understand how certain tasks influence brain activity (Samuelsson et

al., 2020). Other researchers have stimulated people's brains and noted what they experience, such as fear, a funny smell, sexual excitement, or a sense of calm (Koch, 2021).

Neuroimaging techniques give us a superhero-like ability to see inside the living brain. One such tool, **PET (positron emission tomography)** (**FIGURE 5.1**), depicts brain activity by showing each brain area's consumption of its chemical fuel, the sugar glucose. Active neurons gobble glucose. Our brain, though only about 2 percent of our body weight, consumes 20 percent of our calorie intake. After a person receives temporarily radioactive glucose, the PET scan can track the gamma rays released by this "food for thought" as a task is performed. Rather like weather radar showing rain activity, PET-scan "hot spots" show the most active brain areas as the person does mathematical calculations, looks at images of faces, or daydreams.



FIGURE 5.1 The PET scan

In **MRI (magnetic resonance imaging)** brain scans, the person's head is put in a strong magnetic field, which aligns the spinning atoms of

brain molecules. Then, a radio-wave pulse momentarily disorients the atoms. When the atoms return to their typical spin, they emit signals that provide a detailed picture of soft tissues, including the brain. MRI scans have revealed a larger-than-average neural area in the left hemisphere of musicians who display perfect pitch (Yuskaitis et al., 2015). They have also revealed enlarged *ventricles*—fluid-filled brain areas (marked by the red arrows in **FIGURE 5.2**)—in some patients who have *schizophrenia.*

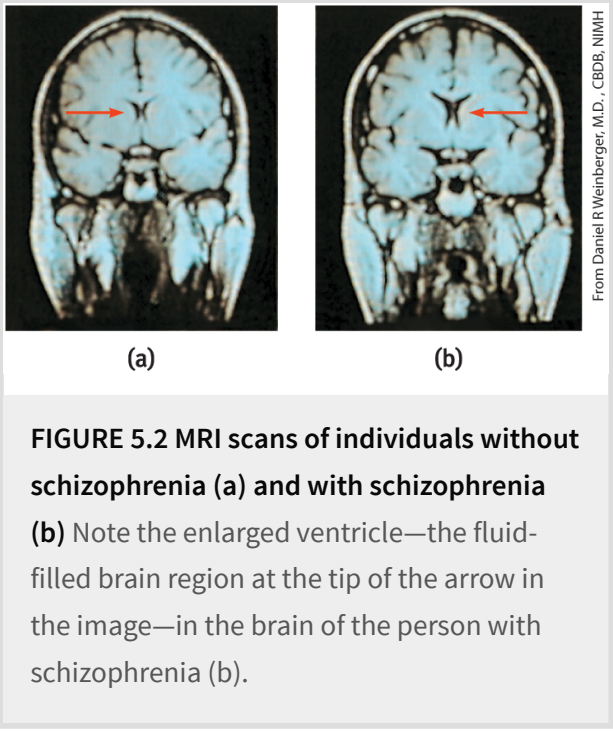


FIGURE 5.2 MRI scans of individuals without schizophrenia (a) and with schizophrenia (b) Note the enlarged ventricle—the fluid-filled brain region at the tip of the arrow in the image—in the brain of the person with schizophrenia (b).

A special application of MRI—**fMRI (functional MRI)**—can reveal the brain's functioning as well as its structure. Where the brain is especially active, blood goes. By comparing successive MRI scans, researchers can watch as specific brain areas activate, showing increased oxygen-laden blood flow. As a person looks at a scene, for

example, the fMRI machine detects blood rushing to the back of the brain, which processes visual information. Another tool, *functional near-infrared spectroscopy (fNIRS),* uses infrared light that shines onto blood molecules to identify brain activity. The fNIRS equipment can fit in a large backpack, enabling researchers to study the biology of mind in difficult-to-reach populations (Burns et al., 2019; Perdue et al., 2019).



Mark Straccia/UCLA Social Cognitive Neuroscience Laboratory

Understanding the non-WEIRD brain Most neuroscience research studies people from Western, Educated, Industrialized, Rich, and Democratic (WEIRD) populations (Falk et al., 2013). Using functional near-infrared spectroscopy (fNIRS), the researchers shown here were able to identify brain areas involved in persuasion among a Jordanian sample (Burns et al., 2019).

See TABLE 5.1 for a comparison of some of these imaging techniques.

TABLE 5.1 Common Types of Neural Measures

Name	How Does It Work?	Sample Finding
EEG (electroencephalogram)	Electrodes placed on the scalp measure electrical activity in neurons.	Symptoms of depression and anxiety correlate with increased activity in the right frontal lobe, a brain area associated with behavioral withdrawal and negative emotion (Thibodeau et al., 2006).
MEG (magnetoencephalography)	A head coil records magnetic fields from the brain's natural electrical currents.	Soldiers with posttraumatic stress disorder (PTSD), compared with soldiers who do not have PTSD, show stronger magnetic fields in the visual cortex when they view trauma-related images (Todd et al., 2015).
PET (positron emission tomography)	Tracks where in the brain a temporarily radioactive form of glucose goes while the person given it performs a task.	Monkeys with an anxious temperament have brains that use more glucose in regions related to fear, memory, and expectations of reward and punishment (Fox et al., 2015).
MRI (magnetic resonance imaging)	People sit or lie down in a chamber that uses magnetic fields and radio waves to provide a map of brain structure.	People with a history of violence tend to have smaller frontal lobes, especially in regions that aid moral judgment and self-control (Glenn & Raine, 2014).
fMRI (functional magnetic resonance imaging)	Measures blood flow to brain regions by comparing continuous MRI scans.	Years after surviving a near plane crash, passengers who viewed material related to their trauma showed greater activation in the brain's fear, memory, and visual centers than when they watched

		footage related to the 9/11 terrorist attacks (Palombo et al., 2015).

Such snapshots of the brain's changing activity provide new insights into how the brain divides its labor and reacts to changing needs. A mountain of recent fMRI studies tells us which brain areas are most active when people feel pain or rejection, listen to angry voices, think about scary things, feel happy, or become sexually aroused. fMRI can even reveal what happens if we deliberately suppress our own personality, as actors do (Brown et al., 2019).

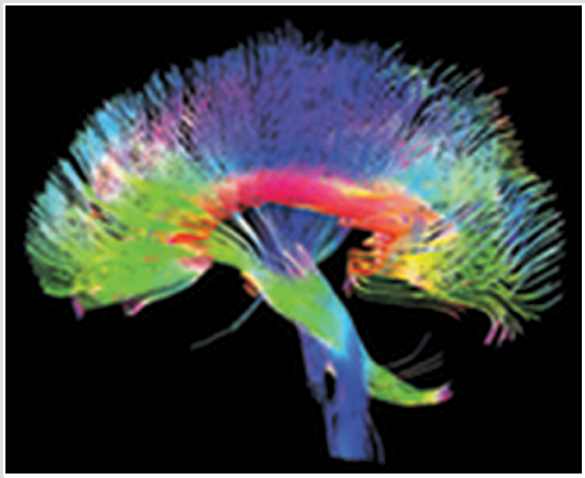
Can brain imaging enable mind reading? fMRI technology has enabled a very basic sort of eavesdropping on the mind. One neuroscience team scanned 129 people's brains as they did eight different mental tasks (such as reading, gambling, or rhyming). Later, they were able, with 80 percent accuracy, to identify which of these mental activities their participants had been doing (Poldrack, 2018).

You've seen the pictures—of colorful "lit up" brain regions with accompanying headlines, such as "your brain on music." Although brain areas don't actually light up, vivid brain-scan images seem impressive. People rated scientific explanations as more believable and interesting when they contained neuroscience (Fernandez-Duque et al., 2015; Im et al., 2017). But "neuroskeptics" caution against overblown claims about any ability to predict customer preferences, to detect lies, and to foretell crime (Schwartz et al., 2016). Neuromarketing, neuroleadership, neurolaw, and neuropolitics are

often neurohype. Imaging techniques illuminate brain structure and activity, and sometimes help us test different theories of behavior (Mather et al., 2013). But given that all human experience is brain-based, it's no surprise that different brain areas become active when one listens to a lecture or lusts for a lover.

***

Today's techniques for peering into the thinking, feeling brain are doing for psychology what the microscope did for biology and the telescope did for astronomy. From them we have learned more about the brain in the last 100 years than in the previous 10,000. And the next decade will reveal much more, as each year massive funding goes into brain research. To advance brain science, researchers from across Europe have undertaken a $1 billion Human Brain Project (Salles et al., 2019). Another project explores brain aging from ages 3 to 96 (Pomponio et al., 2020). These massive undertakings harness the collective power of hundreds of scientists from dozens of countries (Thompson et al., 2020) (**FIGURE 5.3**). "Individually, we contribute little or nothing to the truth," said Aristotle. "By the union of all a considerable amount is amassed."



Tom Barrick, Chris Clark, SGHMS/Science Photo Library/Science Source

FIGURE 5.3 Beautiful brain connections The Human Connectome Project is using cutting-edge *diffusion tensor imaging* MRI methods to map the brain's interconnected network of neurons (Glasser et al., 2016; Wang & Olson, 2018). Such efforts have led to the creation of a new brain map with 100 neural centers not previously described (Glasser et al., 2016). Scientists used the technique to create this multicolored "symphony" of neural fibers transporting water through different brain regions.

Ask Yourself

Were you surprised to learn that there are so many technologies to study the brain's structures and functions? Which techniques do you find most interesting? Why?

Retrieval Practice

RP-1 Match the scanning technique (i–iii) with the correct description (a–c).

Technique	Description
i. fMRI scan	a. Tracks radioactive glucose to reveal brain *activity.*
ii. PET scan	b. Tracks successive images of brain tissue to show brain *function.*
iii. MRI scan	c. Uses magnetic fields and radio waves to show brain *anatomy.*

ANSWERS IN APPENDIX E

REVIEW

Module 5: Tools of Discovery: Having Our Head Examined

Learning Objectives

Test Yourself Answer this repeated Learning Objective Question on your own (before "showing" the answer here, or checking the answer in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 5-1: How do neuroscientists study the brain's connections to behavior and mind?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

lesion [LEE-zhuhn]
EEG (electroencephalogram)
MEG (magnetoencephalography)
PET (positron emission tomography)
MRI (magnetic resonance imaging)
fMRI (functional MRI)

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. Selectively destroying brain cells, which enables scientists to note the resulting effect on brain function, is called _____.

2. The neuroimaging technique that measures magnetic fields from the brain's natural electrical activity is called
   a. MEG.

MODULE 6: Brain Regions and Structures

LOQ 6-1

What are the *hindbrain*, *midbrain*, and *forebrain?*

Vertebrate brains have three main divisions. The **hindbrain** contains brainstem structures that direct essential survival functions, such as our breathing, sleeping, arousal, coordination, and balance. The **midbrain**, atop the brainstem, connects the hindbrain with the forebrain; it also controls some movement and transmits information that enables our seeing and hearing. The **forebrain** manages complex cognitive activities, sensory and associative functions, and voluntary motor activities (**FIGURE 6.1**). Individual organisms' brains have evolved to best suit their environment (Cesario et al., 2020). We humans, for example, have extremely well-developed forebrains, allowing us an unparalleled ability to make complex decisions and judgments. Predatory sharks have complex hindbrains, supporting their impressive ability to chase down prey (Yopak et al., 2010).

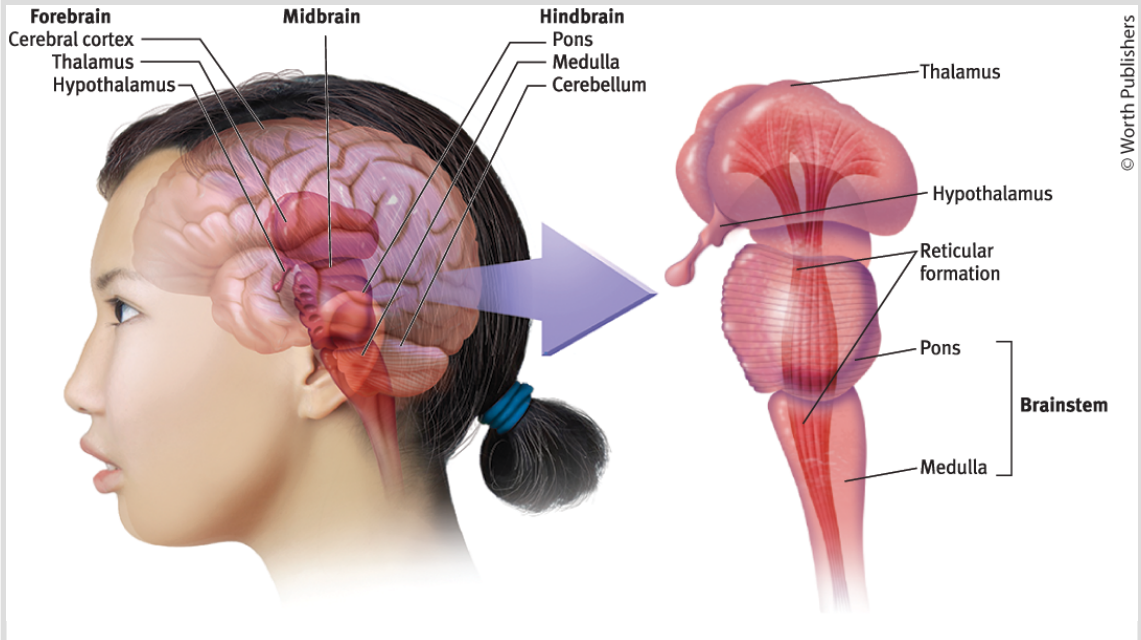


FIGURE 6.1 Brain divisions: forebrain, midbrain, hindbrain In the hindbrain, the brainstem (including the pons and medulla) is an extension of the spinal cord. The thalamus is attached to the top of the brainstem. The reticular formation passes through both structures.

The Brainstem

LOQ 6-2

What structures make up the brainstem, and what are the functions of the brainstem, thalamus, reticular formation, and cerebellum?

The **brainstem** is the brain's innermost region. Its base is the **medulla**, the slight swelling in the spinal cord just after it enters the skull (see Figure 6.1). Here lie the controls for your heartbeat and breathing. As some patients with severe brain damage illustrate, we

do not need a conscious mind to orchestrate our heart's pumping and lungs' breathing. The brainstem handles those tasks. Just above the medulla sits the *pons,* which helps coordinate movements and control sleep.

If a cat's brainstem were cut off from the rest of its brain, the cat would still breathe and live—and even run, climb, and groom (Klemm, 1990). But cut off from its midbrain and forebrain, the cat would not *purposefully* run or climb to get food.

The brainstem is also a crossover point, where most nerves to and from each side of the brain connect with the body's opposite side (**FIGURE 6.2**). This peculiar cross-wiring is but one of the brain's many surprises.

Retrieval Practice



FIGURE 6.2 The body's wiring

RP-1 The _____ is a crossover point where nerves from the left side of the brain are mostly linked to the right side of the body, and vice versa.

ANSWERS IN APPENDIX E

The Thalamus

Sitting atop the brainstem is the forebrain's **thalamus**, a pair of egg-shaped structures that acts as the brain's sensory control center (see

Figure 6.1). The thalamus receives information from all the senses except smell, and routes that information to the brain regions that deal with seeing, hearing, tasting, and touching. The thalamus also receives some of the replies, which it then directs to the medulla and to the hindbrain's *cerebellum.* For sensory information, your thalamus is something like what Seoul is to South Korea's trains: a hub through which traffic passes on its way to various destinations.

The Reticular Formation

Inside the brainstem, between your ears, lies the **reticular** ("netlike") **formation,** a nerve network extending from the spinal cord right up through the thalamus. As the spinal cord's sensory input flows up to the thalamus, some of it travels through the reticular formation, which filters incoming stimuli and relays important information to other brain areas. Have you multitasked today? You can thank your reticular formation (Wimmer et al., 2015).

The reticular formation also controls arousal, as Giuseppe Moruzzi and Horace Magoun discovered in 1949. Electrically stimulating a sleeping cat's reticular formation almost instantly produced an awake, alert animal. When Magoun *severed* a cat's reticular formation without damaging nearby sensory pathways, the effect was equally dramatic: The cat lapsed into a coma from which it never awakened.

The Cerebellum

Extending from the rear of the brainstem is the hindbrain's baseball-sized **cerebellum**, meaning "little brain," which is what its two wrinkled halves resemble (FIGURE 6.3). The cerebellum (along with the *basal ganglia*—deep brain structures involved in motor movement) enables nonverbal learning and skill memory. With assistance from the pons, it also coordinates voluntary movement. When a soccer player skillfully controls the ball, give their cerebellum some credit. Under alcohol's influence, coordination suffers. And if you injured your cerebellum, you would have difficulty walking, keeping your balance, or texting your friend. Your movements would be jerky and exaggerated. Gone would be any dreams of being a dancer or guitarist.

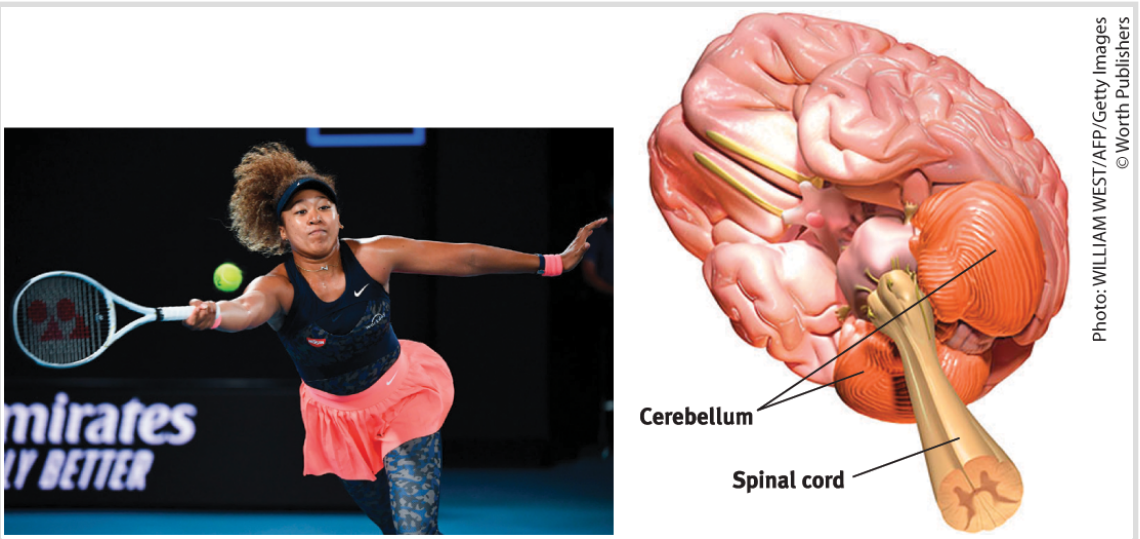


FIGURE 6.3 The brain's organ of agility Hanging at the back of the brain, the cerebellum coordinates our voluntary movements, as when tennis player Naomi Osaka returns the ball.

The cerebellum, which has more than half your brain's neurons, operates just outside your awareness. Quickly answer these questions: How long have you been reading this text? Do your clothes feel loose or tight? How's your mood? You probably answered easily, thanks to your cerebellum.

***

Note: The brain functions we've discussed so far all occur without any conscious effort. This illustrates another of our recurring themes: *Our brain processes most information outside of our awareness.* We are aware of the *results* of our brain's labor—say, our current visual experience—but not *how* we construct the visual image. Likewise, whether we are asleep or awake, our brainstem manages its life-sustaining functions, freeing our conscious brain regions to think, talk, dream, or savor a memory.

Retrieval Practice

RP-2 In what brain region would damage be most likely to (a) disrupt your ability to jump rope? (b) disrupt your ability to hear? (c) leave you in a coma? (d) cut off the very breath and heartbeat of life?

ANSWERS IN APPENDIX E

The Limbic System

LOQ 6-3

What are the limbic system's structures and functions?

A skeleton walks into a café. "What would you like?" asks the barista. The skeleton replies, "I'll take a latte and a mop."

We can thank our **limbic system** for that wonderful emotion when we enjoy a joke. This system, which is associated with emotions and drives, contains the *amygdala,* the *hypothalamus,* and the *hippocampus* (**FIGURE 6.4**).

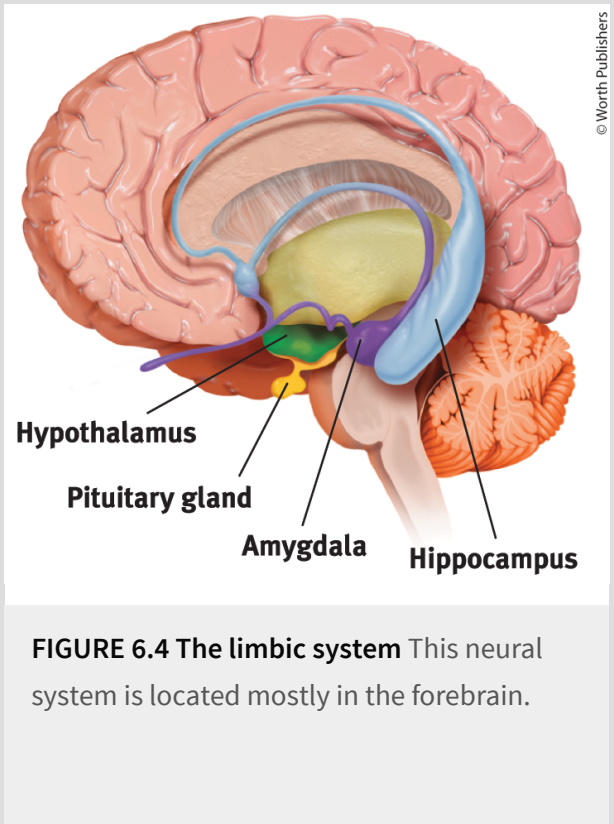


FIGURE 6.4 The limbic system This neural system is located mostly in the forebrain.

The limbic system's hypothalamus controls the nearby pituitary gland.

The Amygdala

The **amygdala**—two almond-shaped neural clusters—enables aggression and fear. In 1939, psychologist Heinrich Klüver and neurosurgeon Paul Bucy surgically removed a rhesus monkey's amygdala, turning the normally ill-tempered animal into the most mellow of creatures. In studies with other wild animals, including the lynx, wolverine, and wild rat, researchers noted the same effect. So, too, with humans. After a rare genetic disease destroyed one woman's amygdala, she no longer experienced fear. Facing a snake, speaking in public, even being threatened with a gun—she is not afraid (Feinstein et al., 2013). Even healthy people who have a smaller-than-average amygdala display reduced arousal to threatening stimuli (Foell et al., 2019). Little amygdala, little fear.

What then might happen if we electrically stimulated the amygdala of a normally placid domestic animal, such as a cat? Do so in one spot and the cat prepares to attack, hissing with its back arched, its pupils dilated, its hair on end. Move the electrode only slightly within the amygdala, cage the cat with a small mouse, and now it cowers in terror.

These and other experiments have confirmed the amygdala's role in fear and rage. Monkeys and humans with amygdala damage become

less fearful of strangers (Harrison et al., 2015). Other studies link criminal behavior with amygdala dysfunction (Dotterer et al., 2017; Ermer et al., 2012). When people view angry and happy faces, only the angry ones increase activity in the amygdala (Mende-Siedlecki et al., 2013). And when negative events energize the amygdala, they become more memorable (Admon et al., 2018).

But we must be careful. The brain is not neatly organized into structures that correspond to our behavior categories. The amygdala is engaged with other mental phenomena as well. And when we feel afraid or act aggressively, there is neural activity in many areas of our brain—not just the amygdala. If you destroy a car's battery, the car won't run. But the battery is merely one link in an integrated system.

Retrieval Practice

RP-3 Electrical stimulation of a cat's amygdala provokes angry reactions. Which *autonomic nervous system* division is activated by such stimulation?



GK Hart/Vikki Hart/Getty Images

ANSWERS IN APPENDIX E

The Hypothalamus

Just below the thalamus is the **hypothalamus**, an important link in the command chain governing bodily maintenance. Some neural clusters in the hypothalamus influence hunger; others regulate thirst, body temperature, and sexual behavior. Together, they help maintain a steady *(homeostatic)* internal state.

To monitor your body state, the hypothalamus tunes in to your blood chemistry and any incoming orders from other brain parts. For example, picking up signals from your brain's cerebral cortex that you are thinking about sex, your hypothalamus will secrete hormones. These hormones will, in turn, trigger the adjacent *master gland* of the

endocrine system, your pituitary (see Figure 6.4), to influence your sex glands to release *their* hormones. These hormones will intensify the thoughts of sex in your cerebral cortex. (Note the interplay between the nervous and endocrine systems: The brain influences the endocrine system, which in turn influences the brain.)

A remarkable discovery about the hypothalamus illustrates how progress in science often occurs—when curious, open-minded investigators make an unexpected observation. Two young McGill University neuropsychologists, James Olds and Peter Milner (1954), were trying to implant an electrode in a rat's reticular formation when they made a magnificent mistake: They placed the electrode incorrectly (Olds, 1975). Curiously, as if seeking more stimulation, the rat kept returning to the location in the cage where it had been stimulated. On discovering that they had actually placed the device in a region of the hypothalamus, Olds and Milner realized they had stumbled upon a brain center that provides pleasurable rewards.

Later experiments located other "pleasure centers" (Olds, 1958). (What the rats actually experience only they know, and they aren't telling. Rather than attribute human feelings to rats, today's scientists refer to *reward centers*.) Just how rewarding are these reward centers? Enough to cause rats to self-stimulate these brain regions more than 1000 times per hour.

In other species, including dolphins and monkeys, researchers later discovered other limbic system reward centers, such as the *nucleus*

accumbens in front of the hypothalamus (Hamid et al., 2016). Animal research has also revealed both a general dopamine-related reward system and specific centers associated with the pleasures of eating, drinking, and sex. Animals, including us, seem to come equipped with built-in systems that reward activities essential to survival.

Researchers have experimented with ways of using brain stimulation to control nonhuman animals' actions in search-and-rescue operations. By rewarding rats for turning left or right, one research team trained previously caged rats to navigate natural environments (Talwar et al., 2002). By pressing buttons on a laptop, the researchers were then able to direct the rat—which carried a receiver, power source, and video camera all in a tiny backpack—to turn on cue, climb trees, scurry along branches, and return.

When we meet likable people or read affirming messages from friends, our brain buzzes with reward center activity (Inagaki et al., 2019; Zerubavel et al., 2018). But as one neurosurgeon found by implanting electrodes in violent patients' reward center areas, the patients reported only mild pleasure. Unlike Olds and Milner's rats, the patients were not driven to a frenzy (Deutsch, 1972; Hooper & Teresi, 1986). Stimulating the brain's "hedonic hot spots" (its reward circuits) produces more *desire* than pure enjoyment (Kringelbach & Berridge, 2012).

Experiments have also revealed the effects of a dopamine-related reward system in people. For example, experimentally boosting

dopamine levels increases the pleasurable "chills" response to a favorite piece of music, whereas reducing dopamine levels decreases musical pleasure (Ferreri et al., 2019). Some researchers believe that many disordered behaviors may stem from malfunctions in natural brain systems for pleasure and well-being. People genetically predisposed to this *reward deficiency syndrome* may crave whatever provides that missing pleasure or relieves negative feelings, such as aggression, fattening food, or drugs and alcohol (Blum et al., 1996, 2014; Chester et al., 2016).

> **"If you were designing a robot vehicle to walk into the future and survive, … you'd wire it up so that behavior that ensured the survival of the self or the species—like sex and eating—would be naturally reinforcing."** — Neuroscientist Candace Pert (1986)

The Hippocampus

The **hippocampus** is a curved brain structure that processes conscious, explicit memories. Humans who lose their hippocampus to surgery or injury lose their ability to form new memories of facts and events (Clark & Maguire, 2016). Those who survive a hippocampal brain tumor in childhood struggle to remember new information in adulthood (Jayakar et al., 2015). Athletes who experience repeated brain trauma may later have a shrunken hippocampus and poor memory (Futterman, 2021; Tharmaratnam et al., 2018). Hippocampus size and function decrease as we grow older, which furthers cognitive

decline (O'Callaghan et al., 2019). The Memory modules explain how our two-track mind uses the hippocampus to process our memories.



Elise Amendola/AP Photo

Are football players' brains protected? When researchers analyzed the brains of 111 deceased National Football League players, 99 percent showed signs of degeneration related to frequent head trauma (Mez et al., 2017). In 2017, NFL player Aaron Hernandez (#81) died by suicide while imprisoned for murder. An autopsy revealed that his brain, at age 27, was already showing advanced degeneration (Kilgore, 2017). In hopes of protecting players, some teams use more protective gear and portable brain-imaging tools to quickly identify potential injuries (Canadian Press, 2018).

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FIGURE 6.5 locates the brain areas we've discussed, as well as the *cerebral cortex*—the body's ultimate control and information-processing center.

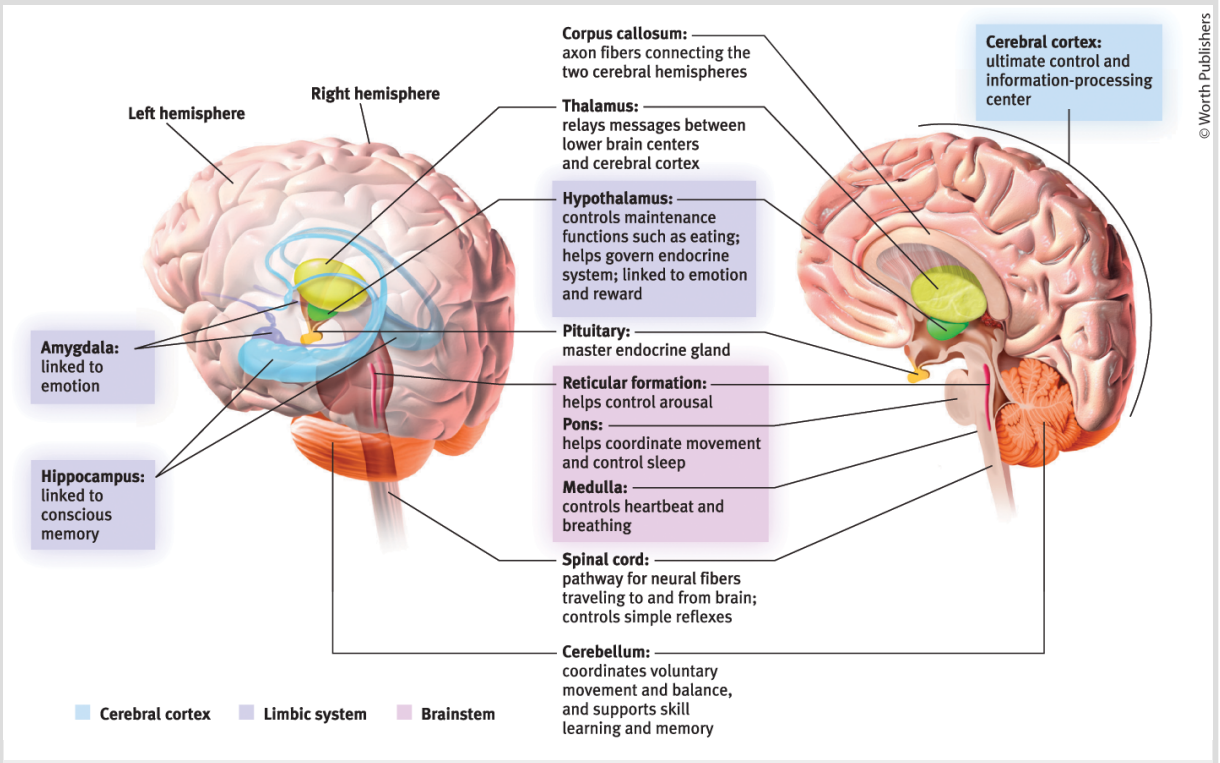


FIGURE 6.5 Brain structures and their functions

Retrieval Practice

RP-4 What are the three key structures of the limbic system, and what functions do they serve?

ANSWERS IN APPENDIX E

The Cerebral Cortex

LOQ 6-4

What four lobes make up the cerebral cortex, and what are the functions of the motor cortex, somatosensory cortex, and association areas?

The *cerebrum*—the two cerebral hemispheres that contribute 85 percent of the brain's weight—enables our perceiving, thinking, and speaking. Like other brain structures, including the thalamus, hippocampus, and amygdala, the cerebral hemispheres come as a pair. Covering those hemispheres, like bark on a tree, is the **cerebral cortex**, a thin surface layer of interconnected neural cells.

> The people who first dissected and labeled the brain used the language of scholars—Latin and Greek. Their words are actually attempts at graphic description: For example, *cortex* means "bark," *cerebellum* is "little brain," and *thalamus* is "inner chamber."

Mammals' complex cerebral cortex offers high capacity for learning and thinking, enabling them to adapt to ever-changing environments. What makes humans distinct is the size and interconnectivity of our cerebral cortex (Donahue et al., 2018). Let's take a look at its structure and function.

Retrieval Practice

RP-5 Which part of the human brain distinguishes us most from other animals?

ANSWERS IN APPENDIX E

Structure of the Cortex

If you opened a human skull, exposing the brain, you would see a wrinkled organ, shaped like the meat of an oversized walnut. Without these wrinkles, a flattened cerebral cortex would require triple the area—roughly that of a large pizza. The brain's left and right hemispheres are filled mainly with axons connecting the cortex to the brain's other regions. The cerebral cortex—that thin surface layer—contains some 20 to 23 billion of the brain's nerve cells and 300 trillion synaptic connections (de Courten-Myers, 2005). Being human takes a lot of nerve.

Each hemisphere's cortex is subdivided into four *lobes,* separated by prominent *fissures,* or folds (**FIGURE 6.6**). Starting at the front of your brain and moving over the top, there are the **frontal lobes** (behind your forehead), the **parietal lobes** (at the top and to the rear), and the **occipital lobes** (at the back of your head). Reversing direction and moving forward, just above your ears, you find the **temporal lobes**. Each of the four lobes carries out many functions, and many functions require the interplay of several lobes.

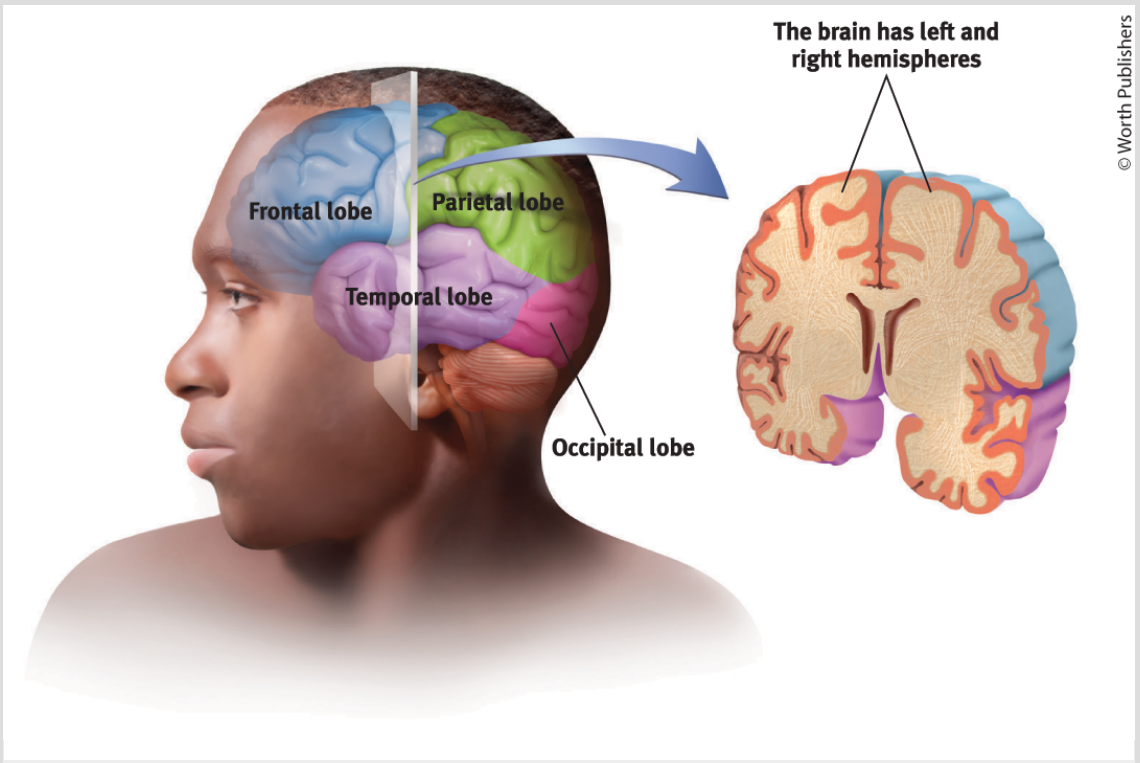


FIGURE 6.6 The cortex and its basic subdivisions

Functions of the Cortex

More than a century ago, surgeons found damaged cortical areas during autopsies of people who had been partially paralyzed or speechless. This rather crude evidence did not prove that specific parts of the cortex control complex functions like movement or speech. A laptop with a broken power cord might go dead, but we would be fooling ourselves if we thought we had "localized" the internet in the cord.

Motor Functions

Scientists had better luck in localizing simpler brain functions. For example, in 1870, German physicians Gustav Fritsch and Eduard Hitzig made an important discovery: Mild electrical stimulation to parts of an animal's cortex made parts of its body move. The effects were selective: Stimulation caused movement only when applied to an arch-shaped region at the back of the frontal lobe, running roughly ear to ear across the top of the brain. Moreover, stimulating parts of this region in the left or right hemisphere caused movements of specific body parts on the *opposite* side of the body. Fritsch and Hitzig had discovered what is now called the **motor cortex**.

Mapping the Motor Cortex

Lucky for brain surgeons and their patients, the brain has no sensory receptors. Knowing this, in the 1930s, Otfrid Foerster and Wilder Penfield were able to map the motor cortex in hundreds of wide-awake patients by stimulating different cortical areas and observing responses. They discovered that body areas requiring precise control, such as the fingers and mouth, occupy the greatest amount of cortical space (**FIGURE 6.7**). In one of his many demonstrations of motor behavior mechanics, Spanish neuroscientist José Delgado stimulated a spot on a patient's left motor cortex, triggering the right hand to make a fist. Asked to keep the fingers open during the next stimulation, the patient, whose fingers closed despite his best efforts, remarked, "I guess, Doctor, that your electricity is stronger than my will" (Delgado, 1969, p. 114).

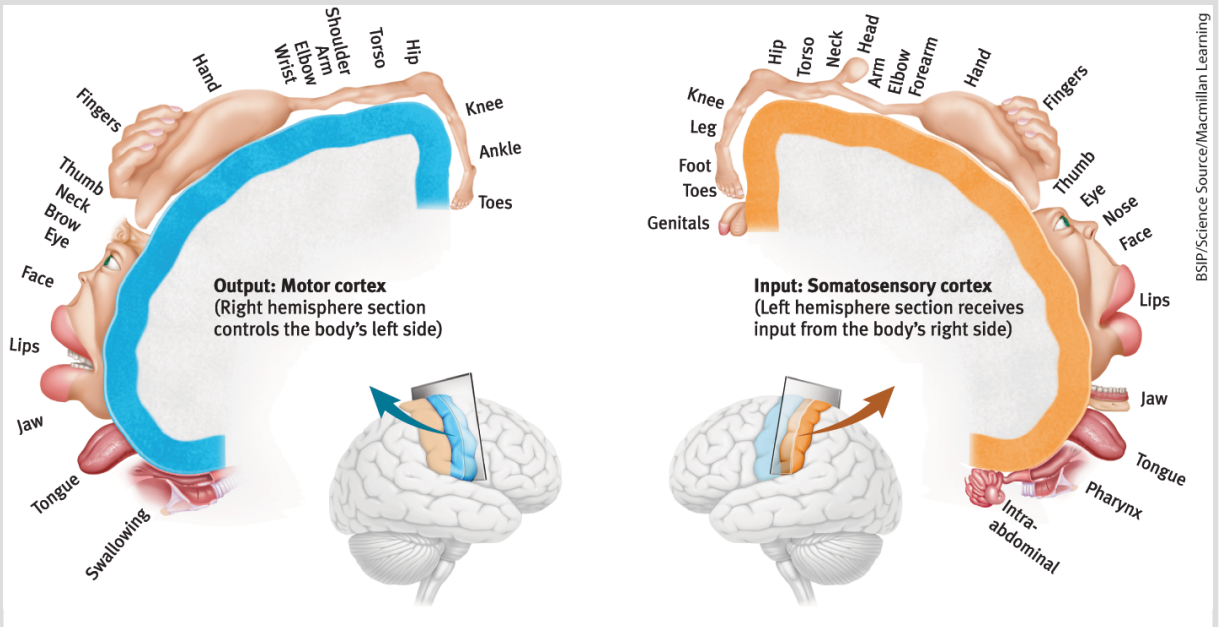


FIGURE 6.7 Motor cortex and somatosensory cortex tissue devoted to each body part As you can see from this classic though inexact representation, the amount of cortex devoted to a body part in the motor cortex (in the frontal lobes) or in the somatosensory cortex (in the parietal lobes) is not proportional to that body part's size. Rather, the brain devotes more tissue to sensitive areas and to areas requiring precise control. So, your fingers have a greater representation in the cortex than does your upper arm.

Scientists can predict a monkey's arm motion *just before* it moves—by repeatedly measuring motor cortex activity preceding specific arm movements (Livi et al., 2019). Scientists have also observed monkeys' motor cortex neurons responding differently when executing a social act (putting an object in an experimenter's hand) rather than a nonsocial act (putting something in a container or in their own mouth) (Coudé et al., 2019). Such findings have opened the door to research on brain-controlled computer technology.

Retrieval Practice

RP-6 If you are able, try moving your right hand in a circular motion, as if cleaning a table. Then start your right foot doing the same motion, synchronized with your hand. Now reverse the right foot's motion, but not the hand's. Finally, try moving the *left* foot opposite to the right hand.

a. Why is reversing the right foot's motion so hard?

b. Why is it easier to move the left foot opposite to the right hand?

ANSWERS IN APPENDIX E

Brain-Machine Interfaces

What might happen if researchers implant a device to detect motor cortex activity in humans? Could such devices help people with paralysis learn to command a cursor or write email or work online? Clinical trials of such *cognitive neural prosthetics* have been under way with people who have severe paralysis or have lost a limb (Andersen et al., 2010; Rajangam et al., 2016). The first patient, a 25-year-old man with paralysis, was able to mentally control a TV, draw shapes on a computer screen, and play video games—all thanks to an aspirin-sized chip with 100 microelectrodes recording activity in his motor cortex (Hochberg et al., 2006). Others with paralysis who have received implants have learned to direct robotic arms with their thoughts (Clausen et al., 2017).

And then there is Ian Burkhart, who lost the use of his arms and legs at age 19. Ohio State University brain researchers implanted recording

electrodes in his motor cortex (Schwemmer et al., 2018). Using computer *machine learning,* they instructed Burkhart to stare at a screen that showed a moving hand. Next, Burkhart imagined moving his own hand. Brain signals from his motor cortex began feeding into the computer, which got the message that he wanted to move his arm and thus stimulated those muscles. The result? Burkhart, with his very own paralyzed arm, grasped a bottle, dumped out its contents, and picked up a stick. He can even play the video game *Guitar Hero.* By learning Burkhart's unique brain response patterns, the computer can predict his brain activity to help him make these movements. "It's really restored a lot the hope I have for the future to know that a device like this will be possible to use in everyday life," Burkhart says, "for me and for many other people" (Wood, 2018). (See tinyurl.com/ControlMotorCortex.)

If everything psychological is also biological—if, for example, every thought is also a neural event—microelectrodes could someday detect complex thoughts well enough to enable many people to control their environment with ever-greater precision (see **FIGURE 6.8**). Scientists have even created a prosthetic voice, which creates (mostly) understandable speech by detecting activity in the brain area that normally controls vocalizing, and converting that activity to computer speech (Anumanchipalli et al., 2019).

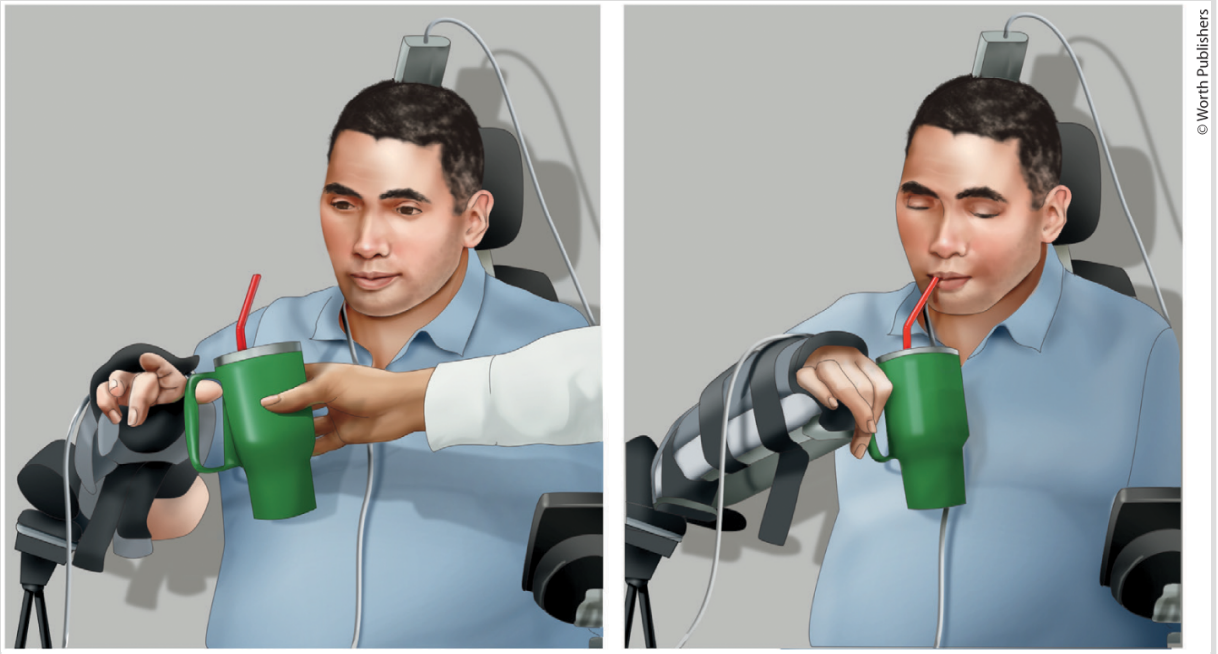


FIGURE 6.8 Brain-machine interaction Electrodes planted in the hand area of the motor cortex, and in the hand, elbow, and shoulder muscles helped a man with paralysis in all four limbs use his paralyzed arm to take a drink of coffee (Ajiboye et al., 2017). Such research advances are paving the way for restored movement in daily life, outside the controlled laboratory environment (Andersen, 2019; Andersen et al., 2010). People's ability to control a robotic arm improves when it also provides touch sensations (Flesher et al., 2021).

Sensory Functions

If the motor cortex sends messages out to the body, where does the cortex receive incoming messages? Wilder Penfield identified a cortical area—at the front of the parietal lobes, parallel to and just behind the motor cortex—that specializes in receiving information from the skin senses, such as touch and temperature, and from the movement of body parts. We now call this area the **somatosensory cortex**. Stimulate a point on the top of this band of tissue and a person

may report being touched on the shoulder; stimulate some point on the side and the person may feel something on the face.

The more sensitive the body region, the larger the somatosensory cortex area devoted to it (see Figure 6.7). Your supersensitive lips project to a larger brain area than do your toes, which is one reason we kiss rather than touch toes. Rats have a large area of the brain devoted to their whisker sensations, and owls to their hearing sensations.

Scientists have identified additional areas where the cortex receives input from senses other than touch. Any visual information you are receiving now is going to the visual cortex in your occipital lobes, at the back of your brain (**FIGURES 6.9** and **6.10**). If you have normal vision, you might see flashes of light or dashes of color if stimulated in your occipital lobes. (In a sense, we *do* have eyes in the back of our head!) Having lost much of his right occipital lobe to a tumor removal, a friend of mine [DM's] was blind to the left half of his field of vision. Visual information travels from the occipital lobes to other areas that specialize in tasks such as identifying words, detecting emotions, and recognizing faces.

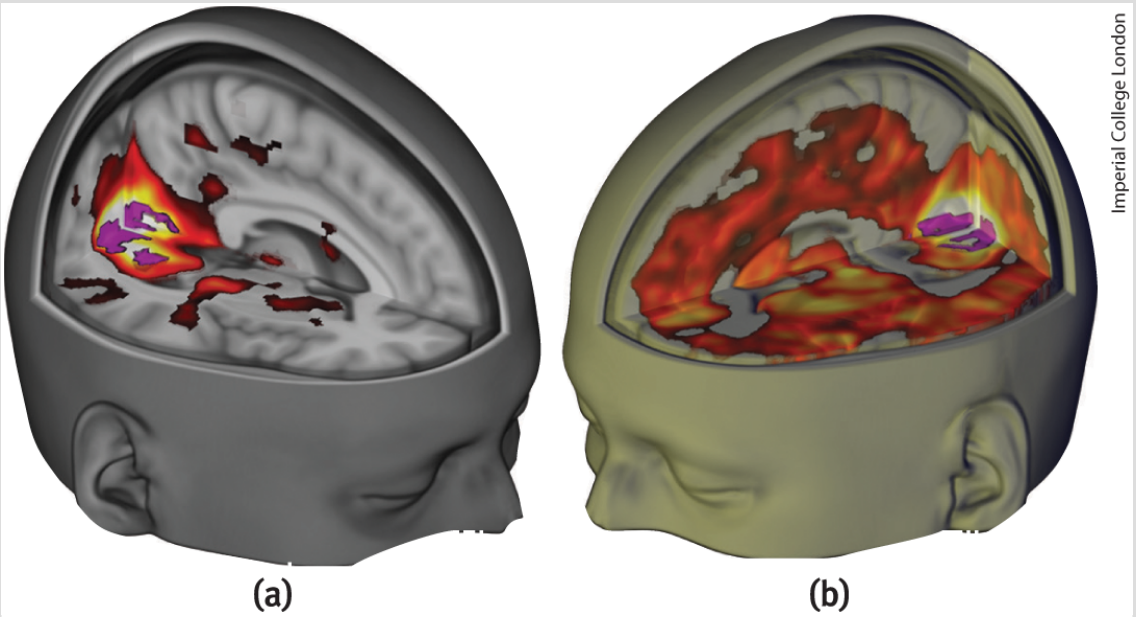


FIGURE 6.9 Seeing without eyes The psychoactive drug LSD often produces vivid *hallucinations.* Why? Because it dramatically increases communication between the visual cortex (in the occipital lobe) and other brain regions. These fMRI (functional MRI) scans show (a) a research participant with closed eyes who has been given a placebo and (b) the same person under the influence of LSD. Color represents increased blood flow (Carhart-Harris et al., 2016). Other researchers have confirmed that LSD increases communication between brain regions (Preller et al., 2019; Timmermann et al., 2018).

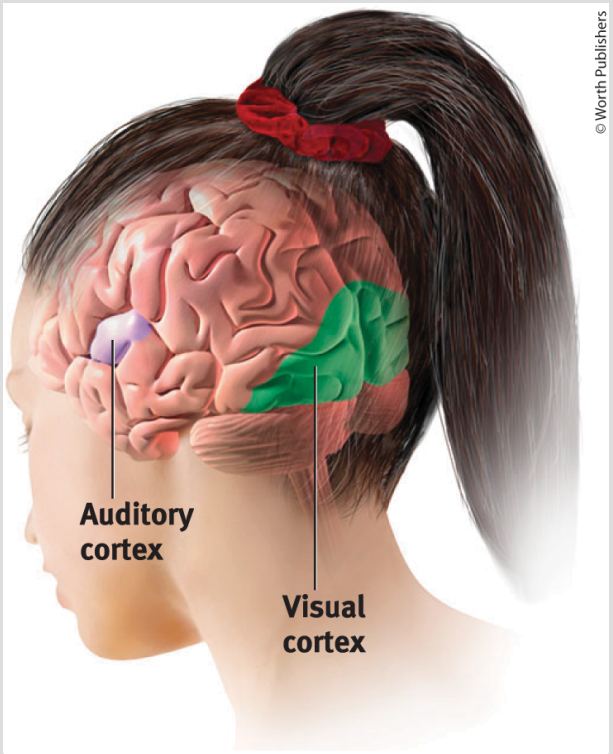


FIGURE 6.10 The visual cortex and auditory cortex The visual cortex in the occipital lobes at the rear of your brain receives input from your eyes. The auditory cortex in your temporal lobes—above your ears—receives information from your ears.

Any sound you now hear is processed by your auditory cortex in your temporal lobes (just above your ears; see Figure 6.10). Most of this auditory information travels a circuitous route from one ear to the auditory receiving area above your opposite ear. If stimulated in your auditory cortex, you might hear a sound. fMRI scans of people with schizophrenia reveal active auditory areas in the temporal lobes (Lennox et al., 1999). Even the phantom ringing sound experienced by people with hearing loss (tinnitus) is—if heard in one ear—associated

with activity in the temporal lobe on the brain's opposite side (Muhlnickel, 1998).

Retrieval Practice

RP-7 Our brain's _____ cortex registers and processes body touch and movement sensations. The _____ cortex controls our voluntary movements.

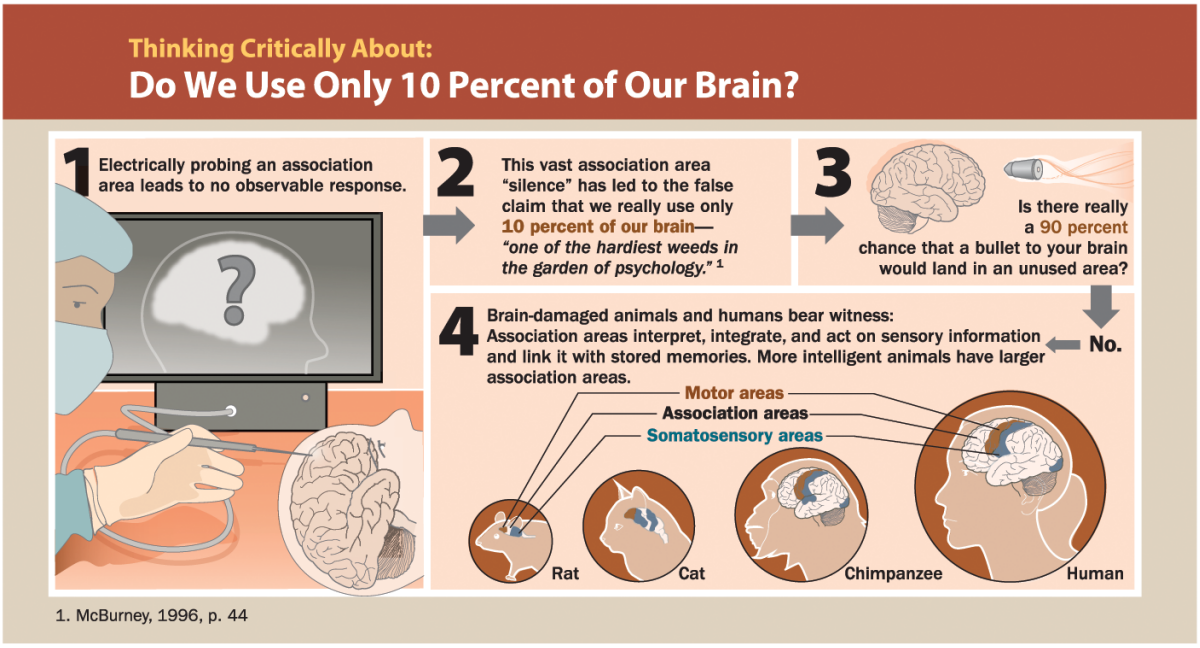
ANSWERS IN APPENDIX E

Association Areas

So far, we have pointed out small cortical areas that either receive sensory input or direct muscular output. Together, these occupy about one-fourth of the human brain's thin, wrinkled cover. What, then, goes on in the remaining vast regions of the cortex? In these **association areas**, neurons are busy with higher mental functions—many of the tasks that make us human. Electrically probing an association area won't trigger any observable response. So, unlike the somatosensory and motor areas, association area functions cannot be neatly mapped. Does this mean we don't use them—or that, as some 4 in 10 people agreed in two surveys, "We use only 10 percent of our brains" (Furnham, 2018; Macdonald et al., 2017)? (See Thinking Critically About: Do We Use Only 10 Percent of Our Brain?)

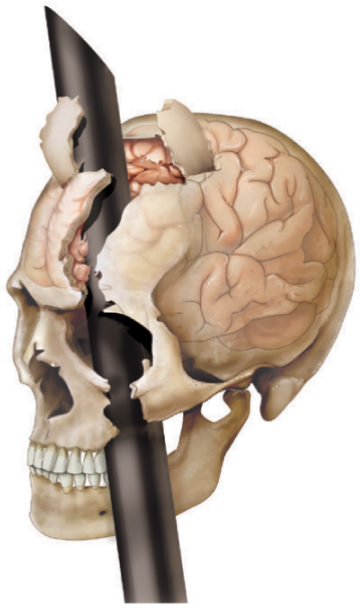
LOQ 6-5

Is it true that 90 percent of our brain isn't really used?

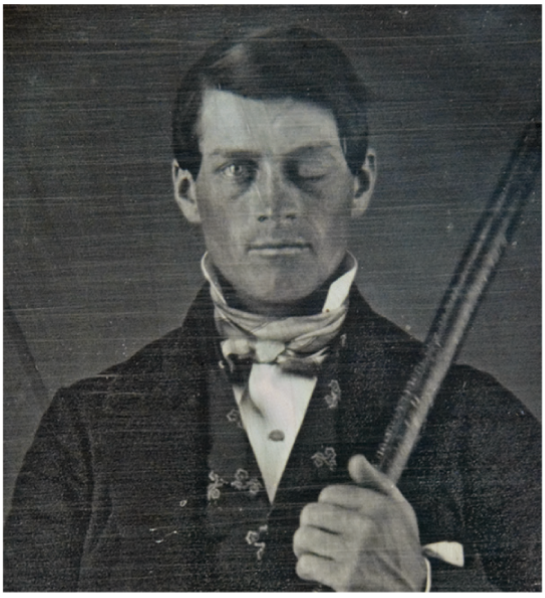


Association areas are found in all four lobes. The *prefrontal cortex* in the forward part of the frontal lobes enables our forward thinking—our planning, judgment, social interactions, and processing of new memories (Panichello & Buschman, 2021). People with damage to this area may have high intelligence test scores and great cake-baking skills. Yet they would not be able to plan ahead to *begin* baking a birthday cake or remember a new recipe (MacPherson et al., 2016). And if they fail to deliver a promised birthday cake, they may feel no regret (Bault et al., 2019).

Frontal lobe damage also can alter personality and remove a person's inhibitions. Consider the classic case of railroad worker Phineas Gage. One afternoon in 1848, Gage, then 25 years old, was using a tamping iron to pack gunpowder into a rock. A spark ignited the gunpowder, shooting the rod up through his left cheek and out the top of his skull, leaving his frontal lobes damaged (**FIGURE 6.11**). To everyone's amazement, Gage was immediately able to sit up and speak, and after the wound healed, he returned to work. But the blast had damaged connections between his frontal lobes and brain regions that control emotion and decision making (Thiebaut de Schotten et al., 2015; Van Horn et al., 2012). How did this damage affect Gage's personality? The usually friendly, soft-spoken man was now irritable, profane, and dishonest. Gage, said his friends, was "no longer Gage." Most of his mental abilities and memories were intact, but for the next few years his personality was not. (Gage later lost his railroad job, but over time he adapted to his disability and found work as a stagecoach driver [Macmillan & Lena, 2010].)



(a)



(b)

b: Warren Anatomical Museum in the Francis A. Countway Library of Medicine. Gift of Jack and Beverly Wilgus. © Worth Publishers

FIGURE 6.11 A blast from the past (a) Phineas Gage's skull was kept as a medical record. Using measurements and modern neuroimaging techniques, researchers have reconstructed the probable path of the rod through Gage's brain (Van Horn et al., 2012). (b) This photo shows Gage after his accident. (The image has been reversed to show Gage's features correctly. Early photos, including this one, were actually mirror images.)

Studies of others with damaged frontal lobes have revealed similar impairments. Not only do they become less inhibited (without the frontal lobe brakes on their impulses), but their moral judgments also seem unrestrained. Cecil Clayton lost 20 percent of his left frontal lobe in a 1972 sawmill accident. Thereafter, his intelligence test score dropped to an elementary school level and he displayed increased impulsivity. In 1996, he fatally shot a deputy sheriff. In 2015, when he was 74, the State of Missouri executed him (Williams, 2015).

The frontal lobes help steer us toward kindness and away from violence (Achterberg et al., 2020; Lieberman et al., 2019). With their frontal lobes ruptured, people's moral compass seems separated from their actions. They know right from wrong but often don't care.

Association areas also perform other mental functions. The parietal lobes, parts of which were large and unusually shaped in Einstein's normal-weight brain, enable mathematical and spatial reasoning (Amalric & Dehaene, 2019; Wilkey et al., 2018). Stimulation of one parietal lobe area in brain-surgery patients produced a feeling of wanting to move an upper limb, the lips, or the tongue without any actual movement. With increased stimulation, patients falsely believed they *had* moved. Curiously, when surgeons stimulated a different association area near the motor cortex in the frontal lobes, the patients did move but had no awareness of doing so (Desmurget et al., 2009). These head-scratching findings suggest that our perception of moving flows not from the movement itself, but rather from our intention and the results we expected.

> **"We held Einstein's brain in our hands and realized that this is the organ that was responsible for changing our perceptions of the universe … we were in awe."**
> — Neuroscientist Sandra Witelson (2011)

On the underside of the right temporal lobe, another association area enables us to instantly recognize faces (Retter et al., 2020). If a stroke or head injury destroyed this area of your brain, you would still be

able to describe facial features and to recognize someone's feminine or masculine features and approximate age, yet be strangely unable to identify the person as, say, Ariana Grande, or even your grandmother.

Nevertheless, to reemphasize, we should be wary of using pictures of brain "hot spots" to create a new phrenology that locates complex functions in precise brain areas (Beck, 2010; Shimamura, 2010; Uttal, 2001). During a complex task, a brain scan shows many islands of brain activity working together—some running automatically in the background, and others under conscious control (Chein & Schneider, 2012). Your memory, language, attention, and social skills result from *functional connectivity*—communication among distinct brain areas and neural networks (Bassett et al., 2018; Silston et al., 2018). What happens when brain areas struggle to communicate with each other? People are at increased risk for mental disorders (J. Baker et al., 2019; Zhang et al., 2019).

The point to remember: Our mental experiences—and our psychological health—rely on coordinated brain activity.

Retrieval Practice

RP-8 Why are association areas important?

ANSWERS IN APPENDIX E

REVIEW

Module 6: Brain Regions and Structures

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 6-1: What are the *hindbrain, midbrain,* and *forebrain?*

LOQ 6-2: What structures make up the brainstem, and what are the functions of the brainstem, thalamus, reticular formation, and cerebellum?

LOQ 6-3: What are the limbic system's structures and functions?

LOQ 6-4: What four lobes make up the cerebral cortex, and what are the functions of the motor cortex, somatosensory cortex, and association areas?

LOQ 6-5: Is it true that 90 percent of our brain isn't really used?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

hindbrain
midbrain
forebrain
brainstem
medulla [muh-DUL-uh]
thalamus [THAL-uh-muss]
reticular formation
cerebellum [sehr-uh-BELL-um]
limbic system
amygdala [uh-MIG-duh-la]
hypothalamus [hi-po-THAL-uh-muss]
hippocampus
cerebral [seh-REE-bruhl] cortex
frontal lobes
parietal [puh-RYE-uh-tuhl] lobes
occipital [ahk-SIP-uh-tuhl] lobes
temporal lobes
motor cortex
somatosensory cortex
association areas

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. The part of the brainstem that controls heartbeat and breathing is the
   a. cerebellum.
   b. medulla.
   c. cortex.
   d. thalamus.

2. The thalamus functions as a
   a. memory bank.
   b. balance center.
   c. breathing regulator.
   d. sensory control center.

3. The lower brain structure that governs arousal is the
   a. spinal cord.
   b. cerebellum.
   c. reticular formation.
   d. medulla.

4. The part of the brain that coordinates voluntary movement and enables nonverbal learning and memory is the

_____.

5. Two parts of the limbic system are the amygdala and the
   a. cerebral hemispheres.
   b. hippocampus.
   c. thalamus.
   d. cerebellum.

6. A cat's ferocious response to electrical brain stimulation would lead you to suppose the electrode had touched the _____.

7. The neural structure that most directly regulates eating, drinking, and body temperature is the
   a. endocrine system.
   b. hypothalamus.
   c. hippocampus.
   d. amygdala.

8. The initial reward center discovered by Olds and Milner was located in the _____.

9. If a neurosurgeon stimulated your right motor cortex, you would most likely
   a. see light.
   b. hear a sound.
   c. feel a touch on the right arm.
   d. move your left leg.

10. How do different neural networks communicate with one another to let you respond when a friend greets you at a party?

11. Which of the following body regions has the greatest representation in the somatosensory cortex?
    a. Upper arm
    b. Toes
    c. Lips
    d. All regions are equally represented.

12. Judging and planning are enabled by the _____ lobes.

13. The “uncommitted” areas that make up about three-fourths of the cerebral cortex are called _____ _____ .

MODULE 7: Damage Responses and Brain Hemispheres

Earlier, we learned about *neuroplasticity*—how our brain adapts to new situations. What happens when we experience mishaps, big and little? Let's explore the brain's ability to modify itself after damage.

Responses to Damage

LOQ 7-1

To what extent can a damaged brain reorganize itself, and what is *neurogenesis?*

Most brain-damage effects can be traced to two hard facts: (1) Severed brain and spinal cord neurons, unlike cut skin, usually do not regenerate. (If your spinal cord were severed, you would probably be permanently paralyzed.) And (2) some brain functions seem preassigned to specific areas. One newborn who experienced damage to temporal lobe facial recognition areas was never able to recognize faces (Farah et al., 2000). But there is good news: Some neural tissue can *reorganize* in response to damage.

Neuroplasticity may also occur after serious damage, especially in young children whose undamaged hemisphere develops extra

connections (Lindenberger & Lövdén, 2019; see also **FIGURE 7.1**). *Constraint-induced therapy* aims to rewire brains and improve the dexterity of a brain-damaged child or even an adult stroke victim (Taub, 2004). By restraining a fully functioning limb, therapists force patients to use the "bad" hand or leg, gradually reprogramming the brain. One stroke victim, a surgeon in his fifties, was put to work cleaning tables, with his good arm and hand restrained. Slowly, the bad arm recovered its skills. As damaged-brain functions migrated to other brain regions, he gradually learned to write again and even to play tennis (Doidge, 2007).



Left: Joe McNally/Hulton Archive/Getty Images; right: Living Art Enterprises, LLC/Science Source

FIGURE 7.1 Half a brain At age 3, Jodie Miller started having life-threatening seizures. To save her life, doctors removed most of her right hemisphere (see MRI of hemispherectomy). Jodie's remaining hemisphere compensated by putting other areas

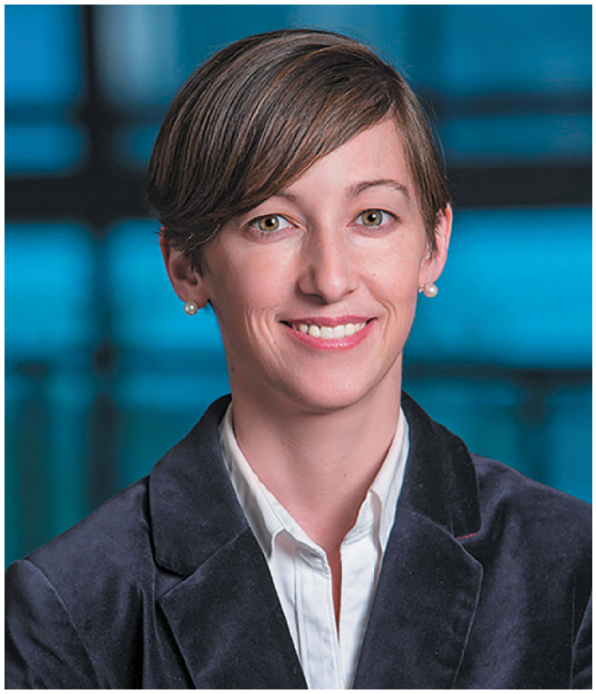
to work, enabling this dance recital at age 6. Today, even without a left hemisphere, Jodie is, so to speak, all-right: She lives a meaningful life, is happily married, and speaks publicly about the power of neuroplasticity. “I have half a brain,” she says. “When people meet me, they have no idea” (BBC, 2017).

The brain’s plasticity is good news for those who are blind or deaf. Blindness or deafness makes unused brain areas available for other uses, such as sound and smell (Amedi et al., 2005; Bauer et al., 2017). If a blind person uses one finger to read Braille, the brain area dedicated to that finger expands as the sense of touch invades the visual cortex that typically helps people see (Barinaga, 1992; Sadato et al., 1996). In sighted people, Braille-reading training produces similar brain changes (Debowska et al., 2016). Neuroplasticity also helps explain why blind people display superior ability to locate sounds, and why deaf people who learned sign language before another language may have enhanced peripheral and motion-detection vision (Battal et al., 2020; Brooks et al., 2020). In deaf people whose native language is sign, the temporal lobe area typically dedicated to hearing waits in vain for stimulation. Finally, it looks for other signals to process, such as those from the visual system used to see and interpret signs.

Similar reassignment may occur when disease or damage frees up other brain areas typically dedicated to specific functions. If a slow-growing left hemisphere tumor disrupts language (which resides mostly in the left hemisphere), the right hemisphere may compensate (Thiel et al., 2006). When people who are born without hands use their feet to perform everyday tasks, their somatosensory cortex for the hand area becomes active—even though they have never had hands

(Striem-Amit et al., 2018). So what do you suppose was the sexual intercourse experience of one patient whose lower leg had been amputated? “I actually experience my orgasm in my [phantom] foot. And there it’s much bigger than it used to be because it’s no longer just confined to my genitals” (Ramachandran & Blakeslee, 1998, p. 36). Note that in Figure 6.8 the toes region is adjacent to the genitals.

Although the brain often attempts self-repair by reorganizing existing tissue, researchers are debating whether it can also mend itself through **neurogenesis**—producing new neurons that may mature more and grow larger than the neurons we are born with (Cole et al., 2020). Neurogenesis happens in part thanks to *stem cells*—special cells that can develop into different types of cells, including brain cells. Researchers have found baby neurons deep in the brain of adult mice, birds, monkeys, and humans (He & Jin, 2016; Jessberger et al., 2008). These neurons may then form connections with neighboring neurons (Gould, 2007; Luna et al., 2019). Neurogenesis varies among individuals, offering another example of how we experience a common process in our own unique way (Kempermann, 2018).



Courtesy of Dr. Danielle Bassett

Physics of the mind Physicist and neuroscientist Danielle Bassett, whose work crosses disciplines, was the youngest person to receive a MacArthur "Genius Grant" in 2014. She applies concepts from physics and mathematics to explain the brain's neural network connections.

The Divided Brain

LOQ 7-2

What do split brains reveal about the functions of our two brain hemispheres?

Our brain's look-alike left and right hemispheres serve differing functions. This *lateralization* is apparent after brain damage. Research

spanning more than a century has shown that left hemisphere accidents, strokes, and tumors can impair reading, writing, speaking, arithmetic reasoning, and understanding. Similar right hemisphere damage has less visibly dramatic effects. Does this mean that the right hemisphere is just along for the ride? Many believed this was the case until the 1960s, when a fascinating chapter in psychology's history began to unfold: Researchers found that the "minor" right hemisphere was not so limited after all.

Splitting the Brain

In the early 1960s, two neurosurgeons speculated that major epileptic seizures were caused by an amplification of abnormal brain activity bouncing back and forth between the two cerebral hemispheres, which work together as a whole system (Bogen & Vogel, 1962). They wondered if they could end this biological tennis match by severing the **corpus callosum**, the wide band of axon fibers connecting the two hemispheres and carrying messages between them (see **FIGURE 7.2**). The neurosurgeons knew that psychologists Roger Sperry, Ronald Myers, and Michael Gazzaniga had divided cats' and monkeys' brains in this manner, with no serious ill effects.

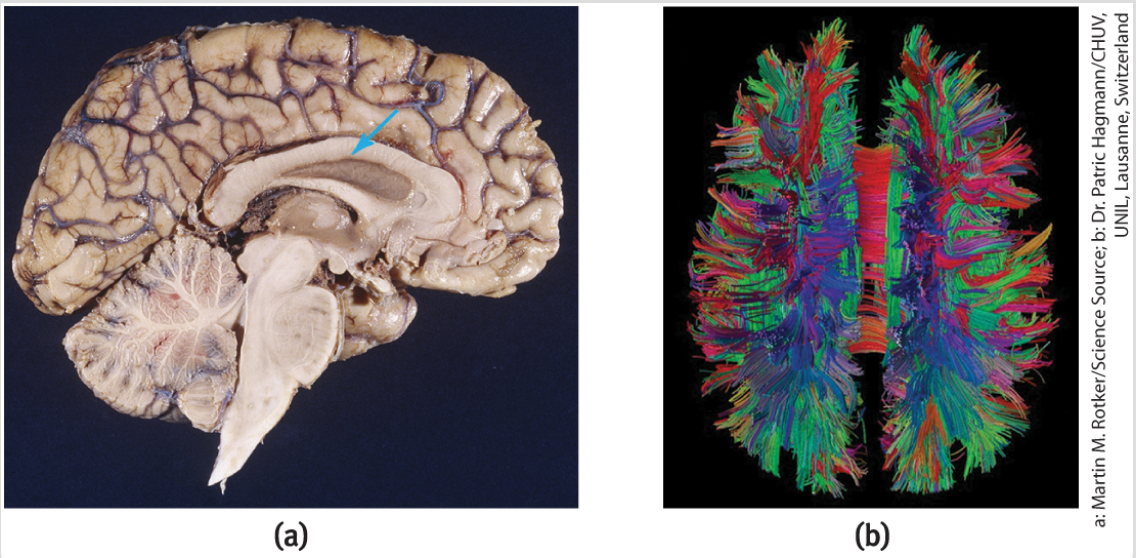


FIGURE 7.2 The corpus callosum This large band of neural fibers connects the two brain hemispheres. (a) To photograph this half brain, a surgeon separated the hemispheres by cutting through the corpus callosum (see blue arrow) and lower brain regions. (b) This high-resolution diffusion spectrum image, showing a top-facing brain from above, reveals brain neural networks within the two hemispheres, and the corpus callosum neural bridge between them.

So the surgeons operated. The result? The seizures all but disappeared. The patients with these **split brains** were surprisingly healthy, their personality and intellect hardly affected. Waking from surgery, one even joked that he had a "splitting headache" (Gazzaniga, 1967). By sharing their experiences, these patients have greatly expanded our understanding of interactions between the intact brain's two hemispheres.

To appreciate these findings, we need to focus for a minute on the peculiar nature of our visual wiring, illustrated in **FIGURE 7.3**. Note that each eye receives sensory information from the entire visual field. But in each eye, information from the left half of your field of

vision goes to your right hemisphere, and information from the right half of your visual field goes to your left hemisphere, which usually controls speech. Information received by either hemisphere is quickly transmitted to the other across the corpus callosum. In a person with a severed corpus callosum, this information-sharing does not take place.

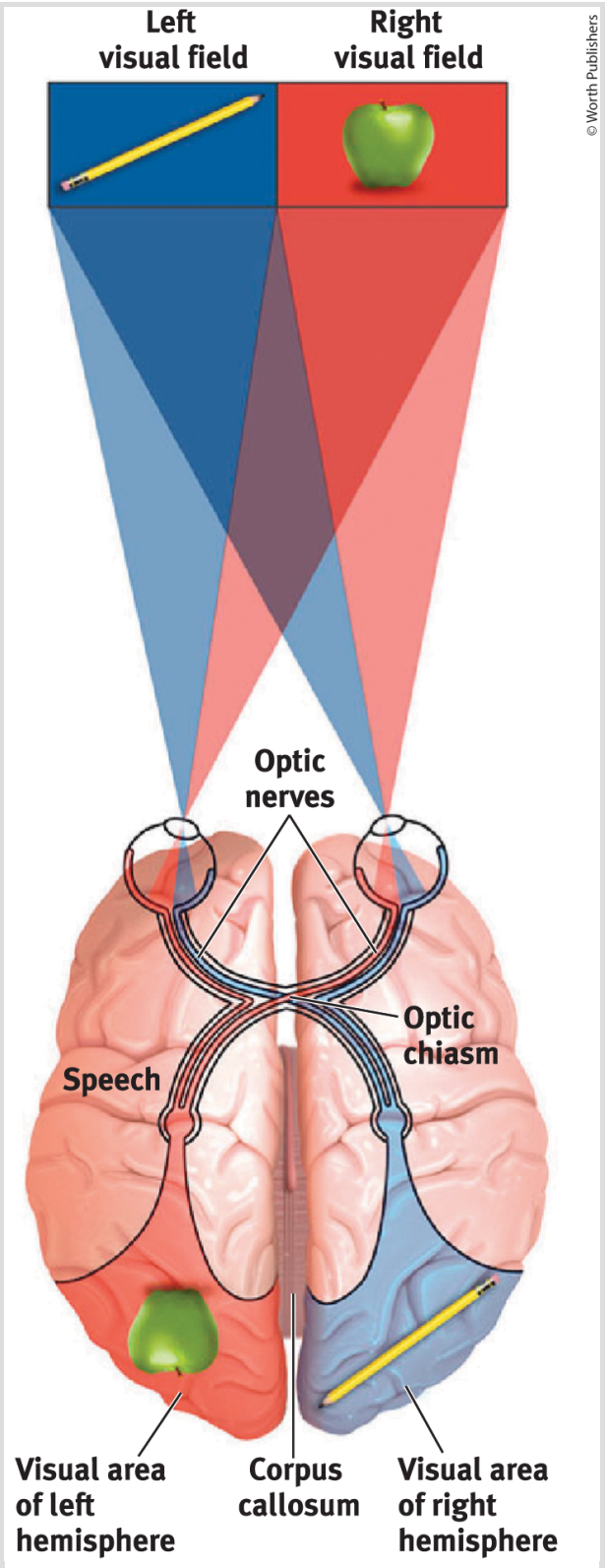


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FIGURE 7.3 The information highway from eye to brain

Knowing these facts, Sperry and Gazzaniga could send information to a patient's left or right hemisphere. As the person stared at a spot, they flashed a stimulus to its right or left. They could do this with you, too, but in your intact brain, the hemisphere receiving the information would instantly pass the news to the other side. Because the split-brain surgery had cut the communication lines between the hemispheres, the researchers could, with these patients, quiz each hemisphere separately.

In an early experiment, Gazzaniga (1967) asked split-brain patients to stare at a dot as he flashed HE•ART on a screen (**FIGURE 7.4**). Thus, HE appeared in their left visual field (which transmits to the right hemisphere) and ART in the right field (which transmits to the left hemisphere). When he then asked them to *say* what they had seen, the patients reported that they had seen ART. But when asked to *point* with their left hand to what they had seen, they were startled when their hand (controlled by the right hemisphere) pointed to HE. Given an opportunity to express itself, each hemisphere indicated what it had seen. The right hemisphere (controlling the left hand) intuitively knew what it could not verbally report.

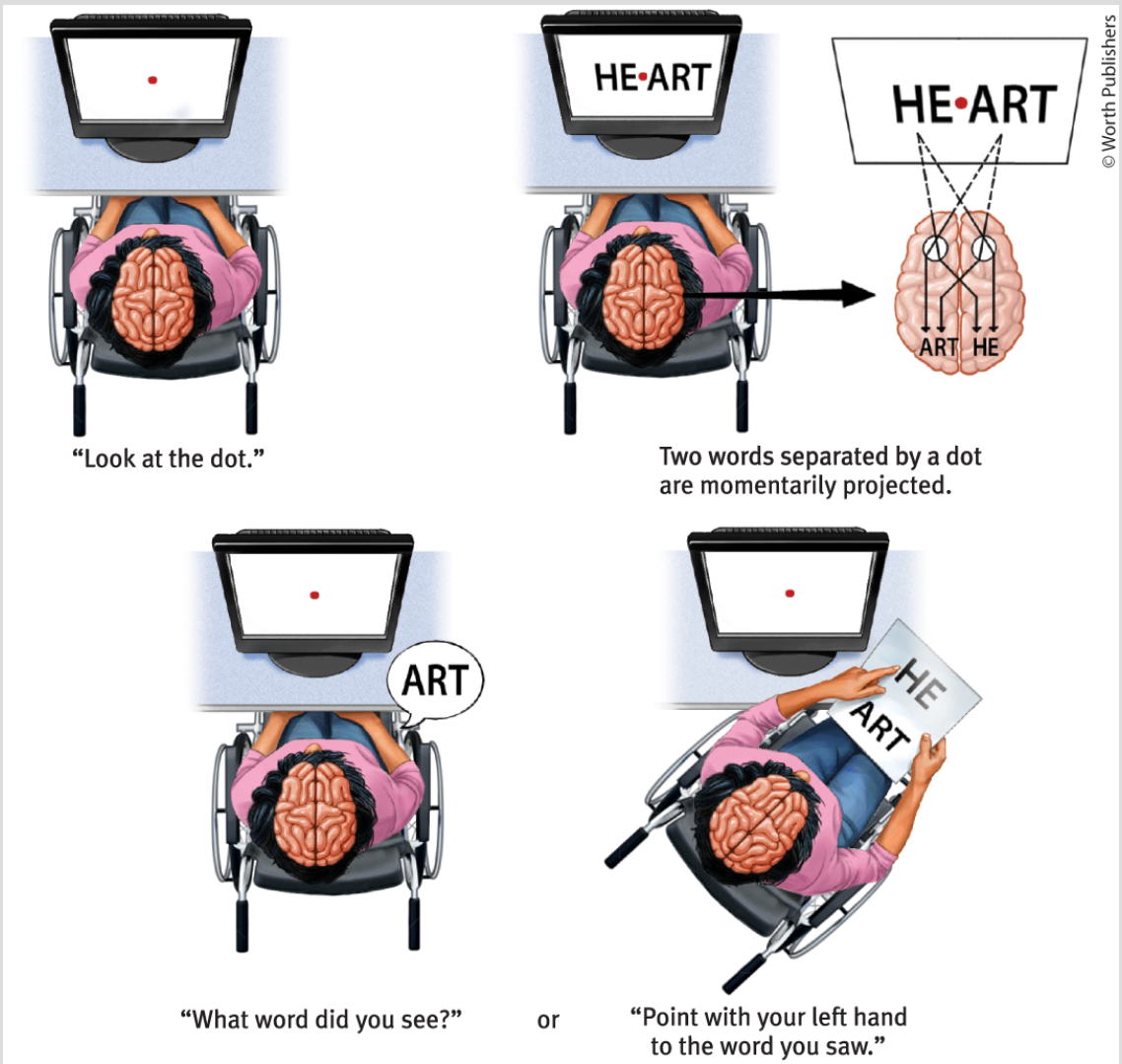

FIGURE 7.4 One skull, two minds When an experimenter flashes HE•ART across the visual field, a woman with a split brain verbally reports seeing the word transmitted to her left hemisphere. However, if asked to indicate with her left hand what she saw, she points to the word transmitted to her right hemisphere (Gazzaniga, 1983).

When a picture of a spoon was flashed to their right hemisphere, the patients could not *say* what they had viewed. But when asked to *identify* what they had viewed by feeling an assortment of hidden objects with their left hand, they readily selected the spoon. If the

experimenter said, “Correct!” the patient might reply, “What? Correct? How could I possibly pick out the correct object when I don’t know what I saw?” It is, of course, the left hemisphere doing the talking here, bewildered by what the nonverbal right hemisphere knows.

A few people who have had split-brain surgery have been for a time bothered by the unruly independence of their left hand. It seemed the left hand truly didn’t know what the right hand was doing. The left hand might unbutton a shirt while the right hand buttoned it, or put grocery store items back on the shelf after the right hand put them in the cart. It was as if each hemisphere was thinking, “I’ve half a mind to wear my green (blue) shirt today.” Indeed, said Sperry (1964), split-brain surgery leaves people “with two separate minds.” With a split brain, both hemispheres can comprehend and follow an instruction to copy—*simultaneously*—different figures with the left and right hands (Franz et al., 2000; see also **FIGURE 7.5**). Today’s researchers believe that a split-brain patient’s mind resembles a river that has branched into separate streams, each unaware of the other (Pinto et al., 2017). (Reading these reports, can you imagine a patient enjoying a solitary game of “rock, paper, scissors”—left versus right hand?)

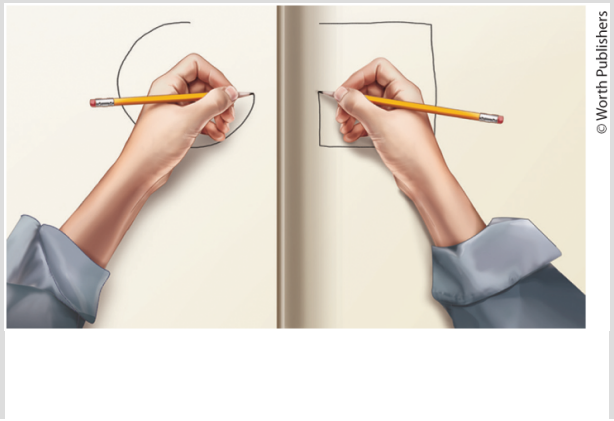

FIGURE 7.5 Try this! People who have had split-brain surgery can simultaneously draw two different shapes.

When the "two minds" are at odds, the left hemisphere does mental gymnastics to rationalize reactions it does not understand. If a patient follows an order ("Walk") sent to the right hemisphere, a strange thing happens. The left hemisphere, unaware of the order, doesn't know why the patient begins walking. But if asked, the patient doesn't reply, "I don't know." Instead, the left hemisphere improvises—"I'm going into the house to get a Coke." Gazzaniga (2006), who described these patients as "the most fascinating people on earth," realized that the conscious left hemisphere resembles an interpreter that instantly constructs explanations. The brain, he concluded, often runs on autopilot; it acts first and then explains itself.

Retrieval Practice

RP-1 (a) If we flash a red light to the right hemisphere of a person with a split brain, and flash a green light to the left hemisphere, will each observe its own color? (b) Will the person be aware that the colors differ? (c) What will the person verbally report seeing?

ANSWERS IN APPENDIX E

Right-Left Differences in the Intact Brain

So, what about the 99.99+ percent of us with undivided brains? Does each of *our* hemispheres also perform distinct functions? The short answer is *Yes.* When a person performs a *perceptual* task, a brain scan often reveals increased activity (brain waves, blood flow, and glucose consumption) in the *right* hemisphere. When the person speaks or does a math calculation, activity usually increases in the *left* hemisphere.

A dramatic demonstration of hemispheric specialization happens before some types of brain surgery. To locate the patient's language centers, the surgeon injects a sedative into the neck artery feeding blood to the left hemisphere, which usually controls speech. Before the injection, the patient is lying down, arms in the air, chatting with the doctor. Can you predict what happens when the drug puts the left hemisphere to sleep? Within seconds, the person's right arm falls limp. If the left hemisphere is controlling language, the patient will be speechless until the drug wears off. If the drug is injected into the artery to the right hemisphere, the left arm will fall limp, but the person will still be able to speak.

To the brain, language is language, whether spoken or signed. (The Thinking and Language modules offer more on how and where the brain processes language.) Just as hearing people usually use the left hemisphere to process spoken language, deaf people use the left hemisphere to process sign language (Corina et al., 1992; Hickok et

al., 2001). Thus, a left hemisphere stroke disrupts a deaf person's signing, much as it would disrupt a hearing person's speaking (Corina, 1998).

Although the left hemisphere is skilled at making quick, literal interpretations of language, the right hemisphere

- *excels in making inferences* (Beeman & Chiarello, 1998; Bowden & Beeman, 1998; Mason & Just, 2004). When given an insight-like problem—"What word goes with *boot, summer,* and *ground?*"—the right hemisphere more quickly comes to a reasoned conclusion and recognizes the solution: *camp.* As one patient explained after a right hemisphere stroke, "I understand words, but I'm missing the subtleties."
- *helps us modulate our speech* to make meaning clear—as when we say, "Let's eat, Grandpa!" instead of "Let's eat Grandpa!" (Heller, 1990).
- *helps orchestrate our self-awareness.* People who have partial paralysis will sometimes stubbornly deny their impairment—constantly claiming they can move a paralyzed limb—if the damage is to the right hemisphere (Berti et al., 2005).

Simply looking at the two hemispheres, so alike to the naked eye, who would suppose they each contribute uniquely to the harmony of the whole? Yet a variety of observations—of people with split brains, of people with intact brains, and even of other species' brains—converge beautifully, leaving little doubt that we have unified brains with

specialized parts (Hopkins & Cantalupo, 2008; MacNeilage et al., 2009).

Ask Yourself

Have you ever been asked if you are "left-brained" or "right-brained"? Now that you understand more about hemispheric functioning, how might you respond to this popular misconception?

REVIEW

Module 7: Damage Responses and Brain Hemispheres

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 7-1: To what extent can a damaged brain reorganize itself, and what is *neurogenesis?*

LOQ 7-2: What do split brains reveal about the functions of our two brain hemispheres?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

neurogenesis
corpus callosum [KOR-pus kah-LOW-sum]
split brain

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers, or check your answers in Appendix E.

1. The flexible brain's ability to respond to damage is especially evident in the brains of
   a. split-brain patients.
   b. young adults.
   c. young children.
   d. right-handed people.

2. An experimenter flashes the word HER•ON across the visual field of a man whose corpus callosum has been severed. HER is transmitted to his right hemisphere and ON to his left

hemisphere. When asked to indicate what he saw, the man says he saw _____, but his left hand points to _____.

3. Studies of people with split brains and brain scans of those with undivided brains indicate that the left hemisphere excels in
   a. processing language.
   b. visual perceptions.
   c. making inferences.
   d. neurogenesis.

4. Damage to the brain's right hemisphere is most likely to reduce a person's ability to
   a. recite the alphabet rapidly.
   b. make inferences.
   c. understand verbal instructions.
   d. solve arithmetic problems.

CHAPTER 3
Consciousness and the Two-Track Mind (Modules 8–10)



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MODULE 8 Basic Consciousness Concepts

Defining Consciousness

Cognitive Neuroscience

Selective Attention

Dual Processing: The Two-Track Mind
MODULE 9 Sleep and Dreams
Biological Rhythms and Sleep
Why Do We Sleep?
Sleep Deprivation and Sleep Disorders
Dreams
MODULE 10 Drugs and Consciousness
Tolerance and Addiction in Substance Use Disorders
THINKING CRITICALLY ABOUT: Tolerance and Addiction
Types of Psychoactive Drugs
Influences on Drug Use

Consciousness is a funny thing. It offers us weird experiences, as when entering sleep or leaving a dream. And sometimes it leaves us wondering who is really in control. After zoning me [DM] out with nitrous oxide, my dentist tells me to turn my head to the left. My conscious mind resists: "No way," I silently say. "You can't boss me around!" Whereupon my robotic head, ignoring my conscious mind, turns obligingly under the dentist's control.

Playing basketball, I have sometimes been mildly irritated as my body passes the ball while my conscious mind says, "No, stop! Sarah is going to intercept!" Alas, my body completes the pass. Other times, as psychologist Daniel Wegner (2002) noted in *The Illusion of Conscious Will,* people believe their conscious mind is controlling their actions when it isn't. In one experiment, two people jointly controlled a computer mouse. Even when their partner (who was actually the experimenter's

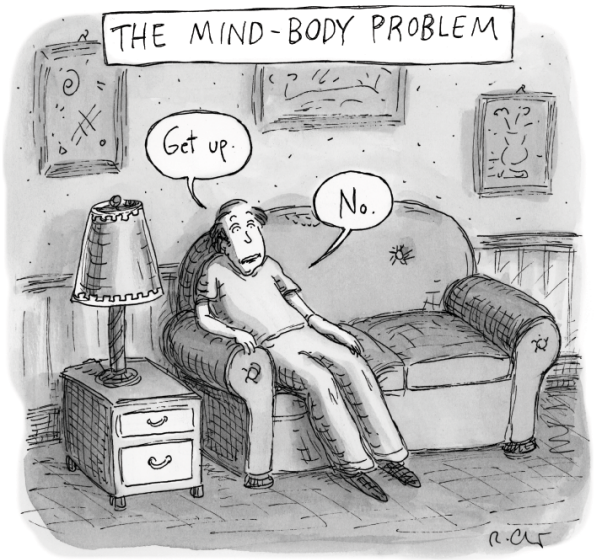
accomplice) caused the mouse to stop on a predetermined square, the participants perceived that *they* had caused it to stop there.

Then there are those times when consciousness seems to split. Sometimes, my [ND's] mind wanders while singing portions of the *Trolls World Tour* soundtrack daily with my young children. So, if a friend interrupts you mid-text to ask what you're doing for lunch, it's not a problem. Your thumbs complete their keyboard dance as you suggest getting tacos.

What do such experiences tell us? Does the mind's wandering while singing or texting reveal a split in consciousness (Module 8)? How do our states of consciousness play out in our sleep and dreams (Module 9)? And was that drug-induced dental episode akin to people's experiences with other mood- and perception-altering *psychoactive drugs* (Module 10)? Before considering these questions and more, let's start with a fundamental question: What is *consciousness?*

MODULE 8: Basic Consciousness Concepts

Every science has concepts so fundamental they are nearly impossible to define. Biologists agree on what is alive but not on precisely what *life* is. In physics, *matter* and *energy* elude simple definition. To psychologists, *consciousness* is similarly a fundamental yet slippery concept.



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Defining Consciousness

Learning Objective Question LOQ 8-1

What is the place of *consciousness* in psychology's history?

At its beginning, *psychology* was "the description and explanation of states of consciousness" (Ladd, 1887). But during the first half of the twentieth century, the difficulty of scientifically studying consciousness led many psychologists—including those in the emerging school of *behaviorism* (Learning modules)—to turn to direct observations of behavior. By 1960, psychology had nearly lost consciousness, defining itself as "the science of behavior." Like a car's speedometer, consciousness "just reflects what's happening" (Seligman, 1991, p. 24).

But in the 1960s, mental concepts reemerged. Neuroscience advances linked brain activity to sleeping, dreaming, and other mental states. Researchers began studying consciousness altered by drugs, hypnosis, and meditation. (More on meditation in the Emotions, Stress, and Health modules.) Psychologists of all persuasions were affirming the importance of *cognition,* or mental processes. Psychology was regaining consciousness.

Today, consciousness is a thriving area of study (Michel et al., 2019). By **consciousness,** most psychologists mean our subjective awareness of ourselves and our environment (Feinberg & Mallatt, 2016).

- Conscious awareness helps us make sense of our life, including our sensations, emotions, and choices (Weisman et al., 2017). It allows us to set and achieve goals as we reflect on our past, adapt to our present, and plan for our future. Most conscious thoughts focus on the present and the future (Baumeister et al., 2020).

- When learning a behavior, conscious awareness focuses our attention (Logan et al., 2018). Over time, our mind tends to run on autopilot (Logan, 2018; Rand et al., 2017). When learning to drive, we focus on the car and the traffic. With practice, driving becomes semiautomatic. We may find our mind wandering on a long stretch of highway—only to have our attention jolted back to the car and the traffic when someone cuts in front of us and we need to react.
- Over time, we flit between different *states of consciousness,* including typical waking awareness and various altered states (FIGURE 8.1).

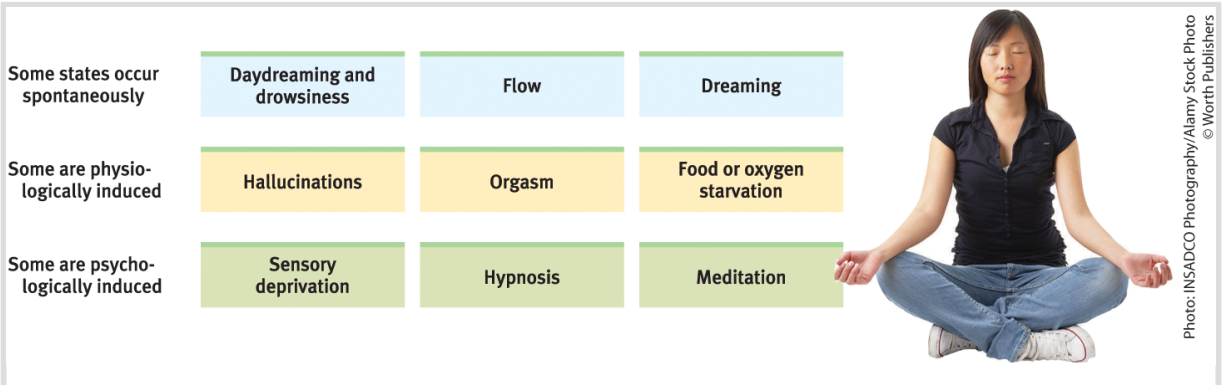

FIGURE 8.1 Altered states of consciousness In addition to normal, waking awareness, consciousness comes to us in altered states, including daydreaming, sleeping, drug-induced hallucinating, and meditating.

Hypnosis

Through **hypnosis**, we may experience an altered state of consciousness involving changes in perceptions, feelings, thoughts, or

behaviors. Researchers and health care providers have for many years used hypnosis to lessen pain related to medical procedures, headaches, burn injuries, heart disease, and dental issues (Milling et al., 2002; Montgomery et al., 2000; Patterson & Jensen, 2003). Hypnosis can also reduce emotional distress, unpleasant thinking, and the pain of social rejection (Rainville et al., 1997; Raz et al., 2005; Schnur et al., 2008). For people who are obese, hypnosis can aid weight loss, especially when used with *psychotherapy* (Milling et al., 2018). (More on hypnosis in the Sensation and Perception modules.)

Cognitive Neuroscience

How does the brain make the mind? Researchers call this the "hard problem": How do brain cells jabbering to one another create our awareness of the taste of toast, the idea of infinity, the feeling of fright? The question of how consciousness arises from the material brain is one of life's deepest mysteries. Even with all the world's technology, we still don't have a clue *how* to make a conscious robot. Such questions are at the heart of **cognitive neuroscience**—the interdisciplinary study of the brain activity linked with our mental processes.

If you just *think* about kicking a soccer ball, an fMRI scan could detect increased blood flow to the brain region that plans such action. In one study, researchers asked skilled soccer players to imagine they were making either creative moves (complex bicycle kicks) or ordinary moves (simply kicking the ball from foot to foot). Scans showed that

thinking of creative moves produced the most coordinated brain activity across different brain regions (Fink et al., 2019).

If brain activity can reveal conscious thinking, could brain scans allow us to discern mental activity in unresponsive patients? *Yes.* A stunning demonstration of consciousness appeared in brain scans of a noncommunicative patient—a 23-year-old woman who had been in a car accident and showed no outward signs of conscious awareness (Owen, 2017a; Owen et al., 2006). When researchers asked her to *imagine* playing tennis, fMRI scans revealed activity in a brain area that controls arm and leg movements (**FIGURE 8.2**). Even in a motionless, noncommunicative body, researchers concluded, the brain—and the mind—may still be active. Follow-up studies of brain activity in dozens of unresponsive patients suggest that 15 to 30 percent may be experiencing meaningful conscious awareness (Claassen et al., 2019; Owen, 2017b).

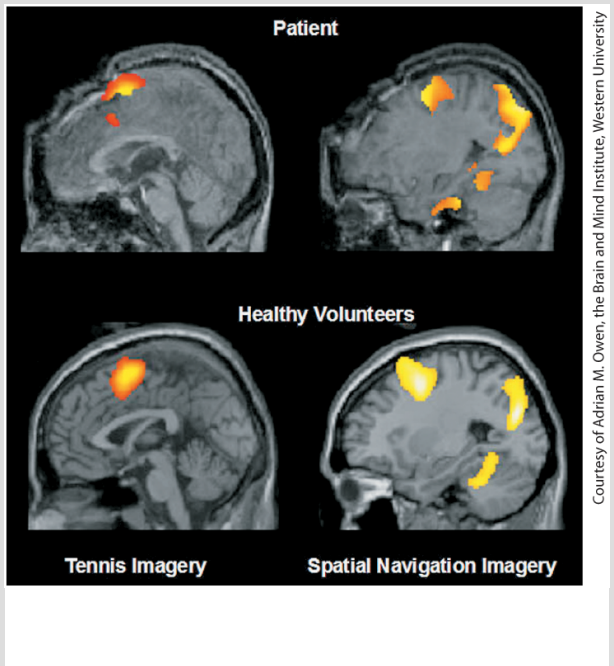

FIGURE 8.2 Evidence of awareness When a noncommunicative patient was asked to imagine playing tennis or walking, her brain (top) exhibited activity similar to a healthy person's brain (bottom). Such fMRI scans enable a "conversation" with some unresponsive patients, by instructing them, for example, to answer *yes* to a question by imagining playing tennis (top and bottom left), and *no* by imagining walking (top and bottom right).

Many cognitive neuroscientists are exploring and mapping the conscious functions of the cortex. Based on your cortical activation patterns, they can now, in limited ways, read your mind (Bor, 2010). They could, for example, tell which of 10 similar objects (hammer, drill, and so forth) you were viewing (Shinkareva et al., 2008).

Conscious experience arises from synchronized activity across the brain (Mashour, 2018; Vaz et al., 2019). If a stimulus activates enough cortex-wide coordinated neural activity—as strong signals in one brain area trigger activity elsewhere—it crosses a threshold for consciousness. A weaker stimulus—perhaps a word flashed too briefly to be consciously perceived—may trigger only visual cortex activity that quickly fades. A stronger visual stimulus will engage other brain areas, such as those involved with language, attention, and memory. Such reverberating activity detected by brain scans is a telltale sign of conscious awareness (Boly et al., 2011; Silverstein et al., 2015).

Coordinated activity across brain areas can therefore provide another indication of awareness in unresponsive patients (Demertzi et al., 2019). How the synchronized activity produces awareness remains a mystery. One theory proposes that consciousness occurs when incoming information activates the cerebral "workspace," a super network that distributes information to and from other brain networks (Baars, 2002; Dehaene & Changeux, 2011). Still, one wonders: How does matter make mind?

Retrieval Practice

RP-1 Those working in the interdisciplinary field called _____ _____ study the brain activity associated with the mental processes of thinking, knowing, remembering, and communicating.

ANSWERS IN APPENDIX E

Selective Attention

LOQ 8-2

How does *selective attention* direct our perceptions?

Through **selective attention**, our awareness focuses, like a flashlight beam, on a minute aspect of all that we experience. We may think we can fully attend to a conversation or a class lecture while checking and

returning text messages. Actually, our consciousness focuses on but one thing at a time.

By one estimate, our five senses take in 11,000,000 bits of information per second, of which we consciously process about 40 (Wilson, 2002). Yet our mind's unconscious track intuitively makes great use of the other 10,999,960 bits.

What captures our limited attention? Things we deem important. A classic example of selective attention is the *cocktail party effect*—your ability to attend to only one voice within a sea of many as you chat with a party guest. But what happens when another voice speaks your name? Your cognitive radar, operating on your mind's other track, instantly brings that unattended voice into consciousness. Even cats selectively respond to their own names (Saito et al., 2019). This effect might have prevented an embarrassing and dangerous situation in 2009, when two Northwest Airlines pilots "lost track of time." Focused on their laptops and in conversation, they ignored alarmed air traffic controllers' attempts to reach them and overflew their Minneapolis destination by 150 miles. If only the controllers had known and spoken the pilots' names.

Selective Attention and Accidents

Have you, like 60 percent of U.S. drivers, read or sent a text message or used your phone's GPS while driving in the last month (Gliklich et al., 2016)? If so, you may have thought—wrongly—that you could

simultaneously attend to the road. Such digital distraction can have tragic consequences, as our selective attention shifts more than we realize (Stavrinos et al., 2017). One study left people in a room for 28 minutes with both internet and television access. On average, they guessed their attention switched 15 times. But they were not even close. Eye-tracking revealed eight times that many attentional switches—120 on average (Brasel & Gips, 2011).



Natalie Dupille/Cartoon Stock

"Are you O.K.? You're barely paying attention to your book, phone, show, laptop and the crossword you started ten minutes ago."

Rapid toggling between activities is today's great enemy of sustained, focused attention. The more we mindlessly check our phone, the more we're distracted from our everyday tasks (Marty-Dugas et al., 2018). When we switch attentional gears, and especially when we shift to and from complex tasks such as noticing and avoiding cars around us, we pay a toll—a slight and sometimes fatal delay in coping (Rubenstein et al., 2001). When a driver attends to a conversation, activity in brain areas vital to driving decreases an average of 37 percent (Just et al., 2008).

Just how dangerous is distracted driving? Each day, distracted driving kills about 9 Americans (CDC, 2018). One video cam study of teen drivers found that driver distraction from passengers or phones occurred right before 58 percent of their crashes (AAA, 2015). Talking with passengers makes the risk of an accident 1.6 times higher than normal. Using a phone (even hands-free) makes the risk 4 times higher than normal—equal to the risk of drunk driving (McEvoy et al., 2005, 2007). And while talking is distracting, texting wins the danger game. One 18-month video cam study tracked the driving habits of long-haul truckers. When they were texting, their risk of a collision increased 23 times (Olson et al., 2009)!



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Inattentional Blindness

At the level of conscious awareness, we are “blind” to all but a tiny sliver of visual stimuli. Ulric Neisser (1979) and Robert Becklen and Daniel Cervone (1983) demonstrated this **inattentional blindness** dramatically by showing people a 1-minute video of basketball players, three in black shirts and three in white shirts, tossing a ball. Researchers told viewers to press a key every time they saw a black-shirted player pass the ball. Most were so intent on their task that they failed to notice a young woman carrying an umbrella saunter across the screen midway through the video (**FIGURE 8.3**). Watching a replay, viewers were astonished to see her (Mack & Rock, 2000). This inattentional blindness is a by-product of what we are really good at: focusing attention on some part of our environment.


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FIGURE 8.3 Inattentional blindness Viewers who attended to basketball tosses among the black-shirted players usually failed to spot the umbrella-toting woman sauntering across the screen (Neisser, 1979).

In a repeat of the experiment, smart-aleck researchers sent a gorilla-suited assistant through the swirl of players (Simons & Chabris, 1999). During its 5- to 9-second cameo appearance, the gorilla paused and thumped its chest. But the gorilla did not steal the show: Half the conscientious pass-counting viewers failed to see it. Inattentional blindness struck again in a study of 50 radiologists who were asked to search for cancer in lung scans. Two out of three radiologists missed a large breast mass, indicating cancer (Williams et al., 2021). They did, however, spot the much tinier groups of lung cancer cells, which were the focus of their attention.

This phenomenon extends to *inattentional numbness.* Pickpockets have long understood that bumping into people makes them unlikely to notice a hand slipping into their pocket. British researchers experimented with this tactile inattention: Sure enough, when distracted, participants failed to perceive an otherwise easily noticed vibration to their hand (Murphy & Dalton, 2016, 2018). Inattentional numbness can lead us to ignore information right beneath our noses. When people focused on a distracting task, they failed to notice a coffee scent in the room (Forster & Spence, 2018). Our attention is a wonderful gift, given to one thing at a time.

Knowing that most people miss someone in a gorilla suit while their attention is riveted elsewhere, imagine the fun that magicians can have by manipulating our selective attention. “Every time you perform a magic trick, you’re engaging in experimental psychology,” says magician Teller (2009), a master of mind-messing methods. Clever thieves know this, too. One Swedish psychologist was surprised in Stockholm by a woman suddenly exposing herself; only later did he realize that he had been pickpocketed, outwitted by thieves who understood the limits of our selective attention (Gallace, 2012).

In other experiments, people exhibited a form of inattentional blindness called **change blindness**. Viewers failed to notice that, after a brief visual interruption, a big Coke bottle had disappeared, a railing had risen, clothing had changed color, and someone they’d been talking to had been replaced by a different person (**FIGURE 8.4**) (Chabris & Simons, 2010; Resnick et al., 1997). Out of sight, out of mind.

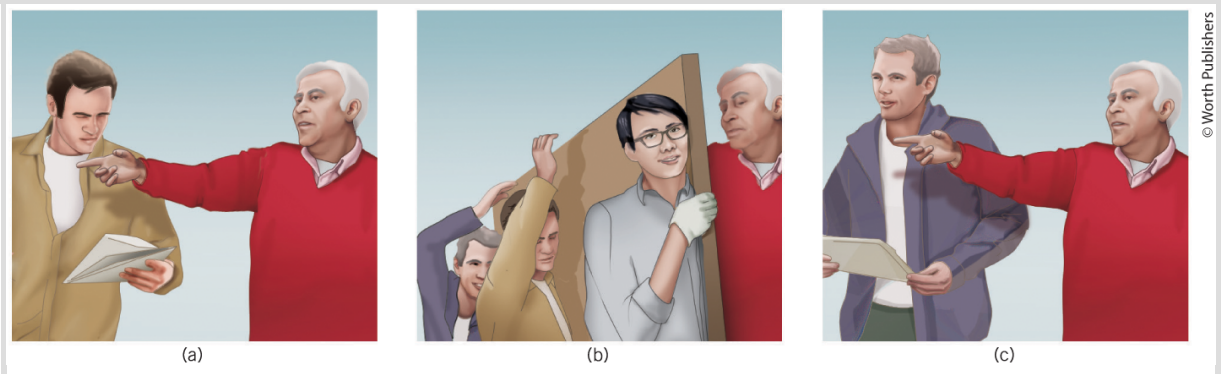

FIGURE 8.4 Change blindness While a man (in red) provides directions to another (a), two experimenters rudely pass between them carrying a door (b). During this interruption, the original direction seeker switches places with another person wearing different-colored

clothing (c). Most people, focused on their direction giving, do not notice the switch (Simons & Levin, 1998).

Ask Yourself

Can you recall a recent time when, as your attention focused on one thing, you were oblivious to something else—perhaps to pain, to someone's approach, or to music lyrics? (If you're reading this while listening to exciting music, you may have struggled to understand the question 😀 [Vasilev et al., 2018]).

Retrieval Practice

RP-2 Explain two attentional principles that magicians may use to fool us.

ANSWERS IN APPENDIX E

Dual Processing: The Two-Track Mind

LOQ 8-3

What is the *dual processing* being revealed by today's cognitive neuroscience?

Discovering which brain regions become active with a particular conscious experience strikes many people as interesting, but not mind-blowing. If everything psychological is simultaneously

biological, then our ideas, emotions, and spirituality must all, somehow, be embodied. What *is* mind-blowing to many of us is evidence that we have, so to speak, two minds, each supported by its own neural equipment.

At any moment, we are aware of little more than what's on the screen of our consciousness. But beneath the surface, unconscious information processing occurs simultaneously on many parallel tracks. When we look at a bird flying, we are consciously aware of the result of our cognitive processing *(It's a hummingbird!)* but not of our subprocessing of the bird's color, form, movement, and distance. One of the grand ideas of today's cognitive neuroscience is that much of our brain work occurs off stage, out of sight. Thinking, knowing, remembering, and communicating all operate on two independent levels—a conscious, deliberate "high road," and an unconscious, automatic "low road." The high road is reflective, the low road intuitive—together making what researchers call **dual processing** (Kahneman, 2011; Pennycook et al., 2018). We know more than we know we know.

If you are a driver, consider how you move into the right lane. Drivers know this unconsciously but cannot accurately explain it (Eagleman, 2011). Most say they would bank to the right, then straighten out—a procedure that would actually steer them off the road. In reality, an experienced driver, after moving right, automatically reverses the steering wheel just as far to the left of center, only then returning to

center. The lesson: The human brain is a device for converting conscious into unconscious knowledge.

Or consider this story, which illustrates how science can be stranger than science fiction. During my sojourns at Scotland's University of St Andrews, I [DM] came to know cognitive neuroscientists David Milner and Melvyn Goodale (2008). They studied a local woman, D. F., who experienced brain damage when overcome by carbon monoxide, leaving her unable to recognize and discriminate objects visually. Consciously, D. F. could see nothing. Yet she exhibited **blindsight**—she acted as though she *could* see. Asked to slip a postcard into a vertical or horizontal mail slot, she could do so without error. Asked the width of a block in front of her, she was at a loss, but she could grasp it with just the proper finger–thumb distance. Likewise, if our right and left eyes view different scenes, we will only be consciously aware of one at a time. Yet we will display some blindsight awareness of the other (Baker & Cass, 2013).

How could this be? Don't we have one visual system? Goodale and Milner knew from animal research that the eye sends information simultaneously to different brain areas, which support different tasks (Weiskrantz, 2009, 2010). Sure enough, a scan of D. F.'s brain activity revealed normal activity in the area concerned with reaching for, grasping, and navigating objects, but damage in the area concerned with consciously recognizing objects.[1] (See another example in **FIGURE 8.5**.)


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FIGURE 8.5 When the blind can "see" In this compelling demonstration of blindsight and the two-track mind, researcher Lawrence Weiskrantz trailed a blindsight patient down a cluttered hallway. Although told the hallway was empty, the patient meandered around all the obstacles without any awareness of them.

How strangely intricate is this thing we call vision, conclude Goodale and Milner in their aptly titled book, *Sight Unseen* (2004). We may think of our vision as a single system that controls our visually guided actions. Actually, it is a dual-processing system (Foley et al., 2015). A *visual perception track* enables us "to think about the world"—to

recognize things and to plan future actions. A *visual action track* guides our moment-to-moment movements.

The dual-track mind also appeared in a patient who lost all of his left visual cortex, leaving him blind to objects and faces presented on the right side of his field of vision. He nevertheless could sense the emotion expressed in faces that he did not consciously perceive (de Gelder, 2010). The same is true of normally sighted people whose visual cortex has been disabled with magnetic stimulation. Such findings suggest that brain areas below the cortex process emotion-related information.

Much of our everyday thinking, feeling, and acting operates outside our conscious awareness (Bargh & Chartrand, 1999). Some "80 to 90 percent of what we do is unconscious," says Nobel laureate and memory expert Eric Kandel (2008). Sometimes our unconscious biases *(I prefer to hire a female nanny)* do not match our conscious beliefs *(I am not biased)* (Greenwald & Lai, 2020). Other times, we're motivated to avoid thinking, especially when careful thought *(How many calories are in that dessert?)* conflicts with temptations *(I want that piece of cake!)* (Woolley & Risen, 2018). Yet most people, most of the time, mistakenly believe that their intentions and deliberate choices rule their lives. They don't.

Although consciousness enables us to exert voluntary control and to communicate our mental states to others, it is but the tip of the information-processing iceberg. Just ask the volunteers who chose a

card after watching a magician shuffle through the deck (Olson et al., 2015). In nearly every case, the magician swayed participants' decisions by subtly allowing one card to show for longer—but 91 percent of the participants believed they had made the choice on their own. Being intensely focused on an activity (such as reading about consciousness, we hope) increases your total brain activity no more than 5 percent above its baseline rate. Even when you rest, activity whirls inside your head (Raichle, 2010).

This unconscious parallel processing is faster than conscious sequential processing, but both are essential. **Parallel processing** enables your mind to take care of routine business (more on this in the Sensation and Perception modules). **Sequential processing** is best for solving new problems, which requires our focused attention on one thing at a time. Try this if you are able: If you are right-handed, move your right foot in a smooth counterclockwise circle and write the number 3 repeatedly with your right hand—at the same time. Or try something equally difficult: Tap a steady beat three times with your left hand while tapping four times with your right hand. Both tasks require conscious attention, which can be in only one place at a time. If time is nature's way of keeping everything from happening at once, then consciousness is nature's way of keeping us from thinking and doing everything at once.

Retrieval Practice

RP-3 What are the mind's two tracks, and what is *dual processing?*

ANSWERS IN APPENDIX E

REVIEW

Module 8: Basic Consciousness Concepts

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 8-1: What is the place of *consciousness* in psychology's history?

LOQ 8-2: How does *selective attention* direct our perceptions?

LOQ 8-3: What is the *dual processing* being revealed by today's cognitive neuroscience?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

consciousness
hypnosis
cognitive neuroscience
selective attention
inattentional blindness
change blindness
dual processing
blindsight
parallel processing
sequential processing

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. Failure to see visible objects because our attention is occupied elsewhere is called _____ _____.

2. We register and react to stimuli outside of our awareness by means of _____ processing. When we devote deliberate attention to stimuli, we use _____ processing.

3. Inattentional blindness is a product of our _____ attention.

MODULE 9: Sleep and Dreams

LOQ 9-1

What is *sleep?*

We humans have about a 16-hour battery life before we lie down on our comfy wireless charging pad and slip into sleep. **Sleep**—the irresistible tempter that commands a third of our lives—matters more than you think. Sleep strengthens our mind and body. It can make or break our ability to remember things, manage our feelings, and even stay alive. "The best bridge between despair and hope," says sleep researcher Matthew Walker (2007), "is a good night's sleep."

Sleep's mysteries puzzled scientists for centuries. Now, in laboratories worldwide, some of these mysteries are being solved as people sleep, while devices measure their bodily and brain activity. By recording brain waves and muscle movements, and by watching and sometimes waking sleepers, researchers are glimpsing things that a thousand years of common sense never told us.

Why is it that the roar of my [ND's] neighbor's motorcycle leaves me undisturbed, but my child's cry will shatter my sleep? While sleeping, we may feel "dead to the world," but we are not. Even when you are deeply asleep, your perceptual window remains open a crack, and

some part of you still attends to your environment. You move around on the bed but manage not to fall out. You maintain a sense of time, perhaps even awakening when you wish without an alarm. EEG recordings confirm that the brain's auditory cortex responds to sound stimuli even during sleep (Kutas, 1990). And when you sleep, as when awake, you process most information outside your conscious awareness.

> **"I love to sleep.... It really is the best of both worlds. You get to be alive and unconscious."** — Comedian Rita Rudner, 1993

By recording the brain waves and muscle movements of sleeping participants, and by observing and occasionally waking them, researchers are solving some of sleep's deepest mysteries. Perhaps you can anticipate some of their discoveries. Are the following statements true or false?

1. When people dream of performing some activity, their limbs often move in concert with the dream.
2. Older adults sleep more than young adults.
3. Sleepwalkers are acting out their dreams.
4. Sleep experts recommend treating insomnia with an occasional sleeping pill.
5. Some people dream every night; others seldom dream.

All these statements (adapted from Palladino & Carducci, 1983) are *false*. To see why, read on.

Biological Rhythms and Sleep

Like the ocean, life has its rhythmic tides. Over varying time periods, our bodies fluctuate, and with them, our minds. Let's look more closely at two of those biological rhythms—our 24-hour *circadian rhythm* and our 90-minute sleep cycle.

Circadian Rhythm

LOQ 9-2

How do our biological rhythms influence our daily functioning?

The rhythm of the day parallels the rhythm of life—from our waking at a new day's birth to our nightly return to what Shakespeare called "death's counterfeit." Our bodies roughly synchronize with the 24-hour cycle of day and night thanks to our internal biological clock called the **circadian rhythm** (from the Latin *circa,* "about," and *diem,* "day"). Our body temperature is lowest at night and begins to rise steadily after we get out of bed, as our grogginess transforms into alertness throughout the morning. Our temperature then plateaus for a time in the afternoon and drops back down in the evening as we wind down for bedtime (Refinetti & Menaker, 1992). Thinking and memory improve as we approach our daily peak in circadian arousal. Have you ever pulled an all-nighter? You might remember feeling groggiest in the middle of the night, but gaining a sense of new alertness with the

arrival of your regular wake-up time. Even our happy moods peak in the afternoon and decline into the evening hours (Murray et al., 2002).

Age and experience can alter our circadian rhythm. Most 20-year-olds are evening-energized "owls," with performance improving across the day (May & Hasher, 1998). Older adults tend to become morning-loving "larks." For our ancestors (and for today's hunter-gatherers), a grandparent who awakened easily and early helped protect the family from predators (Samson et al., 2017). By mid-evening, when the night has hardly begun for many young adults, retirement homes are typically quiet. After about age 20 (slightly earlier for women), we gradually shift from being owls to being larks (Wallace et al., 2022). Night owls tend to be smart and creative (Giampietro & Cavallera, 2007). Morning types tend to do better in school, take more initiative, be more punctual, and be less vulnerable to depression (Preckel et al., 2013; Randler, 2008, 2009; Werner et al., 2015).



Morning lark



Night owl

Left: Peter Chadwick/Science Source; right: Eric Isselee/Shutterstock

Take the test: Morning lark or night owl? Would you consider yourself a night owl or a morning lark? When do you usually feel most energetic? What time of day works best for you to study? This simple quiz from the Sleep Health Foundation will tell you if you are more like a night owl or a morning lark: https://tinyurl.com/4btct7nw.

Sleep Stages

LOQ 9-3

What is the biological rhythm of our sleeping and dreaming stages?

Seeking sleep, we crawl into bed, shut our eyes, and wait. Eventually, sleep overtakes us, and consciousness fades as different parts of our brain's cortex stop communicating (Massimini et al., 2005). Sleep may feel like time-traveling a few hours into the future. Yet the sleeping brain remains active and has its own biological rhythm.

About every 90 minutes, we cycle through distinct sleep stages. This fact came to light when 8-year-old Armond Aserinsky went to bed one night in 1952. His father, Eugene, a University of Chicago graduate student, needed to test an electroencephalograph he had repaired that day (Aserinsky, 1988; Seligman & Yellen, 1987). Placing electrodes near Armond's eyes to record the rolling eye movements then believed to occur during sleep, Aserinsky watched the machine go wild, tracing deep zigzags on the graph paper. Could the machine still be broken? As the night proceeded and the activity recurred, Aserinsky realized that the periods of fast, jerky eye movements were accompanied by energetic brain activity. Awakened during one such episode, Armond reported having a dream, Aserinsky recalled 65 years later, of "a chicken walking through a barnyard" (Nichols, 2018). He had discovered what we now know as **REM sleep** (*r*apid *e*ye *m*ovement sleep; sometimes called *R sleep*).

Similar procedures used with thousands of volunteers showed the cycles were a regular part of sleep (Kleitman, 1960). To appreciate these studies, imagine yourself as a paid participant in this dream job. As the hour grows late, you feel sleepy and yawn in response to reduced brain metabolism. (Yawning stretches your neck muscles and increases your heart rate, which helps keep you awake and alert [Moorcroft, 2003].) When you are ready for bed, a researcher comes in and tapes electrodes to your scalp (to detect your brain waves), on your chin (to detect muscle tension), and just outside the corners of your eyes (to detect eye movement; **FIGURE 9.1**). Other devices may record your heart rate, respiration rate, blood oxygen, and genital

arousal while you sleep. A tracker worn around your wrist records when you are awake or asleep based on your movements.

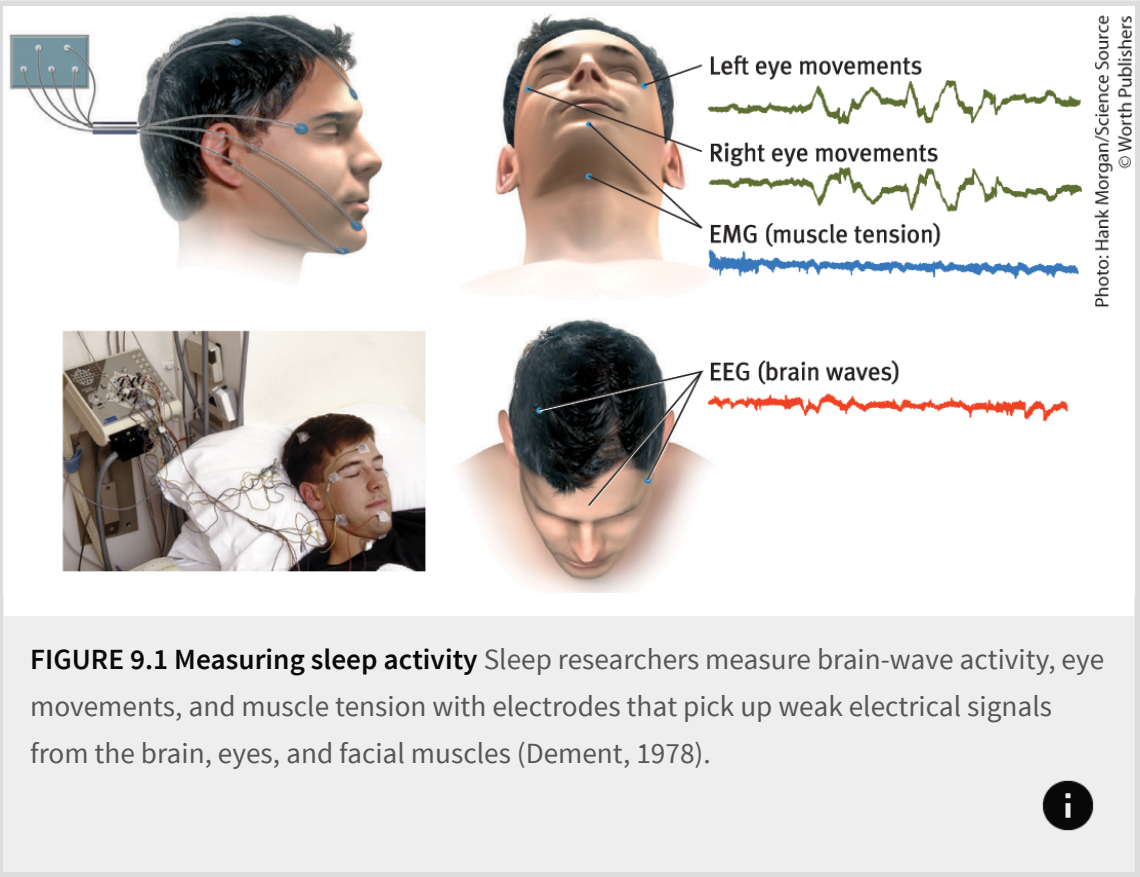


FIGURE 9.1 Measuring sleep activity Sleep researchers measure brain-wave activity, eye movements, and muscle tension with electrodes that pick up weak electrical signals from the brain, eyes, and facial muscles (Dement, 1978).

Dolphins, porpoises, and whales sleep with one side of their brain at a time (Mascetti, 2019).

When you are in bed with your eyes closed, the researcher in the next room sees on the EEG the relatively slow **alpha waves** of your awake but relaxed state (FIGURE 9.2). As time wears on, you adapt to all this equipment, grow tired, and, in an unremembered moment, slip into sleep (FIGURE 9.3). This transition is marked by the slowed breathing

and irregular brain waves of what the American Academy of Sleep Medicine classifies as *N1* sleep—the first stage of non-REM (NREM) sleep (Silber et al., 2007).

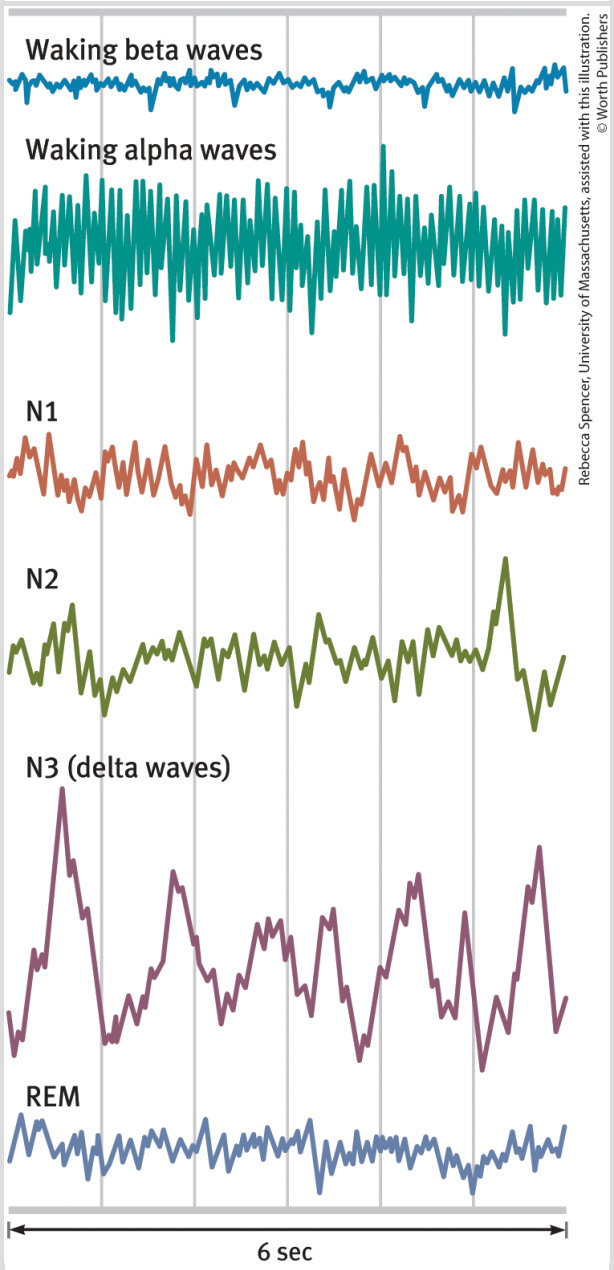


FIGURE 9.2 Brain waves and sleep stages
The beta waves of an alert, waking state and the regular alpha waves of an awake, relaxed

state differ from the slower, larger delta waves of deep Stage 3 (or N3) sleep. Although the rapid REM sleep waves resemble the near-waking Stage 1 (N1) sleep waves, the body is more internally aroused during REM sleep than during NREM sleep (the N1, N2, and N3 stages).

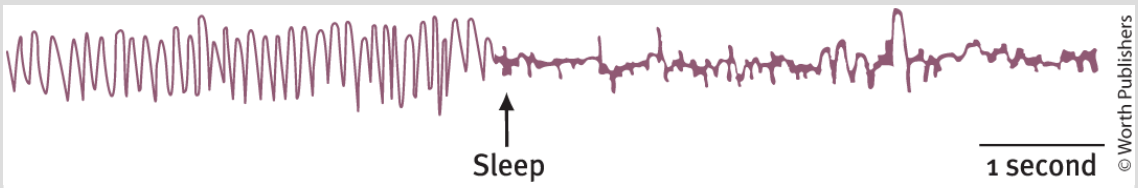


FIGURE 9.3 The moment of sleep We seem unaware of the moment we fall into sleep, but someone watching our brain waves could tell (Dement, 1999).

In one of his 15,000 research participants, William Dement (1999) observed the moment the brain's perceptual window to the outside world slammed shut. Dement asked a sleep-deprived young man with eyelids taped open to press a button every time a strobe light flashed in his eyes (about every 6 seconds). After a few minutes, the young man missed one. Asked why, he said, "Because there was no flash." But there was a flash. He missed it because (as his brain activity revealed) he had fallen asleep for 2 seconds, missing not only the flash 6 inches from his nose but also the awareness of the abrupt moment of entry into sleep. When driving a car or train such *microsleeps* can cause disaster (Koch, 2016; McGeehan, 2018).

During this brief N1 sleep you may experience fantastic images resembling **hallucinations**—sensory experiences that occur without a sensory stimulus from the outside world. You may have a sensation of falling (when your body may suddenly jerk) or of floating weightlessly. These *hypnagogic* (also called *hypnic*) sensations may later be incorporated into your memories. People who claim aliens abducted them—often shortly after getting into bed—commonly recall being floated off of or pinned down on their beds (Clancy, 2005; McNally, 2012). (To catch your own hypnagogic experiences, you might use your alarm's snooze function.)

You then relax more deeply and begin about 20 minutes of *N2* sleep, with its periodic *sleep spindles*—bursts of rapid, rhythmic brain-wave activity that aid memory processing (Studte et al., 2017). Although you could still be awakened without too much difficulty, you are now clearly asleep.

Then you transition to the deep sleep of *N3*. During this slow-wave sleep, which lasts for about 30 minutes, your brain emits large, slow **delta waves** and you are hard to awaken. Have you ever said, "That thunder was so loud last night!" only to have a friend respond, "What thunder?" Those who missed the storm may have been in delta sleep. (It is at the end of this stage that children may wet the bed.)

REM Sleep

About an hour after you first fall asleep, a strange thing happens. Rather than continuing in deep slumber, you ascend from your initial sleep dive. Returning through N2 (where you'll ultimately spend about half your night), you enter the most fascinating sleep phase—REM sleep. For about 10 minutes, your brain waves become rapid and saw-toothed, more like those of the nearly awake N1 sleep. But unlike N1, during REM sleep your heart rate rises, your breathing becomes rapid and irregular, and every half-minute or so your closed eyes dart around in momentary bursts of activity. These eye movements announce the beginning of a dream—often emotional, usually storylike, and richly hallucinatory. Dreams aren't real, but REM sleep tricks your brain into responding as if they were (Andrillon et al., 2015). Anyone watching a sleeper's eyes can notice these REM bursts, but it wasn't until Aserinsky attached his probes to little Armond's eyelids in 1952 that scientists made the connection between these movements and dreaming.

Your genitals may become aroused during REM sleep. You may have an erection or increased vaginal lubrication and clitoral engorgement, regardless of whether the dream's content is sexual (Karacan et al., 1966). During REM sleep, your brain's motor cortex is active, but your brainstem blocks its messages. This leaves your muscles relaxed, so much so that, except for an occasional finger, toe, or facial twitch, you are essentially paralyzed. Moreover, you cannot easily be awakened. (This immobility may occasionally linger as you awaken from REM

sleep, producing a disturbing experience of *sleep paralysis* [Santomauro & French, 2009].) REM sleep is thus sometimes called *paradoxical sleep:* The body is internally aroused, with waking-like brain activity, yet asleep and externally immobile. We spend about 600 hours a year experiencing some 1500 dreams, or more than 100,000 dreams over a typical lifetime—dreams swallowed by the night but not acted out, thanks to REM's protective paralysis.

> People rarely snore during dreams. When REM starts, snoring stops.

The sleep cycle repeats itself about every 90 minutes (with shorter, more frequent cycles for very young children and older adults). As the night goes on, deep N3 sleep grows shorter and disappears, and REM and N2 sleep periods get longer (**FIGURE 9.4**). By morning, we have spent 20 to 25 percent of an average night's sleep—some 100 minutes—in REM sleep. In sleep lab studies, 37 percent of participants have reported rarely or never having dreams that they "can remember the next morning" (Moore, 2004). Yet even they, more than 80 percent of the time, could recall a dream after being awakened during REM sleep. Neuroscientists have also identified brain regions that are active during dreaming, which enables them to detect when dreaming occurs (Siclari et al., 2017).

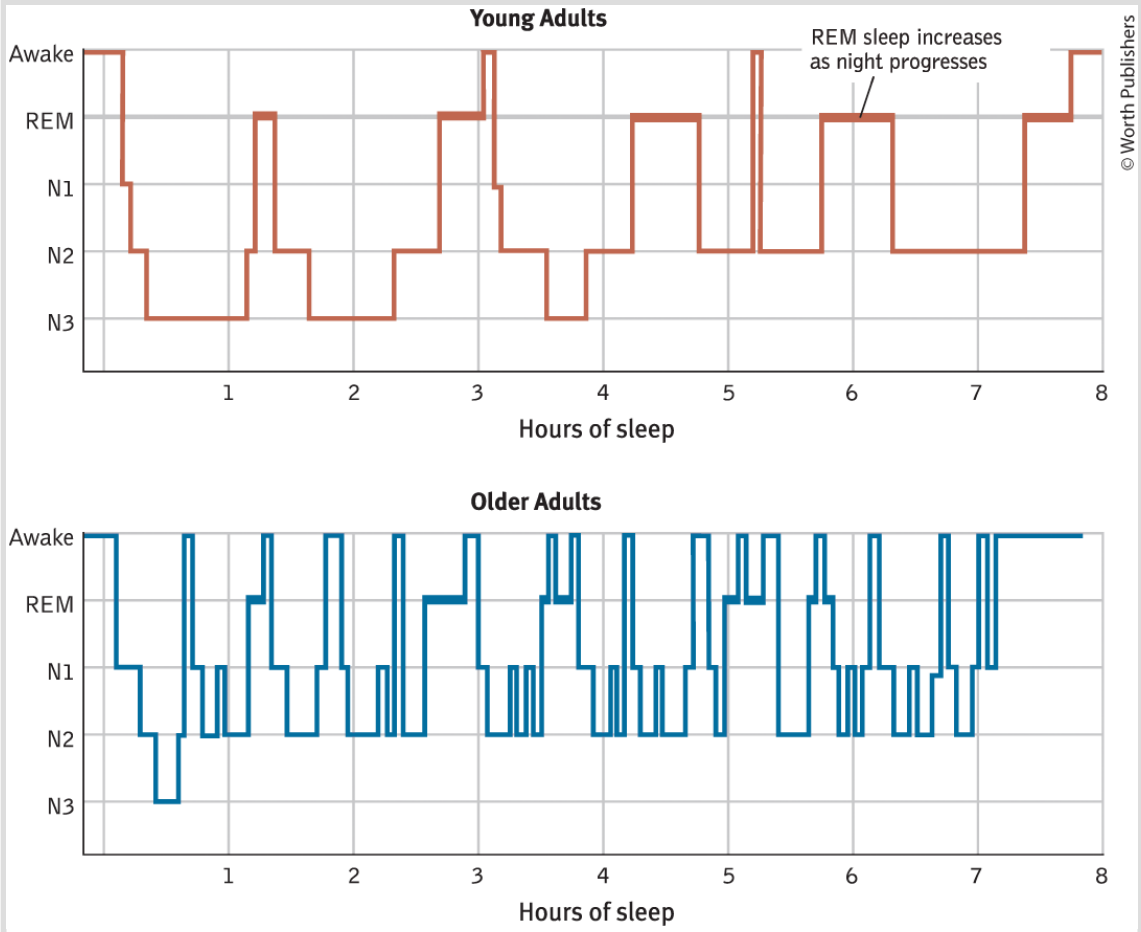


FIGURE 9.4 The stages in a typical night's sleep People pass through a multistage sleep cycle several times each night. As the night goes on, periods of deep sleep diminish and, for younger adults, REM sleep increases. As people age, sleep becomes more fragile, with awakenings more common among older adults (Kamel & Gammack, 2006; Li et al., 2022).

REM sleep is not only the place where dreams are made, it's also where healing happens. Feelings of tension between you and your roommate may not be as tense after a good night's sleep. Some research suggests that REM sleep offers overnight therapy by calming the days' emotions (Walker, 2010). People who were disrupted during

REM sleep were later more emotionally reactive and less attuned to other's emotions (Talbot et al., 2010; van der Helm et al., 2011). Likewise, having our emotions charged up just before bedtime can disrupt both the quality and quantity of our sleep. As psychologist Roxanne Prichard wisely observed: "Nothing gets worse with sleep, and a lot of things get better" (quoted in Brody, 2018). Our sleep and feelings intertwine (Palmer & Alfano, 2017).

Retrieval Practice

RP-1 Why would communal sleeping provide added protection for those whose safety depends on vigilance, such as these Rohingya refugees at a temporary shelter in Indonesia?



Tatan Syuflana/AP Photo

RP-2 What are the sleep stages, and in what order do we typically travel through those stages?

RP-3 Match the sleep stage (i–iii) with the cognitive experience (a–c).

Sleep stage:	Cognitive experience:

i. N1	a. story-like dream
ii. N3	b. fleeting images
iii. REM	c. minimal awareness

ANSWERS IN APPENDIX E

What Affects Our Sleep Patterns?

LOQ 9-4

How do biology and environment interact in our sleep patterns?

Is it true that everyone needs 8 hours of sleep? *No.* Newborns often sleep two-thirds of their day, but most adults sleep no more than one-third. And some people wake up between nightly sleep periods—sometimes called "first sleep" and "second sleep" (Randall, 2012).

Sleep patterns are genetically influenced (Hayashi et al., 2015; Mackenzie et al., 2015). Identical twins are more similar than fraternal twins in their sleep habits (O'Callaghan et al., 2021). One analysis of 1.3 million people identified 956 genes related to sleep patterns such as *insomnia* (Jansen et al., 2019). Another identified genes associated with being a morning person (Jones et al., 2019). Genes also influence how much people sleep (Ashbrook et al., 2019).

Sleep patterns are also culturally, socially, and economically influenced. In Britain, Canada, Germany, Japan, and the United States, adults average 7 hours of sleep a night on workdays and 7 to 8 hours on other days (NSF, 2013). Earlier school start times, more extracurricular activities, and fewer parent-set bedtimes lead U.S. adolescents to get less sleep than their Australian counterparts (Short et al., 2013). Stress also impacts sleep. Those who struggle to pay their bills often also struggle to get enough sleep (Johnson et al., 2018; Mai et al., 2019; Vancampfort et al., 2018). Worldwide, urban dwellers who experience poverty tend to be sleep deprived (Bessone et al., 2021).

With sleep, as with waking behavior, biology and environment interact. Thanks to modern lighting, shift work, and media diversions, many who might have gone to bed at 9:00 P.M. in days past are now up until 11:00 P.M. or later.

Whether for work or play, bright light tweaks the circadian clock by activating light-sensitive retinal proteins. These proteins control the circadian clock by triggering signals to the brain's **suprachiasmatic nucleus (SCN)**—a pair of grain-of-rice-sized, 10,000-cell clusters in the hypothalamus (**FIGURE 9.5**). The SCN does its job partly by causing the brain's pineal gland to decrease its production of the sleep-promoting hormone *melatonin* in the morning and to increase it in the evening (Chang et al., 2015; Gandhi et al., 2015). (A 2017 Nobel Prize was awarded for research on the molecular biology that runs our biological clock.)

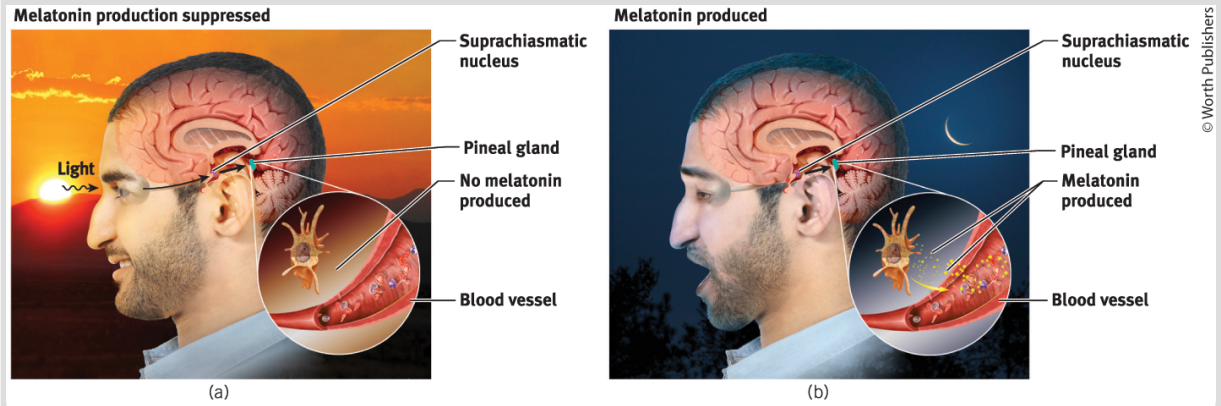


FIGURE 9.5 The biological clock (a) Light striking the retina signals the suprachiasmatic nucleus (SCN) to suppress the pineal gland's production of the sleep hormone melatonin. (b) At night, the SCN quiets down, allowing the pineal gland to release melatonin into the bloodstream.

Being bathed in (or deprived of) light disrupts our 24-hour biological clock (Czeisler et al., 1999; Dement, 1999). Night-shift workers may experience a chronic state of *desynchronization.* As a result, they become more likely to develop fatigue, stomach problems, heart disease, and cancer (Garcia-Saenz et al., 2018; Knutsson & Bøggild, 2010; Lin et al., 2015; Maria et al., 2020; Puttonen et al., 2009).

Our ancestors' body clocks were attuned to the rising and setting Sun of the 24-hour day, leading them to get more sleep during the dark winter months and less during the sunny summer months (van Egmond et al., 2019). Today's young adults adopt something closer to a 25-hour day, by staying up too late to get 8 hours of sleep. Approximately 90 percent of Americans report using a light-emitting electronic device 1 hour before going to sleep (Chang et al., 2015). Such artificial light delays sleep and affects sleep quality. For college

students in one study, staying up late engaged with digital entertainment interfered with the onset, quality, and duration of their sleep (Exelmans & Van den Bulck, 2018). Streaming disrupts dreaming.



Sleep often eludes those who stay up late and sleep in on weekends, then go to bed earlier on Sunday evening in preparation for the week ahead (Oren & Terman, 1998). Like New Yorkers readjusting after a trip to California, they experience a kind of jet lag. For North Americans who fly to Europe and need to be up when their circadian rhythm cries *"SLEEP,"* bright light (spending the next day outdoors) helps reset the biological clock (Czeisler et al., 1986, 1989; Eastman et al., 1995).

Circadian disadvantage: Major League Baseball, National Basketball Association, and National Hockey League teams crossing three time zones have a nearly 60 percent

chance of losing their next game (Roy & Forest, 2018; Winter et al., 2009).

Ask Yourself

How does your need for sleep compare with that of others you know? Do you see age-related differences among your friends and family?

Retrieval Practice

RP-4 The _____ nucleus helps monitor the brain's release of melatonin, which affects our _____ rhythm.

ANSWERS IN APPENDIX E

Why Do We Sleep?

LOQ 9-5

What are sleep's functions?

So, our sleep patterns differ from person to person and from culture to culture. But why do we have this need for sleep? Psychologists offer five possible reasons:

1. ***Sleep protects.*** When darkness shut down the day's hunting, gathering, and travel, our distant ancestors were better off asleep

in a cave, out of harm's way. Those who didn't wander around dark cliffs were more likely to leave descendants. This fits a broader principle: A species' sleep pattern tends to suit its ecological niche (Siegel, 2009). Animals with the greatest need to graze and the least ability to hide tend to sleep less. Animals also sleep less, with no ill effects, during times of mating and migration (Siegel, 2012). (For a sampling of animal sleep times, see **FIGURE 9.6**.)

2. ***Sleep helps us recuperate.*** Sleep gives our body and brain the chance to repair, rewire, and reorganize. It helps the body heal from infection and restores the immune system (Dimitrov et al., 2019; Walker, 2007). Sleep gives resting neurons time to repair themselves, while pruning or weakening unused connections (Ascády & Harris, 2017; Ding et al., 2016; Li et al., 2017). Bats and other animals with high waking metabolism burn a lot of calories, producing *free radicals,* molecules that are toxic to neurons. Sleep sweeps away this toxic waste along with protein fragments that for humans can cause Alzheimer's disease (Beil, 2018; Lewis, 2021). Imagine that when consciousness leaves your house, a cleanup crew comes in and says, "Good night. Sleep tidy."
3. ***Sleep helps restore and rebuild our fading memories of the day's experiences.*** Our memories are *consolidated* during slow-wave deep sleep by replaying recent learning and strengthening neural connections (Paller & Oudiette, 2018; Todorova & Zugaro, 2019; Walker, 2010). Sleep reactivates recent experiences stored in the hippocampus and shifts them for permanent storage elsewhere in the cortex (Girardeau & Lopes-dos-Santos, 2021; Ikegaya &

Matsumoto, 2019). Adults and children trained to perform tasks therefore recall them better after a night's sleep, or even after a short nap, than after several hours awake (He et al., 2020; Seehagen et al., 2015; Werchan et al., 2021). When sleep deprived, people learn and remember less (Newbury et al., 2021). Older adults' more frequently disrupted sleep also disrupts their memory consolidation (Boyce et al., 2016; Pace-Schott & Spencer, 2011).

4. ***Sleep feeds creative thinking.*** Dreams can inspire noteworthy artistic and scientific achievements, such as the dreams that inspired novelist Stephanie Meyer to write the first book in the *Twilight* series (CNN, 2009) and inspired medical researcher Carl Alving (2011) to invent the vaccine patch. More commonplace is the boost that a complete night's sleep gives to our thinking and learning. After working on a task, then sleeping on it, people solve difficult problems more insightfully than do those who stay awake (Barrett, 2011; Sio et al., 2013). They also are better at spotting connections among novel pieces of information (Ellenbogen et al., 2007; Whitehurst et al., 2016). To think smart and see connections, it often pays to ponder a problem just before bed and then sleep on it.
5. ***Sleep supports growth.*** During slow-wave sleep, which occurs mostly in the first half of a night's sleep, the pituitary gland releases a human growth hormone that is necessary for muscle development.

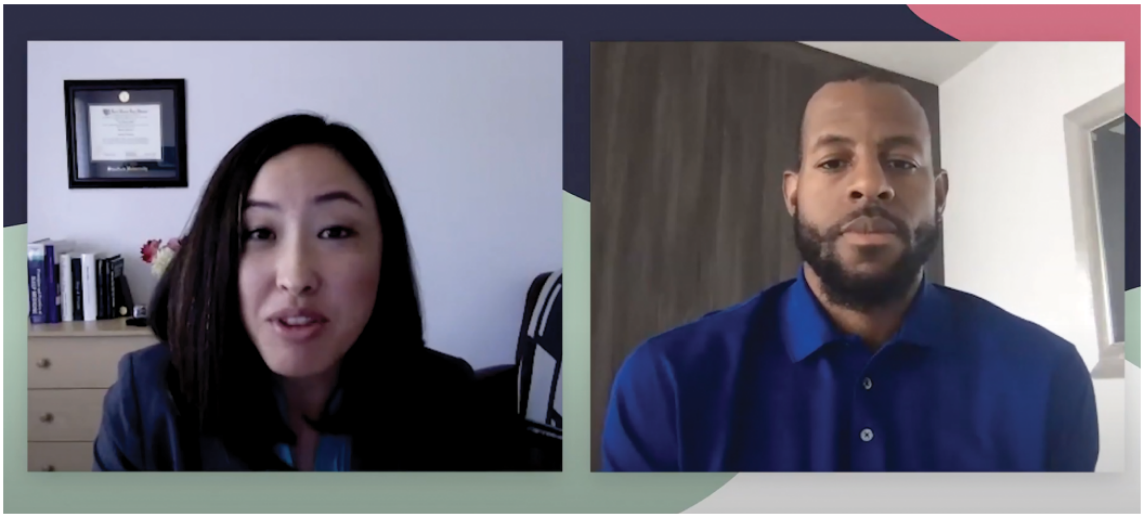


Left to right: Kruglov_Orda/Shutterstock; Andrew D. Myers; Utekhina Anna/Shutterstock; Steffen Foerster/Shutterstock; RubberBall Productions/Getty Images; Eric Isselee/Shutterstock; pandapaw/Shutterstock

FIGURE 9.6 Animal sleep time Would you rather be a brown bat that sleeps 20 hours a day or a giraffe that sleeps 2 hours a day? (Data from NIH, 2010.)

> **"Remember to sleep because you have to sleep to remember."** — James B. Maas and Rebecca S. Robbins, *Sleep for Success,* 2010

A regular full night's sleep can "*dramatically* improve your athletic ability," report James Maas and Rebecca Robbins (2010). REM sleep and N2 sleep—which occur mostly in the final hours of a long night's sleep—help strengthen the neural connections that build enduring memories, including the "muscle memories" learned while practicing tennis or shooting baskets. Sleep scientist Cheri Mah and her colleagues (2011) advise athletes on how to build sleep into their training. She helped professional basketball player Andre Iguodala to transform himself from an afternoon-napping, late-night videogamer into someone with healthy sleep habits (Gonzalez, 2018). The result? Iguodala played more minutes, shot more effectively, and received the 2015 National Basketball Association Finals Most Valuable Player award. Given all the benefits of sleep, it's no wonder that sleep loss hits us so hard.



How to sleep like an MVP Sleep scientist Cheri Mah and NBA star Andre Iguodala have spoken to many groups about his sleep success story, including remotely for this Time for Health Talk.

Retrieval Practice

RP-5 What are five proposed reasons for our need for sleep?

ANSWERS IN APPENDIX E

Sleep Deprivation and Sleep Disorders

LOQ 9-6

How does sleep loss affect us, and what are the major sleep disorders?

When our body yearns for sleep but does not get it, we begin to feel terrible. Trying to stay awake, we will eventually lose. The longer

we're awake, the more the inescapable drive to sleep beckons us. Even when sleep seems elusive, it ultimately finds us. In the tiredness battle, sleep always wins.

Effects of Sleep Loss

Modern sleep patterns—the "Great Sleep Recession"—leave us not only sleepy but drained of energy and our sense of well-being (Keyes et al., 2015; Thorarinsdottir et al., 2019). After several 5-hour short sleeping nights, we accumulate a sleep debt that cannot be satisfied by one long sleep. "The brain keeps an accurate count of sleep debt for at least two weeks," reported sleep researcher William Dement (1999, p. 64).

Obviously, then, we need sleep. Allowed to sleep unhindered, most adults paying off a sleep debt will sleep at least 9 hours a night (Coren, 1996). One experiment demonstrated the benefits of unrestricted sleep by having volunteers spend 14 hours daily in bed for at least a week. For the first few days, the volunteers averaged 12 hours of sleep or more per day, apparently paying off a sleep debt that averaged 25 to 30 hours. That accomplished, they settled back to 7.5 to 9 hours nightly and felt energized and happier (Dement, 1999).

College and university students are especially sleep deprived; 69 percent in one U.S. survey reported "feeling tired" or "having little energy" on at least several days during the previous 2 weeks (AP, 2009). One in four Chinese university students has serious sleep problems (L. Li et al., 2018). And 75 percent of U.S. high school

students report getting fewer than 8 hours nightly, with 28 percent admitting they fall asleep in class at least once a week (CDC, 2019; NSF, 2006). The going needn't get boring before students start snoring.

Sleep loss affects our mood. Tiredness triggers testiness—less sleep predicts more anger (Keller et al., 2019; Krizan & Hisler, 2019). On the days after U.S. President Donald Trump was tweeting during the night, his interviews and speeches were three times more likely to display anger (Almond & Du, 2020).

Depression disrupts sleep, but sleep disturbance also contributes to depression (Plante, 2021). Sleep deprivation makes us more vulnerable to mood disruption and intrusive negative memories (Fang et al., 2021; Harrington et al., 2021). Studies show that sleep loss not only increases teens' fatigue but also depresses their mood and aggravates their sense of worthlessness—and (good news) that sleep improvements "alleviate depression symptoms" (Gradisar et al., 2022). Among a half million people from China, those who slept 5 or fewer hours a night had a more than doubled rate of depression (Sun et al., 2018). Modern psychological treatments now focus on treating sleep difficulties to help lessen depression (Kaplan, 2020).

When youth are followed through time, sleep loss predicts depression (Gregory et al., 2009). For people at risk for suicide, a night of poor sleep increases their next-day suicidal thinking (Littlewood et al., 2019).

But there is hope: In particular, REM sleep's processing of emotional experiences helps protect against depression (Walker & van der Helm, 2009). Later secondary school start times consistently produce more sleep, better and more on-time attendance, and less negative mood (Morgenthaler et al., 2016; Yip et al., 2022). When Minneapolis/St. Paul high schools shifted to an hour-later start time, students stayed up no later—and thus got more sleep (Berry et al., 2021). And when the Seattle School District moved secondary school start times about an hour later, the results were clear: more sleep and better grades (Dunster et al., 2018). The same applies to later-starting Italian high school students (Alfonsi et al., 2020). The American Academy of Pediatrics recommends that middle and high schools start at 8:30 A.M. or later—which, alas, only 7 percent of U.S. high schools do (CDC, 2020). Other sleep experts advocate year-round standard time: better to align students' body clocks with the sun than to awaken to the dark mornings of early spring daylight savings time (Turgeon & Wright, 2022). As sleep experts Michael Grandner and Fabian-Xosé Fernandez (2021) concluded, sleep is a "major contributor" to our health and exerts a "tremendous influence on our well-being."

Lack of sleep can also make you gain weight. Sleep deprivation messes with our hormones, our metabolism, and our brain's responses to food by

- increasing *ghrelin,* a hunger-arousing hormone, and decreasing its hunger-suppressing partner, *leptin* (Shilsky et al., 2012).

- increasing *cortisol,* a stress hormone that stimulates the body to make fat, and decreasing metabolic rate (Potter et al., 2017; Schmid et al., 2015).
- disrupting gene expression, which increases risk for heart disease and other negative health outcomes (Möller-Levet et al., 2013; Mure et al., 2018).
- enhancing limbic brain responses to the mere sight of food and decreasing cortical responses that help us resist temptation (Benedict et al., 2012; Greer et al., 2013; St-Onge et al., 2012).

Thus, children and adults who sleep less are heavier than average, and in recent decades people have been sleeping less and weighing more (Hall et al., 2018; M. Miller et al., 2018). Moreover, experimental sleep deprivation increases appetite and junk food eating; our tired brain finds fatty foods more enticing (Fang et al., 2015; Rihm et al., 2019). So, sleep loss may help explain the weight gain common among sleep-deprived college students (Hull et al., 2007).

Short sleep short-circuits our body's immune system. When we get sick, we typically sleep more, boosting our immune cells. Sleep deprivation can suppress immune cells that battle viral infections and cancer (Opp & Krueger, 2015). One experiment exposed volunteers to a cold virus. Those who averaged less than 5 hours sleep a night were 4.5 times more likely to develop a cold than were those who slept more than 7 hours a night (Prather et al., 2015). Sleep-deprived people's vulnerability to illness helps explain a recent Gallup survey finding: Self-described poor sleepers reported 2.3 unplanned missed

workdays in the past month—more than double that of other workers (Witters & Agrawal, 2022).

Short sleep can also shorten our lives. Sleep's protective effect may help explain why people who sleep 7 to 8 hours a night tend to outlive those who are chronically sleep deprived (Dew et al., 2003; Parthasarathy et al., 2015; Scullin & Bliwise, 2015). When sustained, sleep deprivation produces brain cell death in mice and increased risk of human brain disorders such as neurocognitive disorder (Sabia et al., 2021; Zamore & Veasey, 2022).

Although short-term sleep deprivation does not injure the brain, it does slow reactions and increase errors on visual attention tasks similar to those involved in screening airport baggage, performing surgery, and reading X-rays (Caldwell, 2012; Lim & Dinges, 2010).

For many North Americans, a semi-annual sleep-manipulation experiment is the "spring forward" to daylight saving time and "fall back" to standard time. A review of millions of Canadian and U.S. records revealed that accidents increased immediately after the spring-forward time change, which shortens sleep (Fritz et al., 2020; Kolla et al., 2020; **FIGURE 9.7**). While it seems like a minor annoyance, the 1-hour time change shift associated with daylight savings has been linked with a 24 percent increase in heart attacks the following day (Sandhu et al., 2014).

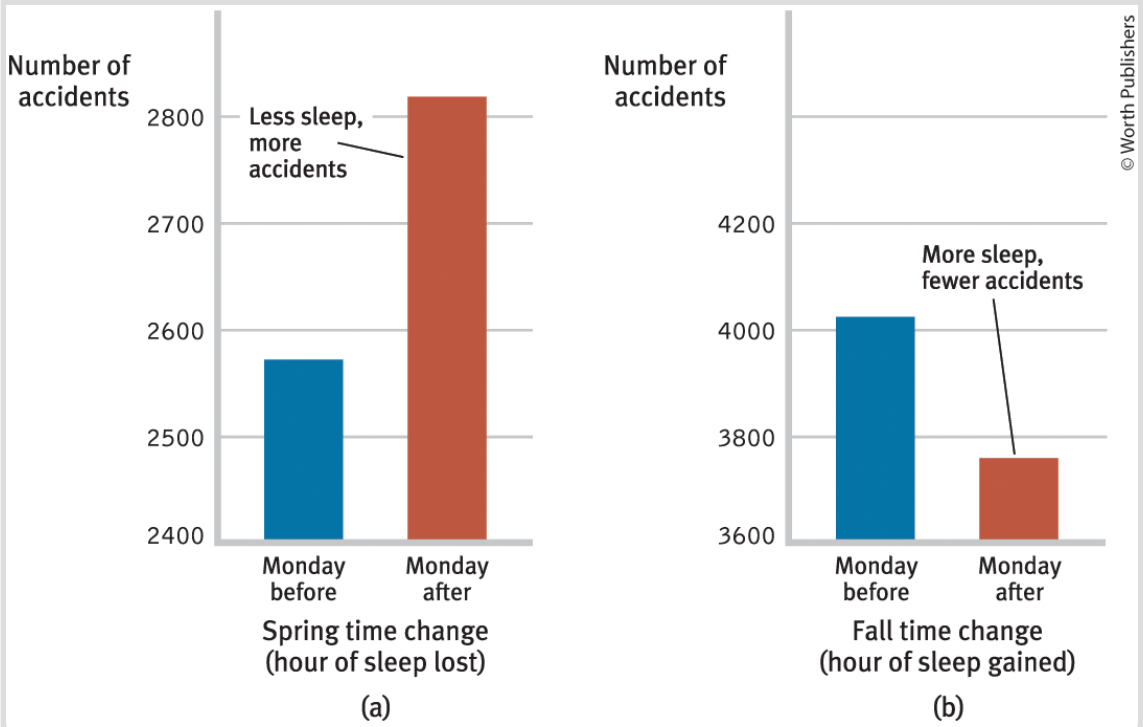


FIGURE 9.7 Less sleep = more accidents (a) On the Monday after the spring time change, when people lose 1 hour of sleep, accidents increased, as compared with the Monday before. (b) In the fall, traffic accidents typically increase because of more snow, ice, and darkness, but they diminished after the time change. (Data from Coren, 1996.)

FIGURE 9.8 summarizes the effects of sleep deprivation. But there is good news! Psychologists have discovered a treatment that strengthens memory, increases concentration, boosts mood, moderates hunger, reduces obesity, fortifies the immune system, improves school performance, and lessens the risk of fatal accidents. Even better news: The treatment feels good, can be self-administered, and is free! If you are a typical college or university student, you might feel trapped in a cycle of sleeplessness. Stress—from school, work, and life generally—might make adequate sleep seem like a luxury. If,

for example, you experienced discrimination today, you might struggle to sleep (Fuller-Rowell et al., 2021; Yip et al., 2020). But one night this week, try to add 15 minutes to your sleep. Until you feel more rested and less like a zombie, try adding more sleep as often as you can. For some additional tips on getting better quality sleep, see TABLE 9.1.

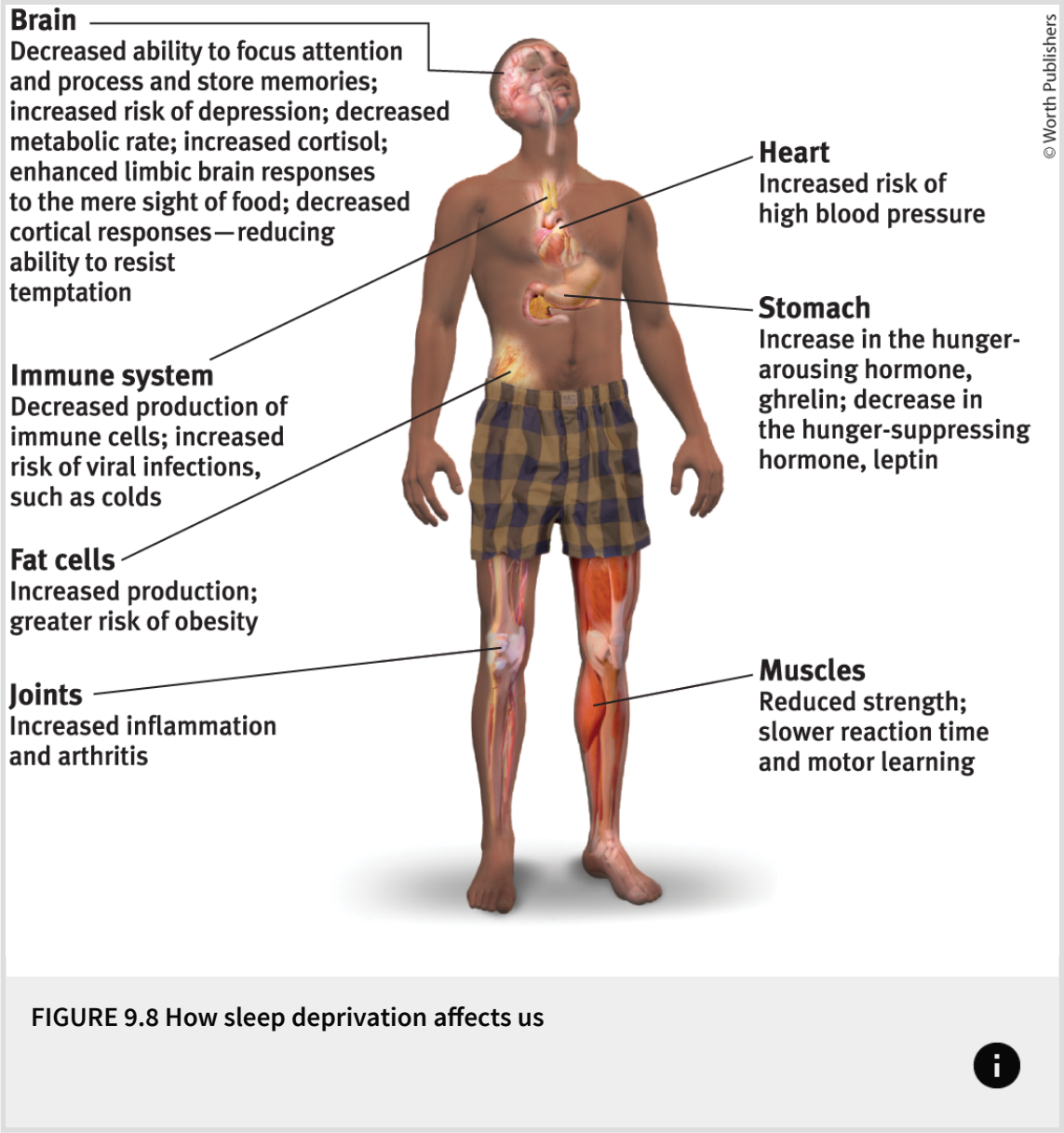


FIGURE 9.8 How sleep deprivation affects us

TABLE 9.1 How to Improve Your Sleep

Better sleep requires a good sleep routine. Here are some tips for improving yours.

- ***Avoid arousing activities, foods, and beverages before bedtime.*** Exercise regularly but not in the late evening—late afternoon is best (Lowe et al., 2019). Avoid caffeine after the early afternoon, and avoid food and drink near bedtime.
- ***Go to the dark side of the room (when sleeping).*** Darkness increases production of the sleep-promoting hormone melatonin. Turn off the lights when you sleep, and avoid bright lights or screens an hour before bedtime. Wear a sleep mask to cover your eyes if there is light you can't control. Consider ear plugs if you can't control noise.
- ***Rise, rest, repeat.*** Wake up and go to bed at the same time, even on weekends and holidays. Use reminders on your phone to stay on schedule both for waking and for getting ready for bed. Patterns yield payoffs. Just say no to naps (Jansson-Fröjmark et al., 2019).
- ***Keep it cool.*** Your body and brain sleep better when it is cooler. Aim for a temperature around 65 degrees F (18 degrees C). Use lighter blankets and bedtime clothing when it's a hot night.
- ***Don't worry.*** Reassure yourself that temporary sleep loss happens, and it's normal to struggle to sleep sometimes. Try not to overthink your sleep, because doing so might keep you awake (Baron et al., 2017).
- ***Embrace a wind down routine.*** Try to relax at least a half-hour before your bedtime. Winding down helps your mind and body calm down before falling asleep. Focus your mind on nonarousing thoughts, such as a relaxing hobby (Gellis et al., 2013).
- ***Don't stay in bed awake.*** Your bed is meant for sleep. If you really can't sleep, get out of bed and go to another room. Come back when you are ready to fall asleep.
- ***Manage stress.*** Realize that for any stressed organism, being vigilant is natural and adaptive. Less stress = better sleep.



Brendan Loper/Cartoon Stock

"Wow, it's only 11:30, that still leaves time for me to ruin tomorrow by staying up doing nothing on the internet."

Ask Yourself

What have you learned about sleep that you could apply to yourself?

Major Sleep Disorders

An occasional loss of sleep is nothing to worry about. But for those who have a major sleep disorder—**insomnia**, **narcolepsy**, **sleep apnea**, **REM sleep behavior disorder**, sleepwalking *(somnambulism),* sleeptalking, or **night terrors**—trying to sleep can be a nightmare. (See **TABLE 9.2** for a summary of these disorders.)

TABLE 9.2 Sleep Disorders

Disorder	Rate	Description	Effects
Insomnia	1 in 5 adults (based on past year's symptoms)	Ongoing difficulty falling or staying asleep.	Chronic tiredness, increased risk of depression, obesity, hypertension, and arthritic and fibromyalgia pain (Olfson et al., 2018).
Narcolepsy	1 in 2000 adults	Sudden attacks of overwhelming sleepiness.	Risk of falling asleep at a dangerous moment. Narcolepsy attacks usually last less than 5 minutes, but they can happen at the worst and most emotional times. Everyday activities, such as driving, require extra caution.
Sleep apnea	1 in 20 adults	Stopping breathing repeatedly while sleeping.	Fatigue and depression as a result of slow-wave sleep deprivation. Associated with obesity, especially among men.
REM sleep behavior disorder	1 in 100 adults; 2 in 100 older adults (APA, 2022)	Dream-enacting behaviors—loud, sometimes profane vocalizations and dramatic motor behaviors during REM sleep	May cause serious injury to self or bed partner, and associated distress and embarrassment.
Sleepwalking and sleeptalking	1–15 in 100 in the general population for sleepwalking (NSF, 2020); about	Doing regular waking activities (sitting up, walking, speaking) while asleep.	Few serious concerns. Sleepwalkers return to their beds on their own or with the help of a family

	half of young children for sleeptalking (Reimão & Lefévre, 1980)	Sleeptalking can occur during any sleep stage. Sleepwalking happens in N3 sleep.	member, rarely remembering their trip the next morning.
Night terrors	1 in 100 adults; 1 in 30 children	Appearing terrified, talking nonsense, sitting up, or walking around during N3 sleep; different from nightmares.	Doubling of a child's heart and breathing rates during the attack. Luckily, children remember little or nothing of the fearful event the next day. As people age, night terrors become increasingly rare.

About 1 in 5 adults have insomnia—persistent problems in either falling or staying asleep (Irwin et al., 2006; Sivertsen et al., 2020). The result is tiredness and increased risk of depression (Baglioni et al., 2016). Sleep researcher Wilse Webb (1992) likened sleep to love or happiness: "If you pursue it too ardently it will elude you." But from middle age on, awakening occasionally during the night becomes the norm, not something to fret over or treat with medication (Vitiello, 2009).

Ironically, insomnia becomes worse when we fret about it. In laboratory studies, people with insomnia do sleep less than others. But even they typically overestimate how long it takes them to fall asleep and underestimate how long they actually have slept (te Lindert et al., 2020). Even if we have been awake only an hour or two,

we may *think* we have had very little sleep because it's the waking part we remember.

The most common quick fixes for true insomnia, sleeping pills and alcohol, typically aggravate the problem by reducing REM sleep, causing concentration and memory problems, and leaving the person with next-day blahs. Such aids can also lead to *tolerance*—a state in which increasing doses are needed to produce an effect. Better to visit a sleep specialist to obtain a healthy long-term treatment plan.

Retrieval Practice

RP-6 A well-rested person would be more likely to have _____ (trouble concentrating/quick reaction times) and a sleep-deprived person would be more likely to _____ (gain weight/fight off a cold).

ANSWERS IN APPENDIX E

Dreams

LOQ 9-7

What do we dream, and what functions have theorists proposed for dreams?

Now playing at an inner theater near you: the premiere of a sleeping person's vivid dream. This never-before-seen mental movie features captivating characters wrapped in a plot so original and unlikely, yet

so intricate and so seemingly real, that the viewer later marvels at its creation.

REM **dreams** are vivid, emotional, and often bizarre (Loftus & Ketcham, 1994). Waking from one, we may wonder how our brain can so creatively, colorfully, and completely construct this alternative world. In the shadowland between our dreaming and waking consciousness, we may even wonder for a moment which is real. Awakening from a nightmare, a 4-year-old may be sure there is a bear in the house.

Discovering the link between REM sleep and dreaming began a new era in dream research. Instead of relying on someone's hazy recall hours later, researchers could catch dreams as they happened, awakening people during or shortly after a REM sleep period to hear a vivid account.

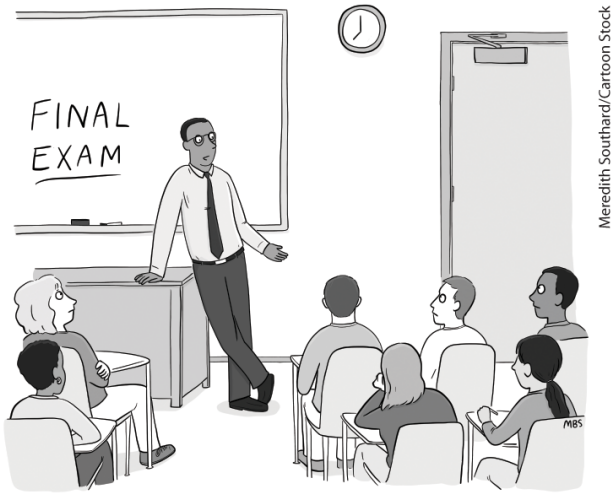
What We Dream

Most of the dreams we can remember are anything but sweet. For women and men, 8 in 10 reported dreams are marked by at least one negative event or emotion (Domhoff, 2007). Common themes include repeatedly failing in an attempt to do something; being attacked, pursued, or rejected; or experiencing misfortune (Hall et al., 1982). Most people experience erotic dreams, but less often than you might think (Van den Bulck et al., 2016). In one study, only 1 in 10 reported dreams among young men and 1 in 30 among young women had sexual content (Domhoff, 1996).

More commonly, a dream's story line incorporates traces of previous days' nonsexual experiences and preoccupations (Nikles et al., 2017):

- ***Trauma and dreams*** After suffering a trauma, people commonly report nightmares, which help extinguish daytime fears (Petrov & Robinson, 2020). Auschwitz concentration camp inmates, Palestinian children living amid conflict, and people living in the United States after the 9/11 terrorist attacks all have experienced frequent trauma-related dreams (Owczarski, 2018; Propper et al., 2007; Punamäki & Joustie, 1998).
- ***Music and dreams*** Compared with nonmusicians, musicians report twice as many dreams of music (Uga et al., 2006). For many, listening to music before bed can produce an "earworm"—a tune that sticks and replays in the mind when trying to sleep (Scullin et al., 2021).
- ***Vision loss and dreams*** Studies in four countries have found people who are blind mostly dreaming of using their nonvisual senses (Buquet, 1988; Taha, 1972; Vekassy, 1977). But even people born blind sometimes "see" in their dreams (Bértolo, 2005). Likewise, people born paralyzed below the waist sometimes dream of walking, standing, running, or cycling (Saurat et al., 2011; Voss et al., 2011).
- ***Media experiences and dreams*** In a study of 1287 Turkish people, participants who reported viewing violent media during daytime hours tended to have violent dreams, and those who reported viewing sexual media tended to have sexual dreams (Van den Bulck et al., 2016).

Our two-track mind continues to monitor our environment while we sleep. Sensory stimuli—a particular odor or a phone's chime—may be instantly and ingeniously woven into the dream story itself. In a classic experiment, researchers lightly sprayed cold water on dreamers' faces (Dement & Wolpert, 1958). Compared with sleepers who did not get the cold-water treatment, these people were more likely to dream about a waterfall, a leaky roof, or even about being sprayed by someone.



"I'd like to extend a special welcome to those of you who are joining us for the first time, as part of a nightmare you're having."

Sleeping superstition: If you dream you are falling and hit the ground, or if you dream of dying, you die. Unfortunately, those who could confirm these ideas are not around to do so. Many people, however, have had such dreams and are alive to report them.

So, could we learn a foreign language by hearing it played while we sleep? If only! While sleeping, we can learn to associate a sound with a mild electric shock (and to react to the sound accordingly). We can also learn to associate a particular sound with a pleasant or unpleasant odor (Arzi et al., 2012). But we do not remember recorded information played while we are soundly asleep (Eich, 1990; Wyatt & Bootzin, 1994). In fact, anything that happens during the moments before we fall asleep is typically lost from memory (Roth et al., 1988). This explains why sleep apnea patients, who repeatedly awaken with a gasp and then immediately fall back to sleep, do not recall the episodes. Ditto someone who awakens momentarily, sends a text message, and the next day can't remember doing so. It also explains why dreams that momentarily awaken us are mostly forgotten by morning. To remember a dream, get up and stay awake for a few minutes.

Why We Dream

Dream theorists have proposed several explanations of why we dream, including these:

Freud's Wish Fulfillment Theory

Sigmund Freud considered dreams the key to understanding our inner conflicts. He proposed that dreams provide a psychic safety valve that discharges otherwise unacceptable feelings. He viewed a dream's **manifest content** (the apparent and remembered story line) as a censored, symbolic version of its **latent content**, the unconscious

drives and wishes (often erotic) that would be threatening if expressed directly. However, modern psychologists largely disregard Freud's dream theory. "There is no reason to believe any of Freud's specific claims about dreams and their purposes," observed dream researcher William Domhoff (2003).

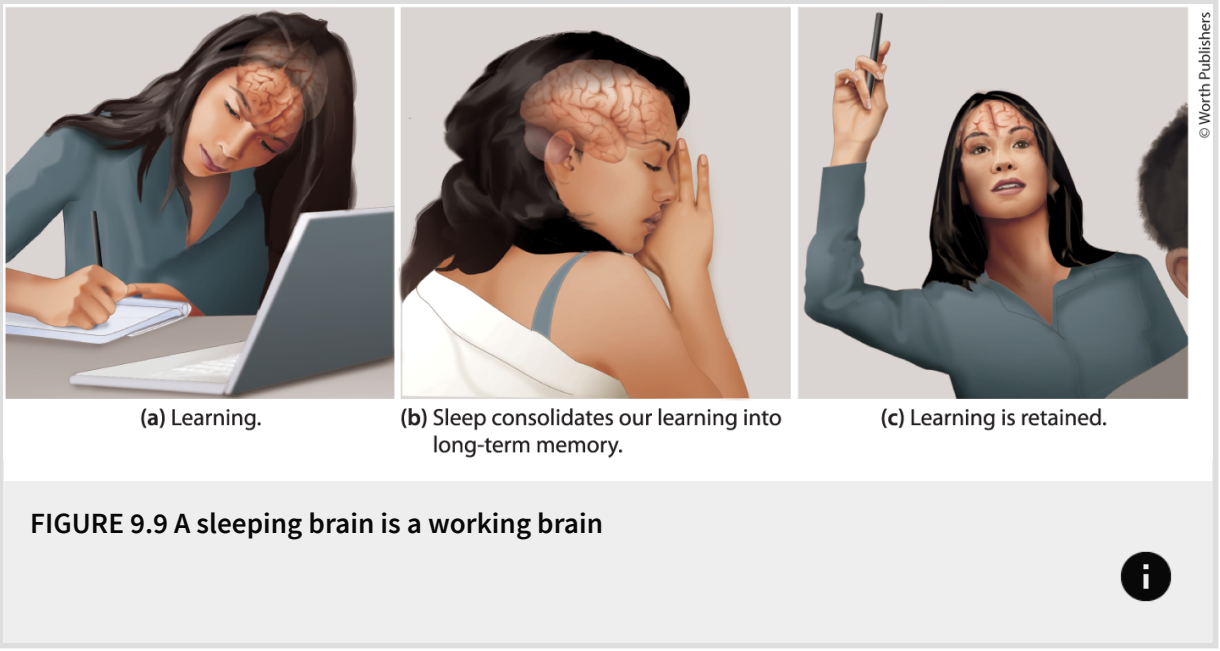
Information-Processing Theory

The *information-processing* perspective proposes that dreams help sift, sort, and fix the day's experiences in our memory. In contrast to Freud's theories, there is research that supports this view. When tested the day after learning a task, those deprived of both slow-wave and REM sleep did not do as well as those who had slept undisturbed (Zadra & Stickgold, 2021). Other studies have shown similar memory lapses for new material among people awakened every time they began REM sleep (Empson & Clarke, 1970; Karni & Sagi, 1994).

Brain scans confirm the link between REM sleep and memory. The brain regions that were active as rats learned to navigate a maze, or as people learned to perform a visual-discrimination task, became active again later during REM sleep (Louie & Wilson, 2001; Maquet, 2001). So precise were these activity patterns that scientists could tell where in the maze the rat would be if awake. To sleep, perchance to remember.

This is important news for students, many of whom are sleep deprived on weekdays and binge sleep on the weekend (Stickgold, 2000). High school students with high grades sleep more than their lower-achieving classmates (Wolfson & Carskadon, 1998; see **FIGURE 9.9**).

Sacrificing sleep time to study actually *worsens* academic performance, by making it harder the next day to understand class material or do well on a test (Gillen-O'Neel et al., 2013). When one psychology professor challenged students to sleep at least 8 hours each night during final exams week, those who completed the challenge earned higher final exam grades than those who did not (Scullin, 2019). *The bottom line:* Sleep better to perform better.



(a) Learning.

(b) Sleep consolidates our learning into long-term memory.

(c) Learning is retained.

FIGURE 9.9 A sleeping brain is a working brain

Neurocognitive Function Theory

Perhaps dreams, or the brain activity associated with REM sleep, serve a *neurocognitive* function, providing the sleeping brain with an opportunity to consolidate memories and process emotional information (Walker & van der Helm, 2009). Researchers have found that infants, whose neural networks are fast developing and rapidly

processing new emotional events, spend much of their abundant sleep time in REM sleep (FIGURE 9.10).

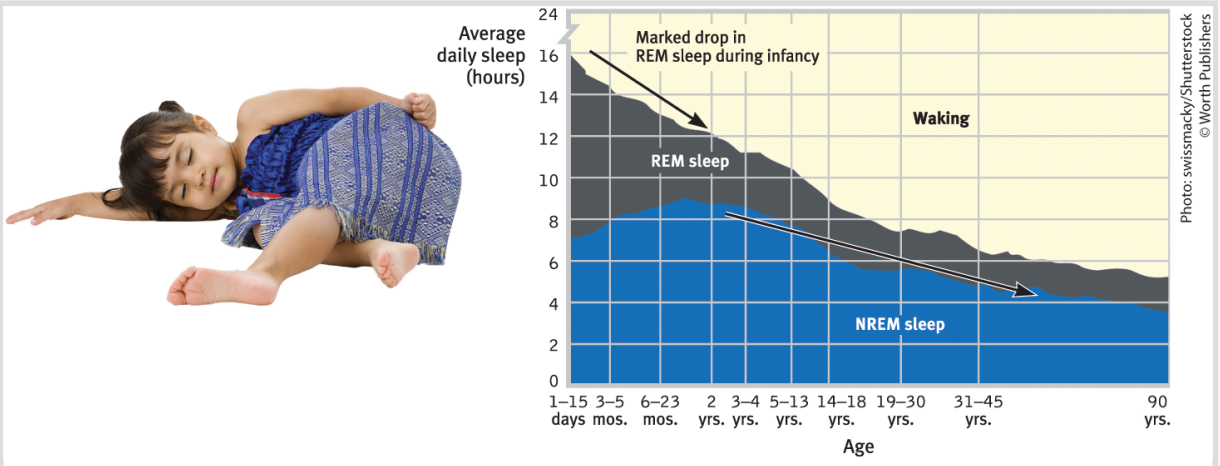


FIGURE 9.10 Sleep across the life span As we age, our sleep patterns change. During infancy and our first 2 years, we spend progressively less time in REM sleep. During our first 20 years, we spend progressively less time asleep. (Data from Snyder & Scott, 1972.)

Rapid eye movements also stir the liquid behind the cornea; this delivers fresh oxygen to corneal cells, preventing their suffocation.

Activation-Synthesis Theory

Other researchers propose that dreams erupt from *neural activation* spreading upward from the brainstem (Antrobus, 1991; Hobson, 2009). According to the *activation-synthesis theory,* dreams are the brain's attempt to synthesize random neural activity. Much as a neurosurgeon can produce hallucinations by stimulating different parts of a patient's

cortex, so can stimulation originating within the brain. PET scans of sleeping people also reveal increased activity in the emotion-related limbic system (in the amygdala) during emotional dreams (Schwartz, 2012). In contrast, frontal lobe regions responsible for inhibition and logical thinking seem to idle, which may explain why we are less inhibited when dreaming than when awake (Maquet et al., 1996). Add the limbic system's emotional tone to the brain's visual bursts and—voila!—we dream. Damage either the limbic system or the visual centers active during dreaming, and dreaming itself may be impaired (Domhoff, 2003).

Cognitive Development Theory

Some dream researchers focus on dreams as part of brain maturation and cognitive development (Domhoff, 2010, 2011; Foulkes, 1999). For example, prior to age 9, children's dreams seem more like a slide show and less like an active story in which the dreamer is an actor. Dreams overlap with waking cognition and they feature coherent speech. They *simulate reality* by drawing on our concepts and knowledge. They engage brain networks that also are active during daydreaming—and so may be viewed as intensified mind-wandering, enhanced by visual imagery (Fox et al., 2013). Unlike the idea that dreams arise from bottom-up brain activation, the cognitive perspective emphasizes our mind's top-down control of our dream content (Nir & Tononi, 2010). "[Dreams] dramatize our wishes, fears, concerns, and interests in striking scenarios that we experience as real events" (Domhoff, 2014).

Question: Does eating spicy foods cause us to dream more?
Answer: No, but a spicy food that causes you to awaken more increases your chance of *recalling* a dream (Moorcroft, 2003).

TABLE 9.3 compares these major dream theories. Although today's sleep researchers debate dreams' function—and some are skeptical that dreams serve any function—there is one thing they agree on: We need REM sleep. Deprived of it by repeated awakenings, people return more and more quickly to the REM stage after falling back to sleep. When finally allowed to sleep undisturbed, they literally sleep like babies—with increased REM sleep, a phenomenon called **REM rebound**. Most other mammals also experience REM rebound, suggesting that the causes and functions of REM sleep are deeply biological. (That REM sleep occurs in mammals—and not in animals such as fish, whose behavior is less influenced by learning—fits the information-processing theory of dreams.)

TABLE 9.3 Dream Theories

Theory	Explanation	Critical Considerations
Freud's wish fulfillment	Dreams provide a "psychic safety valve"—expressing otherwise unacceptable feelings; dreams contain manifest (remembered) content and a deeper layer of latent content (a hidden meaning).	Lacks any scientific support; dreams may be interpreted in many different ways.
Information processing	Dreams help us sort out the day's events and consolidate our memories.	But why do we sometimes dream about things we have

		not experienced and about past events?
Neurocognitive function	REM sleep allows the brain to consolidate memories and process emotional information.	This does not explain why we experience *meaningful* dreams.
Activation synthesis	REM sleep triggers neural activity that evokes random visual memories, which our sleeping brain weaves into stories.	The individual's brain is weaving the stories, which still tells us something about the dreamer.
Cognitive development	Dream content reflects dreamers' level of cognitive development—their knowledge and understanding. Dreams simulate our lives, including worst-case scenarios.	Does not propose an adaptive function of dreams.

So, does this mean that because dreams serve physiological functions and support our cognition, they are psychologically meaningless? Not necessarily. Every psychologically meaningful experience involves an active brain. We are once again reminded of a basic principle: *Biological and psychological explanations of behavior work together to help us understand our experiences.*

Ask Yourself

Which explanation for why we dream makes the most sense to you? How well does it explain your own dreams?

Retrieval Practice

RP-7 What are five theoretical explanations for why we dream?

ANSWERS IN APPENDIX E

REVIEW

Module 9: Sleep and Dreams

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 9-1: What is *sleep?*

LOQ 9-2: How do our biological rhythms influence our daily functioning?

LOQ 9-3: What is the biological rhythm of our sleeping and dreaming stages?

LOQ 9-4: How do biology and environment interact in our sleep patterns?

LOQ 9-5: What are sleep's functions?

LOQ 9-6: How does sleep loss affect us, and what are the major sleep disorders?

LOQ 9-7: What do we dream, and what functions have theorists proposed for dreams?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

sleep
circadian [ser-KAY-dee-an] rhythm
REM sleep
alpha waves
hallucinations
delta waves
suprachiasmatic nucleus (SCN)
insomnia
narcolepsy
sleep apnea
REM sleep behavior disorder
night terrors
dream
manifest content

latent content

REM rebound

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. Our body temperature tends to rise and fall in sync with a biological clock, which is referred to as the _____ _____.

2. During the N1 sleep stage, a person is most likely to experience
   a. sleep spindles.
   b. hallucinations.
   c. night terrors or nightmares.
   d. rapid eye movements.

3. The brain emits large, slow delta waves during _____ sleep.

4. As the night progresses, what happens to the REM stage of sleep?

MODULE 10: Drugs and Consciousness

Mood- and perception-altering psychoactive drugs affect our state of consciousness and may even lead to substance use disorders.

Tolerance and Addiction in Substance Use Disorders

LOQ 10-1

What are *substance use disorders?*

Let's imagine a day in the life of a make-believe drug-using student. It begins with a few cups of coffee to feel alert, then Adderall to help focus on a morning lecture. At midday, an energy drink offsets post-lunch drowsiness, and a little vaping calms frazzled nerves before a class presentation. An after-dinner study session means another Adderall, followed by marijuana with friends before heading to the bar. It used to take only a drink or two to feel relaxed, but now it's three or four. Back home, two Advil PMs help induce sleep. The alarm clock beeps just a few hours later, and the daily cycle of drug use resumes. Over time, our imagined student—and many actual students—may struggle to keep up with school, work, and family

responsibilities; experience strained relationships; and have difficulty limiting their substance use. How do we know when substance use becomes a problem?

The substances our imaginary student uses are **psychoactive drugs**, chemicals that alter the brain, producing changes in perceptions and moods. Most of us manage to use some psychoactive drugs in moderation and without disrupting our lives. But sometimes, drug use crosses the line between recreational or moderate use and **substance use disorder** (**TABLE 10.1**).

TABLE 10.1 When Is Drug Use a Disorder?

According to the American Psychiatric Association (2013), a person may be diagnosed with *substance use disorder* when drug use continues despite significant life disruption. Resulting brain changes may persist after quitting use of the substance (thus leading to strong cravings when exposed to people and situations that trigger memories of drug use). The severity of substance use disorder varies from *mild* (two to three of the indicators listed below) to *moderate* (four to five indicators) to *severe* (six or more indicators). If you are concerned about your substance use or that of a loved one, contact your school counseling center, health clinic, or physician.
Diminished Control
1. Uses more substance or for longer than intended.
2. Tries unsuccessfully to regulate use of substance.
3. Spends much time acquiring, using, or recovering from effects of substance.
4. Craves the substance.
Diminished Social Functioning

5. Use disrupts commitments at work, school, or home.
6. Continues use despite social problems.
7. Causes reduced social, recreational, and work activities.
Hazardous Use
8. Continues use despite hazards.
9. Continues use despite worsening physical or psychological problems.
Drug Action
10. Experiences tolerance (needing more substance for the desired effect).
11. Experiences withdrawal (unpleasant mental or physical reactions) when attempting to end use.

Today's psychiatric diagnostic system identifies separate categories for *substance/medication-induced disorders* (APA, 2022). A substance/medication-induced disorder occurs when people misuse drugs and alcohol, causing changes that resemble various psychological disorders. These include sexual dysfunctions, obsessive-compulsive disorder (OCD), depression, psychosis, and sleep and neurocognitive disorders.

A drug's overall effect depends not only on its biological effects but also on the user's expectations, which vary with social and cultural contexts (Gu et al., 2015; Ward, 1994). If one culture assumes that a particular drug produces euphoria (or aggression or sexual arousal)

and another does not, each culture may find its expectations fulfilled. We'll take a closer look at these interacting forces in the use and potential abuse of particular psychoactive drugs. But first, to consider what contributes to the disordered use of various substances, see Thinking Critically About: Tolerance and Addiction.

LOQ 10-2

What roles do tolerance and addiction play in substance use disorders, and how has the concept of *addiction* changed?

Thinking Critically About:

Tolerance and Addiction

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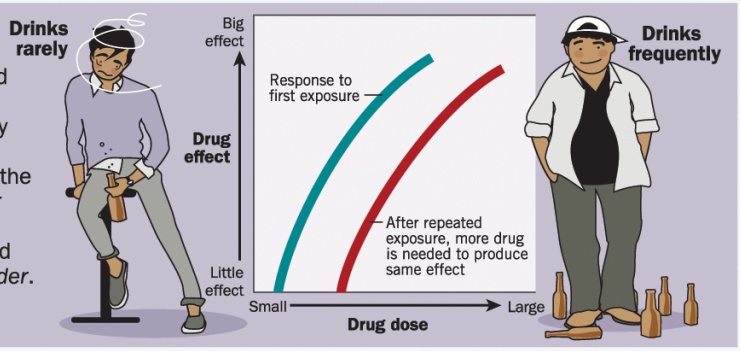
Tolerance

With continued use of alcohol and some other drugs, users develop **tolerance** as their brain chemistry adapts to offset the drug effect (*neuroadaptation*). To experience the same effect, users require larger and larger doses, which increase the risk of becoming **addicted** and developing a *substance use disorder*.



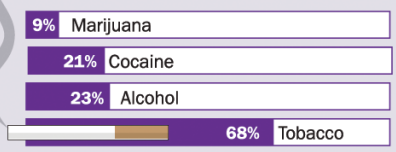
Addiction

Caused by ever-increasing doses of most psychoactive drugs (including prescription painkillers). Prompts user to crave the drug, to continue use despite adverse consequences, and to struggle when attempting to **withdraw** from it. These behaviors suggest a substance use disorder. Once in the grip of addiction, people *want* the drug more than they *like* the drug.[1]

4% of the world's people have an alcohol use disorder.[2]



The lifetime odds of getting hooked after using various drugs:



Source: National Epidemiologic Survey on Alcohol and Related Conditions [3]

Therapy or group support, such as from Alcoholics Anonymous, may help. It also helps to believe that addictions are controllable and that people can change. Many people do voluntarily stop using addictive drugs without any treatment. "Most people who successfully quit smoking kicked the habit on their own."[4]



Behavior Addictions

Psychologists try to avoid using "addiction" to label driven, excessive behaviors such as eating, work, sex, and accumulating wealth.



Yet some behaviors can become compulsive and dysfunctional—similar to problematic alcohol and drug use.[5] Behavior addictions include *gambling disorder*. *Internet gaming disorder* is also now a diagnosable condition.[6] Such gamers display a consistent inability to resist logging on and staying on, even when this excessive use impairs their work and relationships. One international study of 19,000 gamers found that 1 in 3 had at least one symptom of the disorder. But fewer than 1 percent met criteria for a diagnosis.[7]

Psychological and drug therapies may be "highly effective" for problematic internet use.[8]



1. Berridge et al., 2009; Robinson & Berridge, 2003. 2. WHO, 2014. 3. Lopez-Quintero et al., 2011. 4. Newport, 2013. 5. Gentile, 2009; Griffiths, 2001; Hoeft et al., 2008. 6. WHO, 2018. 7. Przybylski et al., 2017. 8. Winkler et al., 2013.

Retrieval Practice

RP-1 What is the process that generally leads to drug tolerance?

RP-2 Can someone become "addicted" to shopping?

ANSWERS IN APPENDIX E

Types of Psychoactive Drugs

The three major categories of psychoactive drugs are *depressants, stimulants,* and *hallucinogens.* All do their work at the brain's synapses, stimulating, inhibiting, or mimicking the activity of the brain's own chemical messengers, the neurotransmitters.

Depressants

LOQ 10-3

What are *depressants,* and what are their effects?

Depressants are drugs such as alcohol, barbiturates (tranquilizers), and opioids that calm neural activity and slow body functions.

Alcohol

True or false? Alcohol is a depressant in large amounts but is a stimulant in small amounts. *False.* In any amount, alcohol is a depressant. Low doses of alcohol may enliven a drinker, but they do so by acting as a *disinhibitor*—they slow brain activity that controls judgment and inhibitions, causing 3 million yearly deaths worldwide (WHO, 2018).

Alcohol is an equal-opportunity drug: It increases (disinhibits) helpful tendencies—as when tipsy restaurant patrons leave extravagant tips and members of a group bond over drinks (Fairbairn & Sayette, 2014; Lynn, 1988). And it increases harmful tendencies, as when sexually aroused men become more disposed to sexual aggression. Drinking increases men's and women's desire for casual sex and perception of attractiveness in others (Bowdring & Sayette, 2018; Johnson & Chen, 2015). *The bottom line:* The urges you would feel if sober are the ones you will more likely act upon when intoxicated.

The prolonged and excessive drinking that characterizes **alcohol use disorder** (commonly referred to as *alcoholism*) contributes to more than 200 diseases, and can even shrink the brain and contribute to premature death (Kendler et al., 2016; Mackey et al., 2019; WHO, 2018). Girls and young women (who have less of a stomach enzyme that digests alcohol) can become addicted to alcohol more quickly than boys and young men do, and they are at risk for lung, brain, and liver damage at lower consumption levels (CASA, 2003). Heavy

drinking has increased among women of all ages, with life-or-death consequences: Canadian women's risk for alcohol-related death between 2001 and 2017 increased at five times the rate of men's (Tam, 2018) (**FIGURE 10.1**). Canadian and Australian researchers are now using computer-based *machine learning* to identify other risk factors and to predict problem alcohol use (Afzali et al., 2019).

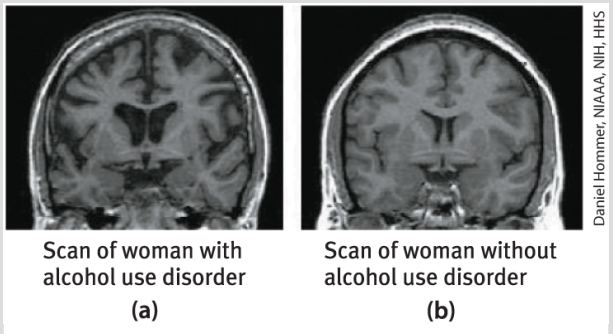


FIGURE 10.1 Disordered drinking shrinks the brain MRI scans show brain shrinkage in a woman with alcohol use disorder (a) compared with a woman in a control group (b).

Slowed Neural Processing

Alcohol slows sympathetic nervous system activity. Larger doses cause reactions to slow, speech to slur, and skilled performance to deteriorate. Alcohol is a potent sedative, especially when paired with sleep deprivation. Add these physical effects to lowered inhibitions, and the result can be deadly. As blood-alcohol levels rise and judgment falters, people's qualms about drinking and driving lessen. When drunk, people aren't aware of how drunk they are (Moore et al.,

2016). Virtually all drinkers insist when sober that they would not drive under the influence later. Yet, in experiments, the majority of intoxicated participants decided to drink and drive (MacDonald et al., 1995; Ouimet et al., 2020). Alcohol can also be life-threatening when heavy drinking depresses the vomiting response. People may poison themselves with an overdose that their bodies would normally throw up.



Lon Clark Diehl

Drinking disaster demo Firefighters reenacted the trauma of an alcohol-related car accident, providing a memorable demonstration for these high school students. Alcohol consumption leads to feelings of invincibility, which become especially dangerous behind the wheel of a car.

Memory Disruption

Alcohol can disrupt memory formation, and heavy drinking can also have long-term effects on the brain and cognition. In rats, at a developmental period corresponding to human adolescence, binge drinking contributes to nerve cell death and reduces the birth of new

nerve cells. It also impairs the growth of synaptic connections (Crews et al., 2006, 2007). In humans, heavy drinking may lead to blackouts, in which drinkers continue to interact but are unable to later recall people they met or what they said or did while intoxicated.

Reduced Self-Awareness

In one experiment, those who consumed alcohol (rather than a placebo beverage) were doubly likely to be caught mind-wandering during a reading task, yet were *less* likely to notice that they zoned out (Sayette et al., 2009). Sometimes we mind-wander to give our brains a break, but unintentional zoning out—while driving, for example—can cause later regret (Seli et al., 2016). Alcohol also focuses attention on an immediate arousing situation (say, provocation) and distracts it from normal inhibitions and future consequences (Giancola et al., 2010; Steele & Josephs, 1990).

Reduced self-awareness may help explain why people who want to suppress their awareness of failures or shortcomings often drink more than do those who feel good about themselves. Losing a business deal, a game, or a romantic partner sometimes elicits binge drinking.

Expectancy Effects

Expectations influence behavior. Adolescents—presuming that alcohol will lift their spirits—sometimes drink when they're upset and alone (Bresin et al., 2018). But solitary drinking just boosts their chance of

developing a substance use disorder (Creswell et al., 2014; Fairbairn & Sayette, 2014).

Simply *believing* we're consuming alcohol can cause us to act out alcohol's presumed influence (Christiansen et al., 2016; Moss & Albery, 2009). In a classic experiment, researchers gave male students at Rutgers University either an alcoholic or a nonalcoholic drink (Abrams & Wilson, 1983). (Both had a strong flavor that masked the taste and smell of alcohol.) After watching an erotic movie clip, the men who *thought* they had consumed alcohol were more likely to report having strong sexual fantasies and feeling guilt free. *The point to remember:* Alcohol's effect lies partly in that powerful sex organ, the mind.

Barbiturates

Like alcohol, the **barbiturate** drugs, which are *tranquilizers,* depress nervous system activity. Barbiturates such as Nembutal, Seconal, and Amytal are sometimes prescribed to induce sleep or reduce anxiety. In larger doses, they can impair memory and judgment. If combined with alcohol—say, a sleeping pill after an evening of heavy drinking—the total depressive effect on body functions can be lethal.

Opioids

The **opioids**—opium and its derivatives—also depress neural functioning. Opioids include *heroin* and its medically prescribed synthetic substitute, *methadone.* They also include pain-relief *narcotics*

such as codeine, OxyContin, Vicodin, and morphine (and morphine's dangerously powerful synthetic counterpart, fentanyl). As blissful pleasure replaces pain and anxiety, the user's pupils constrict and breathing slows, and lethargy sets in. Those who become addicted to this short-term pleasure may pay a long-term price: a gnawing craving for another fix, a need for progressively larger doses (as tolerance develops), and the extreme discomfort of withdrawal. When repeatedly flooded with a synthetic opioid, the brain eventually stops producing *endorphins,* its own natural opioids. If the artificial opioid is then withdrawn, the brain will lack the normal level of these painkilling neurotransmitters.

An alarming number of Americans have been unable or unwilling to tolerate this state, and have paid an ultimate price—death by overdose. Between 2013 and 2016, the U.S. rate of opioid overdose deaths increased almost *ten times* to 43,036 (NIDA, 2018; NSC, 2019). "For the first time in U.S. history, a person is more likely to die from an accidental opioid overdose than from a motor vehicle crash," reported the National Safety Council in 2019. The Covid pandemic increased stress, uncertainty, and social isolation that may have contributed to even more U.S. and Canadian opioid-related deaths in 2020 (Katz et al., 2020; Schmunk, 2020).





Top: Theo Wargo/WireImage/Getty Images; bottom: Jerod Harris/Getty Images

Lives lost to opioids Prince and Tom Petty are among those who have died of opioid overdoses. Both musicians had been prescribed narcotic painkillers for chronic pain conditions.

What started the opioid crisis? Drug companies played a large part by aggressively promoting opioid drugs while downplaying the dangers,

and by sending millions of pills to pharmacies known to sell the drugs illegally (Rashbaum, 2019). As a result, pharmaceutical companies have been fined billions of dollars, including one company in 2019 for "false, misleading, and dangerous marketing" of opioids (Hoffman, 2019). Some doctors have overprescribed pills, making their patients more likely to become addicted (Tompkins et al., 2017). Social influence also matters. People with parents and friends who use opioids are more likely to use opioids (Griesler et al., 2019; Keyes et al., 2014).

Retrieval Practice

RP-3 Alcohol, barbiturates, and opioids are all in a class of drugs called _____.

ANSWERS IN APPENDIX E

Stimulants

LOQ 10-4

What are *stimulants,* and what are their effects?

A **stimulant** excites neural activity and speeds up body functions. Pupils dilate, heart and breathing rates increase, and blood sugar levels rise, reducing appetite. Energy and self-confidence also rise.

Stimulants include caffeine, nicotine, and the more powerful cocaine, **amphetamines**, methamphetamine (also known as "speed"), and Ecstasy. People use stimulants to feel alert, lose weight, or boost mood or athletic performance. Some students resort to stronger stimulant drugs in hopes of boosting their grades, even though the drugs offer little or no benefit (Ilieva et al., 2015; Teter et al., 2018). Stimulants can be addictive, as many know from the fatigue, headaches, irritability, and depression that result from missing their usual caffeine dose (Silverman et al., 1992). A mild dose typically lasts three or four hours, which—if taken in the evening—may impair sleep.

Ask Yourself

Have you ever relied on caffeinated drinks to stay awake for a late-night study session, and then struggled to fall asleep? How might you plan your caffeine intake and study sessions better?

Nicotine

Tobacco products deliver highly addictive **nicotine**. Imagine that cigarettes were harmless—except, once in every 25,000 packs, an occasional innocent-looking one was filled with dynamite instead of tobacco. Not such a bad risk of having your head blown off. But with 250 million packs a day consumed worldwide, we could expect more than 10,000 gruesome daily deaths—surely enough to have cigarettes banned everywhere.[2]

The lost lives from these dynamite-loaded cigarettes approximate those from today's actual cigarettes. A teen-to-the-grave smoker has a 50 percent chance of dying from the habit, and each year, tobacco kills nearly 7 million people worldwide, with another 1.2 million people killed due to exposure to second-hand smoke (WHO, 2020). By 2030, annual tobacco deaths are expected to increase to 8 million. That means that *1 billion* twenty-first-century people may be killed by tobacco (WHO, 2012). Most tobacco deaths will occur in low- and middle-income countries, where 80 percent of the world's smokers live (Akanbi et al., 2019).

Tobacco products include cigarettes, cigars, chewing tobacco, pipe tobacco, snuff, and—most recently—e-cigarettes. Inhaling e-cigarette vapor (vaping) gives users a jolt of nicotine without cancer-causing tar. Thanks to vaping's rapid increase—the fastest drug use increase on record—U.S. high school students in 2019 used e-cigarettes at five times the rate of traditional cigarettes (Miech et al., 2019).

In one survey of regular e-cigarette users from the United States, England, Canada, and Australia, 85 percent reported they vaped because they believed it would help them cut down on smoking traditional cigarettes (Yong et al., 2019). Experts continue to debate whether e-cigarettes can help smokers quit smoking (Hajek et al., 2019; HHS, 2020). But they agree that e-cigarettes are addictive nicotine dispensers that introduce nonsmokers to smoking (Prochaska, 2019). In a British study, nonsmoking teens who started

vaping became four times more likely to move on to cigarette smoking (Miech et al., 2017).

> **"No adult who has never used nicotine should ever use our product."** — Ashley Gould, Chief Administrative Officer of e-cigarette company Juul Labs, 2018

Teen use has prompted legal restrictions as well as investigations, including one by the U.S. Food and Drug Administration on whether e-cigarette companies target teenage users (Richtel & Kaplan, 2018). Fruity flavors, for example, increases teen use (Buckell & Sindelar, 2019; O'Connor et al., 2019). These troubling trends prompted U.S. Surgeon General Jerome Adams to "officially declar[e] e-cigarette use among youth an epidemic" (Stein, 2018).

Smoke a cigarette and nature will charge you 12 minutes—about double the length of time you spend smoking it (*Discover,* 1996). (Researchers don't yet know how e-cigarette use affects life expectancy.) Compared with nonsmokers, smokers' life expectancy is "at least 10 years shorter" (CDC, 2013). Eliminating smoking would increase life expectancy more than any other preventive measure. Why, then, do so many people smoke?

Tobacco products are as powerfully and quickly addictive as heroin and cocaine. Attempts to quit tobacco use, even within the first weeks, often fail (DiFranza, 2008). And, as with other addictions, users develop *tolerance.* Those who attempt to quit will experience nicotine

withdrawal symptoms—craving, insomnia, anxiety, irritability, and distractibility. When trying to focus on a task, their mind wanders at three times the normal rate (Sayette et al., 2010). When not craving a cigarette, they tend to underestimate the power of such cravings (Sayette et al., 2008).

All it takes to relieve the aversive state of craving is a single inhale. With that inhale, a rush of nicotine will signal the central nervous system to release a flood of neurotransmitters (**FIGURE 10.2**): Epinephrine and norepinephrine diminish appetite and boost alertness and mental efficiency. Dopamine and opioids temporarily calm anxiety and reduce sensitivity to pain (Ditre et al., 2011; Gavin, 2004). No wonder some ex-users, under stress, resume their habit—as did some 1 million Americans after the 9/11 terrorist attacks (Pesko, 2014). Ditto for people experiencing major depressive disorder, who are more likely than others to see their efforts to quit go up in smoke (Zvolensky et al., 2015).

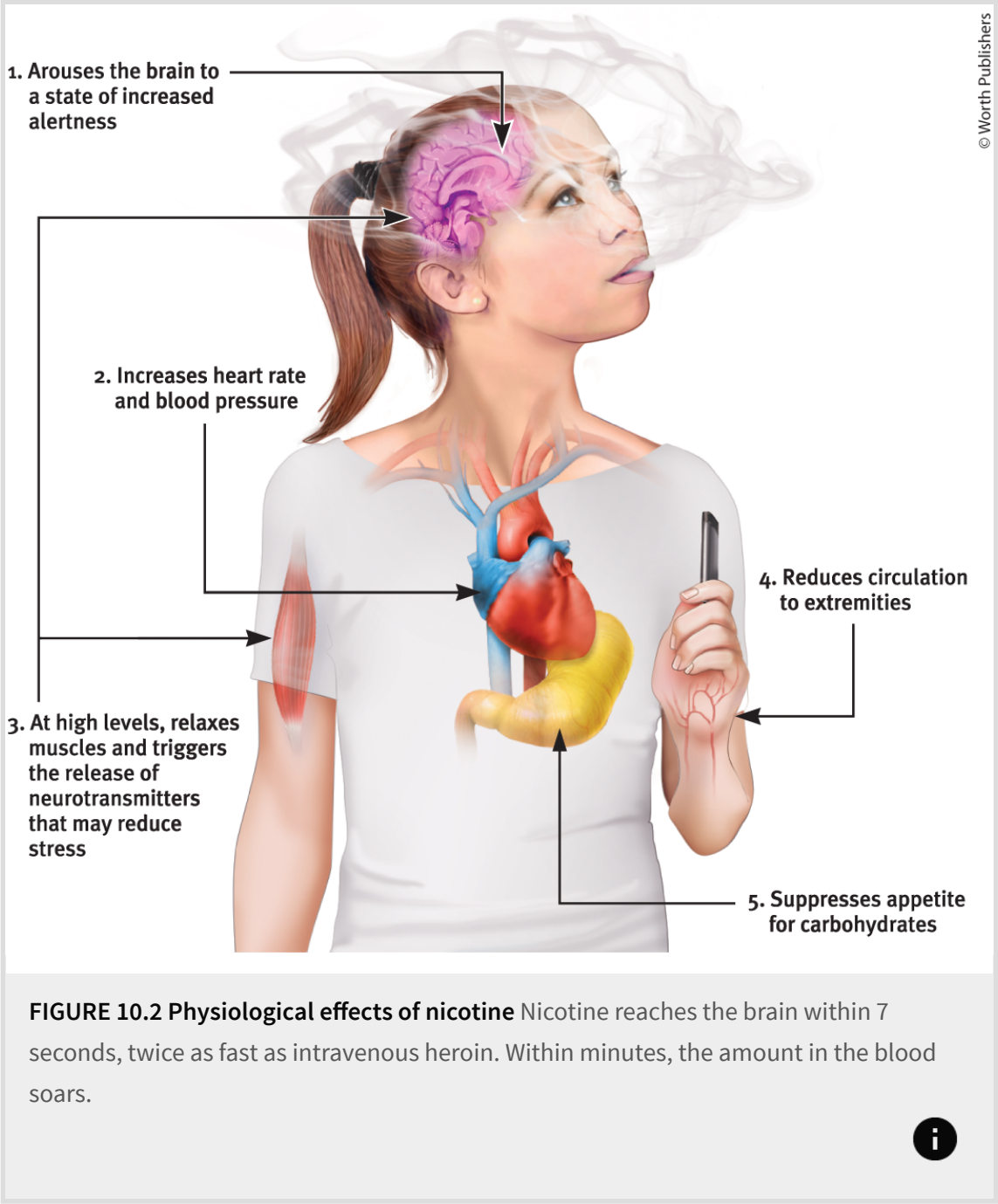


FIGURE 10.2 Physiological effects of nicotine Nicotine reaches the brain within 7 seconds, twice as fast as intravenous heroin. Within minutes, the amount in the blood soars.

Cigarette smoking is the leading cause of preventable death in the United States, killing 480,000 people each year (CDC, 2020). Although 3 in 4 smokers wish they could stop, each year fewer than 1 in 7 will be

successful (Newport, 2013). Even those who know that smoking is slow-motion suicide may be unable to stop (Saad, 2002).

Nevertheless, repeated attempts seem to pay off. The worldwide smoking rate—25 percent among men and 5 percent among women—is down about 30 percent since 1990 (GBD, 2017). The U.S. smoking rate plummeted from 45 percent in 1955 to 15 percent in 2019 (Saad, 2019). Half of all Americans who have ever smoked have quit, sometimes aided by a nicotine replacement drug and with encouragement from a counselor or support group. Some researchers argue that it is best to quit abruptly—to go "cold turkey" (Lindson-Hawley et al., 2016). Others suggest that success is equally likely whether smokers quit abruptly or gradually (Fiore et al., 2008; Lichtenstein et al., 2010). *The point to remember:* If you want to quit using tobacco, there is hope regardless of how you choose to quit.

For those who endure, the acute craving and withdrawal symptoms slowly dissipate over the ensuing 6 months (Ward et al., 1997). After a year's abstinence, only 10 percent will relapse in the next year (Hughes, 2010). These nonsmokers may live not only healthier but also happier lives. Smoking correlates with higher rates of depression, chronic disabilities, and divorce (Doherty & Doherty, 1998; Edwards & Kendler, 2012; Vita et al., 1998). Healthy living seems to add both years to life and life to years. Awareness of nonsmokers' better health and happiness has contributed to U.S. twelfth graders' 88 percent disapproval of smoking a pack or more a day, and also to a plunge in

their daily smoking rate, from 25 percent in 1997 to 2 percent in 2019 (Johnston et al., 2020).

Humorist Dave Barry (1995) recalling why he smoked his first cigarette the summer he turned 15: "Arguments against smoking: 'It's a repulsive addiction that slowly but surely turns you into a gasping, gray-skinned, tumor-ridden invalid, hacking up brownish gobs of toxic waste from your one remaining lung.' Arguments for smoking: 'Other teenagers are doing it.' Case closed! Let's light up!"

Ask Yourself

Think of a friend or family member who is addicted to nicotine. What do you think would be most effective to say to that person to convince them to try to quit?

Retrieval Practice

RP-4 What withdrawal symptoms should your friend expect when quitting smoking?

ANSWERS IN APPENDIX E

Cocaine

Cocaine is a powerfully addictive stimulant derived from the coca plant. The recipe for Coca-Cola originally included coca extract, creating a mild cocaine tonic intended for tired older people. Between 1896 and 1905, Coke was indeed "the real thing." Today, cocaine is

snorted, injected, or smoked (sometimes as *crack cocaine,* a faster-working crystallized form that produces a briefer but more intense high, followed by a more intense crash). Cocaine enters the bloodstream quickly, producing a rush of euphoria that depletes the brain's supply of the neurotransmitters dopamine, serotonin, and norepinephrine (FIGURE 10.3). Within the hour, a crash of agitated depression follows as the drug's effect wears off. After several hours, the craving for more wanes, only to return several days later (Gawin, 1991).

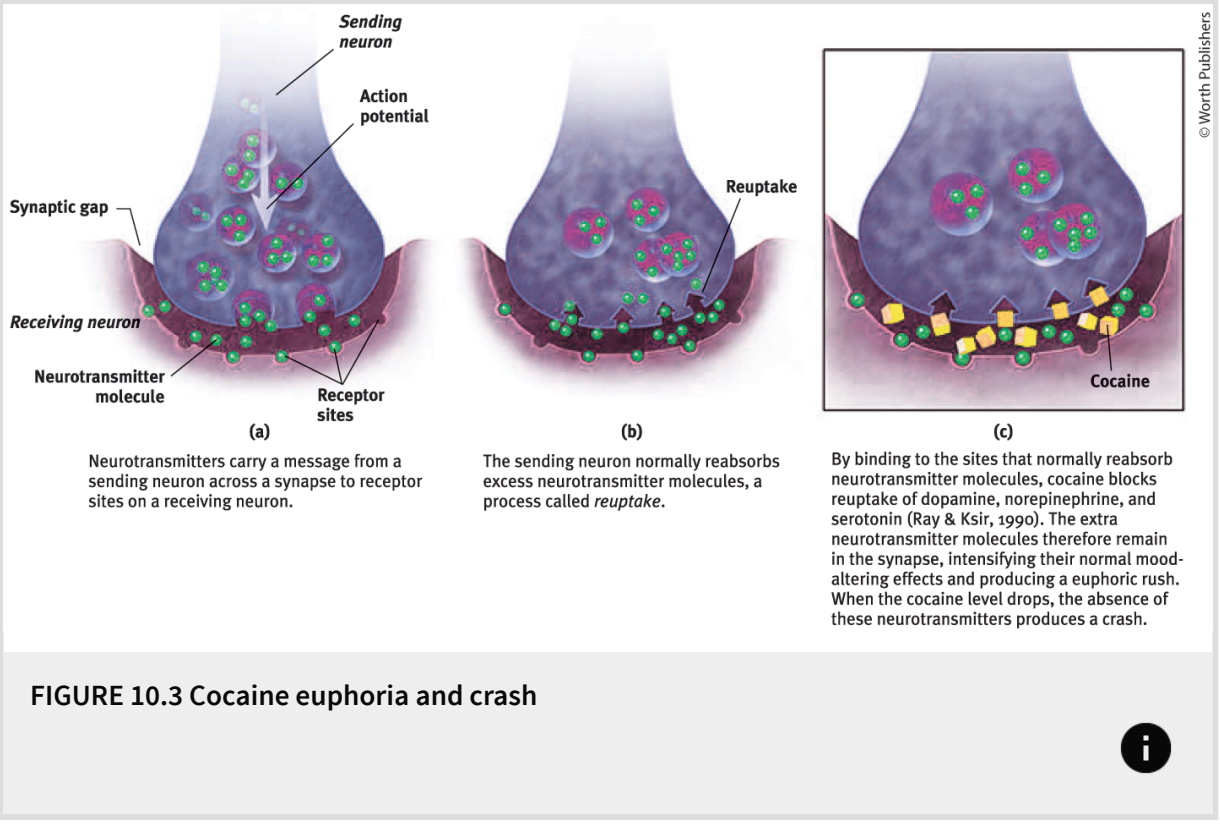


FIGURE 10.3 Cocaine euphoria and crash

In situations that trigger aggression, ingesting cocaine may heighten reactions. Caged rats fight when given foot shocks, and they fight even more when given cocaine *and* foot shocks. Likewise, humans who

voluntarily ingest high doses of cocaine in laboratory experiments impose higher shock levels on a presumed opponent than do those receiving a placebo (Licata et al., 1993). Cocaine use may also lead to emotional disturbances, suspiciousness, convulsions, cardiac arrest, or respiratory failure.

Cocaine powerfully stimulates brain reward pathways (Keramati et al., 2017; Walker et al., 2018). Alcohol or nicotine use, which often precedes cocaine use, amplifies the brain's response to cocaine (Griffin et al., 2017). Cocaine's psychological effects vary with the dosage and form consumed, but the situation and the user's expectations and personality also play a role. Given a placebo, cocaine users who *thought* they were taking cocaine often had a cocaine-like experience (Van Dyke & Byck, 1982).

In national surveys, 2 percent of American twelfth graders and 6 percent of British 18- to 24-year-olds reported having tried cocaine during the past year (ACMD, 2009; Johnston et al., 2020).

Methamphetamine

Amphetamines stimulate neural activity. As body functions speed up, the user's energy rises and mood soars. Amphetamines are the parent drug for the highly addictive **methamphetamine**, which is chemically similar but has greater effects (NIDA, 2002, 2005). Methamphetamine triggers the release of the neurotransmitter dopamine, which stimulates brain cells that enhance energy and mood, leading to 8 hours or so of heightened energy and euphoria. Its aftereffects may

include irritability, insomnia, hypertension, seizures, social isolation, depression, and occasional violent outbursts (Homer et al., 2008). Over time, methamphetamine reduces baseline dopamine levels, leaving the user with continuing depressed functioning.



Dramatic drug-induced decline In the 18 months between these two mug shots, this woman's methamphetamine addiction led to obvious physical changes.

Ecstasy

Ecstasy, a street name for MDMA (*methylenedioxymethamphetamine,* also known in its powder form as *Molly*), is both a stimulant and a mild hallucinogen. As an amphetamine derivative, Ecstasy triggers dopamine release, but its major effect is releasing stored serotonin and blocking its reuptake, thus prolonging serotonin's feel-good flood (Braun, 2001). Users feel the effect about a half-hour after taking an Ecstasy pill. For 3 or 4 hours, they experience high energy, emotional elevation, and (given a social context) connectedness with those around them ("I love everyone!"). Octopuses became similarly

sociable when researchers gave them MDMA (Edsinger & Dölen, 2018). Eight arms + MDMA = a lot of reaching out.

Ecstasy's popularity first soared globally in the late 1990s as a "club drug" taken at nightclubs and all-night dance parties (Landry, 2002). There are, however, reasons not to be ecstatic about Ecstasy. One is its dehydrating effect, which—when combined with prolonged dancing—can lead to severe overheating, increased blood pressure, and death. Another is that long-term, repeated leaching of brain serotonin can damage serotonin-producing neurons, leading to decreased output and increased risk of permanently depressed mood (Croft et al., 2001; McCann et al., 2001; Roiser et al., 2005). Ecstasy also suppresses the immune system, impairs memory, slows thought, and disrupts sleep by interfering with serotonin's control of the circadian clock (Laws & Kokkalis, 2007; Schilt et al., 2007; Wagner et al., 2012). Ecstasy delights for the night but dispirits the morrow.



Malthe Ivarsson/Gonzales Photo/Alamy Stock Photo

The hug drug MDMA, known as Ecstasy and often taken at clubs, produces a euphoric high and feelings of intimacy. But repeated use can

destroy serotonin-producing neurons, impair memory, and permanently deflate mood.

Hallucinogens

LOQ 10-5

What are *hallucinogens,* and what are their effects?

Hallucinogens distort perceptions and evoke sensory images in the absence of sensory input (which is why these drugs are also called *psychedelics,* meaning "mind-manifesting"). Some, such as LSD and MDMA (Ecstasy), are synthetic. Others, including psilocybin, ayahuasca, and the mild hallucinogen marijuana, are natural substances. Researchers are exploring psilocybin and ayahuasca as possible treatments for persistent depression.

Whether provoked to hallucinate by drugs, loss of oxygen, or extreme sensory deprivation, the brain hallucinates in basically the same way (Martial et al., 2019; Siegel, 1982). The experience typically begins with simple geometric forms, such as a spiral. Then come more meaningful images, which may be superimposed on a tunnel; others may be replays of past emotional experiences. Brain scans of people on LSD reveal that their visual cortex becomes hypersensitive and strongly connected to their brain's emotion centers (Carhart-Harris et al., 2016). As the hallucination peaks, people frequently feel separated from their body and experience dreamlike scenes. Their sense of self

dissolves, as does the border between themselves and the external world (Lebedev et al., 2015).

These sensations are strikingly similar to the **near-death experience**, an altered state of consciousness reported by 10 to 23 percent of those revived from cardiac arrest (Martial et al., 2020). Many describe visions of tunnels (**FIGURE 10.4**), bright lights, a replay of old memories, and out-of-body sensations (Siegel, 1980). These experiences can later enhance spirituality and promote feelings of personal growth (Khanna & Greyson, 2014, 2015). Given that oxygen deprivation and other insults to the brain are known to produce hallucinations, we may wonder: Does a brain under stress manufacture the near-death experience? During epileptic seizures and migraines, people may experience similar hallucinations of geometric patterns (Billock & Tsou, 2012). So have solitary sailors and polar explorers while enduring monotony, isolation, and cold (Suedfeld & Mocellin, 1987). The philosopher-neuroscientist Patricia Churchland has called such experiences "neural funny business" (Churchland, 2013, p. 70).

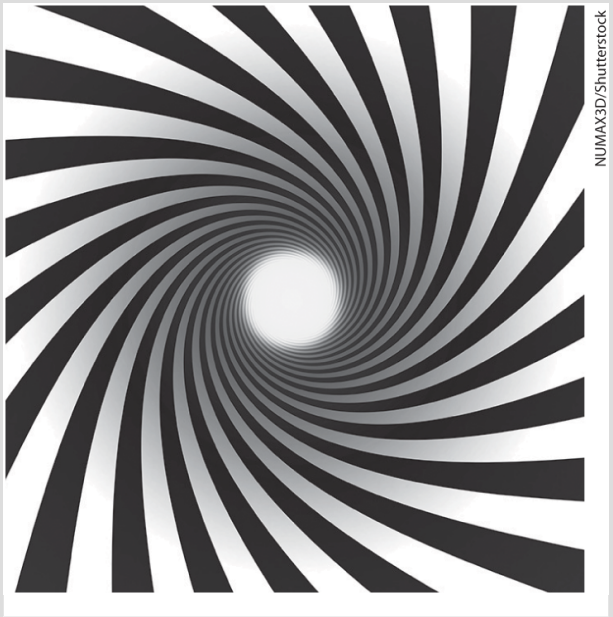


FIGURE 10.4 Near-death vision or hallucination? Psychologist Ronald Siegel (1977) reported that people under the influence of hallucinogenic drugs often see "a bright light in the center of the field of vision…. The location of this point of light create[s] a tunnel-like perspective." This is very similar to others' near-death experiences.

LSD

Chemist Albert Hofmann created—and on one Friday afternoon in April 1943 accidentally ingested—**LSD (lysergic acid diethylamide)**. The result—"an uninterrupted stream of fantastic pictures, extraordinary shapes with intense, kaleidoscopic play of colors"—reminded him of a childhood mystical experience that had left him longing for another glimpse of "a miraculous, powerful, unfathomable reality" (Siegel, 1984; Smith, 2006).

The emotions of an LSD (or *acid*) trip vary from euphoria to detachment to panic. Users' mood and expectations (their "high hopes") color the emotional experience, but the perceptual distortions and hallucinations have some commonalities.

Marijuana

The straight dope on marijuana: Marijuana leaves and flowers contain **THC (delta-9-tetrahydrocannabinol)**. Whether inhaled (getting to the brain quickly) or consumed (traveling through the body slowly), THC produces a mix of effects. An analysis of 15 studies showed that the THC of a single joint may induce psychiatric symptoms such as hallucinations, delusions, and anxiety (Hindley et al., 2020).

Marijuana amplifies sensitivity to colors, sounds, tastes, and smells. But like the depressant alcohol, it relaxes, disinhibits, and may produce a euphoric high. As with alcohol, people sometimes consume marijuana to help them sleep or improve their mood, even though marijuana use often predicts worse sleep and mood (Buckner et al., 2019; Wong et al., 2019). Both alcohol and marijuana impair the motor coordination, perceptual skills, and reaction time necessary for safely operating a vehicle or other machine. "THC causes animals to misjudge events," reported Ronald Siegel (1990, p. 163). "Pigeons wait too long to respond to buzzers or lights that tell them food is available for brief periods; and rats turn the wrong way in mazes."

Marijuana and alcohol also differ. The body eliminates alcohol within hours, while THC and its by-products linger in the body for more than

a week. Although marijuana users develop tolerance—a lesser high for a single dose—repeated short-term use increases the drug's presence in the body (Volkow et al., 2014).

> Synthetic cannabinoids (also known as *synthetic marijuana, Spice,* or *K2*) mimic THC. Their harmful side effects can include agitation and hallucinations (Fattore, 2016; Sherif et al., 2016).

After considering more than 10,000 scientific reports, the U.S. National Academies of Sciences, Engineering, and Medicine (2017) concluded that marijuana use

- alleviates chronic pain, chemotherapy-related nausea, and muscle soreness among people with multiple sclerosis;
- may offer short-term sleep improvements;
- does not increase risk for tobacco-related diseases such as lung cancer;
- predicts increased risk of traffic accidents;
- predicts increased risk of chronic bronchitis, psychosis, social anxiety disorder, and suicidal thoughts; and
- likely contributes to impaired attention, learning, and memory, and possibly to academic underachievement.

The more often the person uses marijuana, especially during adolescence, the greater the risk of anxiety, depression, psychosis, and suicidal behavior (Gage, 2019; Gobbi et al., 2019; Huckins, 2017). One study of nearly 4000 Canadian seventh graders concluded that

marijuana use at that early age was "neurotoxic": It predicted long-term cognitive impairment (Harvey, 2019). Marijuana can also function as a "gateway drug" for future alcohol and opioid use (Gunn et al., 2018; Olfson et al., 2018). "Nearly 1 in 5 people who begin marijuana use during adolescence become addicted," warned U.S. Surgeon General Jerome Adams (Aubrey, 2019).

Americans' attitudes toward marijuana use have changed remarkably—from 12 percent support for legalizing marijuana in 1969 to 66 percent in 2019 (De Pinto, 2019; McCarthy, 2018). Some countries and U.S. states have legalized marijuana possession. Greater legal acceptance may explain why rates of Americans who have tried marijuana rose dramatically between 1969 and 2019, from 4 to 45 percent, with 12 percent saying they now smoke marijuana (Gallup, 2019).

***

Despite their differences, the psychoactive drugs summarized in TABLE 10.2 share a common feature: They trigger changes to the brain and body that grow stronger with repetition. This helps explain both tolerance and withdrawal.

TABLE 10.2 A Guide to Selected Psychoactive Drugs

Drug	Type	Pleasurable Effects	Possible Negative Effects
Alcohol	Depressant	Initial high followed by relaxation and	Depression, memory loss, organ damage, impaired

		disinhibition	reactions
Heroin	Depressant	Rush of euphoria, relief from pain	Depressed physiology, loss of natural endorphin function
Caffeine	Stimulant	Increased alertness and wakefulness	Anxiety, restlessness, and insomnia in high doses
Nicotine	Stimulant	Arousal and relaxation, sense of well-being	Heart disease, cancer
Cocaine	Stimulant	Rush of euphoria, confidence, energy	Cardiovascular stress, suspiciousness, depressive crash
Methamphetamine	Stimulant	Euphoria, alertness, energy	Irritability, insomnia, hypertension, seizures
Ecstasy (MDMA)	Stimulant; mild hallucinogen	Emotional elevation, disinhibition	Dehydration, overheating, depressed mood, impaired cognitive and immune functioning
LSD	Hallucinogen	Visual “trip”	Risk of panic
Marijuana (THC)	Mild hallucinogen	Enhanced sensation, relief of pain, distortion of time, relaxation	Impaired learning and memory, increased risk of psychological disorders

Retrieval Practice

"How curiously [pleasure] is related to what is thought to be its opposite, pain! … Wherever the one is found, the other follows up behind." (Plato, *Phaedo,* fourth century B.C.E.)

RP-5 How does this pleasure-pain description apply to the repeated use of psychoactive drugs?

ANSWERS IN APPENDIX E

Influences on Drug Use

LOQ 10-6

Why do some people become regular users of consciousness-altering drugs?

Drug use by North American youth increased during the 1970s. Then, with increased drug education and a more realistic and deglamorized media depiction of taking drugs, drug use declined sharply (except for a small rise in the mid-1980s). After the early 1990s, the cultural antidrug voice softened, and some drugs for a time were again glamorized in music and films. Consider these historical trends in the use of marijuana:

- In the University of Michigan's annual survey of 15,000 U.S. twelfth graders, the proportion who said there is "great risk" in regular marijuana use rose from 35 percent in 1978 to 79 percent

in 1991, then retreated to 30 percent in 2019 (Johnston et al., 2020).
- After peaking in 1978, marijuana use by U.S. twelfth graders declined through 1992, then rose and held steady until beginning to trend back up in 2015. Canadian use among 15- to 24-year-olds has been similarly trending upward since 2012 (CCSA, 2017), and by late 2019 was 16 percent among Canadians age 15 and older (CBC, 2019). European teen drug use is lower, but with trends mirroring those in North America: rising marijuana and declining cigarette use (Wadley & Lee, 2016).

Adolescents sometimes experiment with mind-altering drugs, unaware or unconvinced that doing so increases their risk of developing a substance use disorder. So why do some teens, but not others, become regular drug users? In search of answers, researchers have engaged biological, psychological, and social-cultural levels of analysis.

Biological Influences

Some people are biologically vulnerable to particular drugs:

- ***Genetics.*** Heredity influences some aspects of substance use problems, especially those appearing by early adulthood (Crabbe, 2002). Researchers have identified genes associated with alcohol use disorder, and they are discovering genes that contribute to nicotine and cannabis use disorders (Erzurumluoglu et al., 2019; Sanchez-Roige et al., 2019).

- ***Brain differences.*** These culprit genes seemingly produce deficiencies in the brain's natural dopamine reward system: While triggering temporary dopamine-produced pleasure, the addictive drugs disrupt normal dopamine balance. Studies of how drugs reprogram the brain's reward systems raise hopes for anti-addiction drugs that might block or blunt the effects of alcohol and other drugs (Volkow & Boyle, 2018). Neuroscientists have also discovered a brain circuit that may predict compulsive drinking. In mice, the circuit's activity in response to drinking alcohol predicts which mice will become excessive alcohol drinkers (Siciliano, 2019).
- ***Twin studies.*** If an identical rather than fraternal twin is diagnosed with alcohol use disorder, the other twin is at increased risk for alcohol problems (Verhulst et al., 2015). In marijuana use, too, identical twins more closely resemble each other than do fraternal twins.
- ***Adoption studies.*** One study tracked 18,115 Swedish adoptees. Those with drug-abusing biological parents were at doubled risk of drug abuse, indicating a genetic influence—a finding confirmed in another Swedish study of 14,000+ twins and 1.3 million other siblings. But then those with drug-abusing adoptive siblings also had a doubled risk of drug abuse, indicating an environmental influence (Kendler et al., 2012; Maes et al., 2016). So, what might those environmental influences be?

Warning signs of alcohol use disorder:

- Drinking binges (five drinks for men and four for women over 2 hours)
- Craving alcohol
- Use results in unfulfilled work, school, or home tasks
- Failing to honor a resolve to drink less
- Continued use despite health risk
- Avoiding family or friends when drinking

Psychological and Social-Cultural Influences

Throughout this text, you will see that biological, psychological, and social-cultural factors interact to produce behavior. An example is problematic drug use (**FIGURE 10.5**). Those without close, secure attachments with family and friends are more likely to turn to substance use (Fairbairn et al., 2018). So, too, are those who find their lives meaningless and directionless (Kim et al., 2020).

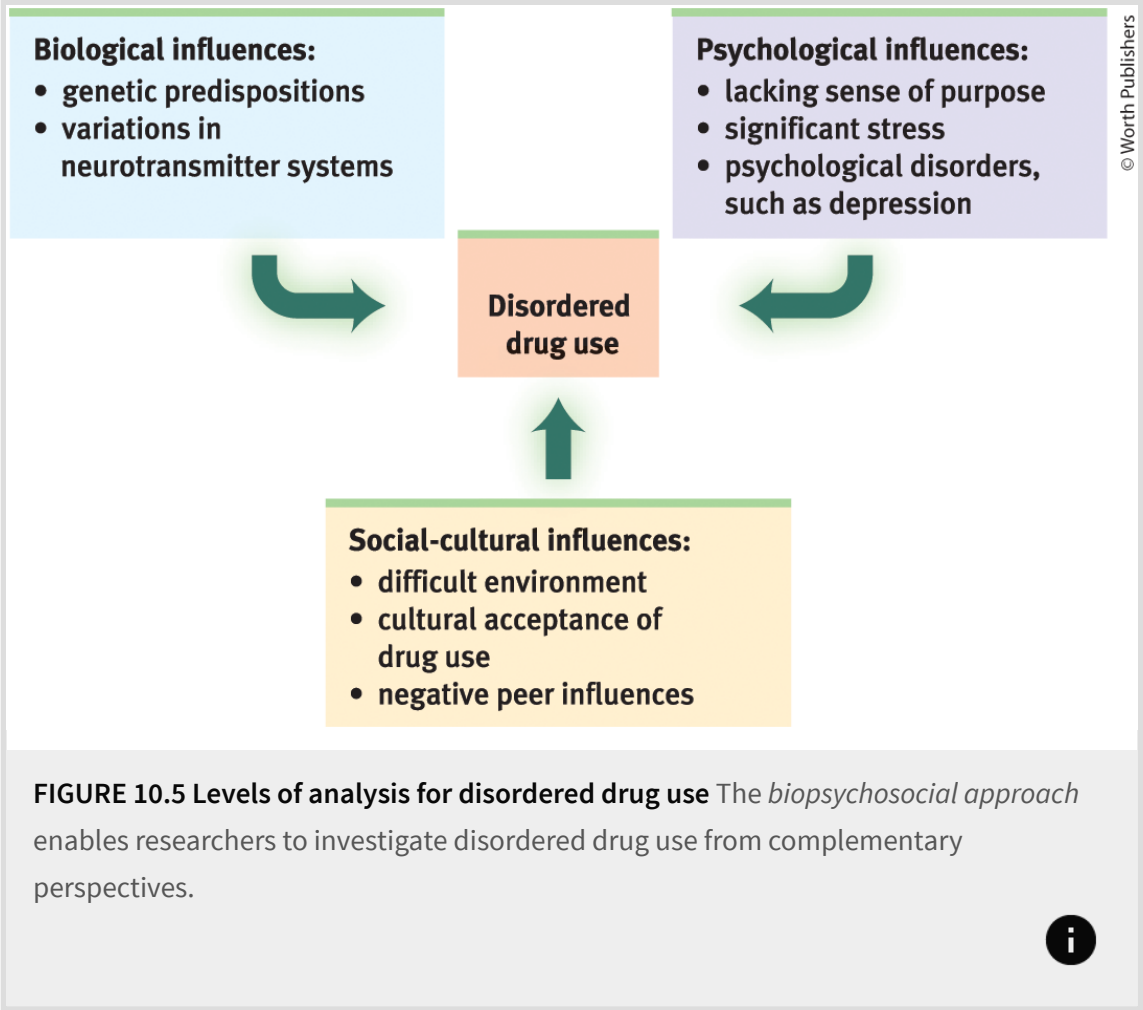


FIGURE 10.5 Levels of analysis for disordered drug use The *biopsychosocial approach* enables researchers to investigate disordered drug use from complementary perspectives.

Sometimes the psychological influence is obvious. Many heavy users of alcohol, marijuana, and cocaine have experienced trauma or failure and are depressed. Girls with a history of depression, eating disorders, or sexual or physical abuse are at increased risk for substance misuse. So are youth undergoing school or neighborhood transitions (CASA, 2003; Logan et al., 2002). Undergraduates who have not yet achieved a clear identity are also at greater risk (Bishop et al., 2005). By temporarily dulling the pain of self-awareness, psychoactive drugs may offer a way to avoid coping with depression, anger, anxiety, or insomnia. (As the learning modules explain, behavior is often

controlled more by its immediate consequences than by its later ones.)

Smoking and vaping usually begin during early adolescence. (If you are in college or university, and tobacco product companies haven't yet made you their devoted customer, they almost surely never will.) Adolescents, self-conscious and often thinking the world is watching their every move, are especially vulnerable. They may first light up to imitate glamorous celebrities, to project a particular image, to handle stress, or to get the social reward of acceptance by other users (Cin et al., 2007; DeWall & Pond, 2011; Tickle et al., 2006). Mindful of these tendencies, tobacco companies have effectively modeled their products with themes that appeal to youth: attractiveness, independence, adventurousness, social approval (Surgeon General, 2012).



VYPE/MEGA/Newscom

Nic-A-Teen Seeing celebrities like singer Lily Allen vaping or smoking may tempt young

people in the vulnerable teen and early-adult years to imitate. In 2017, more than a third of youth-rated (G, PG, PG-13) American movies showed smoking (CDC, 2020).

Rates of drug use vary across cultural and ethnic groups. One survey of European teens found that lifetime marijuana use ranged from 5 percent in Norway to more than eight times that in the Czech Republic (Romelsjö et al., 2014). Alcohol and other drug addiction rates have been low among actively religious people, with extremely low rates among Orthodox Jews, Mormons, Mennonites, and the Amish (DeWall et al., 2014; Salas-Wright et al., 2012). Among Americans aged 12 and older, illicit drug use is higher for people who are White or Indigenous compared with those who are Black or Hispanic (NSDUH, 2020).

Among teens whose parents and best friends are nonsmokers, the smoking rate is close to zero (Moss et al., 1992; also see **FIGURE 10.6**). If teens' friends misuse drugs, the odds are double that they will, too (Liu et al., 2017). Peers throw the parties and provide (or don't provide) the drugs. Teens who come from happy families, who do not begin drinking before age 15, and who do well in school tend not to use drugs, largely because they rarely associate with those who do (Bachman et al., 2007; Hingson et al., 2006; Odgers et al., 2008).

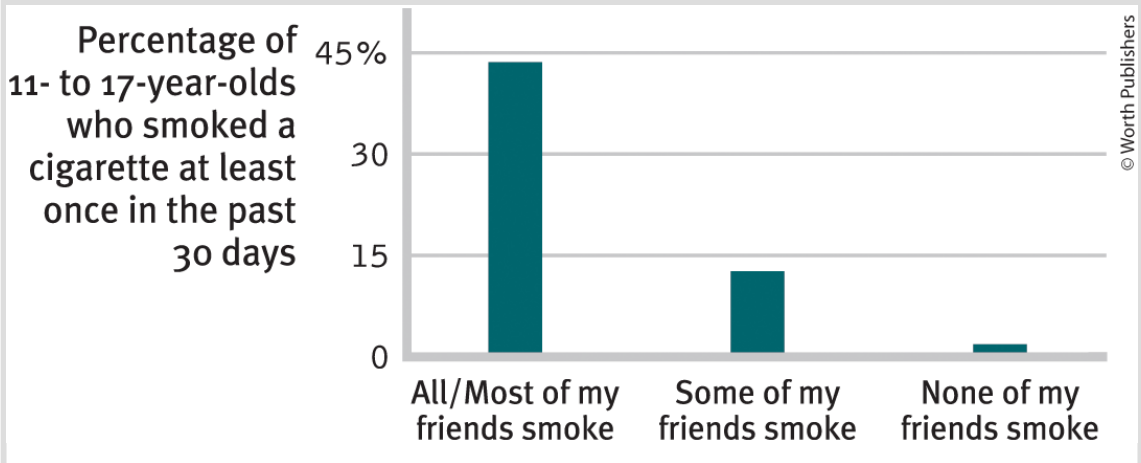


FIGURE 10.6 Peer influence Kids don't smoke if their friends don't (Philip Morris, 2003).

Adolescents' expectations—what they *believe* friends do and like—also influence their behavior (Vitória et al., 2009). University students are not immune to such misperceptions: Drinking can dominate social occasions partly because students overestimate their peers' enthusiasm for alcohol and underestimate their views of its risks (Prentice & Miller, 1993; Self, 1994) (TABLE 10.3). When students' overestimates of peer drinking are corrected, alcohol use often subsides (Moreira et al., 2009).

TABLE 10.3 Facts About U.S. "Higher" Education

- College and university students drink more alcohol than their nonstudent peers and exhibit 2.5 times the general population's rate of substance abuse (NCASA, 2007). After college, many adults "mature out" of problem alcohol use (M. Lee et al., 2018). For others, problems with alcohol haunt their postcollege years.
- Fraternity and sorority members report higher binge-drinking rates and more alcohol abuse symptoms later in life than nonmembers do (McCabe et al., 2018).

People whose beginning use of drugs was influenced by their peers are more likely to stop using when friends stop or their social network changes (Chassin & MacKinnon, 2015). One study that followed 12,000 adults over 32 years found that smokers tend to quit in clusters (Christakis & Fowler, 2008). Within a social network, the odds of a person quitting increased when a spouse, friend, or co-worker stopped smoking. Similarly, most U.S. soldiers who engaged in problematic drug use while in Vietnam ceased after returning home (Robins et al., 1974).

As always with correlations, the traffic between friends' drug use and our own may be two-way: Our friends influence us. Social networks matter. But we also select as friends those who share our likes and dislikes.

What do the findings on drug use suggest for drug prevention and treatment programs? Three channels of influence seem possible:

- Educate young people about the long-term costs of a drug's temporary pleasures.
- Help young people find other ways to boost their self-esteem and discover their purpose in life.
- Attempt to modify peer associations or to "inoculate" youth against peer pressures by training them in refusal skills.

People rarely abuse drugs if they understand the physical and psychological costs, feel good about themselves and the direction

their lives are taking, and are in a peer group that disapproves of using drugs.

"Substance use disorders don't discriminate; they affect the rich and the poor; they affect all ethnic groups. This is a public health crisis, but we do have solutions." — U.S. Surgeon General Vivek Murthy, 2016

Retrieval Practice

RP-6 Why do tobacco product companies try so hard to get customers hooked as teens?

RP-7 Studies have found that people who begin drinking in their early teens are much more likely to develop alcohol use disorder than are those who begin at age 21 or after. What possible explanations might there be for this correlation?

ANSWERS IN APPENDIX E

REVIEW

Module 10: Drugs and Consciousness

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 10-1: What are *substance use disorders?*

LOQ 10-2: What roles do tolerance and addiction play in substance use disorders, and how has the concept of *addiction* changed?

LOQ 10-3: What are *depressants,* and what are their effects?

LOQ 10-4: What are *stimulants,* and what are their effects?

LOQ 10-5: What are *hallucinogens,* and what are their effects?

LOQ 10-6: Why do some people become regular users of consciousness-altering drugs?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

psychoactive drug
substance use disorder
tolerance
addiction
withdrawal
depressants
alcohol use disorder
barbiturates
opioids
stimulants
amphetamines
nicotine
cocaine
methamphetamine
Ecstasy (MDMA)
hallucinogens
near-death experience
LSD (lysergic acid diethylamide)
THC (delta-9-tetrahydrocannabinol)

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. After continued use of a psychoactive drug, the drug user needs to take larger doses to get the desired effect. This is referred to as _____.

2. The depressants include alcohol, barbiturates,
   a. and opioids.
   b. cocaine, and morphine.
   c. caffeine, nicotine, and marijuana.
   d. and amphetamines.

3. Why might alcohol make a person more helpful *or* more aggressive?

4. Long-term use of Ecstasy can
   a. depress sympathetic nervous system activity.
   b. deplete the brain's supply of epinephrine.
   c. deplete the brain's supply of dopamine.
   d. damage serotonin-producing neurons.

5. Near-death experiences are strikingly similar to the experiences evoked by _____ drugs.

6. Use of marijuana
   a. impairs motor coordination, perception, reaction time, and memory.
   b. inhibits people's emotions.
   c. leads to dehydration and overheating.
   d. stimulates brain cell development.

7. An important psychological contributor to drug use is
   a. inflated self-esteem.
   b. the feeling that life is meaningless and directionless.
   c. a genetic predisposition.
   d. overprotective parents.

CHAPTER 4
Nature, Nurture, and Human Diversity (Modules 11–13)



jacoblund/iStock/Getty Images

MODULE 11 Behavior Genetics: Predicting Individual Differences

- Genes: Our Codes for Life
- Twin and Adoption Studies
- Temperament and Heredity
- Heritability
- Gene–Environment Interaction

MODULE 12 Evolutionary Psychology: Explaining Human Nature and Nurture
- Natural Selection and Adaptation
- Evolutionary Success Helps Explain Similarities
- An Evolutionary Explanation of Human Sexuality

MODULE 13 Cultural and Gender Diversity: Understanding Nature and Nurture
- How Does Experience Influence Development?
- Cultural Influences
- Gender Development
- **THINKING CRITICALLY ABOUT:** Gender Bias in the Workplace
- **THINKING CRITICALLY ABOUT:** Sexual Aggression
- Reflections on Nature, Nurture, and Their Interaction

What makes you *you?* In important ways, we are each unique. We are each a one-of-a-kind package of looks, personality, feelings, interests, abilities, cultural background, and language. For example, consider how you greet people. Your affiliative motivation is common, but how you express it is unique. North Americans often ask, “How are you?” Members of an Aboriginal community in remote Australia, in contrast, typically ask, “Which way are you going?” (Boroditsky, 2017). Our cultural values—such as prioritizing our feelings or our sense of direction—interact with our hard-wired traits to make each of us distinct.

Yet we are also the leaves of one tree. Our human family shares not only a common biological heritage—cut us and we bleed—but also common behavioral tendencies. Our shared brain architecture disposes us to

sense the world, develop language, and feel hunger through identical mechanisms. Whether we live by the Arctic Ocean or the Atacama Desert, we prefer sweet tastes to sour. We divide the color spectrum into similar colors. And we affiliate, conform, return favors, punish offenses, organize hierarchies of status, and anguish over a child's death. A visitor from outer space could drop in anywhere and find humans dancing and feasting, singing and worshiping, playing sports and games, laughing and crying, living in families and forming groups. Taken together, such universal behaviors define our human nature.

What causes our striking diversity, and also our shared human nature? How much are our individual differences shaped by our differing genes? And how much by our environment—by every external influence, from maternal nutrition while in the womb to social support while near the tomb? Modules 11, 12, and 13 tell the scientific story of how our genes (nature) and environments (nurture) together knit us.

MODULE 11: Behavior Genetics: Predicting Individual Differences

Learning Objective Question LOQ 11-1

What are *chromosomes, DNA, genes,* and the human *genome?* How do behavior geneticists explain our individual differences?

If Beyoncé and JAY-Z's eldest daughter, Blue Ivy, becomes a popular recording artist, should we attribute her musical talent to her "superstar genes"? To her growing up in a musically rich environment? To high expectations? To her parents' financial resources? Such questions intrigue **behavior geneticists**, who study our differences and weigh the effects and the interplay of **heredity** and **environment**.



A Thousand Words Photography by Erica Comer

The nurture of nature Parents everywhere wonder: Will my baby grow up to be agreeable or aggressive? Successful or struggling? What comes built in, and what is nurtured—and how? Research reveals that both nature and nurture shape our development—every step of the way.

Genes: Our Codes for Life

Behind the story of our body and its brain—surely the most awesome thing on our little planet—is the heredity that interacts with our experience to create both our universal nature and our individual and social diversity. On the eve of the twentieth century, few would have guessed that every cell nucleus in your body contains your genetic master code. It's as if every room in Dubai's Burj Khalifa (the world's tallest structure) contained a book detailing the architect's plans for the entire structure. The plans for your own book of life run to 46 chapters—23 donated by your mother's egg and 23 by your father's sperm. Each of these 46 chapters, called a **chromosome**, is composed of a coiled chain of the molecule **DNA (deoxyribonucleic acid)**. **Genes**, small segments of the giant DNA molecules, form the words of those chapters (**FIGURE 11.1**). Altogether, you have some 20,000 genes, which are either active *(expressed)* or inactive. Environmental events "turn on" genes. When turned on, genes provide the code for creating *protein molecules,* our body's building blocks.

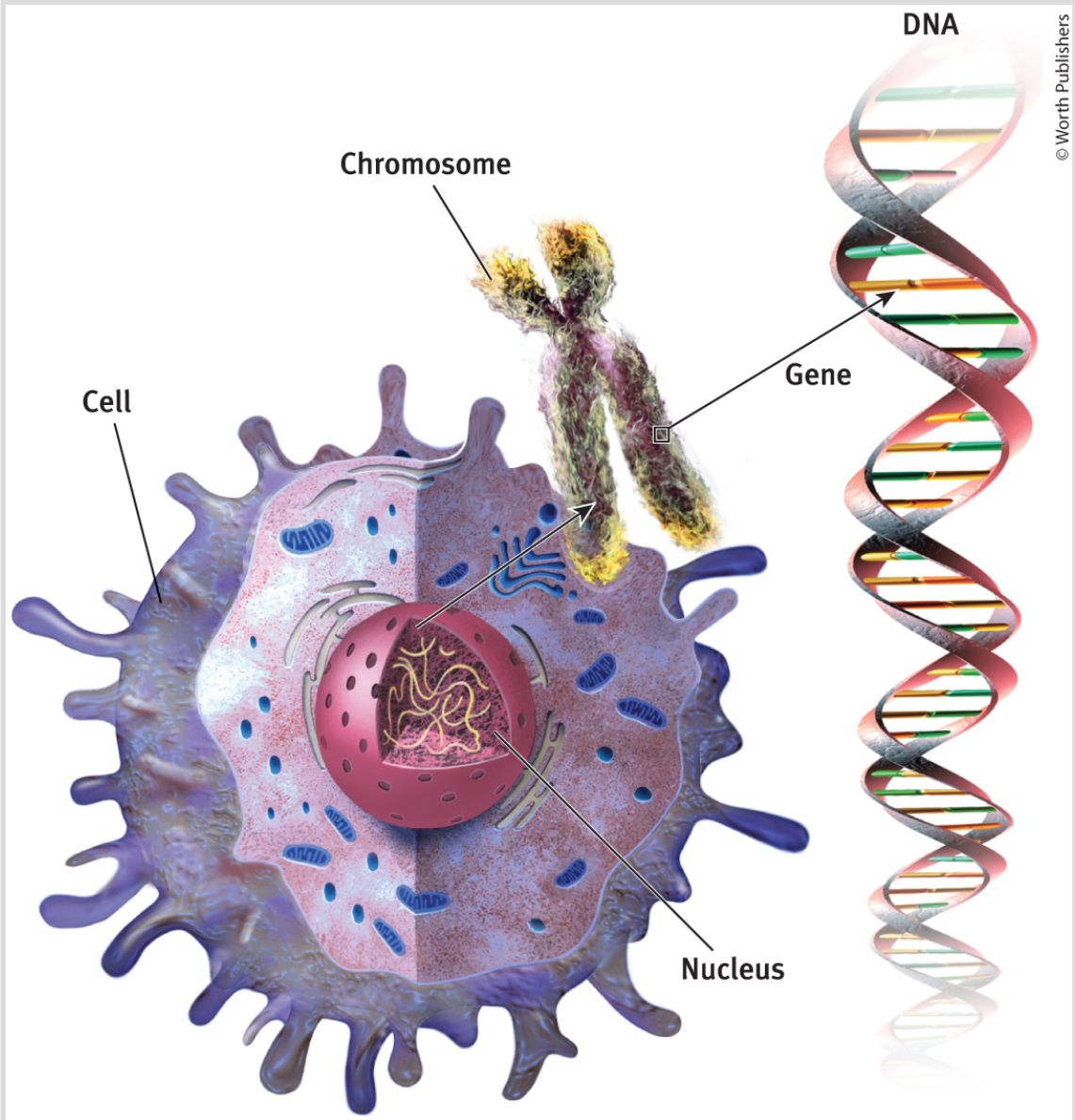


FIGURE 11.1 The life code The nucleus of every human cell contains chromosomes, each comprising two strands of DNA connected in a double helix. Genes are DNA segments that, when expressed (turned on), direct the development of proteins that influence a person's individual development.

Genetically speaking, every other human is nearly your identical twin. Human genome researchers have discovered a common sequence

within human DNA. We share most of our genes with most people, creating a common genetic profile that makes us humans, rather than tulips, bananas, or chimpanzees.

> **"Your DNA and mine are 99.9 percent the same.... At the DNA level, we are clearly all part of one big worldwide family."** — Francis Collins, Human Genome Project director, 2007

Yet we aren't all that different from our chimpanzee cousins. At a genetic level, humans and chimpanzees are 96 percent identical (Mikkelsen et al., 2005). At "functionally important" DNA sites (those that play a key role in our evolution), this number reaches 99.4 percent (Wildman et al., 2003)! Yet that wee 0.6 percent difference matters a lot. It took a human, Shakespeare, to do what our chimpanzee cousins cannot—intricately weave 17,677 words into literary masterpieces.

> **"We share half our genes with the banana."** — Evolutionary biologist Robert May, president of Britain's Royal Society, 2001

Slight differences matter among other species, too. Chimpanzees and bonobos resemble each other in many ways. They should—their genomes differ by much less than 1 percent. But they display markedly different behaviors. Chimpanzees are often aggressive and male-dominated. Bonobos are peaceable and female-led.

Consider how improbable you are. "Each pair of parents," notes behavior geneticist Kathryn Paige Harden (2021), "could produce over 70 *trillion* unique offspring." When your biological parents shuffled their gene decks and dealt your hand, the highly unlikely result was you—with your special combination of traits and abilities. Slight person-to-person variations from the common pattern give clues to our uniqueness—why one person is more susceptible than others to certain psychological disorders, or why one person's face is long and another's is wide (Grotzinger et al., 2022; Zhang et al., 2022).

Most of our traits have complex genetic roots. Your height, for example, reflects the size of your face, vertebrae, leg bones, and so forth—each of which may be influenced by different genes interacting with your specific environment. Your leadership ability, intelligence, aggressiveness, and even happiness are each similarly affected by a whole orchestra of genes (Holden, 2008; Song et al., 2022). Indeed, one of the big take-home findings of today's behavior genetics is that no single gene predicts your smarts, sexual orientation, or personality. Gene analyses of more than 300,000 people have, for example, identified 120 genes associated with schizophrenia (Trubetskoy et al., 2022). Another study of 1.1 million people identified 1271 gene variations that together predicted about 12 percent of the differences in people's years of schooling (J. J. Lee et al., 2018). *The bottom line:* Our differing traits are *polygenic*—influenced by many genes that each have a small effect (Plomin, 2018; von Stumm & d'Apice, 2022).

So, our many genes help explain both our shared human nature and our human diversity. But—another take-home finding—knowing our heredity tells only part of our story. To form us, environmental influences interact with our genetic predispositions.



Jon Kopaloff/FilmMagic/Getty Images

Nature or nurture or both? When talent runs in families—as with musician Lenny Kravitz, actor Lisa Bonet, and their daughter, actor Zoë Kravitz—how do heredity and environment together do their work?

Retrieval Practice

RP-1 Put the following cell structures in order from smallest to largest: nucleus, gene, chromosome.

ANSWERS IN APPENDIX E

Twin and Adoption Studies

LOQ 11-2

How do twin and adoption studies help us understand the effects and interactions of nature and nurture?

To scientifically tease apart the influences of heredity and environment, behavior geneticists could wish for two types of experiments. The first would control heredity while varying the home environment. The second would control the home environment while varying heredity. Such experiments with human infants would be unethical, but nature has done this work for us.

Identical Versus Fraternal Twins

Identical (monozygotic) twins develop from a single fertilized egg that splits. Thus, they are *genetically* identical—nature's own human clones (**FIGURE 11.2**). Indeed, they are clones who share not only the same genes but the same conception and uterus, and usually the same birth date. Two slight qualifications:

- Although identical twins have the same genes, they don't always have the same *number of copies* of those genes repeated within their genome, and they sometimes differ in their brain's tiny wiring structures. These variations help explain why one twin

may have a greater risk for certain illnesses and disorders, including schizophrenia (Lee et al., 2019; Maiti et al., 2011).

- During prenatal development, most identical twins share a *placenta* (which transfers nutrients and oxygen from mother to embryo), but one of every three sets has separate placentas. One twin's placenta may provide slightly better nourishment, contributing to a few identical twin differences (Marceau et al., 2016; van Beijsterveldt et al., 2016).

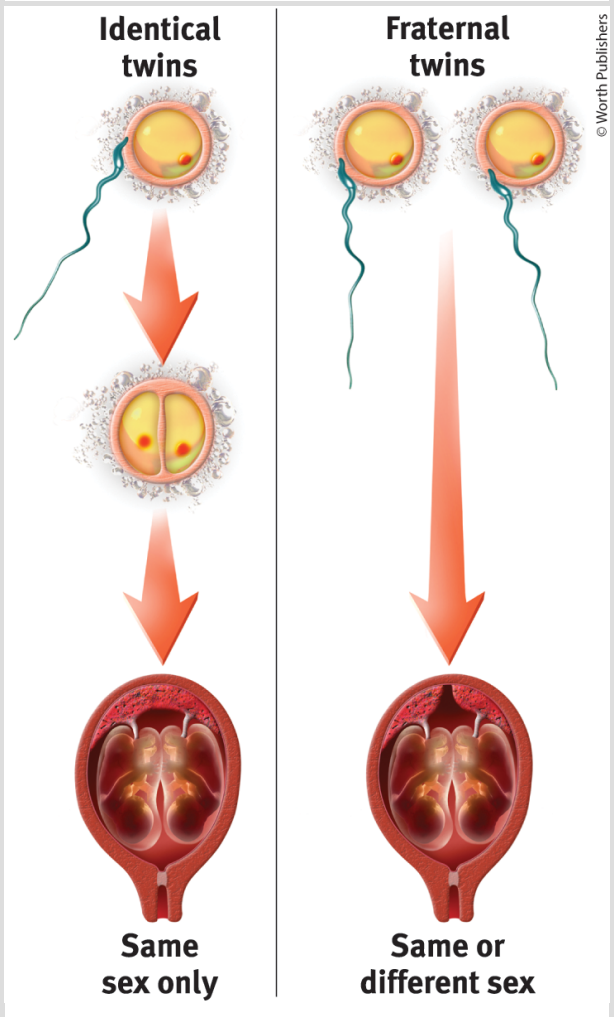


FIGURE 11.2 Same fertilized egg, same genes; different eggs, different genes

Identical twins develop from a single fertilized egg, fraternal twins from two.



The Salyers Family

Double twins When identical twins Brittany and Briana married identical twins Josh and Jeremy, their baby boys became legal cousins, but genetic brothers.

Fraternal (dizygotic) twins develop from two separate fertilized eggs. Although they share a prenatal environment, they are genetically no more similar than ordinary siblings.

Shared genes can translate into shared experiences. A person whose identical twin has *autism spectrum disorder,* for example, has about a 3 in 4 risk of being similarly diagnosed. If the affected twin is fraternal, the co-twin has about a 1 in 3 risk (Tick et al., 2016). To study the effects of genes and environments, several thousand medical and

psychological researchers have studied nearly 15 million identical and fraternal twin pairs (Polderman et al., 2015).

Are genetically identical twins also behaviorally and emotionally more similar than fraternal twins? Compared with fraternal twins, identical twins are much more alike in their personality, their emotions, their politics, and even their marijuana use (Choi et al., 2022; Hufer et al., 2020; Schaefer et al., 2021).

Identical twins, more than fraternal twins, look alike—so much so that most have difficulty distinguishing a flashed photo of their face from their co-twin's face (Martini et al., 2015). So, do people's responses to their looks account for their similarities? *No.* In a clever approach, researcher (and fraternal twin) Nancy Segal (2013) compared personality similarity between identical twins and unrelated look-alike pairs. Only the identical twins reported similar personalities. Other studies have shown that identical twins whose parents treated them alike (for example, dressing them identically) were *not* psychologically more alike than other identical twins (Kendler et al., 1994; Loehlin & Nichols, 1976). In explaining individual differences, identical genes matter more than identical jeans.





Left: Charlie Riedel/AP Photo; right: Bobby McDuffie/Icon Sportswire/Getty Images

Do look-alikes act alike? Genetically unrelated look-alikes, called doppelgangers, tend not to have notably similar personalities (Segal, 2013). Amazingly, these two bearded, red-haired, 6'4" minor league baseball pitchers also share the same unusual name—Brady Feigl—but grew up unaware of each other. Genetic testing confirmed that the two Brady Feigls are unrelated (Gaydos, 2019).

Separated Twins

Imagine the following science fiction experiment: A mad scientist, given two pairs of identical twins, swaps one in each pair. The resulting pairs are then raised in separate environments as if they were fraternal twins. Better yet, consider a *true* story (Dominus, 2015; Segal & Montoya, 2018):

In 2015, William Velasco was working as a butcher in Bogotá, Colombia. One day, customer Laura Vega Garzón mistook him for her colleague, Jorge, who looked the same—same high cheekbones, same

smile, same walking style. Was it Jorge, pretending to be someone else? Confused, she returned to the butcher shop to show William a picture of his look-alike, Jorge. William laughed and didn't take it seriously, but Laura later showed her colleague Jorge a photograph of William, the butcher. "That's me!" Jorge exclaimed. Scrolling through William's social media photos, Jorge found another surprise: his look-alike, William, was sitting next to a mirror image of Jorge's fraternal twin brother.

Until then, William and Jorge had lived utterly separate lives. William grew up in a rural village, whereas Jorge was city-raised. William and Jorge both—thanks to a colossal hospital mistake—believed they had fraternal twin brothers, Wilber and Carlos, respectively. In reality, Wilber and Carlos, like William and Jorge, were identical twins. The hospital had sent William home with Wilber, and Carlos home with Jorge.

Although they were raised apart, William and Jorge both were jokesters, physically strong, and supportive. Wilber and Carlos were moody and serious, always organized, and prone to crying, and they had the same speech impediment. Each of the four had wondered why he felt so different from his supposed fraternal twin. Meeting their identical twins revealed the power of genetics.

Genes matter, but so does environment. Urban dwellers Jorge and Carlos had better nutrition, and were taller than rural-raised William and Wilber. Wilber didn't have access to the speech therapy that

Carlos did, which meant that only Wilber struggled with speaking as an adult.

The remarkable story of the "Bogotá brothers" (see tinyurl.com/BogotaBrothers for photos and more) resembles that of many separated twin pairs. When tested by psychologists Thomas Bouchard and Nancy Segal, separated identical twins exhibited similarities not only of tastes and physical attributes but also of personality, abilities, attitudes, interests, and fears.



Nancy L. Segal, PhD.

Bogotá brothers When two pairs of accidentally switched Colombian identical twins were reunited, the power of nature was evident. But the twins also witnessed the impact of their different childhood environments and family circumstances. Nature and nurture matter.

Separated Jims

In 1979, Jim Lewis awoke next to his second wife, for whom he often left love notes around the house. As he lay in bed, he thought about his son, James Alan, and his dog, Toy. Jim enjoyed building furniture in his basement woodworking shop, including a white bench encircling a tree in his front yard. He also liked driving his Chevy, watching stock-car racing, and drinking Miller Lite beer.

Shockingly, there existed another Jim for whom all these things were also true![1] Thirty-seven days after their birth, identical twins Jim Lewis and Jim Springer were adopted separately and raised with no knowledge of each other until the day Jim Lewis received a call from his genetic clone (who, having been told he had a twin, set out to find him). The 39-year-old brothers became the first of 74 separated twin pairs tested by psychologist Thomas Bouchard and his colleagues (2009; P. Miller, 2012).

Stories of startling twin similarities have not impressed critics, who remind us that "the plural of *anecdote* is not *data*." They note that if researchers created a control group of biologically unrelated pairs of the same age, sex, and ethnicity, who had not grown up together but who were as similar to one another in economic and cultural background as are many of the separated twin pairs, these pairs would also exhibit striking, yet coincidental, similarities (Joseph, 2001). Twin researchers reply that separated fraternal twins do not, however, exhibit similarities comparable to those of separated identical twins.

Even the impressive data from personality assessments are clouded by the reunion of many of the separated twins some years before they were tested. Moreover, when adoption agencies are involved,

separated twins tend to be placed in similar homes. Despite these criticisms, the striking twin-study results helped shift scientific thinking toward a greater appreciation of genetic influences.

Biological Versus Adoptive Relatives

For behavior geneticists, nature's second real-life experiment—adoption—creates two groups: *genetic relatives* (biological parents and siblings) and *environmental relatives* (adoptive parents and siblings). For personality or any other given trait, we can ask whether adopted children are more like their biological parents, who contributed their genes, or their adoptive parents, who contribute a home environment. And while sharing that home environment, do adopted siblings come to share traits?

The stunning finding from studies of hundreds of adoptive families is that, apart from identical twins, people who grow up together—whether biologically related or not—do not much resemble one another in personality (McGue & Bouchard, 1998; Plomin, 2011; Rowe, 1990). In personality traits such as extraversion and agreeableness, for example, people who have been adopted are more similar to their *biological* parents than to their caregiving adoptive parents.

The finding is important enough to bear repeating: Unless an environment is extreme (such as conditions of war or famine), *shared family environment has little discernible impact on children's personality*. Two adopted children raised in the same home are no more likely to

share personality traits with each other than with the child down the block.

Heredity shapes other primates' personalities, too. Macaque monkeys raised by foster mothers exhibit social behaviors that resemble their biological, rather than foster, mothers (Maestripieri, 2003).

The genetic leash may limit the family environment's influence on personality, but it does not mean that adoptive parenting is a fruitless venture. One study followed more than 3000 Swedish children with at least one biological parent who had depression. Compared with their not-adopted siblings, those raised by an adoptive family were about 20 percent less likely to develop depression (Kendler et al., 2020). As an adoptive parent, I [ND] find it heartening to know that parents do influence their children's attitudes, values, manners, politics, education, and faith (Gould et al., 2019; Willoughby et al., 2021). This was dramatically illustrated during World War II by separated identical twins Jack Yufe, who was Jewish, and Oskar Stöhr, a member of Germany's Hitler Youth. After later reuniting, Oskar mused to Jack: "If we had been switched, I would have been the Jew, and you would have been the Nazi" (Segal, 2005, p. 70). Parenting—and the cultural environments in which parents place children—matters!

Siblings so different: Hermann Goering was outgoing, loved crowds, and became Hitler's right-hand man and founder of the Nazi Gestapo. His younger brother Albert Goering was quiet and reclusive, and worked to save the Jewish people that brother Hermann's regime was killing (Brennan, 2010).

Moreover, child neglect and abuse and even parental divorce are rare in adoptive homes. (Adoptive parents are carefully screened; biological parents are not.) One study looked at biological mothers with multiple children who were raised apart—some of whom they parented, and some of whom an adoptive mother parented (Natsuaki et al., 2019). Compared with the biological mothers, the adoptive mothers used gentler parenting and gave more guidance. So it is not surprising that most adopted children thrive, especially when adopted as infants (Loehlin et al., 2007; van IJzendoorn & Juffer, 2006; Wierzbicki, 1993). Seven in eight adopted children have reported feeling strongly attached to one or both adoptive parents. As children of self-giving parents, they have grown up to be more self-giving and altruistic than average (Sharma et al., 1998). Many scored higher than their biological parents and raised-apart biological siblings on intelligence tests, and most grew into happier and more stable adults (Kendler et al., 2015; van Ijzendoorn et al., 2005). In one Swedish study, children adopted as infants grew up with fewer problems than were experienced by children whose biological mothers initially registered them for adoption but then decided to raise the children themselves (Bohman & Sigvardsson, 1990). *The bottom line:* Most adopted children benefit from adoption.





Top: Guillaume Collet/Sipa/Shutterstock; bottom: Tim Clayton/Corbis/Getty Images

Adoption matters Oscar-winning actor Frances McDormand and Olympic gold medal gymnast Simone Biles both benefited from one of the biggest gifts of love: adoption.

Ask Yourself

Do you know biological siblings who, despite having been raised together, have very different personalities? (Are *you* one of these siblings, perhaps?) Knowing what you do of their lives and upbringing, what do you think contributed to these differences?

Retrieval Practice

RP-2 How do researchers use twin and adoption studies to learn about psychological principles?

ANSWERS IN APPENDIX E

Temperament and Heredity

LOQ 11-3

What have psychologists learned about temperament?

As most parents with multiple children report, babies differ right out of the womb (Willoughby et al., 2019). One aspect of personality—**temperament** (emotional reactivity and intensity)—is quickly apparent, and it is genetically influenced (Kandler et al., 2012; Raby et al., 2012). Identical twins, more than fraternal twins, often have similar temperaments (Fraley & Tancredy, 2012; Kandler et al., 2013). Temperament differences typically persist. Emotionally reactive

infant monkeys tend to become reactive adults (Fox et al., 2021). Ditto for emotionally intense preschoolers, who tend to become relatively intense young adults (Larsen & Diener, 1987). One study of 1037 New Zealanders found that a 45-minute assessment of 3-year-olds' frustration tolerance, impulsivity, and intelligence could predict "with considerable accuracy" which of them would, by age 38, consume the most welfare benefits, parent and then abandon the most children, and commit the most crime (Caspi et al., 2016).

The genetic effect appears in physiological differences. Anxious, inhibited infants have high and variable heart rates and a reactive nervous system. When facing new or strange situations, they become more physiologically aroused (Kagan & Snidman, 2004; Roque et al., 2012).

Heritability

LOQ 11-4

What is *heritability,* and how does it relate to individuals and groups?

So, our biology helps form our personality. Yet asking whether our personality is more a product of our genes or our environment is like asking whether a basketball court's size is more the result of its length or its width. However, we could ask whether different court sizes are more the result of *differences* in their length or width. Similarly, we can

ask whether person-to-person personality differences are influenced more by nature or by nurture.

Using twin and adoption studies, behavior geneticists can mathematically estimate the **heritability** of a trait—the extent to which variation among individuals in a group can be attributed to their differing genes. For many personality traits, heritability is about 40 percent (Weinschenk et al., 2022). For major depressive disorder, heritability is about 30 percent (Pettersson et al., 2019). For adult intelligence, heritability is about 60 percent (Plomin et al., 2016). This does *not* mean that *your* intelligence is 40–60 percent genetic. Rather, it means that genetic influence explains 60 percent of the observed *variation* among adults. We can never say what percentage of an *individual's* personality or intelligence is inherited. It makes no sense to say that your personality is due *x* percent to your heredity and *y* percent to your environment. This point is so often misunderstood that we repeat: Heritability refers to how much *differences among people* are due to genes.



"You can be whatever you want to be, but you'll probably turn out like me."

The heritability of traits such as intelligence varies from study to study. Consider humorist Mark Twain's (1835–1910) fictional idea of raising boys in barrels until age 12, feeding them through a hole. If we followed his suggestion, the boys would all emerge with lower-than-average intelligence scores at age 12. Yet, given their equal environments, their test score differences could be explained only by their heredity. With the same environment, heritability—differences due to genes—would be nearly 100 percent.

As environments become more similar, heredity becomes the primary source of differences. If all schools were of uniform quality, all families equally loving, and all neighborhoods equally healthy, then heritability would *increase* (because differences due to environment would *decrease*). But consider the other extreme: If all people had similar heredities but were raised in drastically different environments (some in barrels, some in luxury homes), heritability

would be much lower. So, heritability is not a single fixed score; it varies with changing environments.

If genetic influences help explain variations in traits among individuals in a group, can the same be said of trait differences *between* groups? Not necessarily. Height is 90 percent heritable, yet nutrition (an environmental factor) rather than genes explains why, as a group, today's adults are taller (Floud et al., 2011). In 1896, the global average height for men was 5 feet 3 inches (162 centimeters) and for women was 4 feet 10 inches (151 centimeters) (Our World in Data, 2019). In the 1990s, their male and female counterparts stood 3.5 inches (9 centimeters) taller. The two groups differ, but not because human genes have changed in this eyeblink of time. With their better diets, South Korean men and women now average 6 inches (15 centimeters) taller than genetically similar North Koreans (Johnson et al., 2009). Genes matter, but so does environment.

As with height, so with personality and intelligence scores: Heritable individual differences need not imply heritable group differences. And, if some *individuals* are genetically disposed to be more aggressive than others, that needn't explain why some *groups* are more aggressive than others. Putting people in a new social context can change their aggressiveness. Today's peaceful Scandinavians carry many genes inherited from their Viking warrior ancestors.

Retrieval Practice

RP-3 Those studying the *heritability* of a trait try to determine how much of the person-to-person variation in that trait among members of a specific group is due to their differing _____.

ANSWERS IN APPENDIX E

Gene–Environment Interaction

Among our similarities, the most important—the behavioral hallmark of our species—is our enormous adaptive capacity. Some human traits develop the same way in virtually every environment. But other traits are expressed only in particular environments. Go barefoot for a summer and you will develop toughened, callused feet—a biological adaptation to friction. Meanwhile, your shod neighbor will remain a tenderfoot. The difference between the two of you is an effect of the environment. But it is the product of a biological mechanism—*adaptation.* Our shared biology enables our developed diversity (Buss, 1991). Thus, to say that genes and experience are *both* important is true. But more precisely, they **interact**.

Just *how* our genes and our experiences interact to form us is one of psychology's hottest topics. Gene–environment interaction studies reveal that family genetics help predict child abuse and neglect, which in turn predicts poor mental health (Warrier et al., 2021). These studies also demonstrate who is most at risk of permanent harm from

stress or abuse and who is most likely to benefit from interventions (Byrd et al., 2019; Manuck & McCaffery, 2014). The National Institutes of Health *All of Us* research program is now studying 1 million people from all backgrounds to pinpoint precisely how their genes and environment interact to predict physical and mental health (NIH, 2022).



Derek Storm/Splash News/Newscom

An out-of-this-world study of genes and environments In 2015, Scott Kelly (left) spent 340 days orbiting the planet in the International Space Station. His identical twin, Mark Kelly (right), remained on Earth. Both twins underwent the same physical and psychological testing (Garrett-Bakelman et al., 2019). Only Scott Kelly's immune system temporarily went into overdrive, possibly due to the stresses of living in space and exposure to greater-than-average levels of radiation.

Molecular Behavior Genetics

LOQ 11-5

How is molecular genetics research changing our understanding of the effects of nature and nurture?

Behavior geneticists have progressed well beyond asking "Do genes influence behavior?" The newest frontier of behavior-genetic research draws on "bottom-up" **molecular genetics,** which studies the molecular structure and function of genes.

Searching for Specific Genes Influencing Behavior

As we've seen, genes typically are not solo players. For example, twin and adoption studies have revealed no single "obesity gene." Some genes influence how quickly the stomach tells the brain, "I'm full" (Adetunji, 2014). Others might dictate how much fuel the muscles need, how many calories are burned off by fidgeting, and how efficiently the body converts extra calories into fat. So, one goal of **molecular behavior genetics** is to find some of the many genes that together orchestrate complex traits such as body weight, sexual orientation, and impulsivity.

Genome-Wide Studies

Most genes have tiny effects, which means it makes little sense to look for a single "smart gene" or "optimism gene." The human traits we care about, observes Kathryn Paige Harden (2021), "are influenced by many (very, very, very many) genetic variants, each of which contributes only a drop of water to the swimming pool of genes that make a difference." Nevertheless, these tiny effects can add up to big effects—shaping our personality, mental health, and longevity.

Genome-wide association studies (GWAS) study the entire genome of a large group of people to find genetic variations associated with an observed trait or behavior (a *phenotype*). Copious correlations from thousands of these variants combine to predict meaningful differences among people. In one large study, only 11 percent of high school students with the lowest genome-wide scores predicting school success later graduated from college—as did 55 percent of those with the highest combined genome score (Lee et al., 2018). Controlling for individual genetic differences, using a GWAS measure, can even promote social equity by identifying who is most likely to benefit from environmental interventions such as school programs or income support (Harden, 2021). In this way, scientists can use genetics to improve lives rather than to classify people as genetically superior or deficient.

Epigenetics: Triggers That Switch Genes On and

Off

Genes can be either active (expressed, as hot water activates a tea bag) or inactive. **Epigenetics** (meaning "in addition to" or "above and beyond" genetics) studies the molecular mechanisms by which environments can trigger or block genetic expression. Genes are *self-regulating*. Rather than acting as blueprints that lead to the same result no matter the context, genes react. An African butterfly that is green in summer turns brown in fall, thanks to a temperature-controlled genetic switch. The same genes that produce green in one situation produce brown in another.

The molecules that trigger or block genetic expression are called *epigenetic marks*. These marks tell the associated genes "what to do, where to do it, and when to do it" (NIH, 2021). For example, when one of these molecules attaches to part of a DNA segment, it may "turn off" the gene at that site (**FIGURE 11.3**). As one geneticist explained, "Things written in pen you can't change. That's DNA. Things written in pencil you can. That's epigenetics" (Reed, 2012).

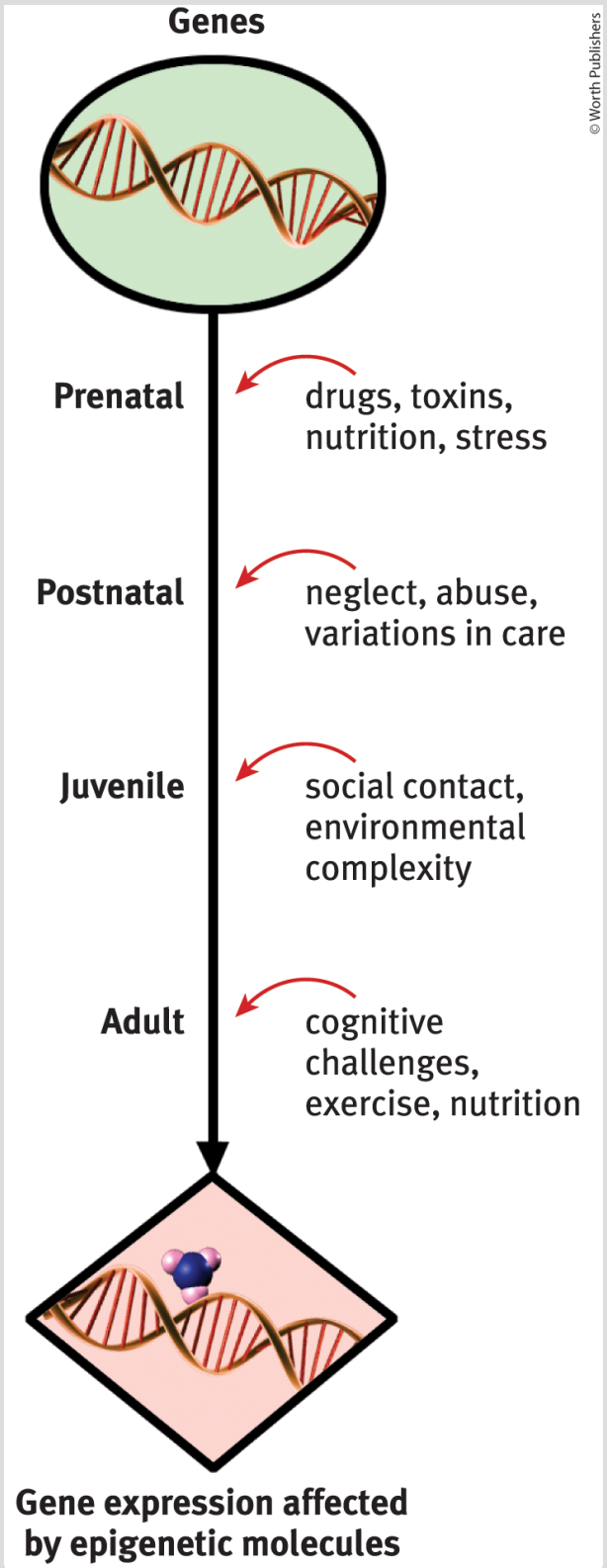


FIGURE 11.3 Epigenetic expression

Beginning in the womb, life experiences lay

down *epigenetic marks*—often organic methyl molecules—that can influence the expression of any gene in the DNA segment they affect. (Research from Champagne, 2010.)



Environmental factors such as diet, drugs, and stress can affect the epigenetic molecules that regulate gene expression. Mother rats normally lick their infants. In experiments, infant rats deprived of this licking had more epigenetic molecules blocking access to their brain's "on" switch for developing stress hormone receptors. When stressed, animals with above-average levels of free-floating stress hormones displayed more stress (Champagne et al., 2003; Champagne & Mashoodh, 2009).

Thanks to epigenetics, the effects of our experiences can last a lifetime—and beyond. Traumatic experiences, such as childhood trauma, poverty, or malnutrition, for example, may leave their fingerprints in a person's genome (Nugent et al., 2016; Peter et al., 2016; Swartz et al., 2016). While some people experience prolonged distress and related epigenetic changes, for others, traumatic experiences increase the expression of genes related to psychological resilience (Smeeth et al., 2021). Epigenetic changes like these may get passed down to future generations, leading some evolutionary biologists to theorize that inheritance occurs not only through gene transmission, but also through experience (Uller & Laland, 2019). Evolution, they argue, predisposes human culture and experiences,

which then influence evolution. Other scientists dispute the idea that children can inherit their parents' epigenetic changes (Horsthemke, 2018; Ryan & Kuzawa, 2020). Stay tuned: This scientific story is still being written.



Adrian Wyld/The Canadian Press/AP Photo

Lasting effects Former Canadian Senator Murray Sinclair led an in-depth investigation on Canada's residential school program, which, for more than a century, removed Indigenous children from their families. Disease and abuse were common, with an estimated 10,000 students dying or missing (Austen, 2022). In 2022, Pope Francis visited Canada to apologize for the Roman Catholic Church's extensive involvement in the program (Picheta et al., 2022). Although the

program shut down in 1996, its devastating effects on Indigenous Canadians continue to fuel income inequality, prejudice, and discrimination (Greenwood, 2021).

Epigenetics research may solve some scientific mysteries, such as why only one member of an identical twin pair may develop a genetically influenced mental disorder (Spector, 2012). Epigenetics can also help explain why identical twins may look slightly different. Researchers studying mice have found that in utero exposure to certain chemicals can cause genetically identical twins to have different-colored fur (Dolinoy et al., 2007).

Retrieval Practice

RP-4 Match the following terms (i–iii) to the correct definition (a–c).

Term:	**Definition:**
i. Epigenetics	a. Study of the relative effects of our genes and our environment on our behavior.
ii. Molecular behavior genetics	b. Study of how the structure and function of specific genes interact with our environment to influence behavior.
iii. Behavior genetics	c. Study of environmental factors that affect how our genes are *expressed*.

ANSWERS IN APPENDIX E

REVIEW

Module 11: Behavior Genetics: Predicting Individual Differences

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 11-1: What are *chromosomes, DNA, genes,* and the human *genome?* How do behavior geneticists explain our individual differences?

LOQ 11-2: How do twin and adoption studies help us understand the effects and interactions of nature and nurture?

LOQ 11-3: What have psychologists learned about temperament?

LOQ 11-4: What is *heritability,* and how does it relate to individuals and groups?

LOQ 11-5: How is molecular genetics research changing our understanding of the effects of nature and nurture?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

behavior genetics
heredity
environment
chromosomes
DNA (deoxyribonucleic acid)
genes
genome
identical (monozygotic) twins
fraternal (dizygotic) twins
temperament
heritability
interaction
molecular genetics
molecular behavior genetics
epigenetics

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in

Appendix E.

1. The threadlike structures made largely of DNA molecules are called _____.

2. A small segment of DNA that codes for particular proteins is referred to as a _____.

3. When the mother's egg and the father's sperm unite, each contributes
   a. one chromosome pair.
   b. 23 chromosomes.
   c. 23 chromosome pairs.
   d. 25,000 chromosomes.

4. Fraternal twins result when
   a. a single egg is fertilized by a single sperm and then splits.
   b. a single egg is fertilized by two sperm and then splits.
   c. two eggs are fertilized by two sperm.
   d. two eggs are fertilized by a single sperm.

5. _____ twins share the same DNA.

6. Adoption studies seek to understand genetic influences on personality. They do this mainly by
   a. comparing adopted children with nonadopted children.
   b. evaluating whether adopted children's personalities more closely resemble those of their adoptive parents or those of their biological parents.

c. studying the effect of prior neglect on adopted children.
d. studying the effect of children's age at adoption.

7. From the very first weeks of life, infants differ in their characteristic emotional reactions, with some infants being intense and anxious, while others are easygoing and relaxed. These differences are usually explained as differences in _____.

8. _____ is the proportion of variation among individuals in groups that we can attribute to genes.

9. Epigenetics is the study of the molecular mechanisms by which _____ trigger or block genetic expression.

MODULE 12: Evolutionary Psychology: Explaining Human Nature and Nurture

LOQ 12-1

How do evolutionary psychologists use natural selection to explain behavior tendencies?

Behavior geneticists explore the genetic and environmental roots of human differences. **Evolutionary psychologists** instead focus mostly on what makes us so much alike as humans. They use Charles Darwin's principle of **natural selection**—"arguably the most momentous idea ever to occur to a human mind," said Richard Dawkins (2007)—to understand the roots of behavior and mental processes. The idea, simplified, is this:

- Organisms' varied offspring compete for survival.
- Certain biological and behavioral variations increase organisms' reproductive and survival chances in their particular environment.
- Offspring that survive are more likely to pass their genes to ensuing generations.
- Thus, over time, population characteristics may change.

To see these principles at work, let's consider a straightforward example in foxes.

Natural Selection and Adaptation

A fox is a wild and wary animal. If you capture a fox and try to befriend it, be careful: If the timid fox cannot flee, it may snack on your fingers. In the early 1950s, Russian scientist Dmitry Belyaev wondered how our human ancestors had domesticated dogs from their equally wild wolf forebears. Might he, within a comparatively short stretch of time, accomplish a similar feat by transforming the fearful fox into a friendly fox?

To find out, Belyaev set to work with 100 female and 30 male foxes selected from fox farms (where some domestication would have already occurred [Gorman, 2019]). From their offspring he selected and mated the tamest 20 percent of females and 5 percent of males. (He measured tameness by the foxes' responses to attempts to feed, handle, and stroke them.) Over 57 generations of foxes, Belyaev and his successor, Lyudmila Trut, have repeated that simple procedure (Dugatkin & Trut, 2017). After 40 years and 45,000 foxes, they had a new breed of foxes that, in Trut's (1999) words, were "docile, eager to please, and unmistakably domesticated.... Before our eyes, 'the Beast' has turned into 'beauty,' as the aggressive behavior of our herd's wild [ancestors] entirely disappeared." So friendly and eager for human contact were these animals, so inclined to whimper to attract attention and to lick people like affectionate dogs, that the cash-

strapped institute seized on a way to raise funds—marketing its friendly foxes as house pets.



Courtesy Institute of Cytology and Genetics, SB RAS

How to tame a fox Over six decades, geneticist Lyudmila Trut has bred silver foxes into friendly human companions.

Does the same process work with naturally occurring selection? Does natural selection explain our human tendencies? Nature has indeed selected advantageous variations from the new gene combinations produced at each human conception, plus occasional **mutations** (random errors in gene replication that become nature's preliminary tests of alternative possibilities). But the tight genetic leash that predisposes a dog's retrieving, a cat's pouncing, or a bird's nesting is looser on humans. The genes selected during our ancestral history

provide more than a long leash; they give us a great capacity to learn and therefore to *adapt* to life in varied environments, from the tundra to the jungle. Genes and experience together wire the brain. Our adaptive flexibility in responding to different environments contributes to our *fitness*—our ability to survive and reproduce.

Retrieval Practice

RP-1 How are Belyaev and Trut's breeding practices similar to, and how do they differ from, the way natural selection normally occurs?

ANSWERS IN APPENDIX E

Evolutionary Success Helps Explain Similarities

Human differences grab our attention. Guinness World Records entertain us with the tallest, oldest, longest-haired, and most-tattooed humans. But our deep similarities also demand explanation. At the Amsterdam Airport's international arrivals area, one sees the same delighted joy on the faces of Indonesian grandmothers, Chinese children, and homecoming Dutch. "Even at a time when everything seems to be changing," notes physician-sociologist Nicholas Christakis (2019), "fundamental ways that humans live together remain constant."

Our Genetic Legacy

Our similarities arise from our shared human *genome,* our common genetic profile. No more than 5 percent of the genetic differences among humans arise from population group differences. Some 95 percent of genetic variation exists *within* populations (Rosenberg et al., 2002). The typical genetic difference between two South Africans or between two Singaporeans is much greater than the *average* difference between the two groups. Thus, if after a worldwide catastrophe only South Africans or Singaporeans survived, the human species would suffer only "a trivial reduction" in its genetic diversity (Lewontin, 1982).

And how did we develop this shared human genome? At the dawn of human history, our ancestors faced certain questions: Who is my ally, who is my foe? With whom should I mate? What food should I eat? Some individuals answered those questions more successfully than others. For example, women who experienced nausea in the critical first three months of pregnancy were genetically predisposed to avoid certain bitter, strongly flavored, and novel foods. Avoiding such foods had survival value, since they are the very foods most often toxic to prenatal development (Profet, 1992; Schmitt & Pilcher, 2004). Early humans disposed to eat nourishing rather than poisonous foods survived to contribute their genes to later generations. Those who deemed leopards "nice to pet" often did not.

Similarly successful were those whose mating helped them produce and nurture offspring. Over generations, the genes of individuals not disposed to mate or nurture tended to be lost from the human gene pool. As success-enhancing genes continued to be selected, behavioral tendencies and learning capacities emerged that prepared our Stone Age ancestors to survive, reproduce, and send their genes into the future—and into you.

> Consider yourself fortunate: Despite high infant mortality and rampant disease in past millennia, not one of your countless ancestors died childless.

Across our cultural differences, we even share a "universal moral grammar" (Mikhail, 2007). Men and women, young and old, liberal and conservative, living in Sydney or Seoul, all respond negatively when asked, "If a lethal gas is leaking into a vent and is headed toward a room with seven people, is it okay to push someone into the vent—saving the seven but killing the one?" And they all respond more approvingly when asked if it's okay to *allow* someone to fall into the vent, again sacrificing one life but saving seven. Our shared moral instincts survive from a distant past where we lived in small groups in which direct harm-doing was punished. For all such universal human tendencies, from our intense need to give parental care to our shared fears and lusts, evolutionary theory proposes a one-stop-shopping explanation (Schloss, 2009).

As heirs to this prehistoric legacy, we were not born as unprogrammed "blank slates." Instead, we are genetically predisposed to think and act in ways that promoted our biological ancestors' surviving and reproducing. But in some ways, we are biologically prepared for a world that no longer exists. We love the taste of sweets and fats, nutrients that prepared our physically active ancestors to survive food shortages. Few of us now gather and hunt for our food; instead, we too readily find sweets and fats in fast-food outlets and vending machines. Our deeply rooted natural dispositions are mismatched with today's junk food and often inactive lifestyle.

Evolutionary Psychology Today

Darwin's theory of evolution has become one of biology's fundamental organizing principles and lives on in the *second Darwinian revolution:* the application of evolutionary principles to psychology. In concluding *On the Origin of Species,* Darwin (1859, p. 346) anticipated this, foreseeing "open fields for far more important researches. Psychology will be based on a new foundation."

Those who are troubled by an apparent conflict between scientific and religious accounts of human origins may find it helpful to consider that different perspectives on life can be complementary. For example, the scientific account attempts to tell us *when* and *how;* religious creation stories usually aim to tell about an ultimate *who* and *why.* As Galileo explained to the Grand Duchess Christina, "The Bible teaches how to go to heaven, not how the heavens go."

Elsewhere in this text, we address questions that intrigue evolutionary psychologists: Why do infants start to fear strangers about the time they become mobile? Why do more people develop a *specific phobia* in response to spiders, snakes, and heights than to modern threats such as guns? And why do we fear commercial air travel more than much riskier driving?

To see how evolutionary psychologists think and reason, let's pause to explore their answers to two questions: How are men and women alike? How and why does their sexuality differ?

An Evolutionary Explanation of Human Sexuality

LOQ 12-2

How might an evolutionary psychologist explain male-female differences in sexuality and mating preferences?

Having faced many similar challenges throughout history, all genders have adapted in similar ways: We eat the same foods, avoid the same dangers, and perceive, learn, and remember similarly. When looking for a mate, we all prize many of the same traits—kindness, honesty, and intelligence—and we avoid our close genetic relatives (Dandine-Roulland et al., 2019). It is only in those domains where we have faced differing adaptive challenges—most obviously in behaviors related to reproduction—that we differ, say evolutionary psychologists.

Male-Female Differences in Sexuality

And differ we do. Consider sex drives. Men and women are sexually motivated, some women more so than many men. Yet on average, who thinks more about sex? Hooks up more often? Masturbates more often? Views more pornography? The answers worldwide: *men, men, men,* and *men* (Baumeister et al., 2001; Hall et al., 2017; Lippa, 2009; Petersen & Hyde, 2010). Even among 65- to 80-year-old Americans, 12 percent of women and 50 percent of men reported being "very" or "extremely" interested in sex (Malani et al., 2018).

Unattached straight men are alert for women's interest, and often misperceive a woman's friendliness as a sexual come-on (Abbey, 1987). This *sexual overperception bias* was evident in speed-dating men, who believed their dating partners expressed more sexual interest than the partners reported actually expressing (Perilloux et al., 2012). (This may be partially explained by unattached straight women underreporting their own sexual interests [Engeler & Raghubir, 2018]). Long-term couples do better at gauging their partners' sexual interest (Dobson et al., 2018).

Many gender similarities and differences transcend sexual orientation. Compared with gay women, gay men (like straight men) report more responsiveness to visual sexual stimuli, and more concern with their partner's physical attractiveness (Bailey et al., 1994; Doyle, 2005; Schmitt, 2007; Sprecher et al., 2013). Gay male couples also report having sex more often than do gay female couples

(Peplau & Fingerhut, 2007). And men, regardless of sexual orientation, report more interest in uncommitted sex than do women (Schmitt, 2003).

Natural Selection and Mating Preferences

Natural selection is nature selecting traits and appetites that contribute to survival and reproduction. Evolutionary psychologists use the principle of *sex selection* to explain how females and males tend to differ in dating and mating patterns, whether they're chimpanzees or elephants, farmworkers or corporate presidents (Buss & Schmitt, 2019; Hughes et al., 2021). Our natural yearnings, they say, are our genes' way of reproducing themselves.



"Is that all you can think about?"

Why do women tend to be choosier than men when selecting sexual partners? Women have more at stake. To send her genes into the future, a woman conceives and protects a fetus growing inside her body for up to 9 months, and may nurse for months following birth. No surprise then, that straight women prefer partners who will offer their joint offspring support and protection—stick-around dads over likely cads (Meeussen et al., 2019). Straight women are attracted to tall

men with slim waists and broad shoulders—all signs of reproductive success (Sidari et al., 2021). And straight women worldwide prefer men who seem affluent (Walter et al., 2020). One study of hundreds of Welsh pedestrians asked people to rate a driver pictured at the wheel of a humble Ford Fiesta or a swanky Bentley. Men said a female driver was equally attractive in both cars. Women, however, found a male driver more attractive if he was in the luxury car (Dunn & Searle, 2010). Similarly, when people viewed pictures of others in luxury or standard apartments, women found men more attractive when they appeared in the luxury apartment, but men's perceptions were not affected by the backdrop (Dunn & Hill, 2014).

The data are in, say evolutionists: Men pair widely; women pair wisely. And what traits do straight men find desirable? Some traits, such as smooth skin and a youthful shape, are culturally universal, and they convey health and fertility (Buss & Von Hippel, 2018). Mating with such women might increase a man's chances of sending his genes into the future. And sure enough, men feel most attracted to women whose waist is roughly a third narrower than their hips—a fertility indicator (Lassek & Gaulin, 2018, 2019; Lewis et al., 2015). Even blind men show this preference for women with a low waist-to-hip ratio (Karremans et al., 2010). Men are most attracted to women whose ages in the ancestral past (when ovulation began later than today) would be associated with peak fertility (Kenrick et al., 2009). Thanks to males' sensitivity to fertility cues, teen boys are most attracted to women several years older than themselves; mid-twenties men to women around their own age; and older men to younger

women. This pattern consistently appears across European singles ads, Indian marital ads, and marriage records from North and South America, Africa, and the Philippines (Singh, 1993; Singh & Randall, 2007).



MGP/Photodisc/Getty Images

Nature selects behaviors that increase genetic success. As mobile gene machines, say evolutionary psychologists, we are designed to prefer whatever worked for our ancestors in their environments. Had they not been genetically predisposed to act in ways that would produce children, we wouldn't be here. As carriers of their genetic legacy, we are similarly predisposed.

Critiquing the Evolutionary Perspective

LOQ 12-3

What are the key criticisms of evolutionary explanations of human sexuality, and how do evolutionary psychologists respond?

Most psychologists agree that natural selection prepares us for survival and reproduction. But critics say there is a weakness in evolutionary psychology's explanation of our mating preferences. Let's consider how an evolutionary psychologist might explain the findings in a startling, classic study of straight women and men (Clark & Hatfield, 1989), and how a critic might object.

In this experiment, a woman or man posing as an interested stranger approached men or women and remarked, "I have been noticing you around campus. I find you to be very attractive." The "stranger" then asked a question, which was sometimes "Would you go to bed with me tonight?" What percentage of women and men do you think agreed? An evolutionary explanation of sexuality would predict that women would be choosier than men in selecting their sexual partners. Indeed, not a single woman agreed—but 70 percent of the men did. A French replication of this study produced a similar result (Guéguen, 2011).

Did the research support evolutionary psychology? Critics note that evolutionary psychologists start with an effect—in this case, the survey

result showing that men were more likely to accept casual sex offers—and work backward to explain what happened. What if research showed the opposite effect? If men refused an offer for casual sex, might we not reason that men who partner with one woman for life make better fathers, whose children more often survive?

Other critics ask why we should try to explain today's behavior based on our ancestors' decisions thousands of years ago. Don't cultural expectations also bend the genders? Alice Eagly and Wendy Wood (1999, 2013) point to the smaller behavioral differences between women and men in cultures with greater gender equality. Such critics believe that *social learning theory* offers a better, more immediate explanation. We all learn **social scripts**—our culture's guide to how people should act in certain situations. By watching and imitating others in their culture, women may learn that sexual encounters with strange men can be dangerous, that casual sex may not offer much sexual pleasure, and that women (more than men) who engage in casual sexual activity have low self-esteem (Conley, 2011; Krems et al., 2021). This alternative explanation suggests that women are reacting to sexual encounters in socially scripted ways. And men's reactions may reflect *their* learned social scripts: "Real men" take advantage of every opportunity to have sex.

A third criticism focuses on evolutionary psychology's possible social effects. Are straight men truly hardwired to have sex with any woman who approaches them? If so, does it mean that men have no moral responsibility to remain faithful to their partners? Does this

explanation excuse inappropriate sexual behavior as men's evolutionary legacy? Might evolutionary psychology weaken social movements aimed at reducing *sexual aggression,* such as #MeToo?

Evolutionary psychologists agree that much of who we are is *not* hardwired. Our destiny is not written in our genes. Instead, our environment shaped how our ancestors cooperated and competed (Geary, 2021). And evolutionary psychology research confirms that men and women, having faced similar adaptive problems, are far more alike than different. Natural selection has prepared us to be flexible. Thanks to our neuroplasticity, we humans have a great capacity for learning and social progress. We adjust and respond to varied environments. We adapt and survive, whether we live in the arctic or the desert.

Evolutionary psychologists also agree with their critics that some traits and behaviors, such as suicide, are hard to explain in terms of natural selection (Barash, 2012; Confer et al., 2010). But they ask us to remember evolutionary psychology's scientific goal: to explain behaviors and mental traits by offering testable predictions using principles of natural selection (Lewis et al., 2017). We may, for example, predict that people are more likely to perform favors for those who share their genes or can later return those favors. Is this true? (The answer is *Yes.*) And evolutionary psychologists remind us that studying how we *came to be* need not dictate how we *ought to be.* Understanding our questionable tendencies can help us overcome them.

Ask Yourself

Based on what you've learned so far, how would you say that genes and environment work together to influence sexual behavior?

Retrieval Practice

RP-2 How do evolutionary psychologists explain male-female differences in sexuality?

RP-3 What are the three main criticisms of the evolutionary explanation of human sexuality?

ANSWERS IN APPENDIX E

REVIEW

Module 12: Evolutionary Psychology: Explaining Human Nature and Nurture

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 12-1: How do evolutionary psychologists use natural selection to explain behavior tendencies?

LOQ 12-2: How might an evolutionary psychologist explain male-female differences in sexuality and mating preferences?

LOQ 12-3: What are the key criticisms of evolutionary explanations of human sexuality, and how do evolutionary psychologists respond?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

evolutionary psychology
natural selection
mutation
social script

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. Behavior geneticists are most interested in exploring _____ (commonalities/differences) in our behaviors. Evolutionary psychologists are most interested in exploring _____ (commonalities/differences).

2. Evolutionary psychologists are most likely to focus on
   a. how individuals differ from one another.
   b. the social consequences of learned behaviors.
   c. the natural selection of traits that helped our ancestors survive and reproduce.
   d. social scripts.

3. How do evolutionary psychologists use the principle of *natural selection* to explain differences in mating preferences in women and men?

MODULE 13: Cultural and Gender Diversity: Understanding Nature and Nurture

From conception onward, we are the product of accumulating *interactions* between our genes and our environment (McGue, 2010). Our genes affect how people react to and influence us. And they affect our family environment (Barlow, 2019; Kong et al., 2018). Forget nature *versus* nurture; think nature *via* nurture.

Imagine two babies, one genetically predisposed to be attractive, friendly, and easygoing, the other less so. Assume further that the first baby attracts more affection and care from others, and so develops into a warmer and more outgoing person. As the two children grow older, the more naturally outgoing child may seek activities and friends that encourage even more social confidence.

What has caused their resulting personality differences? Neither heredity nor experience acts alone. Environments trigger gene activity. And our genetically influenced traits *evoke* significant responses in others. Thus, a child's impulsivity and aggression may evoke an angry reaction from a parent or teacher, who reacts warmly to well-behaved children in the family or classroom. In such cases, the

child's nature and the parents' nurture interact. Gene and scene dance together.

Identical twins not only share the same genetic predispositions; they also seek and create similar experiences that express their shared genes (Kandler et al., 2012). Identical twins raised in different families have recalled their parents' warmth as remarkably similar—almost as similar as if they had been raised by the same parents (Plomin et al., 1988, 1991, 1994). Fraternal twins have more differing recollections of their early family life—even if raised in the same family. "Children experience us as different parents, depending on their own qualities," noted Sandra Scarr (1990).

How Does Experience Influence Development?

Our genes, when expressed in specific environments, influence our developmental differences. We are like coloring books, with certain lines predisposed and experience filling in the full picture. The formative nurture that conspires with nature begins at conception, with the prenatal environment in the womb, where embryos receive differing nutrition and varying levels of exposure to toxic agents. Nurture continues outside the womb, where our early experiences foster brain development.

Experience and Brain Development

LOQ 13-1

How do early experiences modify the brain?

How do early experiences leave their fingerprints in the brain? Mark Rosenzweig, David Krech, and their colleagues (1962) opened a window on that process when they raised some young rats in solitary confinement and others in a communal rat playground. The rats living in the enriched social environment often developed a heavier and thicker brain cortex (FIGURE 13.1).

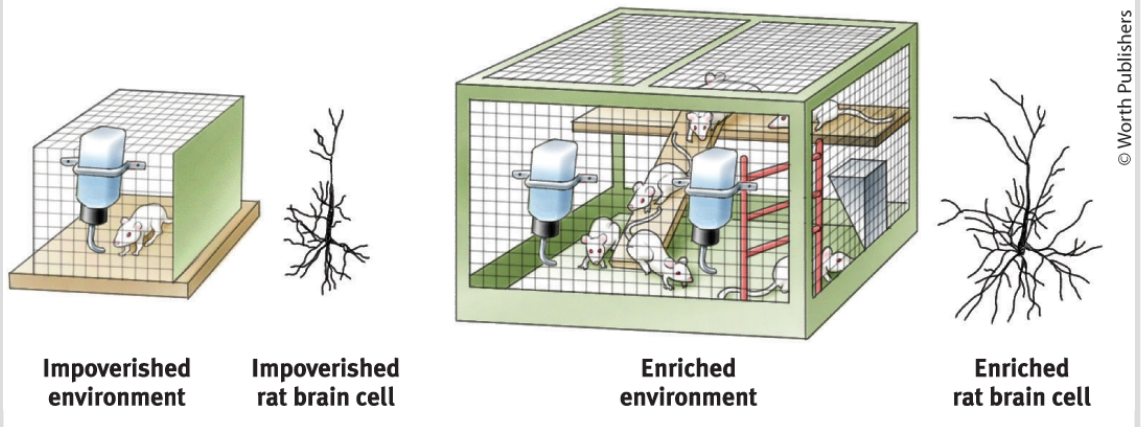


FIGURE 13.1 Experience affects brain development Researchers raised rats either alone in an environment without playthings, or with other rats in an environment enriched with playthings that changed daily (Rosenzweig et al., 1962). In 14 of 16 replications of this basic experiment, rats in the enriched environment developed significantly more cerebral cortex than did those in the impoverished environment.

Rosenzweig was so surprised that he repeated the experiment several times before publishing his findings (Renner & Rosenzweig, 1987; Rosenzweig, 1984). So great were the effects that, shown brief video clips of the rats, you could tell from their activity and curiosity whether their environment had been impoverished or enriched (Renner & Renner, 1993). After 60 days in the enriched environment, the rats' brain weights increased 7 to 10 percent and the number of brain *synapse* connections ballooned by about 20 percent (Kolb & Whishaw, 1998). The enriched environment literally increased brain power. In humans, lack of stimulation can also slow brain and cognitive development (Farah, 2017).

Such results have motivated improvements in environments for laboratory, farm, and zoo animals—and for children in institutions. Infant rats and premature babies also benefit from touch and massage (Charpak et al., 2021; Sarro et al., 2014). "Handled" infants of both species develop faster neurologically and gain weight more rapidly. Preemies who have had skin-to-skin contact with their parents show better cognitive development, lower aggressiveness, and lower hyperactivity 20 years later (Charpak et al., 2017).

Nature and nurture interact to sculpt our synapses. Brain maturation provides us with an abundance of neural connections. Experiences—sights and smells, touches and tastes, music and movement—activate and strengthen some neural pathways while others weaken from disuse. Similar to paths through a forest, less-traveled neural pathways gradually disappear and popular ones are strengthened

(Dahl et al., 2018; Gopnik et al., 2015). By puberty, this *pruning process* results in a massive loss of underused connections.

At the juncture of nurture and nature is the biological reality of early childhood learning. During early childhood—while excess connections are still on call—youngsters can most easily master such skills as the grammar and accent of another language. Lacking any exposure to language before adolescence, a person will never become proficient in any language. Likewise, lacking visual experience during the early years, a person whose vision is later restored by cataract removal will never achieve typical perceptions (Gregory, 1978; Wiesel, 1982). Without that early visual stimulation, the brain cells usually assigned to vision will die or be diverted to other uses. The maturing brain's rule: Use it or lose it.



Courtesy of C. Brune

Stringing the circuits young String musicians who started playing before age 12 have larger and more complex neural circuits controlling the note-making left-hand fingers than do

string musicians whose training started later (Elbert et al., 1995).

Although normal stimulation during the early years is critical, brain development does not end with childhood. Thanks to the brain's remarkable neuroplasticity, our neural tissue is ever changing and reorganizing in response to new experiences. New neurons are also born. If a monkey pushes a lever with the same finger many times a day, brain tissue controlling that finger will change to reflect the experience (Karni et al., 1998). Human brains work similarly. Whether learning to play a musical instrument or to navigate London's streets, we perform with increasing skill as our brain incorporates the learning (Bianco et al., 2022; Maguire et al., 2000).

"Genes and experiences are just two ways of doing the same thing—wiring synapses." — Joseph LeDoux, *The Synaptic Self,* 2002

Ask Yourself

What skills did you practice the most as a child—sports, music, art, cooking, video gaming? How do you think this affected your brain development? How will you continue to develop your brain with new learning and new skills?

How Much Credit or Blame Do Parents

Deserve?

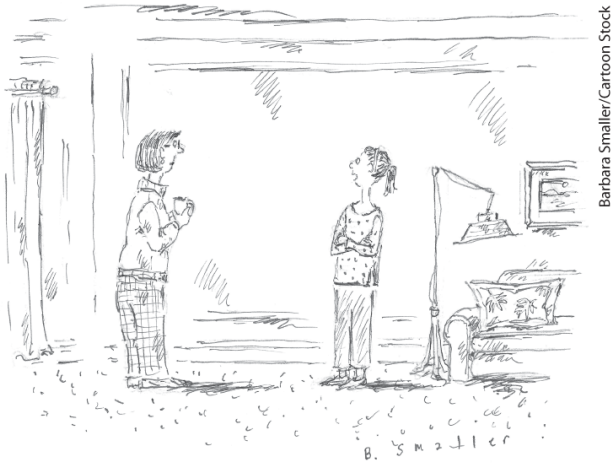
LOQ 13-2

In what ways do parents and peers shape children's development?

Biological parents shuffle their gene decks and deal a life-forming hand to their child-to-be, who is then subjected to countless influences beyond their control. But all parents—whether biological or adoptive—feel enormous satisfaction in their children's successes, and guilt over their failures. They beam over the child who wins trophies and titles. They wonder where they went wrong with the child who is repeatedly in trouble.



"To be frank, officer, my parents never set boundaries."



"Nature, nurture—either way, it's still all your fault."

Do parents really produce wounded future adults by being (take your pick from the toxic-parenting lists) overbearing—or uninvolved? Pushy—or indecisive? Overprotective—or distant? Should we then blame our parents for our failings, and ourselves for our children's failings? Or does talk of wounding fragile children through normal parental mistakes trivialize the brutality of real abuse? To paraphrase developmental psychologist Alison Gopnik (2016), parents may be less like potters who mold clay, and more like gardeners who provide the soil for their children's natural growth.

Parents matter. But parenting wields its largest effects at the extremes: the abused children who become abusive, the deeply loved but firmly handled children who become self-confident and socially competent. The power of the family environment also appears in the remarkable academic and vocational successes of many children of people who leave their home countries, such as those of refugees who fled war-torn Vietnam and Cambodia—successes attributed to close-

knit, supportive, even demanding families (Caplan et al., 1992). Parents' power also appears in their children's tendency to share their politics, religion, and values (O'Reilly, 2021).

Yet in personality measures, shared environmental influences from the womb onward typically account for less than 10 percent of children's differences. Referring to our traits rather than our values, behavior geneticist Robert Plomin (2018) noted, "We would essentially be the same person if we had been adopted at birth and raised in a different family." (Rub your eyes and read that last sentence again.)

Peer Influence

As children mature, what other experiences do the work of nurturing? At all ages, but especially during childhood and adolescence, we seek to fit in with our groups (Blakemore, 2018; Harris, 1998, 2000):

- Preschoolers who dislike a certain food often will eat that food if put at a table with a group of children who like it.
- Children who hear English spoken with one accent at home and another in the neighborhood and at school will invariably adopt the accent of their peers, not their parents. Accents (and slang) reflect culture, "and children get their culture from their peers," as Judith Rich Harris (2007) has noted.
- Teens who start smoking or vaping typically have friends who model smoking, suggest its pleasures, and offer cigarettes or pods (Liu et al., 2017). Part of this peer similarity may result from a *selection effect,* as adolescents seek out peers with similar

attitudes, interests, and traits (Domingue et al., 2018). Those who smoke (or don't) may select as friends those who also smoke (or don't).

Retrieval Practice

RP-1 What is the *selection effect,* and how might it affect a teen's decision to join a school sports team?

ANSWERS IN APPENDIX E

Cultural Influences

LOQ 13-3

How does culture affect our behavior?

Compared with the narrow path taken by flies, fish, and foxes, the road along which environment drives humans is wider. Our species' success is born of our ability to imitate and invent. We absorb the collective wisdom of those who came before us, and we sometimes improve upon it. We come equipped with a powerful cerebral mobile device, ready to download cultural apps.

How do you cook rice? Dry your wet clothes? What type of treatment do you seek when you're sick? Rather than use trial and error, we imitate people close to us. **Culture** consists of the behaviors, ideas,

and values shared by a group of people and passed down from generation to generation (Brislin, 1988; Cohen, 2009). Wolves are social animals; they live and hunt in packs. Ants are incessantly social, never alone. Humans are social animals, but more.



Staffan Widstrand/The Image Bank Unreleased/ Getty Images

Humans are cultural animals More than any other species, humans imitate and invent. They absorb the wisdom of previous generations, build upon it, and pass it along through teaching.

"We will lead not merely by the example of our power but by the power of our example." — U.S. President Joe Biden, Inaugural Address, 2021

Humans' social nature helps us exploit accumulated cultural know-how. While wolves function pretty much as they did 10,000 years ago, humans enjoy microwave ovens, clothes dryers, and antibiotics—things unknown to most of our ancestors. Culture also enables an efficient *division of labor.* Although three lucky people get their names on this book (which transmits accumulated cultural wisdom), it

actually results from the coordination and commitment of a team of gifted people, no one of whom could produce it alone.

Across cultures, we differ in our language, money, sports, religion, and customs. But beneath these differences lies our great similarity—our capacity for culture. Culture works. It transmits the customs and beliefs that enable us to communicate, to exchange money for things, to play, to eat, and to drive with agreed-upon rules and without crashing into one another.

Variation Across Cultures

We see our adaptability in cultural variations among our beliefs and our values, in how we nurture our children and bury our dead, and in what we wear (or whether we wear anything at all). We are always mindful that this book's worldwide readers are culturally diverse. You and your ancestors reach from Australia to Algeria and from Singapore to Samoa. Cultures influence how we sleep, eat, dress, learn, love, and worship.

Gender equity: Among the Aka people of Central Africa, men and women interchangeably perform roles such as hunting and child care. As a result, fathers form an especially close bond with their infants, even suckling the babies with their own nipples when hunger makes the child impatient for Mother's return. Fathers in this culture are holding or within reach of their babies 47 percent of the time (Hewlett, 1991).

Riding along with your culture is like biking with the wind. As it carries us along, we hardly notice it. When we try traveling against the wind, we feel its force. Face-to-face with a different culture, we become aware of the cultural winds. Visiting Europe, someone from the United States may notice the small cars and tiny coffee cups. Visiting North America, someone from Japan may wonder why people wear their shoes in the house and can't seem to line up properly.

But humans in varied cultures nevertheless share some basic moral ideas. Even before they can walk, babies prefer helpful people over naughty ones (Hamlin et al., 2011). Worldwide, people prize honesty, fairness, and kindness (McGrath, 2015). Yet each cultural group also evolves its own **norms**. The British have a norm for orderly waiting in line. Many in South Asia, Africa, and the Middle East use only the right hand for eating. Sometimes social expectations seem oppressive: "Why should it matter how I dress?" Yet, norms—how to greet, how to eat—grease the social machinery. Norms also served our ancestors by encouraging food sharing and fostering communal defense, notes Joseph Henrich (2020): "Norms create communities in which the health and survival of each individual depend on almost everyone else." If someone were to invent a drug that made people unresponsive to social norms, cultures would collapse. We are cultural animals.

Cultures also differ in how strictly people follow norms. In **tight cultures**, people more often obey social norms: A pedestrian might wait for the light to say "WALK," even on a deserted corner at

midnight. In such cultures, people arrive on time, rarely drop a piece of trash, and might not kiss their sweetheart in public. **Loose cultures** have norms, too (as drivers appreciate), but people expect variability (Gelfand, 2018). In loose cultures, people tolerate some jaywalking, late arrivals, littering, and public affection. Each cultural pattern has benefits: Tight cultures coordinate their actions well, ensuring reliable public transportation and clean streets—and fewer Covid-19 cases and deaths (Gelfand et al., 2021). In contrast, looseness allows for creativity, innovation, and self-expression.

When we don't understand what's expected or accepted, we may experience *culture shock*. People from Mediterranean cultures have perceived northern Europeans as efficient but cold, and preoccupied with punctuality (Triandis, 1981). People from time-conscious Japan—where pedestrians walk briskly and postal clerks fill requests speedily—have found themselves growing impatient when visiting Indonesia, where the pace of life is more leisurely (Levine & Norenzayan, 1999). Someone from the European community, which requires 20 paid vacation days each year, may also experience culture shock when working in the United States, which does not guarantee workers any paid vacation (Ray et al., 2013).

Variation Over Time

Like biological creatures, cultural groups vary, compete for resources, and, over time, evolve (Mesoudi, 2009). Cultures change when many people copy the innovations of a few. Not long ago, humans roamed

Earth in groups of 150; today, we mostly live in stable, cooperative societies of millions (Dunbar, 1993; Johnson & Earle, 2000). What changed? The cultural inventions of agriculture and animal domestication provided dependable sources of calories (Diamond, 1997). And when religion encouraged people to control their selfish impulses and cooperate, settlements typically grew and became more successful (Henrich, 2020; Norenzayan et al., 2016).

Cultures can change rapidly. At the beginning of the last century, people lived in a world without cars, radio broadcasting, or electric lighting. If you could sit down to chat with your great-great-grandparents, you might even have trouble understanding one another's accents, words, and expressions. And in the thin slice of history since 1960, most Western cultures have changed with astonishing speed. People enjoy expanded human rights. Middle-class people earn twice as much as they did then. They also enjoy the convenience of air-conditioned housing, online shopping, and anywhere-anytime electronic communication.

But some changes seem not so wonderfully positive. Had you fallen asleep in the United States in 1960 and awakened today, you would open your eyes to a culture where more people experience depression and economic inequality. You would also find U.S. people—like their counterparts in Britain, Australia, and New Zealand—spending more hours working, fewer hours with friends and family, and fewer hours asleep (BLS, 2011; Twenge, 2017).

Whether we love or loathe these changes, we cannot fail to be impressed by their breathtaking speed. And we cannot explain them by changes in the human gene pool, which evolves too slowly to account for high-speed cultural transformations. Cultures vary. Cultures change. Cultures shape our lives.

Culture and the Self

LOQ 13-4

How do individualist and collectivist cultures shape values and goals?

A little quiz: In each statement pair, choose the statement that best describes you.

- "I value self-sufficiency and being unique" or "I value loyalty and getting along with others."
- "I experience pride more often than shame" or "I experience shame more often than pride."
- "I aim to stand out and to win" or "I aim to fit in and cooperate."

If you grew up in a city in Canada, the United States, the United Kingdom, Australia, or New Zealand, you likely expressed **individualism** by preferring the first options. If you grew up in rural Japan, China, India, Guatemala, or Indonesia, you more likely expressed **collectivism**, as reflected in your preferring the second options.

Another question to ponder: Imagine that someone ripped away your social connections, making you a solitary refugee in a foreign land. How much of your identity would remain intact?

If you are an individualist, a great deal. You would have an independent sense of "me," and an awareness of your unique personal convictions and values. Individualists prioritize personal goals. They seek personal control and individual achievement. They define their identity mostly in terms of personal traits. (Ask some friends to complete this sentence with three answers: "I am _____." If they're from an individualist culture, they likely will respond with personal descriptors such as "passionate," "outgoing," or "tall" rather than defining themselves in terms of their relationships or group memberships, such as "a daughter" or "a brother.")

The human need to belong is universal. So, even in individualist cultures, people seek out and join groups. But individualists focus less on group harmony or social duty (Brewer & Chen, 2007). As children, they value a sense of free will (Chernyak et al., 2019). Being more self-contained, individualists move in and out of social groups more easily. They feel relatively free to switch places of worship, change jobs, or even leave their extended families and migrate to a new place. Marriage is often for as long as they both shall love.

When individualists feel coerced, they often rebel—sometimes with devastating consequences. Individualist cultures suffered the worst Covid-19 death rates, with many citizens rejecting distancing,

vaccines, and masking (Fischer & Karl, 2022; Huang et al., 2022) (FIGURE 13.2). Japan, by contrast, experienced one-twelfth of the U.S. Covid-19 death rate, thanks to people's support for the common good—as shown by a 90 percent masking rate on public transit (Rich & Dooley, 2022). Within the United States, people living in the most individualist regions (such as Florida and Louisiana) were most likely to contract and die from the virus (Bazzi et al., 2020; CovidCast, 2020). Promoting collectivism, suggested one group of psychological researchers, "may be a way to increase engagement with efforts to reduce the spread of Covid-19" (Biddlestone et al., 2020, p. 663).

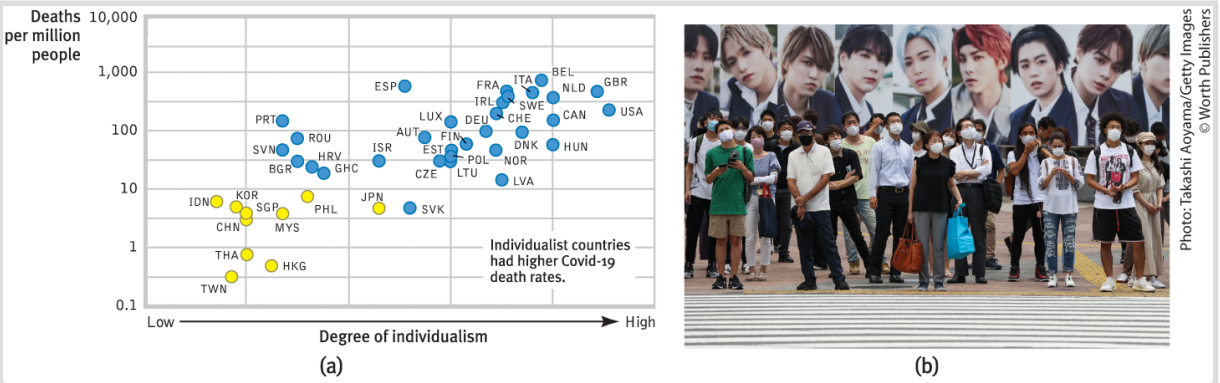


FIGURE13.2 Deadly individualism Worldwide, countries' levels of individualism correlated positively with Covid-19 death rates ($r = .75$). (Data from Garland et al., 2020.)

If set adrift in a foreign land as a collectivist, you might experience a greater loss of identity. Cut off from family, groups, and loyal friends, you would lose the connections that have defined who you are. *Group identifications* provide a sense of belonging, a set of values, and an assurance of security. Collectivists have deep attachments to their

groups—their family, clan, company, or country. Elders receive respect. Adults in collectivist countries often feel duty-bound to support their aging parents, such as by paying for some of their living expenses (Sethi, 2021; Yang, 2015).

Sportscasters in collectivist contexts credit coaches and teammates as much as individual athletes for success (Markus et al., 2006). Collectivists find satisfaction in advancing their groups' interests while keeping their personal needs in the background. They may preserve group spirit by avoiding direct confrontation, blunt honesty, and uncomfortable topics. Norms favor humility, not self-importance (Bond et al., 2012). Collectivists view forgiveness as a way to strengthen group harmony (Joo et al., 2019). Given the priority on "we," not "me," that satisfying, super-customized latte in Seattle might seem selfishly demanding in Seoul (Kim & Markus, 1999).



Changing ME to WE To transform individualism to collectivism, rotate

the letter M 180 degrees.

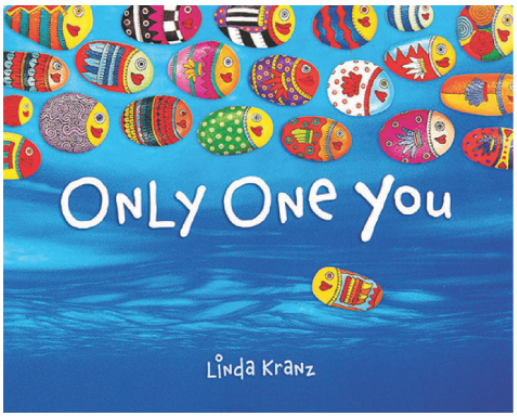


Cartoon by Buddy Hickerson

"One needs to cultivate the spirit of sacrificing the *little me* to achieve the benefits of the *big me*." — Chinese saying

Culture teaches us which behaviors are "good" and "bad." What do you think of people who willingly change their behavior to suit different people and situations? Or of people who say one thing ("We should all do our part to address the climate crisis") and do another (drive a gas-guzzling SUV)? People in largely individualist countries, such as the United States, tend to see traits as fixed and believe that people cannot

have seemingly opposite traits, such as being both extraverted and introverted (Choi & Choi, 2002). People from these countries are also more likely to judge others harshly when they are not true to their word—when they don't "practice what they preach" (Dong et al., 2022; Levine, 2016). Traditionally collectivist cultures (China and Japan, for example) emphasize adopting more flexible perceptions (Peng & Nisbett, 1999). Thus, people in collectivist countries view personality traits as more fluid, and more often perceive disagreement between one's words and one's deeds as indicative of being "mature," "honest," "trustworthy," and "sincere." A country's cultural values are powerful, but not absolutely so. Even though Christmas permeates U.S. spaces every December, many Americans do not celebrate it. Similarly, even when a country's dominant messages are collectivist (or individualist), its people vary. All countries host distinct subcultures related to religion, economic status, and region (Cohen, 2009).





Me or we? U.S. school systems are likely to favor books, such as *Only One You,* that encourage individuality and taking pride in one's personal identity. In contrast, Japanese stories, such as *A Big Turnip,* often describe how groups are stronger together (Imada, 2012).

Collectivism varies across cultures, but also *within* cultures. Southern Chinese farmers typically grow rice, a crop that requires intense labor and rewards farmers' coordinating with one another. Northern Chinese farmers often grow wheat, a crop that can be farmed independently (Dong et al., 2019; Obschonka et al., 2018; Talhelm et al., 2014). In one clever study, researchers used chairs to block aisles in Starbucks coffeehouses across China. They observed who acted like a typical individualist, controlling the environment by moving chairs out of the way, and who acted like a typical collectivist, adapting to the environment by squeezing through the chairs (Talhelm et al., 2018). Compared with the more collectivist Southern Chinese, the Northern Chinese were more likely to simply move the chair.

In collectivist Japan, a spirit of individualism marks the "northern frontier" island of Hokkaido (Kitayama et al., 2006). And even in the most individualist countries, people hold some collectivist values. *E pluribus unum,* says the U.S. motto: "Out of many, one." But in general (especially for men), competitive, individualist cultures encourage more personal freedom and independence from family, enable more privacy, and induce folks to take pride in personal achievements (TABLE 13.1).

TABLE 13.1 Value Contrasts Between Individualism and Collectivism

Concept	Individualism	Collectivism
Self	Independent (identity from internal, individual traits)	Interdependent (identity from group roles)

Life task	Discover and express one's uniqueness	Maintain connections, fit in, perform role
What matters	Me—personal achievement and fulfillment; rights and liberties; self-esteem	Us—group goals and solidarity; responsibilities and relationships; family duty
Coping method	Change reality	Accommodate to reality
Morality	Defined by the individual (choice-based)	Defined by social networks (duty-based)
Relationships	Easier to enter and leave relationships	Fewer but closer and more stable relationships
Attributing behavior	Behavior reflects the individual's personality and attitudes	Behavior also reflects social norms and roles

Information from Thomas Schoeneman (1994) and Harry Triandis (1994).

People even value unusual names in individualist contexts, as psychologist Jean Twenge noticed while seeking a name for her first child. When she and her colleagues analyzed the first names of 358 million U.S. babies born between 1880 and 2015, they discovered that the most common baby names had become less common (Twenge et al., 2010, 2016). As **FIGURE 13.3** illustrates, the percentage of boys and girls given one of the 10 most common names for their birth year has plunged. Collectivist Japan provides a contrast: Half of Japanese baby names are among the country's 10 most common names, though unique names are also increasing in that culture (Ogihara et al., 2015).

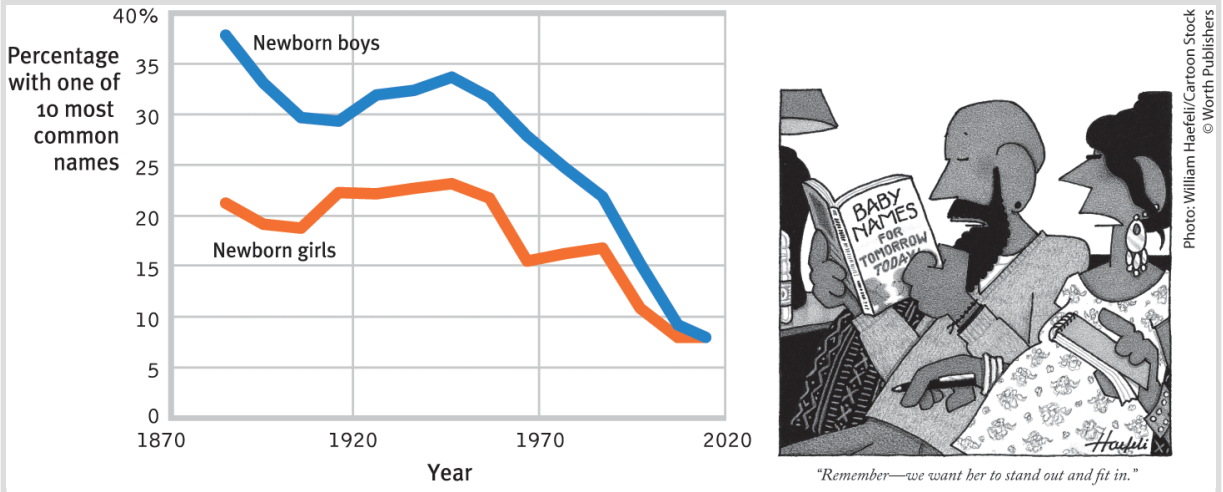


FIGURE 13.3 A child like no other In recent years, the percentage of U.S. babies receiving one of that year's 10 most common names has plunged, reflecting the nation's individualist tendencies. (Data from Twenge et al., 2010, 2016.)

The individualist-collectivist divide appears in reactions to Olympic medals received. U.S. gold medal winners and the U.S. media covering them have attributed the achievements mostly to the athletes themselves (Markus et al., 2006). "I think I just stayed focused," explained swimming gold medalist Misty Hyman. "It was time to show the world what I could do." Japan's gold medalist in the women's marathon, Naoko Takahashi, had a different explanation: "Here is the best coach in the world, the best manager in the world, and all of the people who support me—all of these things … became a gold medal."

Individualists frequently demand romance and personal fulfillment in marriage (Dion & Dion, 1993). In contrast, collectivist love songs have often expressed enduring commitment and friendship, as in this one

from China: “We will be together from now on.... I will never change from now to forever” (Rothbaum & Tsang, 1998).

What predicts cultural change over time, or differences between cultures? Social history matters. Individualism and independence have been fostered by mobility and emigration, a capitalist economy, and a sparsely populated, challenging environment (Buttrick & Oishi, 2021; Kitayama et al., 2009, 2010). Worldwide, individualism has increased, following increasing affluence (Grossmann & Varnum, 2015; Hamamura, 2012; Santos et al., 2017).



Sam Harrel/ZUMA Press/Newscom

Collectivist culture Although the United States emphasizes individualism, many cultural subgroups remain collectivist. This is true for Alaska Natives, who demonstrate respect for tribal elders, and whose identity springs largely from their group affiliations.

Ask Yourself

Is the culture you live in more collectivist or individualist? How have your culture’s values influenced your behavior, emotions, and thoughts?

Culture and Child Raising

Child-raising values reflect cultural similarity and diversity. Across cultures, most mothers want to establish rules, ensure child safety, encourage socializing, and teach right from wrong (Cho et al., 2021). Yet cultural traditions also differ in parental preferences. Do your parents prefer children who are independent, or children who comply with what others think? Compared with families in Asian cultures, families in Western cultures more often prefer independence: "You are responsible for yourself. Follow your conscience. Be true to yourself. Discover your gifts." Some Western parents go even further, telling their children, "You are more special than other children" (Brummelman et al., 2015).

But that was not always so. Western cultures formerly prioritized obedience, respect, and sensitivity to others (Alwin, 1990; Remley, 1988). In the 1950s, Western parents were more likely to teach their children, "Be true to your traditions. Be loyal to your heritage and country. Show respect toward your parents and other superiors." Cultures vary. And cultures change.

Children across place and time have thrived under various child-raising systems. Upper-class British parents traditionally handed off routine caregiving to nannies, then sent their 10-year-olds away to boarding school.

Those from Asian and African cultures more often value physical closeness and shared emotions. Children often sleep with their

parents and spend their days close to a family member (Shweder et al., 1995; Xiong et al., 2020). Many of these cultures encourage a strong sense of *family self*—meaning that what shames children shames their parents, and what brings honor to children brings honor to their parents (Chen & Zhou, 2021).

In western Kenya's traditional Gusii society, babies nurse freely but spend most of the day on their mother's or a sibling's back—with lots of body contact but little face-to-face and language interaction. To these Gusii parents, what would seem weird is Westerners' lesser body contact as they push babies in strollers, plant them in car seats, and leave them in playpens (Small, 1997). Diversity in child raising cautions us against presuming that any one culture's way is the only way to raise children successfully.



Stephen H. Reehl

Cultures vary Parents everywhere care about their children, but raise and protect them differently depending on the surrounding culture. In big cities, parents keep children close. In smaller, close-knit communities, such as Scotland's Orkney Islands' town of Stromness, social trust has enabled parents to park their toddlers outside shops.

Developmental Similarities Across Groups

Mindful of how others differ from us, we often fail to notice the similarities predisposed by our shared biology. Regardless of our culture, we humans are more alike than different. We share the same life cycle. We speak to our infants in similar ways and respond similarly to their coos and cries (Bornstein et al., 1992a,b).

Even differences *within* a culture, such as those sometimes attributed to race, are often easily explained by an interaction between our biology and our culture. Consider this illustration (Rowe et al., 1994, 1995): Black men tend to have higher blood pressure than White men. Suppose that (1) in both groups, salt consumption correlates with blood pressure, and (2) salt consumption is higher among Black men than among White men. The blood pressure "race difference" might then actually, at least partly, reflect nothing about race—and more about a difference in diet.

And that parallels psychological findings. Ethnic groups sometimes differ, such as in average school achievement. But such differences are, as the researchers noted, "no more than skin deep." To the extent that family structure, peer influences, and parental education predict behavior in one of these ethnic groups, they do so for the others.

So as members of different ethnic and cultural groups, we may differ in surface ways. But as members of one species, we are subject to the same psychological forces. Our outward reactions vary, yet our basic emotions are universal. Our tastes vary, yet they reflect common principles of hunger. Our social behaviors vary, yet they reflect pervasive principles of human influence. Cross-cultural research helps us appreciate both our cultural diversity *and* our human similarity.

Retrieval Practice

RP-2 How do individualist and collectivist cultures encourage people to see themselves?

ANSWERS IN APPENDIX E

Gender Development

LOQ 13-5

How does the meaning of *gender* differ from the meaning of *sex?*

We humans share an irresistible urge to organize our worlds into simple categories. Among the ways we classify people—as tall or short, dull or smart, cheerful or churlish—one stands out. It's what everyone first wanted to know about you: "Boy or girl?" Your parents may have offered clues about your assigned **sex** through your clothing and name. For most people, biological traits help define their assigned **gender**, their culture's expectations about what it means to be a man or a woman. In recent years, cultural and scientific understandings of gender development have grown.



Michae Allen/Shutterstock

Is it a boy or a girl? Some people question an early emphasis on gender; others enjoy celebrations such as U.S. “gender reveal” parties.

Cultural norms vary and change. “The generally accepted rule is pink for the boy and blue for the girl,” declared the *Earnshaw’s Infants’ Department* in 1918 (Frassanito & Pettorini, 2008). “Pink being a more decided and stronger color is more suitable for the boy, while blue, which is more delicate and dainty, is prettier for the girls.”

Simply said, your body defines your sex; your mind defines your gender. But your mind’s understanding of gender arises from the interplay between your biology and your experiences (Eagly & Wood, 2013). Before we consider that interplay, let’s look at some ways that males and females are alike, and some ways that they differ.

Similarities and Differences

LOQ 13-6

What are some of the ways males and females tend to be alike and to differ?

Whether male, female, or **intersex**, most of us receive 23 chromosomes from each parent. Of those 46 chromosomes, 45 are *unisex*—the same for everyone. Our similar biology helped our evolutionary ancestors face similar adaptive challenges. For example, survival for men and women involved traveling long distances (migration, outrunning threats), which today is reflected biologically in men's and women's similar finishing times for ultralong-distance races. Everyone needed to survive, reproduce, and avoid predators, and so we are in most ways alike. How you identify yourself—as male, female, neither, or some combination of the two—gives no clue to your vocabulary, happiness, or ability to see, learn, and remember, report gender researcher Janet Shibley Hyde and her colleagues (2019). Whatever our gender, we are, on average, comparably creative and intelligent and feel similar emotions and longings (Hyde, 2014; Lauer et al., 2019; Reilly et al., 2019).

But in some areas, female and male traits do differ, and differences command attention. Some oft-noted differences (like women being more helpful than men) are actually quite modest (Olsson et al., 2021). Others are more striking. The average female enters puberty about two years earlier than the average male, and her life expectancy is 4

years longer. She expresses most emotions more freely, smiling and crying more, and, in social media updates, more often expresses "love" and being "sooo excited!!!" (Fischer & LaFrance, 2015; Schwartz et al., 2013). She is better at spelling and reading (Reilly et al., 2019). Ms. Average can detect fainter odors and become sexually re-aroused sooner after orgasm, but she also has twice the risk of developing depression and anxiety, and 10 times the risk of developing an eating disorder. Yet the average male is 4 times more likely to die by suicide, to abuse tobacco products, and to develop an alcohol use disorder. Mr. Average also has greater size and strength, but is more likely to be diagnosed with autism spectrum disorder, color-deficient vision, and antisocial personality disorder. And Mr. Average more often becomes Mr. Extreme, with males displaying greater variability than do females in their risk-taking and patience (Thöni & Volk, 2022). Whatever our gender, we come predisposed to certain rewards and risks.

Aggression

To a psychologist, **aggression** is any physical or verbal behavior intended to hurt someone physically or emotionally (Bushman & Huesmann, 2010). Try this: Pause to picture in your mind an aggressive person.

Is the person a man? Likely yes. Men generally admit to more aggression, especially extreme physical violence (Yount et al., 2017). Nearly half of 14- to 19-year-old U.S. boys feel pressure to be "willing to punch someone if provoked" (PLAN USA, 2018). In romantic relationships between women and men, minor acts of physical

aggression, such as slaps, are roughly equal, but the most violent acts are mostly committed by men (Archer, 2000; Buss, 2021). Domestic abuse is usually hidden. As a result of home confinement, unemployment, and food insecurity during the Covid pandemic, violence against women and children increased in more than two dozen countries (Bourgault et al., 2021).

Men worldwide commit more violent crimes and represent 90 percent of those convicted of murder (UNODC, 2019). Men also take the lead in hunting, fighting, warring, and supporting war (Liddle et al., 2012; Wood & Eagly, 2002, 2007). Such gender differences are not limited to physical aggression. In laboratory experiments, men have been more willing to blast people with what they believed was intense and prolonged noise (Bushman et al., 2007).

Here's another situation to consider: Picture in your mind a person who harms others by passing along hurtful gossip, socially rejecting others, or bullying people online.

Was the person a woman? Perhaps. Those behaviors are acts of **relational aggression**, and women have been slightly more likely than men to commit some forms of them (Archer, 2004, 2007, 2009).

Social Power

Imagine you've walked into a job interview and are taking your first look at the two interviewers. The unsmiling person on the left oozes self-confidence and independence, maintaining steady eye contact.

The person on the right gives you a warm, welcoming smile, but makes less eye contact and seems to expect the other interviewer to take the lead.

Which interviewer is male?

If you said the person on the left, you're not alone. Around the world, from Nigeria to New Zealand, people have perceived gender differences in power (Williams & Best, 1990). Even in 2020, a United Nations global survey found that almost half of humanity believed men to be superior political leaders, and more than 40 percent believed them to be better business executives (UNDP, 2020). These biased perceptions can start from an early age, with 6- to 10-year-olds in one study associating power with being male (Reyes-Jaquez & Koenig, 2022). (For more on this topic, see Thinking Critically About: Gender Bias in the Workplace.)

LOQ 13-7

What factors contribute to gender bias in the workplace?

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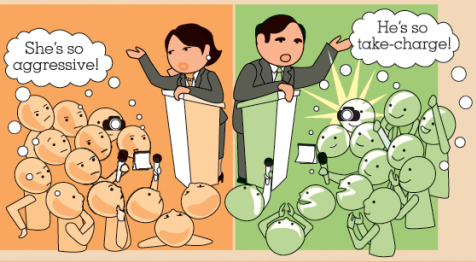
Thinking Critically About:
Gender Bias in the Workplace

Differences in PERCEPTION



Among politicians who seem power-hungry, women are less successful than men.[1]

Most political leaders are men:



Men held 74% of seats in the world's governing parliaments in 2022.[2]

People around the world tend to see men as more powerful.[3]

When groups form, whether as juries or companies, leadership tends to go to males.[4] In a study of 2000+ U.S. companies, male CEOs outnumbered female CEOs 17 to 1.[5]

Differences in COMPENSATION

Women in traditionally male occupations have received less than their male colleagues.[6]

Medicine
Over their careers, how much more male doctors will earn than female doctors:[7]



Academia **Female** research grant applicants have received lower quality of researcher ratings and have been less likely to be funded.[8] (But as we will see, gender attitudes and roles are changing.)





Differences in FAMILY-CARE RESPONSIBILITY

U.S. mothers still do nearly **twice** as much child care as **fathers**.[9] In the workplace, women are less often driven by money and status, compromise more, and more often opt for reduced work hours.[10]

What else contributes to WORKPLACE GENDER BIAS?

Social norms

In most societies, men place more importance on power and achievement, and are socially dominant.[11]

Leadership styles

Men are more *directive*, telling people what to do and how to do it.

Women are more *democratic*, welcoming others' input in decision making.[12]



Interaction styles

Women are more likely to express support.[13]

Men are more likely to offer opinions.[13]





Everyday behavior

Women smile and apologize more than men.[14]

Men are more likely to talk assertively, interrupt, initiate touches, and stare.[14]

Yet GENDER ROLES VARY WIDELY across place and time.

Women are increasingly represented in leadership (now 50% of Canada's cabinet ministers) and in the workforce. In 1963, the Harvard Business School admitted its first women students. Among its Class of 2020, 41% were women.[15] In 1960, women were 6% of U.S. medical students. Today they are slightly more than half.[16]

1. Okimoto & Brescoll, 2010. 2. IPU, 2022. 3. Eagly et al., 2020. 4. Colarelli et al., 2006. 5. Kapadia, 2021. 6. LMIC, 2020. 7. Whaley et al., 2021. 8. Witteman et al., 2019. 9. CEA, 2014; Parker & Wang, 2013; Pew, 2015. 10. Nikolova & Lamberton, 2016; Pinker, 2008. 11. Gino et al., 2015; Schwartz & Rubel-Lifschitz, 2009. 12. Eagly & Carli, 2007; van Engen & Willemsen, 2004. 13. Aries, 1987; Wood, 1987. 14. Leaper & Ayres, 2007; Major et al., 1990; Schumann & Ross, 2010. 15. Harvard Business School, 2019. 16. AAMC, 2018.

"I hate to say there are female and male ways of dealing with power, because I think each of us has a male and a female part. But based on my own experience,

> **women will tend to be inclusive, to reach out more, to care a little more.”** — Christine Lagarde, president of the European Central Bank, 2011

Now picture a heterosexual couple negotiating a car purchase price. “If you won’t lower your price, we’re leaving,” says one of them to the salesperson.

Which member of the couple—male or female—made the demand?

If you said the male, you’re again in good company. People tend to associate negotiation with males, and men often have an advantage in negotiation outcomes (Mazei et al., 2015).

When asked a difficult question to which they don’t know the answer —“Do you have any idea why the sky is blue?”—men are more likely than women to hazard answers than to admit they don’t know, a phenomenon researchers have called the *male answer syndrome.* This tendency is related to “mansplaining” (men’s explaining something to women in a condescending and sometimes inaccurate manner) (Giuliano et al., 1998; Tramontana, 2020).



Emily Bernstein/The New Yorker Collection/The Cartoon Bank

"Oh, you've read it? I'll just describe it to you as if you hadn't."



Cadet Hallie H. Pound/U.S. Army

Making history In 2019, West Point's 34 Black female cadets, many shown here, were part of its most diverse graduating class in history. These newly commissioned officers will add to a growing body of female military leaders.

Social Connectedness

Whatever our gender, we all have a need to belong, though we may satisfy this need in different ways (Baumeister, 2010). Males tend to be *independent.* Even as children, males typically form large play groups that brim with activity and competition, with little intimate discussion (Rose & Rudolph, 2006). As adults, men usually enjoy side-by-side activities, and their conversations often focus on problem solving (Baumeister, 2010; Tannen, 1990).

A neuroscientist could not tell whether a brain is male or female just by looking. Brain scans show few structural male-female differences, apart from male brains being a tad larger and female brains having thicker cortexes (Ritchie et al., 2018; van Eijk et al., 2021; Wierenga et al., 2019). "Human brains cannot be categorized into two distinct classes—male brain/female brain," reported neuroscientist Daphna Joel and her colleagues (2015).

Brain scans do, however, show some male-female differences. For example, a female's brain, more than a male's, is usually wired in a way that enables social relationships (Kiesow et al., 2020). This finding helps explain why females tend to be more *interdependent.* Across nearly a thousand studies, women have been characterized as "more communal than men" (Hsu et al., 2021). In childhood, girls usually play in small groups, often with one friend. They compete less and imitate social relationships more (Maccoby, 1990; Roberts, 1991). Teen girls spend more time with friends and less time alone (Wong & Csikszentmihalyi, 1991). In late adolescence, they spend more time on

social media and enjoy it more (Rideout et al., 2022). Girls' and women's friendships are more intimate, with more conversation that explores relationships (Maccoby, 2002). In one analysis of 10 million posts to Facebook (which more women use), women's status updates were as assertive as men's, but used warmer words; men more often swore or expressed anger (Gramlich, 2018; Park et al., 2016). An analysis of over 700 million Facebook words found that women also used more family-related words, whereas men used more work-related words (Schwartz et al., 2013). In an analysis of 1.9 billion phone conversations, women's calls were longer (Dunbar, 2021).

When searching for understanding from someone who will share their worries and hurts, people usually turn to women. Women and men have reported that their friendships with women are more intimate, enjoyable, and nurturing (Kuttler et al., 1999; Rubin, 1985; Sapadin, 1988). Bonds and feelings of support are stronger among women than among men (Rossi & Rossi, 1993). Women's ties—as mothers, daughters, sisters, aunts, and grandmothers—can bind families together. As friends, women talk more often and more openly (Berndt, 1992; Dindia & Allen, 1992). "Perhaps because of [women's] greater desire for intimacy," reported Joyce Benenson and colleagues (2009), first-year college and university women are twice as likely as men to change roommates. When stressed, women are also more likely than men to turn to others for support. They *tend and befriend* (Tamres et al., 2002; Taylor, 2002).





Left: Anthony Asael/Danita Delimont Stock Photography; right: © 2/Rob Van Petten/Ocean/Corbis

Free-for-all, or tend and befriend? Gender differences in the way we interact with others begin to appear at a very young age.

Gender differences in both social connectedness and power are greatest in adolescence and early adulthood—the prime years for dating and mating (Hoff et al., 2018). By their teen years, girls appear less assertive and more insecure, and boys seem more dominant and less expressive (Chaplin, 2015). In adulthood, attitude and behavior differences often peak with parenthood. Mothers especially may express more traditionally female attitudes and behaviors (Ferriman et al., 2009; Katz-Wise et al., 2010). By age 50, most gender differences subside. Men become less domineering and more empathic, and women—especially those with paid employment—become more assertive and self-confident (Kasen et al., 2006; Maccoby, 1998). Worldwide, fewer women than men work for pay. But, like men, women tend to be more satisfied with their lives when gainfully employed (Ryan, 2016).

"In the long years liker must they grow; The man be more of woman, she of man." — Alfred Lord Tennyson, *The Princess,* 1847

So, although women and men are more alike than different, there are some behavior differences between the average woman and man—and likewise, between male and female nonhuman primates (de Waal, 2022). Psychologists Alice Eagly and William Revelle (2022) remind us that gender equality does not require gender similarity. Differences are not deficits. Indeed, they note, "groups composed of diverse individuals are more effective in solving problems."

Are gender differences dictated by our biology? Shaped by our cultures and other experiences? Read on.

Retrieval Practice

RP-3 _____ (Men/Women) are more likely to commit relational aggression, and _____ (men/women) are more likely to commit physical aggression.

ANSWERS IN APPENDIX E

The Nature of Gender

LOQ 13-8

How do sex hormones influence prenatal and adolescent sexual development?

In most physical ways—regulating heat with sweat, preferring energy-rich foods, growing calluses where the skin meets friction—we are all alike. Although biology does not *dictate* gender, it can influence our gender psychology in two ways:

- *Genetically*—We have differing sex chromosomes.
- *Physiologically*—We have differing concentrations of sex hormones, which trigger other anatomical differences.

These two influences began to form you long before you were born.

Prenatal Sexual Development

Six weeks after you were conceived, you looked much the same as any other tiny embryo. Then, as your genes kicked in, your biological sexual characteristics—determined by your twenty-third pair of chromosomes (the two sex chromosomes)—became more apparent. If you are male or female, your mother's contribution to that chromosome pair was an **X chromosome.** From your father, you received the 1 chromosome out of the usual 46 that is not unisex—either another X chromosome, making you female, or a **Y chromosome,** making you male.

About seven weeks after conception, a single gene on the Y chromosome throws a master switch, which triggers the testes to develop and to produce **testosterone**, the main *androgen* (male hormone) that promotes male sex organ development. Females also have testosterone, but less of it; the main female sex hormones are the **estrogens**, such as *estradiol.*

Later, during the fourth and fifth prenatal months, sex hormones bathe the fetal brain and influence its wiring. Gender-typical male and female traits develop under the influence of the male's greater testosterone and the female's estrogens (see **FIGURE 13.4**) (Hines, 2004; Udry, 2000). Females who are prenatally exposed to unusually high male hormone levels tend to grow up with more male-typical interests (Berenbaum & Beltz, 2021; Endendijk et al., 2016). Likewise, males prenatally exposed to *low* male hormone levels tend to grow up with more female-typical interests (Shirazi et al., 2022).

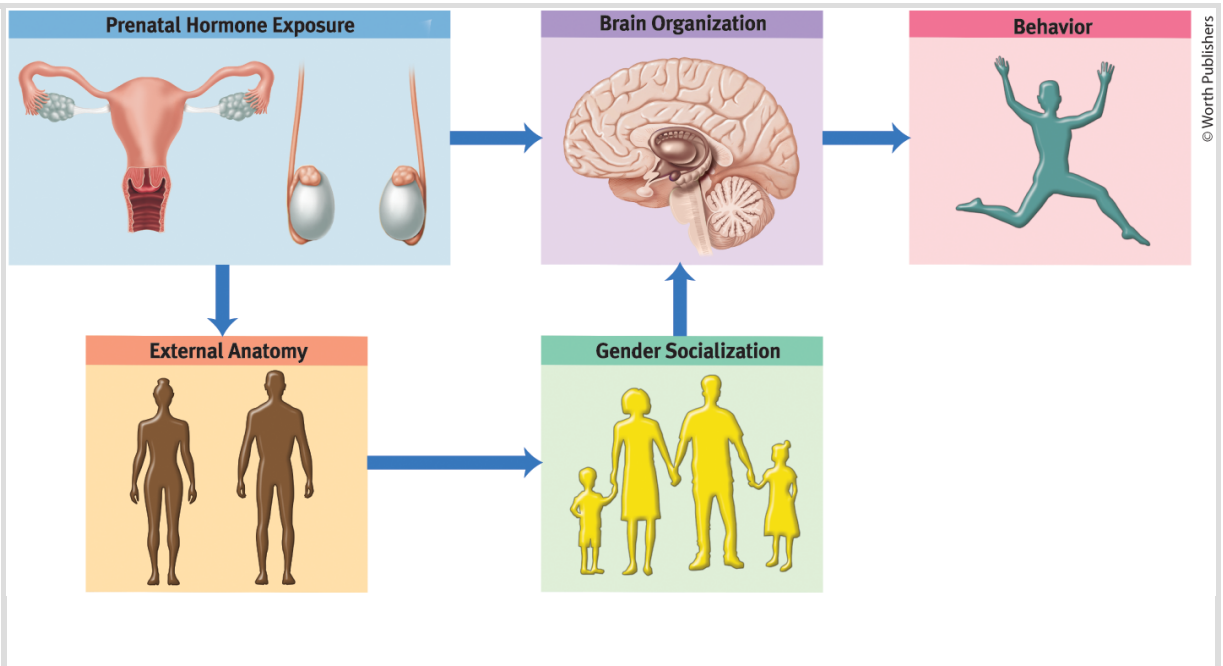


FIGURE 13.4 From hormones to behavior Researchers are exploring how nature (prenatal exposure to male hormones, plus external anatomy, and brain organization) and nurture (gender socialization) contribute to male- or female-typical behaviors.

Adolescent Sexual Development

A flood of hormones triggers another period of dramatic physical change when we enter **puberty**. In this 2-year period of rapid sexual maturation, pronounced female-male differences emerge. A variety of changes begin at about age 10 in girls and at about age 12 in boys (Biro et al., 2012; Herman-Giddens et al., 2012). A year or two before visible physical changes, we often feel the first stirrings of sexual attraction (McClintock & Herdt, 1996).

Girls' earlier entry into puberty can at first propel them to greater height than boys of the same age. But boys catch up when they begin puberty, and by age 14 they are usually taller than girls. During these growth spurts, the **primary sex characteristics**—the reproductive organs and external genitalia—develop dramatically. So do the nonreproductive **secondary sex characteristics**. Pubic and underarm hair emerges. Girls develop breasts and larger hips. Boys' facial hair begins growing and their voices deepen (**FIGURE 13.5**).

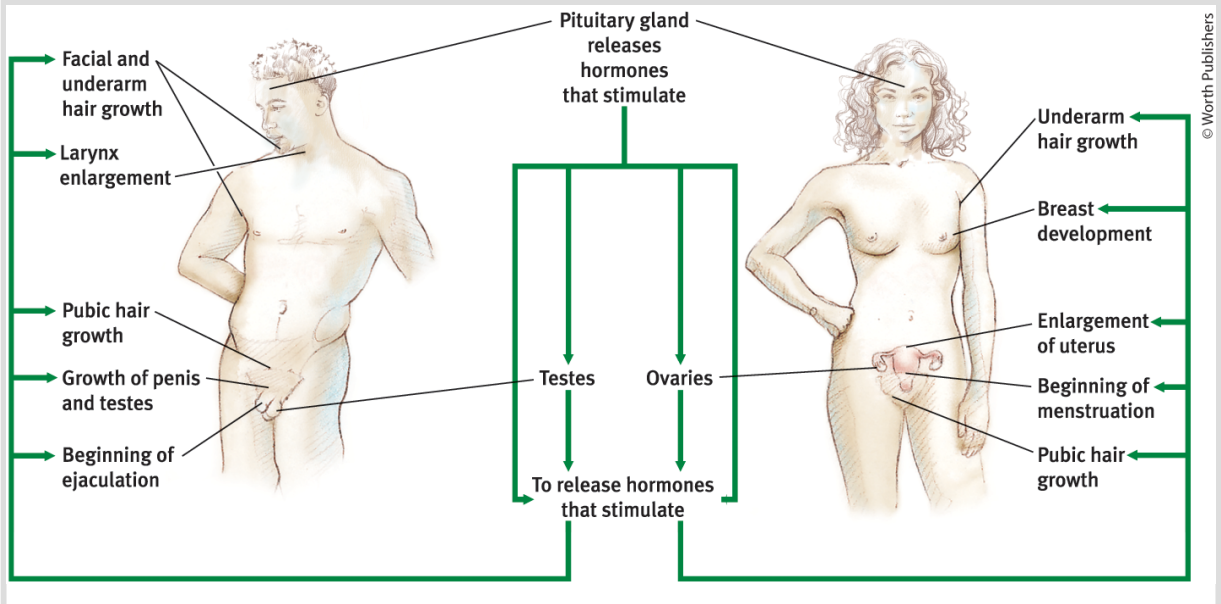


FIGURE 13.5 Body changes at puberty

Pubertal boys may not at first like their sparse beard. (But then it grows on them.)

For boys, puberty's landmark is the first ejaculation, which often occurs first during sleep (as a "wet dream"). This event, called **spermarche**, usually happens by about age 14.

In girls, the landmark is the first menstrual period, **menarche**, usually within a year of age $12^1/_2$ (Anderson et al., 2003). Scientists have identified nearly 250 genes that predict age at menarche (Day et al., 2017). But environment matters, too. Early menarche is more likely following stresses related to poverty, father absence, sexual abuse, insecure attachments, or a history of a mother's smoking during

pregnancy (Richardson et al., 2018; Shrestha et al., 2011; Sun et al., 2017). Girls in various countries are reaching puberty earlier today than in the past. Suspected triggers include increased body fat, increased hormone-mimicking chemicals in the diet, and increased stress related to family disruption (Biro et al., 2010, 2012; Ellis et al., 2012; Herman-Giddens, 2013). But there is good news for children with a secure child-mother attachment: This bond can provide a buffer against childhood stresses, including those related to early puberty (Sung et al., 2016). Remember: *Nature and nurture interact.*

Retrieval Practice

RP-4 Prenatal sexual development begins about _____ weeks after conception. Adolescence is marked by the onset of _____.

ANSWERS IN APPENDIX E

Sexual Development Variations

Nature may blur the biological line between males and females. People who are intersex may be born with combinations of male and female chromosomes, hormones, and anatomy. For example, a genetic male may be born with two or more X chromosomes as well as a Y chromosome *(Klinefelter syndrome),* often resulting in sterility and small testes. Genetic females born with only one normal X chromosome *(Turner syndrome)* may not have menstrual periods,

develop breasts, or be able to have children without reproductive assistance. Such individuals may struggle with their *gender identity*.

In the 1970s, physician Julianne Imperato-McGinley discovered one of the rarest sexual development variations. She traveled to a remote village in the Dominican Republic, where she had learned that some seemingly female children became male children at the beginning of puberty. These children—called *güevedoces,* meaning "penis at 12"—were born with an apparent vagina, and neither a visible penis nor testes. The children were raised as girls until puberty, when they grew a penis and testes and developed male-typical secondary sex characteristics. Through genetic and biological analysis, Imperato-McGinley showed that these children had XY sex chromosomes—typical of genetic males—but lacked an enzyme that converts testosterone to form visible male genitalia (Imperato-McGinley et al., 1974). So puberty's testosterone surge prompted not only the usual development of secondary sex characteristics (such as deepening voice), but also the belated development of male genitalia. This rare genetic condition was widespread in the village, affecting 1 in 90 children.

Despite being raised as girls, güevedoces children often display male-typical childhood interests, and most eventually self-identify as males. Carlos, named Carla at birth, was more interested in playing soccer than in playing with dolls (Ennis, 2015). At the beginning of puberty, he told his dad he no longer wanted to have long hair or "to be a girl anymore" (Univision, 2015). Johnny, who grew up as Felicita, noted

that “I never liked to dress as a girl and when they bought me toys for girls I never bothered playing with them—when I saw a group of boys I would stop to play ball with them.” Like many güevedoces children, when his characteristics changed to become typically male, Johnny was bullied by peers.



Jon Sayers/BBC

The amazing *güevedoces* Catherine and Carla, pictured here, are cousins with güevedoces syndrome. Born without visible male reproductive organs at birth, they were raised as girls. At the onset of puberty, they grew a penis and testes and asked people to call them Cástulo and Carlos, respectively.

In the past, medical professionals often recommended surgery to create an unambiguous sex identity for children with conditions affecting their external anatomy. In one famous case, when a baby boy named Bruce Reimer lost his penis in a botched circumcision, his parents followed a psychologist’s advice to seek surgery and raise him as a girl, “Brenda.” When Reimer learned as a teenager what had happened, he immediately rejected the assigned female identity, choosing the name David and undergoing surgery to remove the

breasts he'd developed from hormone therapy. He eventually married a woman and became a stepfather. Sadly, he later died by suicide—as had his depressed identical twin brother (Colapinto, 2000). Today, most experts recommend postponing surgery until people's naturally developing physical appearance and gender identity become clear.

The Nurture of Gender

For many people, birth-assigned sex and gender coexist in harmony. Biology draws the outline, and culture paints the details. The physical traits that define a newborn as male, female, or intersex are the same worldwide. But the gender traits that define how men (or boys) and women (or girls) should act, interact, or feel about themselves differ across time and place (Zentner & Eagly, 2015).

Gender Roles

LOQ 13-9

What are some cultural influences on gender roles?

Cultures shape our behaviors by defining how we ought to behave in a particular social position, or **role.** We can see this shaping power in **gender roles**—the social expectations that guide people's behavior as men or as women.

In just a thin slice of history, gender roles worldwide have undergone an extreme makeover. At the beginning of the twentieth century, only one country in the world—New Zealand—granted women the right to vote (Briscoe, 1997). By 2015, that right existed in all countries. A century ago, U.S. women could not vote in national elections, serve in the military, or divorce a husband without cause. If a woman worked for pay, she would more likely have been a maid than a manager. Between 2007 and 2018, 1.4 million tests of attitudes toward gender roles showed decreasing endorsement of traditional stereotypes, such as associating men with "career" and "science" and women with "family" and "arts" (Charlesworth & Banaji, 2022).



MARWAN NAAMANI/AFP/Getty Images

Driving change Thanks to the advocacy of Manal al-Sharif and others, driving a car became a universal right for women in 2018, when Saudi Arabia lifted its ban. She said, "The fight for women's rights anywhere contributes to the fight for women's rights everywhere" (2019).



Nick Wilson Photography

Benefits of belonging Women are gaining ground in STEM fields, as illustrated by the 2014 Nobel Prize in medicine going to neuroscientist May-Britt Moser (who was a psychology major). Moser credits her passion for studying the brain to having capable and encouraging mentors: “I was not always the best student, but my teachers saw something in me and tried to encourage me” (Moser, 2014).

Gender roles also vary from one place to another. Nomadic societies of food-gathering people have had little division of labor by sex. Boys and girls receive much the same upbringing. In agricultural societies, where women typically work in the nearby fields and men roam while herding livestock, cultures have shaped children to assume more distinct gender roles (Segall et al., 1990; Van Leeuwen, 1978).

Take a minute to check your own gender expectations. Would you agree that “When jobs are scarce, men should have more right to a job”? In Sweden and Spain, barely more than 10 percent of adults

agreed. In Egypt and Jordan, about 90 percent agreed (UNFPA, 2016). We're all human, but my, how our views differ.



Suvra Kanti Das/Abaca Press/Alamy Stock Photo

The gendered pandemic As the Covid pandemic devastated people's careers, many more women than men were forced to reduce their work hours or leave the workplace. Women more often work in low-paying jobs that offer few benefits and little flexibility, such as remote work or paid leave to care for sick relatives. In 2020, women worldwide lost 64 million jobs and $800 billion in income (Oxfam International, 2021). These unemployed domestic workers in Dhaka, Bangladesh, wait to receive food aid.

> **"You cannot put women and men on an equal footing. It is against nature."** — Turkish President Recep Tayyip Erdoğan, 2014

Cultural expectations about gender roles also factor into **sexual aggression**. In the United States, 1 in 5 women and 1 in 16 men are sexually assaulted while in college (Lisak et al., 2010). In the aftermath of credible accusations of sexual aggression by famous and powerful men, many countries are making efforts to reduce sexual harassment and assault. Still, the problem persists, with a survey of nearly 10,000 in the Hollywood entertainment industry revealing the power of harassers: "You can fire somebody, you can influence their ability to get another job, or you can just destroy their reputation" (Noveck, 2020). (See Thinking Critically About: Sexual Aggression.)

LOQ 13-10

What are the effects of sexual aggression? How have cultural views changed, and how can we reduce sexual aggression?

Thinking Critically About:
Sexual Aggression

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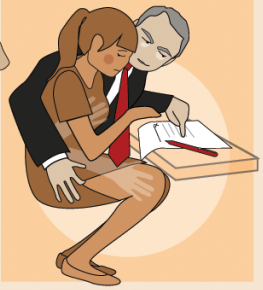
Definition of Sexual Aggression

Sexual harassment involves making unwanted sexual advances, obscene remarks, or requests for sexual favors.[1]



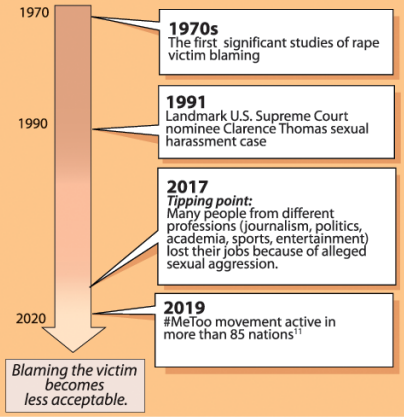
Sexual assault is "any type of sexual contact or behavior that occurs without the explicit consent of the recipient," such as unwanted touching, molestation, and attempted or completed rape.[2]



Cultural Effects on Our Views

By Place:
Some cultures view victims of sexual aggression as guilty of disgracing their families. In India and Pakistan, male family members kill an unknown number of women—one source estimates 1000 annually in each country[10]—for dishonoring their families.

Over Time:
Changes in global norms have made it less acceptable to blame victims of sexual aggression.



Victims

In the U.S., **81%** of women and **43%** of men report having experienced sexual aggression in their lifetime.[3]

Sexual aggression affects people of *all ethnic groups*.[4]

Nearly **70%** of rape victims are between the ages of 11 and 24.4.[4]

In a National School Climate survey, **8** out of **10** gay or lesbian adolescents reported experiencing sex-related harassment in the prior year.[5]

Effects on Well-Being

Thanks to human resilience, victims of sexual aggression often recover and lead healthy and meaningful lives. Yet many also suffer serious setbacks, including:



- Greater anxiety, depression, and risk for posttraumatic stress disorder[6]
- Disrupted sleep[7]
- Poor physical health[8]
- Difficulty trusting new relationship partners[9]

How to Reduce Sexual Aggression

Therapy to treat sexual aggressors has not been very effective.[12] However, other, broader-based strategies do work:

Encourage victims to report their experiences to authority figures (parents, supervisors, law enforcement officials) and to share their experiences publicly.[13]

Empower victims to take control of their situation and refuse to let their perpetrators dominate or manipulate them. Adjust social norms so that victims feel safe reporting their experiences.

Educate people about preventive bystander intervention strategies, such as "Green Dot," which has reduced sexual aggression in communities by as much as 20%.[14]



1. McDonald, 2012; U.S.E.E.O.C., 2018. 2. U.S.D.O.J., 2018. 3. Stop Street Harassment, 2018. 4. Black et al., 2011. 5. GLSEN, 2012. 6. Choudhary et al., 2012; Krahé & Berger, 2017; Snipes et al., 2017; Zanarini et al., 1997. 7. Krakow et al., 2001, 2002. 8. Schuyler et al., 2017; Zinzow et al., 2011. 9. Muldoon et al., 2016; Starzynski et al., 2017. 10. HBVA, 2018. 11. Stone & Vogelstein, 2019. 12. Grønnerød et al., 2015; Klapilová et al., 2019. 13. Holland et al., 2020. 14. Coker et al., 2017. 15. Jesse, 2019.

Retrieval Practice

RP-5 What are gender roles, and what do their variations tell us about our human capacity for learning and adaptation?

ANSWERS IN APPENDIX E

Gender Identity

LOQ 13-11

How do we form our gender identity?

A *gender role* describes how others expect us to think, feel, and act. Our **gender identity**, when *binary* (involving only two options), is our personal sense of being male or female. Those with a *nonbinary* gender identity may not feel male or female, or they may identify as some combination of male *and* female. How do we develop our gender identity?

Social learning theory assumes that we acquire our identity in childhood, by observing and imitating others' gender-linked behaviors and by being rewarded or punished for acting in specific ways. ("Tatiana, you're such a good mommy to your dolls"; "You're such a tough kid, Armand.") But there's more to gender identity than imitation and reward. **Gender typing**—taking on a traditional female or male role—varies from child to child (Tobin et al., 2010).

> **"We need to keep changing the attitude that raises our girls to be demure and our boys to be assertive, that criticizes our daughters for speaking out and our sons for shedding a tear."** — Former U.S. President Barack Obama, 2016

Parents help transmit their culture's views on gender. In one analysis of 43 studies, parents with traditional gender views were more likely to have gender-typed children who shared their expectations about how males and females should act (Tenenbaum & Leaper, 2002). When fathers share equally in housework, their daughters develop higher aspirations for work outside the home (Croft et al., 2014).

But no matter how much parents encourage or discourage traditional gender behavior, children may drift toward what feels right to them. Some organize themselves into "boy worlds" and "girl worlds," each guided by their understanding of the rules. Others conform to these rules more flexibly. Still others prefer **androgyny:** A blend of male and female roles feels right to them. Androgyny has benefits. As adults, androgynous people are more adaptable. They are more flexible in their actions and in their career choices (Bem, 1993). From childhood onward, they tend to be more resilient and self-accepting, and they experience less depression (Lam & McBride-Chang, 2007; Mosher & Danoff-Burg, 2008; Pauletti et al., 2017).

Feelings matter, but so does how we think. Early in life, we all form *schemas,* or concepts that help us make sense of our world. Our *gender schemas* organize our experiences of male-female characteristics and

help us think about our gender identity, about who we are as unique individuals (Bem, 1987, 1993; Martin et al., 2002).

As young children, we were "gender detectives" (Martin & Ruble, 2004). Before our first birthday, we knew the difference between a typically male and female voice or face (Martin et al., 2002). After we turned 2, language forced us to label the world in terms of gender. The English language has classified people as *he* and *she,* though *they* is increasingly used as a gender-neutral pronoun. Other languages classify objects as masculine ("*le* train") or feminine ("*la* table").

For young children, gender looms large. Children tend to learn that two sorts of people exist and they begin to search for clues about gender. In every culture, people communicate their gender in many ways. Their *gender expression* drops hints not only in their language but also in their clothing, interests, and possessions. Having picked up such clues, 3-year-olds may divide the human world in half. "Girls," they may decide, are the ones who love *Frozen* and have longer hair. "Boys" think *Captain Underpants* is hilarious and don't wear dresses. Armed with their newly collected "proof," they then adjust their behaviors to fit their concept of gender. These stereotypes are most rigid at about age 5 or 6. If the new neighbor is a girl, a 6-year-old boy may assume he cannot share her interests.

What children learn has, however, slowly been broadening from the "two sorts of people" found in the animated classics and separate toy aisles for dolls and action heroes. In 2022, the popular Pixar film

Lightyear portrayed two female characters in a same-sex relationship, including a scene where they kiss. “We’re reflecting the world around us,” said producer Gayle Susman (Cavna, 2022).

For people who are *cisgender,* gender identity corresponds with their sex assigned at birth. For those who are **transgender,** gender identity differs from what’s typical for that person’s assigned sex (APA, 2010; Bockting, 2014). For example, a person assigned female at birth may identify as a male from childhood onward. Others first identify as transgender in adolescence or adulthood. One study of 300 transgender girls and boys found them to be as strongly gender-typed and gender-identified as cisgender children (Gülgöz et al., 2019).

In most countries, it’s not easy being transgender. Cisgender people often perceive transgender people as mentally ill or confused (Howansky et al., 2021). In North America, Europe, and Asia, transgender people frequently experience verbal harassment, prejudice, and discrimination (James et al., 2016; Spielmann et al., 2022). Transgender people may experience distress due to this mistreatment, increasing their risk of depression and suicidal thinking (de Graaf et al., 2022; Pellicane & Ciesla, 2022). Perhaps due to experiencing or anticipating prejudice, U.S. transgender veterans have twice the risk of dying by suicide as cisgender military veterans (Tucker, 2019). Some transgender people may develop *gender dysphoria,* which involves clinical levels of distress associated with dissimilarity between a person’s experienced or expressed gender and their sex assigned at birth. This distress may impact their ability to

work, interact with loved ones, or experience satisfying sexual relationships (APA, 2022; Lindley et al., 2022). But when accepted by their families, transgender youth are not at higher risk for depression, and experience only slightly higher levels of anxiety than their cisgender peers (Durwood et al., 2017; Gibson et al., 2021).

Transgender people may undergo a social transition, changing their hairstyles, clothing, first names, or pronouns to align with their gender identity. After the start of puberty, transgender people may use medical interventions to align their outward appearance and everyday lives with their gender identity. Gender-affirming medical procedures (including hormone use and surgery) reduce transgender people's depression, anxiety, and posttraumatic stress (Almazan & Keuroghlian, 2021; Baker et al., 2021; Tomita et al., 2019). Only 1 percent of transgender people report regretting their gender-affirming medical procedure (Bustos et al., 2021). Younger people have begun to seek these medical procedures, sparking debates within psychology and medical communities about what age to begin use of "puberty blocker" medication, administer gender-affirming hormones, or undergo genital surgery (Tavris, 2022; Temming, 2021).

Gender identity is distinct from *sexual orientation* (the direction of one's sexual attraction). Transgender people may be sexually attracted to people of any gender or to no one at all, just as cisgender people may be. Your sexual orientation is who you fantasize going to bed *with;* your gender identity is who you go to bed *as.*

Worldwide, an estimated 25 million people are transgender (WHO, 2016). That's 0.4 percent of humans, which is a number similar to that reported in an Alberta census (Frew, 2022). About 1.6 million people in the United States (0.6 percent) are transgender (Herman et al., 2022). Roughly 30 percent of those not identifying with their assigned sex have a nonbinary gender identity (Barr et al., 2016; James et al., 2016; Mikalson et al., 2012).

In North America and Europe, the number of transgender people is rising, most notably among adolescents who were assigned female at birth (Thompson et al., 2022). Referrals to UK clinics for adolescents seeking gender-affirming medical care increased from 250 in 2011 to 5000 in 2021, with two-thirds of patients having been assigned female at birth (Ghorayshi, 2022). In a 2022 U.S. survey, 3.1 percent of 18- to 24-year-olds identified as transgender—six times the proportion of those aged 25 to 29 and 16 times the proportion of those aged 50 and older (Brown, 2022). Thus, half of U.S. young adults, but only one in five of those over 65, personally know someone who is transgender (McCarthy, 2021).

The large differences among age groups have sparked debate: Is the increase in youth and young adults who identify as transgender a healthy trend, with greater awareness and acceptance of transgender people, more of whom feel comfortable sharing their identities? Or is the multiplying number a social phenomenon? Or both (Tavris, 2022)? Regardless, early childhood gender identity tends to be stable:

Transgender youth who socially transitioned at an early age rarely retransition to a cisgender identity (Olson et al., 2022).



Erich Bartlebaugh/BuzzFeed News/Redux Pictures

Nonbinary on the big screen Asia Kate Dillon is a nonbinary actor whose films include *John Wick 3.* Dillon describes educating others about gender identity as "a dialogue … about what pronouns are, what gender identity is, the fact that we're all assigned a sex, but that everyone actually has the autonomy to

[determine] how they identify" (Soloski, 2019).

"It is no lie nor fable, that females may turn to be males." — Pliny the Elder, *Natural History,* 77 C.E. (quoted in Wilkinson, 2021).

Ask Yourself

How gender-typed are you? What has influenced your feelings of being male, female, neither, or some combination of male and female?

Reflections on Nature, Nurture, and Their Interaction

LOQ 13-12

How do nature, nurture, and our own choices influence gender roles and sexuality?

"There are trivial truths and great truths," reflected the physicist Niels Bohr on the paradoxes of science. "The opposite of a trivial truth is plainly false. The opposite of a great truth is also true." Our ancestral history helped form us as a species. Where there is variation, natural selection, and heredity, there will be evolution. Our genes form us. This is a great truth about human nature.



San Diego Museum of Man, photograph by Rose Tyson

Culture matters As this exhibit at a San Diego museum illustrates, children learn their culture. A baby's foot can step into any culture.

But our experiences also shape us. Our families and peer relationships teach us how to think and act. Differences initiated by our nature may be amplified by our nurture. If their genes and hormones predispose males to be more physically aggressive than females, culture can amplify this gender difference through norms that reward macho men and gentle women. If men are encouraged toward roles that demand physical power, and women toward more nurturing roles, each may act accordingly. Roles remake their players. Lawyers in time become more lawyerly, professors more professorial. Gender roles similarly shape us.

In many modern cultures, gender roles are merging. Brute strength has become less important for power and status (think of how climate

activist Greta Thunberg has galvanized millions of people worldwide to environmental protest and action). From 1965 to 2021, women soared from 9 percent to 56 percent of U.S. medical students (AAMC, 2014, 2021). In the quarter century since 1996, U.S. partnered heterosexual men have been doing more and more of the laundry, cleaning, and cooking—though still less than women contribute (Brenan, 2020). A 30-country survey shows that women complete two more hours of unpaid daily work than do men, but the gender gap is shrinking (OECD, 2022). Such swift changes signal that biology does not define gender roles.



If nature and nurture jointly form us, are we "nothing but" the product of nature and nurture? Are we rigidly determined?

We *are* the product of nature and nurture, but we are also an open system (FIGURE 13.6). Genes are all-pervasive but not all-powerful. People may reject their evolutionary role as transmitters of genes and choose not to reproduce. Culture, too, is all-pervasive but not all-powerful. People may defy peer pressures and resist social expectations.

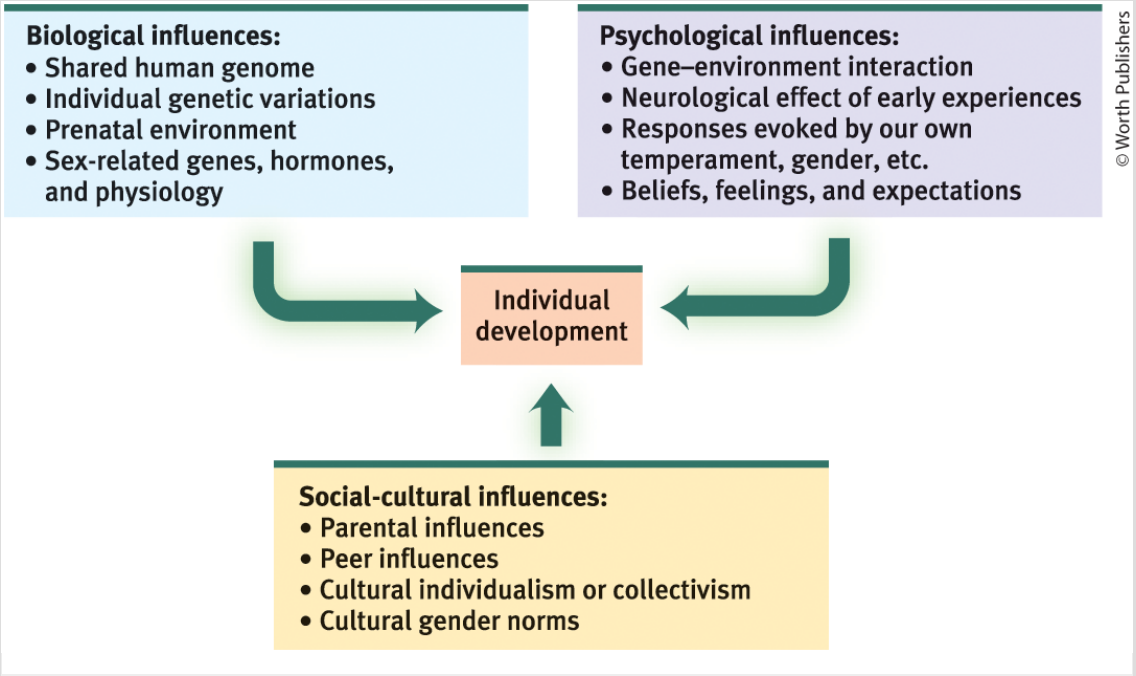


FIGURE 13.6 The biopsychosocial approach to development

Moreover, we cannot excuse our failings by blaming them solely on bad genes or bad influences. In reality, we are both creatures and creators of our worlds. So many things about us—including our gender roles—are the products of our genes and environments. Yet the stream that runs into the future flows through our present choices. Our decisions today design our environments tomorrow. We are the

architects. Our hopes, goals, and expectations influence our destiny. And that is what enables cultures to vary and to change. Mind matters.

Retrieval Practice

RP-6 How does the biopsychosocial approach explain our individual development?

ANSWERS IN APPENDIX E

***

We know from our correspondence and from surveys that some readers are troubled by the naturalism and evolutionism of contemporary science. (A note to readers from other nations: In the United States there can be a gulf between scientific and lay thinking about evolution.) "The idea that human minds are the product of evolution is … unassailable fact," declared a 2007 editorial in *Nature,* a leading science journal. In *The Language of God,* Human Genome Project director Francis Collins (2006, pp. 141, 146), a self-described Christian, compiled the "utterly compelling" evidence that led him to conclude that Darwin's big idea is "unquestionably correct." Yet Gallup pollsters report that 40 percent of U.S. adults believe that humans were created "pretty much in their present form" within the last 10,000 years (Brenan, 2019). Many people who dispute the scientific story worry that a science of behavior (and evolutionary science in particular) will destroy our sense of human beauty, mystery, and

spiritual significance. For those concerned, we offer some reassuring thoughts.

> **"Let's hope that it's not true; but if it is true, let's hope that it doesn't become widely known."** — Lady Ashley, commenting on Darwin's theory

When Isaac Newton explained the rainbow in terms of light of differing wavelengths, the British poet John Keats feared that Newton had destroyed the rainbow's mysterious beauty. Yet, as evolutionary biologist Richard Dawkins (1998) noted in *Unweaving the Rainbow,* Newton's analysis led to an even more profound mystery—Einstein's theory of special relativity. Nothing about Newton's optics need diminish our appreciation for the dramatic elegance of a rainbow arching across a brightening sky.

> **"Is it not stirring to understand how the world actually works—that white light is made of colors, that color measures light waves, that transparent air reflects light … ? It does no harm to the romance of the sunset to know a little about it."** — Carl Sagan, *Skies of Other Worlds,* 1988

When Galileo assembled evidence that the Earth revolved around the Sun, not vice versa, he did not offer irrefutable proof for his theory. Instead, he provided a coherent explanation for a variety of observations, such as the changing shadows cast by the Moon's mountains. His explanation eventually won the day because it

described and explained things in a way that made sense, that hung together. Darwin's theory of evolution likewise is a coherent view of natural history. It offers an organizing principle that unifies various observations.

Many people of faith find the scientific idea of human origins congenial with their spirituality. In the fifth century, St. Augustine (quoted by Wilford, 1999) wrote, "The universe was brought into being in a less than fully formed state, but was gifted with the capacity to transform itself from unformed matter into a truly marvelous array of structures and life forms." In the fourteenth century, Muslim historian Ibn Khaldun (1377) wrote, "One should then look at the world of creation. It started out from the minerals and progressed, in an ingenious, gradual manner to plants and animals." Some 800 years later, Pope Francis in 2015 welcomed a science–religion dialogue, saying, "Evolution in nature is not inconsistent with the notion of creation, because evolution requires the creation of beings that evolve."



heromen30/Shutterstock

Meanwhile, many people of science are awestruck at the emerging understanding of the universe and the human creature. It boggles the mind—the entire universe popping out of a point some 14 billion years ago, and instantly inflating to cosmological size. Had the energy of this Big Bang been the tiniest bit less, the universe would have collapsed back on itself. Had it been the tiniest bit more, the result would have been a soup too thin to support life. Astronomer Sir Martin Rees has described *Just Six Numbers* (1999), any one of which, if changed ever so slightly, would produce a cosmos in which life could not exist. Had gravity been a tad stronger or weaker, or had the weight of a carbon proton been a wee bit different, our universe just wouldn't have worked.

What caused this almost too-good-to-be-true, finely tuned universe? Why is there something rather than nothing? How did it come to be, in the words of Harvard-Smithsonian astrophysicist Owen Gingerich

(1994), “so extraordinarily right, that it seemed the universe had been expressly designed to produce intelligent, sentient beings”? On such matters, a humble, awed, scientific silence is appropriate, suggested philosopher Ludwig Wittgenstein: “Whereof one cannot speak, thereof one must be silent” (1922, p. 189).

Rather than fearing science, we can welcome its enlarging our understanding and awakening our sense of awe. In *The Fragile Species,* Lewis Thomas (1992) described his utter amazement that the Earth in time gave rise to bacteria and eventually to Bach’s Mass in B Minor. In a short 4 billion years, life on Earth has come from nothing to structures as complex as a 6-billion-unit strand of DNA and the incomprehensible intricacy of the human brain. Atoms no different from those in a rock somehow formed dynamic entities that produced extraordinary, self-replicating, information-processing systems—us (Davies, 2007). Although we appear to have been created from dust, over eons of time, the end result is a priceless creature, rich with potential beyond our imagination.

“The possession of knowledge does not kill the sense of wonder and mystery. There is always more mystery.” — Anaïs Nin, *The Diary of Anaïs Nin,* 1934

REVIEW

Module 13: Cultural and Gender Diversity: Understanding Nature and Nurture

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 13-1: How do early experiences modify the brain?

LOQ 13-2: In what ways do parents and peers shape children's development?

LOQ 13-3: How does culture affect our behavior?

LOQ 13-4: How do individualist and collectivist cultures shape values and goals?

LOQ 13-5: How does the meaning of *gender* differ from the meaning of *sex?*

LOQ 13-6: What are some of the ways males and females tend to be alike and to differ?

LOQ 13-7: What factors contribute to gender bias in the workplace?

LOQ 13-8: How do sex hormones influence prenatal and adolescent sexual development?

LOQ 13-9: What are some cultural influences on gender roles?

LOQ 13-10: What are the effects of sexual aggression? How have cultural views changed, and how can we reduce sexual aggression?

LOQ 13-11: How do we form our gender identity?

LOQ 13-12: How do nature, nurture, and our own choices influence gender roles and sexuality?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

culture
norms
tight culture
loose culture
individualism
collectivism
sex
gender
intersex
aggression

relational aggression
X chromosome
Y chromosome
testosterone
estrogens
puberty
primary sex characteristics
secondary sex characteristics
spermarche [sper-MAR-key]
menarche [meh-NAR-key]
role
gender role
sexual aggression
gender identity
social learning theory
gender typing
androgyny
transgender

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. Individualist cultures tend to value _____; collectivist cultures tend to value _____.
   a. interdependence; independence
   b. independence; interdependence
   c. solidarity; uniqueness
   d. duty; fulfillment

2. In psychology, _____ is the biologically influenced characteristics by which people define *male, female,* and *intersex.* The behavioral characteristics that people associate with *boy, girl, man,* and *woman* is _____.

3. Females and males are very similar, but one way they differ is that
   a. females interrupt more often than males.
   b. males are more democratic than females in their leadership roles.
   c. as children, females tend to play in small groups, while males tend to play in large groups.
   d. females are more likely to die by suicide.

4. A fertilized egg will develop into a male if it receives a/n _____ chromosome from its father.

5. Primary sex characteristics relate to _____; secondary sex characteristics refer to _____.
   a. spermarche; menarche
   b. breasts and facial hair; ovaries and testes
   c. emotional maturity; hormone surges

d. reproductive organs; nonreproductive traits

6. On average, girls begin puberty at about the age of _____, boys at about the age of _____.

7. A person born with a combination of male and female biological sexual characteristics is _____.

8. *Gender role* refers to our
   a. sense of being male, female, neither, or some combination of male and female.
   b. culture's expectations about the "right" way for men and women to behave.
   c. assigned sex at birth—our chromosomes and anatomy.
   d. gender identity.

9. Our personal sense of being male, female, neither, or some combination of male and female is known as our _____ _____.

CHAPTER 5
Developing Through the Life Span (Modules 14–17)



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MODULE 14 Developmental Issues, Prenatal Development, and the Newborn

Developmental Psychology's Major Issues

Prenatal Development and the Newborn

MODULE 15 Infancy and Childhood

Physical Development
Cognitive Development
Social Development
THINKING CRITICALLY ABOUT: Parenting Styles
MODULE 16 Adolescence and Emerging Adulthood
Physical Development
Cognitive Development
Social Development
Emerging Adulthood
MODULE 17 Adulthood
Physical Development
Cognitive Development
Social Development

Life is a journey, from womb to tomb. So it is for me [DM], and so it will be for you. My story, and yours, began when a man and a woman together contributed 20,000+ genes to an egg that became a unique person. Those genes coded the protein building blocks that, with astonishing precision, form our body and predispose our traits. My grandmother bequeathed to my mother a rare hearing-loss pattern, which she, in turn, gave to me (the least of her gifts). My father was an amiable extravert, and sometimes I forget to stop talking (although as a child, my talking was impeded by stuttering, for which Seattle Public Schools provided speech therapy).

Along with my parents' nature, I also received their nurture. Like you, I was born into a particular family and culture, with its own way of viewing

the world. My values have been shaped by a family culture filled with talking and laughter, by a religious culture that speaks of love and justice, and by an academic culture that encourages critical thinking (asking, *What do you mean? How do you know?*).

We are formed by our genes and by our contexts, so our stories all differ. But in many ways we are each like nearly everyone else on Earth. Being human, you and I have a need to belong. My mental video library, which began after age 4, is filled with scenes of social attachment. Over time, my attachments to parents loosened as peer friendships grew. After lacking the confidence to date in high school, I fell in love with a college classmate and married at age 20. Natural selection predisposes us to survive and perpetuate our genes. Sure enough, two years later a child entered our lives, and I experienced a new form of love that surprised me with its intensity.

But life is marked by change. That child and his brother now live 2000 miles away, and their sister has found her calling in South Africa. The tight rubber bands linking parent and child have loosened, as yours likely have as well.

Change also marks most vocational lives, which for me transitioned from a teen working in the family insurance agency, to a premed chemistry major and hospital aide, to (after discarding my half-completed medical school applications) a psychology professor and author. I predict that in 10 years, you will also be doing things you do not currently anticipate.

Stability also marks our development: Our life situations change, but we experience a continuous self. When I look in the mirror, I do not see the person I once was, but I feel like the person I have always been. I am the same person who, as a late teen, played basketball and discovered love. Sixty years later, I still enjoy basketball and still love (with less passion but more security) the life partner with whom I have shared life's griefs and joys.

Continuity morphs through stages—for me, growing up, raising children, enjoying a career, and, eventually, life's final stage, which will demand my presence. As I wend my way through this cycle of life and death, I am mindful that life is a journey, a continuing process of development, seeded by nature and shaped by nurture, animated by love and focused by work, begun with wide-eyed curiosity and completed, for those blessed to live to a good old age, with peace and never-ending hope.

Across the life span, we grow from newborn to toddler, from toddler to teenager, and from teenager to mature adult. At each stage of life there are physical, cognitive, and social milestones. We begin with prenatal development and the newborn (Module 14). Then we'll turn our attention to infancy and childhood (Module 15), adolescence (Module 16), and adulthood (Module 17).

MODULE 14: Developmental Issues, Prenatal Development, and the Newborn

Researchers find human development interesting for the same reasons most of us do—they want to understand more about how we've become our current selves, and how we may change in the years ahead.

Developmental Psychology's Major Issues

Learning Objective Question LOQ 14-1

What three issues have engaged developmental psychologists?

Developmental psychologists often do **cross-sectional studies** (comparing people of different ages) and **longitudinal studies** (following people across time) to explore three major issues:

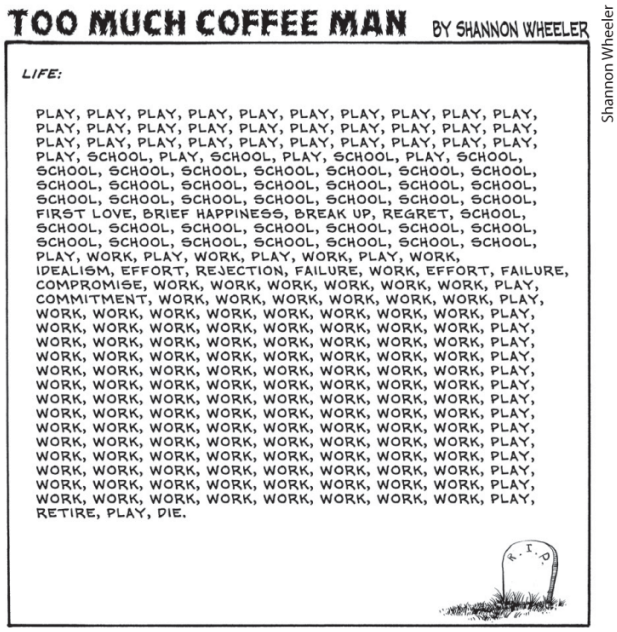
1. ***Nature and nurture:*** How does our genetic inheritance (our nature) interact with our experiences (our nurture) to influence our development? (This is our focus in the Nature, Nurture, and Human Diversity modules.)

2. ***Continuity and stages:*** What parts of development are gradual and continuous, like riding an escalator? What parts change abruptly in separate stages, like climbing rungs on a ladder?
3. ***Stability and change:*** Which of our traits persist through life? How do we change as we age?

Continuity and Stages

Do adults differ from infants as a giant redwood differs from its seedling—a difference created mainly by gradual, cumulative growth? Or do they differ as a butterfly differs from a caterpillar—a difference of distinct stages?

Researchers who emphasize experience and learning typically see development as a slow, continuous shaping process. Those who emphasize biological maturation tend to see development as a sequence of genetically predisposed stages or steps: Although progress through the various stages may be quick or slow, everyone passes through the stages in the same order.



Stages of the life cycle

Are there clear-cut stages of psychological development, as there are physical stages such as walking before running? The *stage theories* we will consider—of Jean Piaget on cognitive development, Lawrence Kohlberg on moral development, and Erik Erikson on psychosocial development—propose developmental stages (summarized in **FIGURE 14.1**). But as we will also see, some research casts doubt on the idea that life proceeds through neatly defined age-linked stages.

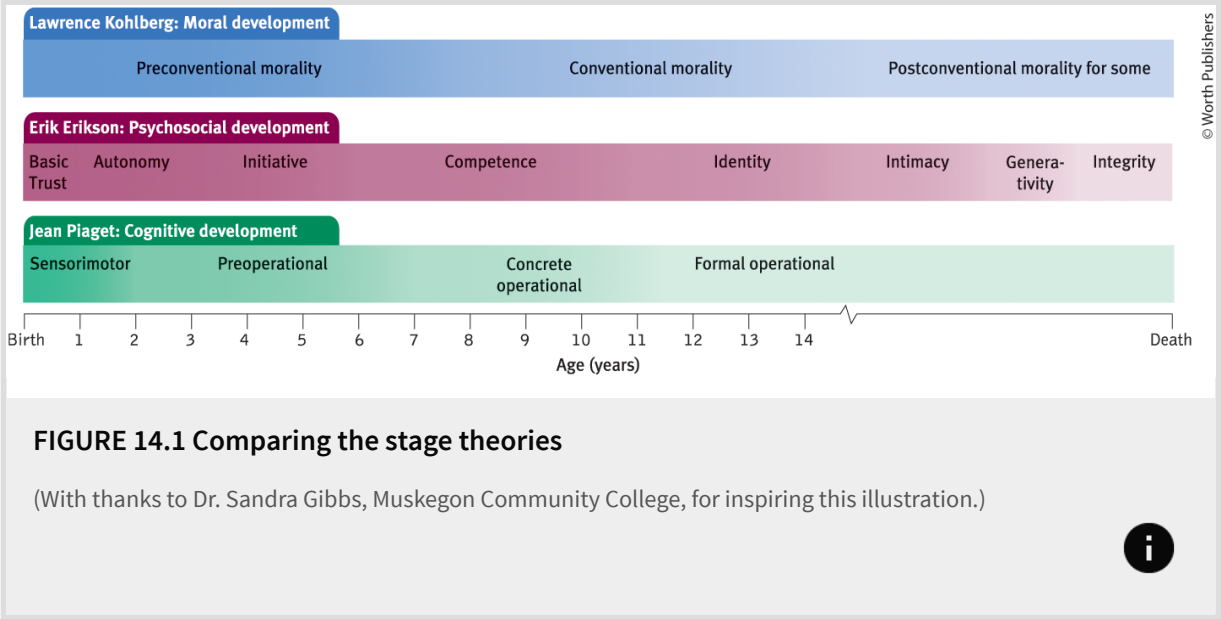


FIGURE 14.1 Comparing the stage theories

(With thanks to Dr. Sandra Gibbs, Muskegon Community College, for inspiring this illustration.)

Although many modern developmental psychologists do not identify as stage theorists, the stage concept remains useful. The human brain does experience growth spurts during childhood and puberty that correspond roughly to Piaget's stages (Thatcher et al., 1987). And stage theories contribute a developmental perspective on the whole life span, by suggesting how people of one age might come to think and act differently when they arrive at a later age.

Stability and Change

As we follow lives through time, do we find more evidence for stability or change? If reunited with a long-lost childhood friend, do we instantly realize that "it's the same old Jordan"? Or do long-ago friends now seem like strangers? (At least one acquaintance of mine [DM's] would choose the second option. At his 40-year college reunion, he failed to recognize a former classmate. The understandably appalled classmate was his first wife!)

We experience both stability and change. Some of our characteristics, such as *temperament,* are very stable. Following thousands of people in New Zealand and the United States over several decades, researchers have been struck by the consistency of temperament and emotionality across time (Kassing et al., 2019; Moffitt et al., 2013; Slutske et al., 2012). Inhibited 14-month-olds mostly grow up to be reserved, introverted adults (Tang et al., 2020). Out-of-control preschoolers are later the most likely to engage in teen smoking, adult criminal behavior, or out-of-control gambling. From age 10 to 22, most people become nicer, though the meaner kids tend also to become the meaner adults (Vaillancourt & Farrell, 2021). Inattentive Canadian kindergarteners are less likely to earn high salaries in their adult careers (Vergunst et al., 2019). Moreover, children observed being repeatedly cruel to animals often became violent adults (Hensley et al., 2018). But on a happier note, the widest smilers in childhood and college photos are the ones most likely to enjoy enduring marriages (Hertenstein et al., 2009).



(a) (b)

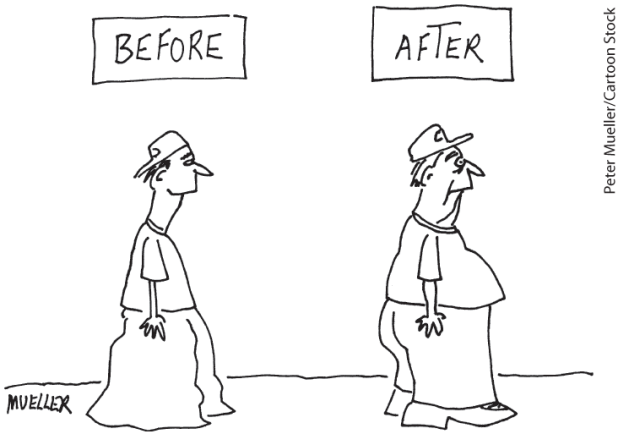
Left: Tom Prokop/Shutterstock; right: Photodisc/Getty Images

Perks of temperament stability In one study of 306 U.S. college graduates, 1 in 4 with yearbook expressions like the one in photo (a) later had divorced, as had only 1 in 20 with

smiles like the one in photo (b) (Hertenstein et al., 2009).

"As at 7, so at 70." — Jewish proverb

We cannot, however, predict all aspects of our future selves based on our early life. Our social attitudes, for example, are much less stable than our temperament, especially during the impressionable late adolescent years (Krosnick & Alwin, 1989; Rekker et al., 2015). Older children and adolescents learn new ways of coping. Although delinquent children have elevated rates of later problems, many confused and troubled children blossom into mature, successful adults (Moffitt et al., 2002; Roberts et al., 2013; Thomas & Chess, 1986). Life is a process of becoming. Our present struggles may lay the foundation for a happier tomorrow.



As adults grow older, there is continuity of self.

In some ways, we *all* change with age. Most shy, fearful toddlers begin opening up by age 4, and after adolescence people gradually become more conscientious and self-disciplined (Richmond-Rakerd et al., 2021). Risk-prone adolescents tend, as adults, to become more cautious (Mata et al., 2016). Indeed, many irresponsible 18-year-olds have matured into 40-year-old business or cultural leaders. (If you are the former, you aren't done yet.) But when asked how they have changed in the last decade and will change in the next decade, people —both young and old—exhibit an *end of history illusion.* They recognize that they have changed but expect they will change little in the future (Quoidbach et al., 2013).

Life requires *both* stability and change. Stability provides our identity. Change gives us our hope for a brighter future, allowing us to adapt and grow from experience.

Ask Yourself

Are you the same person you were as a preschooler? As an 8-year-old? As a 12-year-old? How are you different? How are you the same?

Retrieval Practice

RP-1 Developmental researchers who emphasize learning and experience are supporting _____; those who emphasize biological maturation are supporting _____.

RP-2 What findings in psychology support (1) the stage theory of development and (2) the idea of stability in personality across the life span?

ANSWERS IN APPENDIX E

Prenatal Development and the Newborn

LOQ 14-2

What is the course of prenatal development, and how do teratogens affect that development?

Conception

Nothing is more natural than a species reproducing itself. And nothing is more wondrous. For you, the process started inside your *grandmother*—as an egg formed inside a developing female fetus inside of her. (Your mother was born with all the immature eggs she would ever have.) Your father, in contrast, began producing sperm cells

nonstop at puberty—in the beginning at a rate of more than 1000 sperm during the second it takes to read this phrase.

Some time after puberty, your mother's ovary released a mature egg—a cell roughly the size of the period that ends this sentence. Like space voyagers approaching a huge planet, some 250 million deposited sperm began their frantic race upstream, approaching a cell 85,000 times their own size. The small number reaching the egg released digestive enzymes that ate away the egg's protective coating (**FIGURE 14.2a**). As soon as the one winning sperm penetrated that coating and was welcomed in (Figure 14.2b), the egg's surface blocked out the others. Before half a day elapsed, the egg nucleus and the sperm nucleus fused: The two became one.

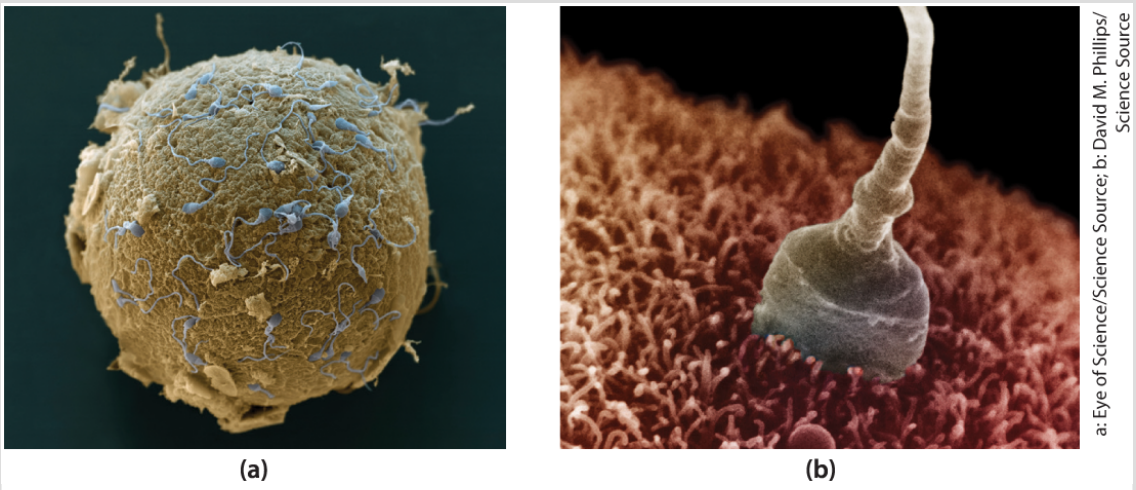


FIGURE 14.2 Life is sexually transmitted (a) Sperm cells surround an egg. (b) One sperm penetrates the egg's jellylike outer coating, triggering a series of chemical events that will cause sperm and egg to fuse into a single cell. If all goes well, that cell will subdivide again and again to emerge 9 months later as a 37-trillion-cell human being (Bianconi et al., 2013).

Consider it your most fortunate of moments. Among some 250 million sperm, the one needed to make you, in combination with that one particular egg, won the race. (As individual humans, we do not reproduce, we recombine.) And so it was for innumerable generations before us. If any one of our ancestors had been conceived with a different sperm or egg, or died before conceiving, or not chanced to meet their partner, or.... The mind boggles at the improbable, unbroken chain of events that produced us.

Prenatal Development

How many fertilized eggs, called **zygotes,** survive beyond the first 2 weeks? Fewer than half (Grobstein, 1979; Hall, 2004). But for us, good fortune prevailed. One cell became 2, then 4—each just like the first—until this cell division had produced some 100 identical cells within the first week. Then the cells began to differentiate—to specialize in structure and function ("I'll become a brain, you become intestines!").

About 10 days after conception, the zygote attaches to the mother's uterine wall, beginning approximately 37 weeks of the closest human relationship. Near the beginning of this maternal bodybuilding feat, the tiny clump of cells forms two parts. The inner cells become the **embryo** (**FIGURE 14.3a**). Many outer cells become the *placenta,* the life-link that transfers nutrients and oxygen from mother to embryo. Over the next 6 weeks, the embryo's organs begin to form and function. The heart begins to beat.



FIGURE 14.3 Prenatal development (a) The embryo grows and develops rapidly. At 40 days, the spine is visible and the arms and legs are beginning to grow. (b) By the start of the ninth week, when the fetal period begins, facial features, hands, and feet have formed. (c) As the fetus enters the sixteenth week, its 3 ounces could fit in the palm of your hand.

By 9 weeks after conception, an embryo looks unmistakably human (Figure 14.3b). It is now a **fetus** (Latin for "offspring" or "young one"). During the sixth month, organs such as the stomach develop enough to give the fetus a good chance of surviving and thriving if born prematurely.

At each prenatal stage, genetic and environmental factors affect our development. By the sixth month, the fetus is responsive to sound. Microphone readings taken inside the uterus reveal that the fetus is exposed to the sound of its mother's muffled voice (Ecklund-Flores, 1992; Hepper, 2005). Immediately after emerging from their underwater world, newborns prefer their mother's voice to another woman's, or to their father's (DeCasper et al., 1986, 1994; Lee & Kisilevsky, 2014).

Review prenatal development:
Zygote: Conception to 2 weeks
Embryo: 2 weeks through 8 weeks
Fetus: 9 weeks to birth

They also prefer hearing their mother's language. In one study, day-old American and Swedish newborns paused more in their pacifier sucking when listening to familiar vowels from their mother's language (Moon et al., 2013). After repeatedly hearing a fake word *(tatata)* in the womb, Finnish newborns' brain waves displayed recognition when hearing the word after birth (Partanen et al., 2013). If their mother spoke two languages during pregnancy, newborns displayed interest in both (Byers-Heinlein et al., 2010). And just after birth, the melodic ups and downs of newborns' cries bear the tuneful signature of their mother's native tongue (Mampe et al., 2009). Babies born to French-speaking mothers tended to produce cries with the rising intonation of French; babies born to German-speaking mothers produced cries with the falling tones of German (Mampe et al., 2009). Would you have guessed? The learning of language begins in the womb.

In the 2 months before birth, fetuses demonstrate learning in other ways, as when they adapt to a vibrating, honking device placed on their mother's abdomen (Dirix et al., 2009). Like people who adapt to the sound of trains in their neighborhood, fetuses get used to the honking. Moreover, 4 weeks later, they recall the sound (as evidenced

by their blasé response, compared with the reactions of those fetuses not previously exposed).

Sounds are not the only environmental factors that impact fetal development. In addition to transferring nutrients and oxygen from mother to fetus, the placenta screens out many harmful substances. But some slip by. **Teratogens**, agents such as viruses and drugs, can damage an embryo or fetus. This is one reason pregnant people are advised not to drink alcoholic beverages or use nicotine or marijuana (Kuehn, 2019; Saint Louis, 2017). A pregnant person never smokes, vapes, or drinks alone: When alcohol, nicotine, or other drugs enter their bloodstream, and that of the fetus, activity is affected in the parent *and* the baby's central nervous systems. Those exposed to alcohol in the womb may be primed to like alcohol, which may put them at risk for heavy drinking and alcohol use disorder during their teen years. In experiments, when pregnant rats drank alcohol, their young offspring later displayed a liking for alcohol's taste and odor (Youngentob & Glendinning, 2009; Youngentob et al., 2007).

Worldwide, 1 in 10 women report consuming alcohol while pregnant (S. Popova et al., 2019). Even light drinking, occasional binge drinking, or marijuana smoking can affect the fetal brain (CDC, 2018; Ghazi Sherbaf et al., 2019; Lees et al., 2020). Persistent heavy drinking puts the fetus at risk for *congenital* (present at birth) disorders, future behavior problems, and lower intelligence. For 1 in about 130 children worldwide and 1 in 30 in the United States, the effects are visible as *fetal alcohol spectrum disorder* (Lange et al., 2017; May et al., 2018). Its

most serious form is **fetal alcohol syndrome (FAS)**, which is marked by lifelong physical and mental function deficits. The fetal damage may occur because alcohol has an *epigenetic effect:* It leaves chemical marks on DNA that switch genes abnormally on or off (Liu et al., 2009). Smoking cigarettes or marijuana during pregnancy also leaves epigenetic scars that may increase vulnerability to stress or addiction (Stroud et al., 2014; Szutorisz & Hurd, 2016).

Retrieval Practice

RP-3 The first 2 weeks of prenatal development is the period of the _____. The period of the _____ lasts from 9 weeks after conception until birth. The time between those two prenatal periods is considered the period of the _____.

ANSWERS IN APPENDIX E

The Competent Newborn

LOQ 14-3

What are some newborn abilities, and how do researchers explore infants' mental abilities?

Babies come with apps preloaded. Having survived prenatal hazards, we as newborns came equipped with automatic reflex responses ideally suited for our survival. We withdrew our limbs to escape pain.

If a cloth over our face interfered with our breathing, we turned our head from side to side and swiped at it.

New parents are often in awe of the coordinated sequence of reflexes by which their baby gets food. When something touches their cheek, babies turn toward that touch, open their mouth, and vigorously *root* for a nipple. Finding one, they automatically close on it and begin *sucking*. (Failing to find satisfaction, the hungry baby may cry—a behavior parents find highly unpleasant, and very rewarding to relieve.) Other adaptive reflexes include the *startle* reflex (when arms and legs spring out, quickly followed by fist clenching and loud crying) and the surprisingly strong *grasping* reflex, both of which may have helped infants stay close to their caregivers.

The pioneering American psychologist William James presumed that the newborn experiences a "blooming, buzzing confusion," an assumption few people challenged until the 1960s. But then scientists discovered that babies can tell you a lot—if you know how to ask. To ask, you must capitalize on what babies can do—gaze, suck, and turn their heads. So, equipped with eye-tracking machines and pacifiers wired to electronic gear, researchers set out to answer parents' age-old questions: What can my baby see, hear, smell, and think?

Consider how researchers exploit **habituation**—a decrease in responding with repeated stimulation. We saw this earlier when fetuses adapted to a vibrating, honking device placed on their mother's abdomen. The novel stimulus gets attention when first

presented. With repetition, the response weakens. This seeming boredom with familiar stimuli gives us a way to ask infants what they see and remember.

As newborns, we prefer sights and sounds that facilitate social responsiveness. We turn our head in the direction of human voices. And we prefer face-like images over abstract images (**FIGURE 14.4**). Even late-stage fetuses look more at face-like patterns in red lights shined into the womb (Reid et al., 2017). As young infants, we also prefer to look at objects 8 to 12 inches away, which—wonder of wonders—just happens to be about the distance between a nursing infant's eyes and its mother's (Maurer & Maurer, 1988). Our brain's default settings help us connect socially.

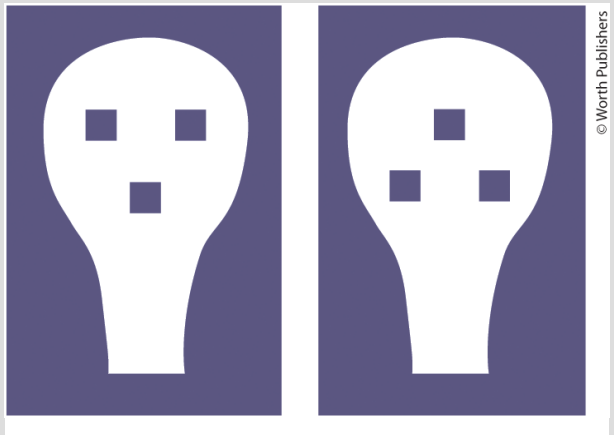

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FIGURE 14.4 Newborns' preference for faces
When shown these two images with the same three elements, Italian newborns spent nearly twice as many seconds looking at the face-like image (Valenza et al., 1996). Newborns—average age 53 minutes in one Canadian study—have an apparently inborn

preference for looking toward faces (Mondloch et al., 1999).

Within days after birth, our brain's neural networks were stamped with the smell of our mother's body. Week-old nursing babies, placed between a gauze pad from their mother's bra and one from another nursing mother, have usually turned toward the smell of their own mother's pad (MacFarlane, 1978). What's more, that smell preference lasts. One experiment capitalized on the fact that some nursing mothers in a French maternity ward used a chamomile-scented balm to prevent nipple soreness (Delaunay-El Allam et al., 2010). Twenty-one months later, their toddlers preferred playing with chamomile-scented toys! Their peers who had not sniffed the scent while breast-feeding showed no such preference. (This makes us wonder: Will these children grow up to become devoted chamomile tea drinkers?) Such studies reveal the remarkable abilities with which we enter our world.





Left: JamesBrey/E+/Getty Images; right: Alice DeWall

Prepared to feed and eat Like birds and other animals, we are predisposed to respond to our offspring's cries for food—even if we are in the middle of a 314-mile ultramarathon, as

I [ND] was when my 18-month-old, Bevy, decided that only Daddy could feed her.

Retrieval Practice

RP-4 Infants' _____ to repeated stimulation helps developmental psychologists study what infants can learn and remember.

ANSWERS IN APPENDIX E

REVIEW

Module 14: Developmental Issues, Prenatal Development, and the Newborn

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 14-1: What three issues have engaged developmental psychologists?

LOQ 14-2: What is the course of prenatal development, and how do teratogens affect that development?

LOQ 14-3: What are some newborn abilities, and how do researchers explore infants' mental abilities?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

developmental psychology
cross-sectional study
longitudinal study
zygote
embryo
fetus
teratogens
fetal alcohol syndrome (FAS)
habituation

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. How do cross-sectional and longitudinal studies differ?

2. The three major issues that interest developmental psychologists are nature/nurture, stability/change, and _____/_____.

3. Although development is lifelong, there is stability of personality over time. For example,
   a. most personality traits emerge in infancy and persist throughout life.
   b. temperament tends to remain stable throughout life.
   c. few people change significantly after adolescence.
   d. people tend to undergo greater personality changes as they age.

4. Body organs first begin to form and function during the period of the _____; within 6 months, during the period of the _____, the organs are sufficiently functional to provide a good chance of surviving and thriving.
   a. zygote; embryo
   b. zygote; fetus
   c. embryo; fetus
   d. placenta; fetus

5. Chemicals that the placenta isn't able to screen out that can harm an embryo or fetus are called _____.

6. Stroke a newborn's cheek and the infant will root for a nipple. This illustrates
   a. a reflex.

b. nurture.

c. a preference.

d. continuity.

MODULE 15: Infancy and Childhood

As a flower unfolds in accord with its genetic instructions, so do we. **Maturation**—the orderly sequence of biological growth—decrees many of our commonalities. Babies stand, then walk. Toddlers use nouns, then verbs. Severe deprivation or abuse can slow development, but genetic growth patterns come "factory-installed"—they are inborn. Maturation (nature) sets the basic course of development; experience (nurture) adjusts it. Genes and scenes interact.

Physical Development

LOQ 15-1

During infancy and childhood, how do the brain and motor skills develop?

Brain Development

In your mother's womb, your developing brain formed nerve cells at the explosive rate of nearly one-quarter million per minute. On the day you were born, you had most of the brain cells you would ever have. However, your nervous system was immature: After birth, the branching neural networks that eventually enabled all your abilities

had a wild growth spurt (FIGURE 15.1). This rapid development helps explain why infant brain size increases rapidly in the early days after birth (Holland et al., 2014). From ages 3 to 6, the most rapid growth was in your frontal lobes, which enable rational planning. During those years, your brain required vast amounts of energy (Kuzawa et al., 2014). This energy-intensive process caused rapid progress in your ability to control your attention and behavior (Garon et al., 2008; Thompson-Schill et al., 2009).

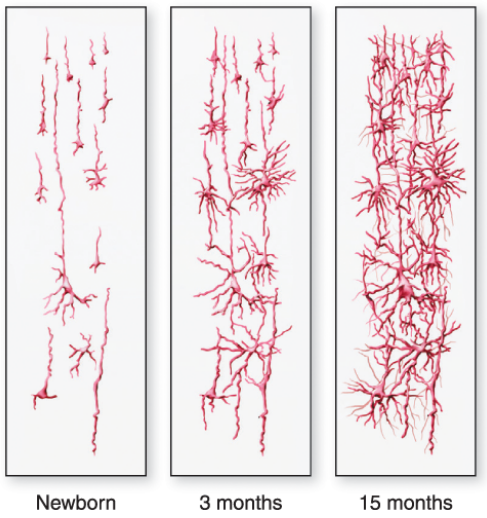




Photo: © PA Archive/Topfoto
© Worth Publishers

FIGURE 15.1 Mapping infant brain development By fitting infants with an electrode cap, researchers are able to detect changes in their brain activity triggered by different stimuli. The brain is immature at birth, but as the child matures, the neural networks grow increasingly complex.

The brain's association areas—those linked with thinking, memory, and language—were the last cortical areas to develop. As they did, your mental abilities surged (Chugani & Phelps, 1986; Thatcher et al., 1987). Fiber pathways supporting agility, language, and self-control proliferated into puberty. Under the influence of adrenal hormones,

tens of billions of synapses formed and organized, while a use-it-or-lose-it *synaptic pruning* process shut down unused links (Paus et al., 1999; Thompson et al., 2000).

Motor Development

The developing brain enables physical coordination. Skills emerge as infants exercise their maturing muscles and nervous system. With occasional exceptions, the motor development sequence is universal. Babies roll over before they sit unsupported, and they usually crawl before they walk. These behaviors reflect not imitation but a maturing nervous system; blind children, too, crawl before they walk.



Juice Images/JupiterImages/Getty Images

Physical development Sit, crawl, walk, run—the sequence of these motor development milestones is the same around the world, though babies reach them at varying ages.



Genes guide motor development. In the United States, 25 percent of all babies walk by age 11 months, 50 percent within a week after their first birthday, and 90 percent by age 15 months (Frankenburg et al., 1992). Identical twins typically begin walking on nearly the same day (Wilson, 1979). Maturation—including the rapid development of the cerebellum at the back of the brain—creates our readiness to learn walking at about age 1. The same is true for other physical skills, including bowel and bladder control. Before necessary muscular and neural maturation, neither pleading nor punishment will produce successful toilet training. You can't rush a child's first flush.

Still, nurture may amend what nature intends. In some regions of Africa, the Caribbean, and India, caregivers often massage and exercise babies, which can accelerate the process of learning to walk (Karasik et al., 2010). The recommended infant *back to sleep position*

(putting babies to sleep on their backs to reduce crib-death risk) has been associated with somewhat later crawling but not with later walking (Davis et al., 1998; Lipsitt, 2003).

In the 8 years following the 1994 launch of a U.S. Back to Sleep educational campaign, the number of infants sleeping on their stomach dropped from 70 to 11 percent—and sudden infant deaths fell significantly (Braiker, 2005).

Retrieval Practice

RP-1 The biological growth process called _____ explains why most children begin walking by about 12 to 15 months.

ANSWERS IN APPENDIX E

Brain Maturation and Infant Memory

Can you recall your third birthday? Most of us *consciously* remember little from before age 4. Mice and monkeys also forget their early life, as rapid neuron growth disrupts the circuits that stored old memories (Akers et al., 2014). But as children mature, this *infantile amnesia* wanes, and they become increasingly capable of remembering experiences, even for a year or more (Bauer & Larkina, 2014; Morris et al., 2010). The brain areas underlying memory, such as the hippocampus and frontal lobes, continue to mature during and after adolescence (Luby et al., 2016; Murty et al., 2016).

Despite consciously recalling little from our early years, our brain was processing and storing information. While finishing her doctoral work in psychology, Carolyn Rovee-Collier observed nonverbal infant memory in action. Her 2-month-old, Benjamin, could be calmed by a moving crib mobile. Hoping to keep the baby entertained while she worked, she strung a cloth ribbon connecting the mobile to Benjamin's foot. Soon, he was kicking his foot to move the mobile. Thinking about her unintended home experiment, Rovee-Collier realized that, contrary to popular opinion in the 1960s, babies can learn and remember. To know for sure that her son wasn't just a whiz kid, she repeated the experiment with other infants (Rovee-Collier, 1989, 1999). Sure enough, they, too, soon kicked more when hitched to a mobile, both on the day of the experiment and the day after. If, however, she hitched them to a different mobile the next day, the infants showed no learning, indicating that they remembered the original mobile and recognized the difference. Moreover, when tethered to the familiar mobile a month later, they remembered the association and again began kicking.

Traces of forgotten childhood languages may also persist. One study tested English-speaking British adults who had no conscious memory of the Hindi or Zulu they had spoken as children. Yet up to age 40, they could relearn subtle sound contrasts in these languages that other English speakers could *not* learn (Bowers et al., 2009). Chinese adoptees living in Canada since age 1 process Chinese sounds as do fluent Chinese speakers, even if they have no conscious recollection of Chinese words (Pierce et al., 2014). We see our two-track mind at work

here: What the conscious mind does not know and cannot express in words, the nervous system and unconscious mind somehow remember.

Ask Yourself

What do you regard as your earliest memory? Now that you know about infantile amnesia, has your opinion changed about the accuracy of that memory?

Cognitive Development

LOQ 15-2

How did Piaget broaden our understanding of the way a child's mind develops, and how have today's researchers built on his work?

Somewhere on your precarious journey "from egghood to personhood" (Broks, 2007), you became conscious. When was that? And once conscious, how did your mind grow? Developmental psychologist Jean Piaget [pee-ah-ZHAY] spent his life searching for the answers. He studied children's developing **cognition**—all the mental activities associated with thinking, knowing, remembering, and communicating. His interest in children's cognitive development began in 1920, when he was in Paris developing questions for children's intelligence tests. While administering the tests, Piaget became intrigued by children's wrong answers, which were often

strikingly similar among same-age children. Where others saw childish mistakes, Piaget saw developing intelligence at work. Such accidental discoveries are among the fruits of psychological science.



Bill Anderson/Science Source

Jean Piaget (1896–1980) "If we examine the intellectual development of the individual or of the whole of humanity, we shall find that the human spirit goes through a certain number of stages, each different from the other" (1930).

A half-century spent with children convinced Piaget that a child's mind is not a miniature model of an adult's. Thanks partly to his careful observations, we now understand that children reason differently than adults, in "wildly illogical ways" (Brainerd, 1996).

Piaget's studies led him to believe that a child's mind develops through a series of stages, in an upward march from the newborn's simple

reflexes to the adult's abstract reasoning power. Thus, an 8-year-old can comprehend things a toddler cannot, such as the analogy that "getting an idea is like having a light turn on in your head."

Piaget's core idea was that our intellectual progression reflects an unceasing struggle to make sense of our experiences. To this end, the maturing brain builds **schemas**—concepts or mental molds into which we pour our experiences (**FIGURE 15.2**).



Left: Image Ideas/Getty Images; right: Christian L Birmele

FIGURE 15.2 A changing marriage schema Most people once had a *marriage* schema as a union between a man and a woman. By 2021, 29 countries had legalized same-sex marriage. Marriage equality laws are both informed by and inform a culture's changing marriage schema.

To explain how we use and adjust our schemas, Piaget proposed two more concepts. First, we **assimilate** new experiences—we interpret them according to our current schemas (understandings). Having a simple schema for *dog,* for example, a toddler may call all four-legged animals *dogs.* But as we interact with the world, we also adjust, or

accommodate, our schemas to incorporate information provided by new experiences. Thus, the child soon learns that the original *dog* schema is too broad and accommodates by refining the category.

Ask Yourself

Can you recall a time when you misheard some song lyrics because you assimilated them into your own schema? (For hundreds of examples of this, visit KissThisGuy.com.)

Piaget's Theory and Current Thinking

Piaget believed that children construct their understanding of the world while interacting with it. Their mind experiences spurts of change, followed by greater stability as they move from one cognitive plateau to the next, each with distinctive characteristics that permit specific kinds of thinking. In Piaget's view, cognitive development consisted of four major stages—*sensorimotor, preoperational, concrete operational,* and *formal operational.*

Sensorimotor Stage

In the **sensorimotor stage**, from birth to nearly age 2, babies take in the world through their senses and actions—through looking, hearing, touching, mouthing, and grasping. As their hands and limbs begin to move, they learn to make things happen.

Very young babies seem to live in the present: Out of sight is out of mind. In one test, Piaget showed an infant an appealing toy and then flopped his beret over it. Before the age of 6 months, the infant acted as if the toy ceased to exist. Young infants lack **object permanence**—the awareness that objects continue to exist even when not perceived. By 8 months, infants begin exhibiting memory for things no longer seen. If you hide a toy, the infant will momentarily look for it (**FIGURE 15.3**). Within another month or two, the infant will look for it even after being restrained for several seconds.



© Doug Goodman/Science Source

FIGURE 15.3 Object permanence Infants younger than 6 months seldom understand that things continue to exist when they are out of sight. But for this older infant, out of sight is definitely not out of mind.

So, does object permanence in fact blossom suddenly at 8 months, much as tulips blossom in spring? Today's researchers believe object permanence unfolds gradually, and they see development as more continuous than Piaget did. Even young infants will momentarily look for a toy where they saw it hidden a second before (Wang et al., 2004). And infants with impaired vision rely on their hearing and touch to

understand object permanence, resulting in a slight developmental delay (Bruce & Vargas, 2012; Ihsen et al., 2010).

Today's researchers also believe Piaget and his followers underestimated young children's competence. Young children think like little scientists. They test ideas, make causal inferences, and learn from statistical patterns (Gopnik et al., 2015). Consider these simple experiments:

- ***Baby physics:*** Like adults staring in disbelief at a magic trick (the *"Whoa!"* look), infants look longer at and explore impossible scenes—a car seeming to pass through a solid object, a ball stopping in midair, or an object violating object permanence by magically disappearing (Shuwairi & Johnson, 2013; Stahl & Feigenson, 2015). Why do infants show this visual bias? Because impossible events violate infants' expectations (Baillargeon et al., 2016).
- ***Baby math:*** Karen Wynn (1992, 2000, 2008) showed 5-month-olds one or two objects (**FIGURE 15.4a**). Then she hid the objects behind a screen, and visibly removed or added one (Figure 15.4d). When she lifted the screen, the infants sometimes did a double take, staring longer when shown a wrong number of objects (Figure 15.4f). But were they just responding to a greater or smaller *mass* of objects, rather than a change in *number* (Feigenson et al., 2002)? Later experiments showed that babies' number sense extends to larger numbers, to ratios, and to such things as drumbeats and motions (Libertus & Brannon, 2009;

McCrink & Wynn, 2004; Spelke et al., 2013). If accustomed to a Daffy Duck puppet jumping three times on stage, they showed surprise if it jumped only twice.

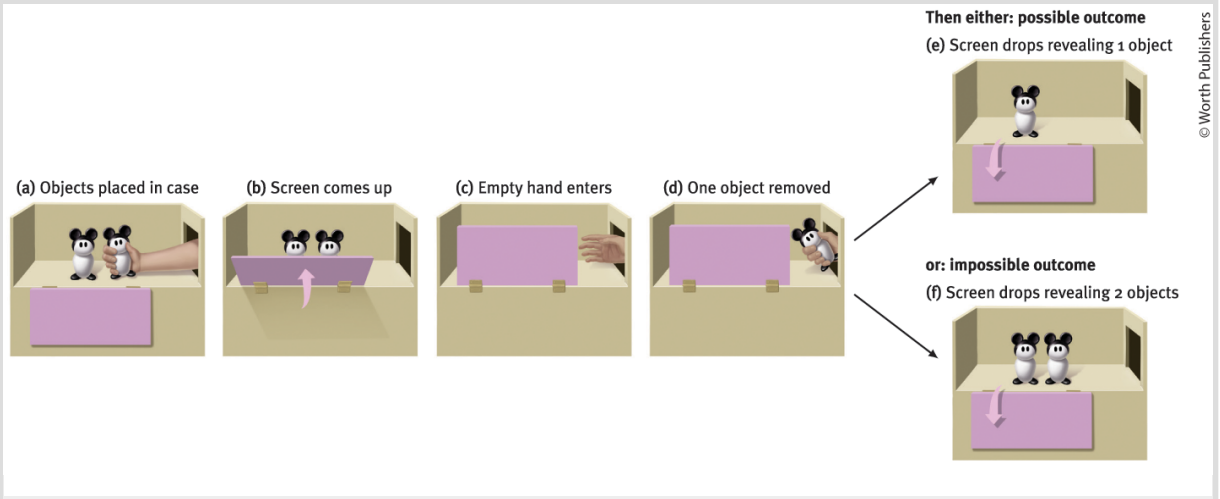


FIGURE 15.4 Baby math Shown a numerically impossible outcome, 5-month-old infants stare longer (Wynn, 1992). Clearly, infants are smarter than Piaget appreciated. Even as babies, we had a lot on our minds.

"It is a rare privilege to watch the birth, growth, and first feeble struggles of a living human mind." — Annie Sullivan, in Helen Keller's *The Story of My Life,* 1903

Preoperational Stage

Piaget believed that until about age 6 or 7, children are in a **preoperational stage**—able to represent things with words and images but too young to perform *mental operations* (such as imagining an action and mentally reversing it).

Pretend Play

Symbolic thinking and *pretend play* occur at this stage, at an earlier age than Piaget supposed. Judy DeLoache (1987) discovered this when she showed children a model of a room and hid a miniature stuffed dog behind its miniature couch. The $2^1/_2$-year-olds easily remembered where to find the miniature toy, but they could not use the model to locate an actual stuffed dog behind a couch in a real room. Three-year-olds—only 6 months older—usually went right to the actual stuffed animal in the real room, showing they *could* think of the model as a symbol for the room. Another study with 3-year-olds involved pretending to play firefighter (Kalkusch et al., 2020). The researchers found that the kids were actively making up stories—they knew they weren't actually firefighters, but that didn't stop them from pretending to fight fires and rescue princes and princesses from burning towers. Although Piaget did not view the stage transitions as abrupt, he probably would have been surprised to see symbolic thinking at such an early age.

Egocentrism

Piaget taught us that preschool children are **egocentric:** They have difficulty perceiving things from another's perspective. They are like the person who, when asked by someone across a river, "How do I get to the other side?" answered, "You're *on* the other side." Asked to "show Mommy your picture," 2-year-old Gabriella holds the picture up facing her own eyes. Asked what he would do if he saw a bear, 3-year-old Grant replies, "We cover our eyes so the bear can't see us."



Dave Myers

Egocentrism in action "Look, Granddaddy, a match!" So said my [DM's] granddaughter, Allie, at age 4, when showing me two memory game cards with matching pictures—that faced her.

Children's conversations also reveal their egocentrism, as one young boy demonstrated (Phillips, 1969, p. 61):

> *"Do you have a brother?"*
> *"Yes."*
> *"What's his name?"*
> *"Jim."*
> *"Does Jim have a brother?"*
> *"No."*

Like Gabriella, TV-watching preschoolers who block your view of the TV assume that you see what they see. They simply have not yet developed the ability to take another's viewpoint. Even adolescents egocentrically overestimate how much others are noticing them (Lin, 2016). And adults may overestimate the extent to which others share their opinions, knowledge, and perspectives. We assume that

something will be clear to others if it is clear to us, or that email recipients will "hear" our "just kidding" intent (Epley et al., 2004; Kruger et al., 2005). Perhaps you can recall asking someone to guess a simple tune such as "Happy Birthday" as you clapped or tapped it out. With the tune in your head, it seemed so obvious! But you suffered from the egocentric *curse of knowledge,* assuming that what was in your head was also in someone else's.

Concrete Operational Stage

By about age 7, said Piaget, children enter the **concrete operational stage**. Given concrete (physical) materials, they begin to grasp complex operations, such as spatial and mathematical relationships.

Consider a 5-year-old, who tells you there is too much milk in a tall, narrow glass. "Too much" may become just right if you pour that milk into a short, wide glass. Focusing only on the height dimension, the child cannot perform the operation of mentally pouring the milk back into the tall glass. Before about age 6, said Piaget, young children lack the concept of **conservation**—the idea that the amount remains the same even if it changes shape (**FIGURE 15.5**).



Bianca Moscatelli/Macmillan Learning

FIGURE 15.5 Piaget's test of conservation This visually focused preoperational child does not yet understand the principle of conservation. When the milk is poured into a tall, narrow glass, it suddenly seems like "more" than when it was in the shorter, wider glass. In another year or so, she will understand that the amount stays the same.

Understanding that change in form does not mean change in quantity, they can mentally pour milk back and forth between glasses of different shapes. They also enjoy jokes that use this new understanding:

> Mr. Jones went into a restaurant and ordered a whole pizza for his dinner. When the waiter asked if he wanted it cut into 6 or 8 pieces, Mr. Jones said, "Oh, you'd better make it 6, I could never eat 8 pieces!" (McGhee, 1976)

Piaget believed that during the concrete operational stage, children become able to comprehend mathematical transformations and conservation. When my [DM's] daughter, Laura, was 6, I was surprised at her inability to reverse simple arithmetic. Asked, "What is 8 plus 4?" she required 5 seconds to compute "12," and another 5 seconds to then compute 12 minus 4. By age 8, she could answer a reversed question instantly.

Formal Operational Stage

By age 12, our reasoning expands from the purely concrete (involving actual experience) to encompass abstract thinking (involving imagined realities and symbols). As children approach adolescence, said Piaget, they can ponder hypothetical propositions and deduce

consequences: *If* this, *then* that. Systematic reasoning, what Piaget called **formal operational** thinking, is now within their grasp.

Although full-blown logic and reasoning await adolescence, the rudiments of formal operational thinking begin earlier than Piaget realized. Consider this simple problem:

> If John is in school, then Mary is in school. John is in school. What can you say about Mary?

Formal operational thinkers have no trouble answering correctly. But neither do most 7-year-olds (Suppes, 1982). **TABLE 15.1** summarizes the four stages in Piaget's theory.

TABLE 15.1 Piaget's Stages of Cognitive Development

Typical Age Range	Stage and Description	Key Milestones
Birth to nearly 2 years	*Sensorimotor* Experiencing the world through senses and actions (looking, hearing, touching, mouthing, and grasping)	• Object permanence • Stranger anxiety
About 2 to 6 or 7 years	*Preoperational* Representing things with words and images; using intuitive rather than logical reasoning	• Pretend play • Egocentrism
About 7 to 11 years	*Concrete operational* Thinking logically about concrete events; grasping concrete analogies and performing arithmetical operations	• Conservation • Mathematical transformations
About 12 through adulthood	*Formal operational* Reasoning abstractly	• Abstract logic • Potential for mature moral reasoning



Pretend play

Retrieval Practice

RP-2 Object permanence, pretend play, conservation, and abstract logic are developmental milestones for which of Piaget's stages, respectively?

RP-3 Label each of the following developmental phenomena (i–vi) with the correct cognitive developmental stage: (a) sensorimotor, (b) preoperational, (c) concrete operational, or (d) formal operational.

i. Thinking about abstract concepts, such as "freedom."

ii. Enjoying imaginary play (such as dress-up).
iii. Understanding that physical properties stay the same even when objects change form.
iv. Having the ability to reverse math operations.
v. Understanding that something is not gone for good when it disappears from sight.
vi. Having difficulty taking another's point of view (as when blocking someone's view of the TV).

ANSWERS IN APPENDIX E

Reflecting on Piaget's Theory

What remains of Piaget's ideas about the child's mind? Plenty—enough to merit his being singled out by *Time* magazine as one of the twentieth century's 20 most influential scientists and thinkers, and his being rated in a survey of British psychologists as the last century's greatest psychologist (*Psychologist,* 2003). Piaget identified significant cognitive milestones and stimulated worldwide interest in how the mind develops. His emphasis was less on the ages at which children typically reach specific milestones than on their sequence. Worldwide studies, from Australia to Algeria to North America, have confirmed that human cognition unfolds basically in the sequence Piaget described (Lourenco & Machado, 1996; Segall et al., 1990).

"Assessing the impact of Piaget on developmental psychology is like assessing the impact of Shakespeare on English literature." — Developmental psychologist Harry Beilin (1992)

However, today's researchers see development as more continuous than did Piaget. By detecting the beginnings of each type of thinking at earlier ages, they have revealed conceptual abilities Piaget missed. Moreover, they see formal logic as a smaller part of cognition than he did. Today, as part of our own cognitive development, we are adapting Piaget's ideas to accommodate new findings.

> **"Childhood has its own way of seeing, thinking, and feeling, and there is nothing more foolish than the attempt to put ours in its place."** — Philosopher Jean-Jacques Rousseau, 1798

Implications for Parents and Teachers

Future parents and teachers, remember: Young children are incapable of adult logic. Preschoolers who block one's view of the TV simply have not learned to take another's viewpoint. What seems simple and obvious to us—getting off a seesaw will cause a friend on the other end to crash—may be incomprehensible to a 3-year-old. And all of us need to remember that children are not passive receptacles waiting to be filled with knowledge. Better to build on what they already know, engaging them in concrete demonstrations and stimulating them to think for themselves. Finally, accept children's cognitive immaturity as adaptive. It is nature's strategy for keeping children close to protective adults and providing time for learning and socialization (Bjorklund & Green, 1992).

An Alternative Viewpoint: Lev Vygotsky and the Social Child

LOQ 15-3

How did Vygotsky view children's cognitive development?

As Piaget was forming his theory of cognitive development, Russian psychologist Lev Vygotsky was also studying how children think and learn. Where Piaget emphasized how the child's mind grows through interaction with the physical environment, Vygotsky emphasized how the child's mind grows through interaction with the *social* environment. If Piaget's child was a young scientist, Vygotsky's was a young apprentice. By giving children new words and mentoring them, parents, teachers, and other children provide what we now call a temporary **scaffold** from which children can step to higher levels of thinking (Renninger & Granott, 2005; Wood et al., 1976). Children learn best when their social environment presents them with something in the sweet spot between too easy and too difficult.

Language, an important ingredient of social mentoring, provides the building blocks for thinking, noted Vygotsky (who was born the same year as Piaget, but died prematurely of tuberculosis). By age 7, children increasingly think in words and use words to solve problems. They do this, Vygotsky said, by internalizing their culture's language and relying on inner speech (Fernyhough, 2008). Parents who say, "No, no, Bevy!" when pulling their child's hand away from a cup of hot

coffee are giving their child a self-control tool. When Bevy later needs to resist temptation, she may likewise think, *"No, no, Bevy!"* Second graders who muttered to themselves while doing math problems grasped third-grade math better the following year (Berk, 1994). Whether out loud or inaudibly, talking to themselves helps children control their behavior and emotions and master new skills. (It helps adults, too. Adults who motivate themselves using self-talk—"You can do it!"—experience better performance [Kross et al., 2014].)



SDI Productions/E+/Getty Images

Scaffolding in action

Theory of Mind

LOQ 15-4

What does it mean to develop a *theory of mind,* and how is this impaired in those with autism spectrum disorder?

When Little Red Riding Hood realized her "grandmother" was really a wolf, she swiftly revised her ideas about the creature's intentions and raced away. Preschoolers, although still egocentric, develop this

ability to infer others' mental states when they begin forming a **theory of mind** (Premack & Woodruff, 1978).

Infants as young as 7 months show some knowledge of others' beliefs (Kovács et al., 2010). With time, the ability to take another's perspective develops. They come to understand what made a playmate angry, when a sibling will share, and what might make a parent buy a toy. They begin to tease, empathize, and persuade. And when making decisions, they use their understanding of how their actions will make others feel (Repacholi et al., 2016). Preschoolers and young children who have an advanced ability to understand others' minds tend to be well-liked (McElwain et al., 2019; Slaughter et al., 2015).

Between about ages 3 and $4^1/_2$, children come to realize that others may hold false beliefs (Callaghan et al., 2005; Rubio-Fernández & Geurts, 2013; Sabbagh et al., 2006). Jennifer Jenkins and Janet Astington (1996) showed Canadian children a Band-Aid box and asked them what was inside. Expecting Band-Aids, the children were surprised to discover that the box actually contained pencils. Asked what a child who had never seen the box would think was inside, 3-year-olds typically answered "pencils." By age 4 to 5, the children's theory of mind had leapt forward, and they anticipated their friends' false belief that the box would hold Band-Aids.

In a follow-up experiment, children viewed a doll named Sally leaving her ball in a red cupboard (**FIGURE 15.6**). Another doll, Anne, then

moved the ball to a blue cupboard. Researchers then posed a question: When Sally returns, where will she look for the ball? Children with *autism spectrum disorder* (discussed in the Psychological Disorders modules) had difficulty understanding that Sally's state of mind differed from their own—that Sally, not knowing the ball had been moved, would return to the red cupboard. They also have difficulty reflecting on their own mental states. They are, for example, less likely to use the personal pronouns *I* and *me.* Deaf children with hearing parents and minimal communication opportunities have had similar difficulty inferring others' states of mind (Peterson & Siegal, 1999).

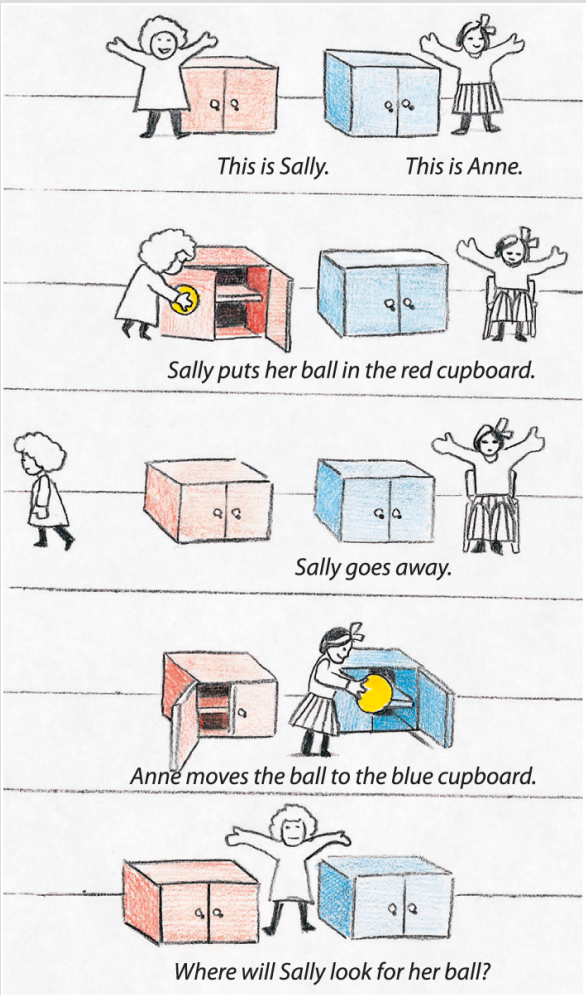


FIGURE 15.6 Testing children's theory of mind This simple problem illustrates how researchers explore children's presumptions about others' mental states. (Inspired by Baron-Cohen et al., 1985.)

Retrieval Practice

RP-4 What does *theory of mind* have to do with autism spectrum disorder?

ANSWERS IN APPENDIX E

Social Development

LOQ 15-5

How do caregiver-infant attachment bonds form?

From birth, most babies are social creatures, developing an intense attachment to their caregivers. (Infancy is the time of life when we get the most kisses.) Infants come to prefer familiar faces and voices, then to coo and gurgle when given a caregiver's attention. By 4.5 months, infants can tell apart familiar and unfamiliar languages (Fecher & Johnson, 2019). After about 8 months, soon after object permanence emerges and children become mobile, a curious thing happens: They develop **stranger anxiety**. They may greet strangers by crying and reaching for familiar caregivers, as if to say "No! Don't leave me!" Children this age have schemas for familiar faces, and may resist being handed to someone unfamiliar (Quinn et al., 2019). Once again, we see an important principle: *The brain, mind, and social-emotional behavior develop together.*

Origins of Attachment

One-year-olds typically cling tightly to a caregiver when they are frightened or expect separation. Reunited after being apart, they often shower the caregiver with smiles and hugs. This striking caregiver-

infant **attachment** bond is a powerful survival impulse that keeps infants close to their caregivers. Infants usually become attached to those—typically their parents—who are comfortable and familiar. For many years, psychologists reasoned that infants became attached to those who satisfied their need for nourishment. But an accidental finding overturned this explanation.

Body Contact

During the 1950s, psychologists Harry Harlow and Margaret Harlow bred monkeys for their learning studies. To equalize experiences and to isolate any disease, they separated the infant monkeys from their mothers shortly after birth and raised them in individual cages, each including a cheesecloth baby blanket (Harlow et al., 1971). Then came a surprise: When their soft blankets were taken to be washed, the monkeys became distressed.

The Harlows recognized that this intense attachment to the blanket contradicted the idea that attachment derives from an association with nourishment. But how could they show this more convincingly? To pit the drawing power of a food source against the comfort of the blanket, they created two artificial mothers. One was a bare wire cylinder with a wooden head and an attached feeding bottle; the other a cylinder with no bottle, but covered with foam rubber and wrapped with terry cloth.

When raised with both, the monkeys overwhelmingly preferred the comfy cloth mother (**FIGURE 15.7**). Like other infants clinging to their

live mothers, anxious monkey babies would cling to their cloth mothers, soothed by this *contact comfort.* When exploring their environment, they used her as a *secure base,* as if attached to her by an invisible elastic band that stretched only so far before pulling them back. Researchers soon learned that other qualities—rocking, warmth, and feeding—made the cloth mother even more appealing.

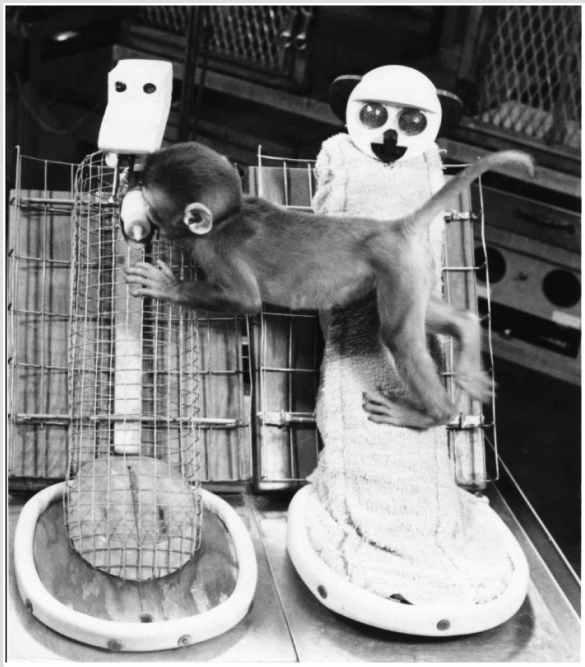


Photo Researchers/Science History Images/Alamy Stock Photo

FIGURE 15.7 The Harlows' monkey mothers
The Harlows' discovery surprised many psychologists: The infants much preferred contact with the comfortable cloth mother, even while feeding from the nourishing wire mother.

Human infants, too, become attached to parents who are soft and warm and who rock, feed, and pat. Much parent-infant emotional communication occurs via touch, which can be either soothing

(snuggles) or arousing (tickles) (Hertenstein et al., 2006). People across the globe agreed that the ideal mother "shows affection by touching" (Mesman et al., 2015). Such parental affection not only feels good, it boosts brain development and later cognitive ability (Davis et al., 2017).

Human attachment also consists of one person providing another with a secure base from which to explore and a safe haven when distressed. As we mature, our secure base shifts—from parents to peers and partners (Mikulincer & Shaver, 2020; A. Schmidt et al., 2019). But at all ages we are social creatures. We gain strength when someone offers, by words and actions, a safe haven: "I will be here. I am interested in you. Come what may, I will support you" (Crowell & Waters, 1994).

Familiarity

Contact is one key to attachment. Another is familiarity. In many animals, attachments based on familiarity form during a **critical period**—an optimal period when certain events must take place to facilitate proper development (Bornstein, 1989). For goslings, ducklings, or chicks, that period falls in the hours shortly after hatching, when the first moving object they see is typically their mother. From then on, the young fowl follow her, and her alone.

Konrad Lorenz (1937) explored this rigid attachment process, called **imprinting.** He wondered: What would ducklings do if he was the first moving creature they observed? What they did was follow him

around: Everywhere that Konrad went, the ducks were sure to go. Although baby birds imprint best to their own species, they also will imprint to a variety of moving objects—an animal of another species, a box on wheels, or a bouncing ball (Colombo, 1982; Johnson, 1992). Once formed, this attachment is difficult to reverse.



Nina Leen/The LIFE Picture Collection/ Getty Images

Daddy duck? Konrad Lorenz demonstrated that ducks will imprint on the first moving thing they see, which in this case was him!

Children—unlike ducklings—do not imprint. However, they do become attached to what they've known. *Mere exposure* to people and things fosters fondness. Children like to reread the same books, rewatch the same movies, reenact family traditions. They prefer to eat familiar foods, live in the same familiar neighborhood, attend school with the same old friends. Familiarity is a safety signal. Familiarity breeds content.

For some people, a perceived relationship with God functions as do other attachments, by providing a secure base for exploration and a safe haven when threatened (Granqvist et al., 2010; Kirkpatrick, 1999).

Retrieval Practice

RP-5 What distinguishes imprinting from attachment?

ANSWERS IN APPENDIX E

Attachment Differences

LOQ 15-6

How have psychologists studied attachment differences, and what have they learned?

What accounts for children's attachment differences? To answer this question, Mary Ainsworth (1979) designed the *strange situation* experiment. She observed mother-infant pairs at home during their first 6 months. Later she observed the 1-year-old infants in a strange situation (usually a laboratory playroom) with and without their mothers. Such research has shown that about 60 percent of infants and young children display *secure attachment* (Moulin et al., 2014). In their mother's presence they play comfortably, happily exploring their new environment. When she leaves, they become distressed; when she returns, they seek contact with her.

Other infants show *insecure attachment,* marked by either anxiety or avoidance of trusting relationships. These infants are less likely to explore their surroundings. Anxious infants may cling to their mother.

When she leaves, they might cry loudly and remain upset. Avoidant infants seem not to notice or care about her departure and return (Ainsworth, 1973, 1989; Kagan, 1995; van Ijzendoorn & Kroonenberg, 1988). Ainsworth and others found that sensitive, responsive mothers—those who noticed what their babies were doing and responded appropriately—had infants who exhibited secure attachment (De Wolff & van IJzendoorn, 1997). Insensitive, unresponsive mothers—mothers who attended to their babies when they felt like doing so but ignored them at other times—often had infants who were insecurely attached. The Harlows' monkey studies, with unresponsive artificial mothers, produced even more striking effects. When put in strange situations without their artificial mothers, the deprived infants were terrified (**FIGURE 15.8**).



Science History Images/Alamy Stock Photo

FIGURE 15.8 Social deprivation and fear In the Harlows' experiments, monkeys raised with artificial mothers were overwhelmed when placed in strange situations without those mothers.

Many remember Harry Harlow as the researcher who tortured helpless monkeys, and today's climate of greater respect for animal welfare would likely prevent such primate studies. But Harlow defended his methods: "Remember, for every mistreated monkey there exist a million mistreated children," he said, expressing the hope that his research would sensitize people to child abuse and neglect. "No one who knows Harry's work could ever argue that babies do fine without companionship, that a caring mother doesn't matter," noted Harlow biographer Deborah Blum (2011, pp. 292, 307). "And since we … didn't fully believe that before Harry Harlow came along, then perhaps we needed—just once—to be smacked really hard with that truth so that we could never again doubt."

So, caring parents (and other caregivers) matter. But is attachment style the result of parenting? Or is attachment style the result of genetically influenced *temperament?* Studies reveal that heredity affects temperament, and that temperament affects attachment style (Picardi et al., 2011; Raby et al., 2012). Shortly after birth, some babies are noticeably *difficult*—irritable, intense, and unpredictable. Others are *easy*—cheerful, relaxed, and on predictable feeding and sleeping schedules (Chess & Thomas, 1987). By neglecting such inborn differences, the parenting studies, noted Judith Harris (1998), are like "comparing foxhounds reared in kennels with poodles reared in apartments." So, to separate nature and nurture, we would need to vary parenting while controlling temperament. Pause and think: If you were the researcher, how might you do this?

Dutch researcher Dymphna van den Boom's (1994) solution was to randomly assign 100 temperamentally difficult 6- to 9-month-olds to either an experimental group, in which mothers received personal training in sensitive responding, or to a control group, in which they did not. At 12 months of age, 68 percent of the infants in the experimental group were securely attached, as were only 28 percent of the control-group infants. Other studies confirm that intervention programs can increase parental sensitivity and, to a lesser extent, infant attachment security (Bakermans-Kranenburg et al., 2003; Van Zeijl et al., 2006). Such "positive parenting" interventions seem to be especially beneficial for children with difficult temperaments (Slagt et al., 2016).

As these examples indicate, researchers have more often studied mother care than father care. Infants who lack a caring mother are said to suffer "maternal deprivation"; those lacking a father's care merely experience "father absence." This reflects a wider attitude in which "fathering a child" has meant impregnating, and "mothering" has meant nurturing. But fathers are more than just mobile sperm banks. Across nearly 100 studies worldwide, a father's love and acceptance have been comparable with a mother's love in predicting their offspring's health and well-being (Rohner & Veneziano, 2001; see also **TABLE 15.2**). Fathers matter.

TABLE 15.2 Dual Parenting Positives

- *Active dads are caregiving more.* Today's co-parenting fathers are more engaged, with a doubling in the weekly hours spent with their children, compared with fathers in 1965 (Livingston & Parker, 2011).
- *Couples that share housework and child care are happier in their relationships and less divorce-prone* (Wilcox & Marquardt, 2011).
- *Dual parenting supports children.* After controlling for other factors, children average better life outcomes "if raised by both parents" (Taylor, 2014).
- *Parents' gender and sexual orientation do not affect children's well-being.* The American Academy of Pediatrics (2013) reports that what matters is competent, secure, nurturing parents. The American Sociological Association (2013) concurs: Parental stability and resources matter, but "whether a child is raised by same-sex or opposite-sex parents has no bearing on a child's well-being." One analysis of 21,000 American children aged 4 to 17 found that, compared to those with straight parents, children with gay or lesbian parents experienced similar levels of well-being (Calzo et al., 2019).


Lorie Hailey

A large British study following 7259 children from birth to adulthood showed that those whose fathers were most involved in parenting (through outings, reading to them, and taking an interest in their

education) tended to achieve more in school, even after controlling for other factors such as parental education and family wealth (Flouri & Buchanan, 2004). Fathers can also help children cope with stress. Among children who grew up in Belfast, Northern Ireland, during the violent conflict, those with engaged fathers experienced fewer mental health problems (Luningham et al., 2021). Girls with supportive fathers expect that other men will treat them with care and respect, and they are less prone to risky sexual behavior (DelPriore et al., 2017, 2019). Increasing nonmarital births and the greater instability of cohabiting versus married partnerships has, however, meant more father-absent families (Hymowitz et al., 2013). In Europe and the United States, for example, children born to married parents (compared to cohabiting parents) are about half as likely to experience their parents' separation, which often entails diminished father care (Brown et al., 2016; Wilcox & DeRose, 2017). Even after controlling for parents' income, education, and race, children whose parents are married experience a lower rate of school problems (Zill, 2020).

Children's anxiety over separation from parents peaks at around 13 months, then gradually declines (**FIGURE 15.9**). This happens whether they live with one parent or two, are cared for at home or in day care, live in North America, Guatemala, or the Kalahari Desert. Does this mean our need for and love of others also fades away? Hardly. Our capacity for love grows, and our pleasure in touching and holding those we love never ceases.

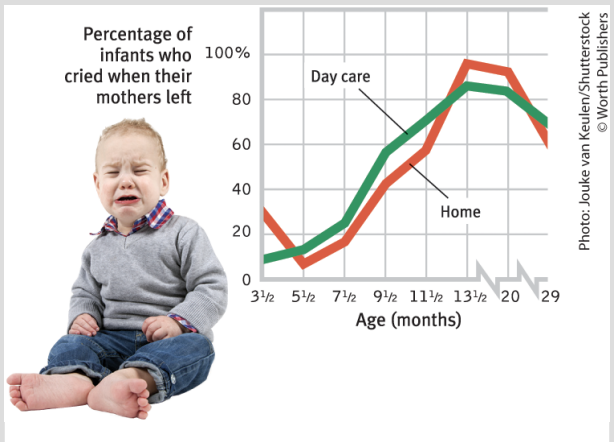


FIGURE 15.9 Infants' distress over separation In an experiment, infants were left by their mothers in an unfamiliar room. Regardless of whether the infant had experienced day care, the percentage who cried when the mother left peaked at about 13 months of age (Kagan, 1976).

Attachment Styles and Later Relationships

Developmental psychologist Erik Erikson (1902–1994), working with his wife, Joan Erikson (1902–1997), believed that securely attached children approach life with a sense of **basic trust**—a sense that the world is predictable and reliable. He attributed basic trust not to environment or inborn temperament, but to early parenting. He theorized that infants blessed with sensitive, loving caregivers form a lifelong attitude of trust rather than fear.

Many researchers now believe that our early attachments form part of the foundation for our adult relationships and our comfort with

affection and intimacy (Fraley et al., 2021). People who report secure relationships with their parents tend to enjoy secure friendships (Gorrese & Ruggieri, 2012). Students leaving home to attend college or university—another kind of "strange situation"—tend to adjust well if they have been closely attached to parents (Mattanah et al., 2011). Children with sensitive, responsive mothers tend to flourish socially and academically (Raby et al., 2014).

Feeling insecurely attached to others may take either of two main forms (Fraley, 2019). One is *anxious attachment,* in which people constantly crave acceptance but remain vigilant to signs of possible rejection. (Being sensitive to threat, anxiously attached people also tend to be skilled lie detectors and poker players [Ein-Dor & Perry, 2012, 2013].) The other is *avoidant attachment,* in which people experience discomfort getting close to others and use avoidant strategies to maintain distance from others. In romantic relationships, an anxious attachment style creates constant concern over rejection, leading people to cling to their partners. An avoidant style decreases commitment and increases conflict (DeWall et al., 2011; Girme et al., 2021).

Adult attachment styles can also affect relationships with one's own children. But say this for those (nearly half of all people) who exhibit wary, insecure attachments: Anxious or avoidant tendencies have helped our groups detect or escape dangers (Ein-Dor et al., 2010).

Ask Yourself

How has your upbringing affected your attachment style?

Facing Adversity

LOQ 15-7

How does experiencing adversity affect children's social development?

Deprivation of Attachment

If secure attachment nurtures social competence, what happens when circumstances prevent a child's forming any attachments? In all of psychology, there is no sadder research literature. Babies locked away at home under conditions of abuse or extreme neglect are often withdrawn, frightened, even silent. The same is true of those raised in institutions without the stimulation and attention of a regular caregiver, as was tragically illustrated during the 1970s and 1980s in Romania. Having decided that economic growth for his impoverished country required more human capital, Nicolae Ceauşescu, Romania's Communist dictator, outlawed contraception, forbade abortion, and taxed families with fewer than five children. The birthrate skyrocketed. But unable to afford the children they had been coerced into having, many families had to leave them at government-run orphanages with untrained and overworked staff. Child-to-caregiver

ratios often were 15 to 1, so the children were deprived of healthy attachments with at least one adult.

When tested after Ceauşescu's 1989 execution, and compared with children assigned to quality foster care, the socially deprived children had lower intelligence scores, abnormal stress responses, and quadruple the rate of attention-deficit/hyperactivity disorder (ADHD) (van IJzendoorn et al., 2020). Hundreds of studies have shown that orphaned children generally fare better on later physical health and intelligence tests when raised in family homes from an early age (van IJzendoorn et al., 2020).



Benjamin Rasmussen/Reportage Archive/Getty Images

Starved of love Izidor Ruckel spent most of his early years in a Romanian orphanage, deprived of close attachment until his adoption at age 10 by a loving U.S. family. But Ruckel's early neglect left lasting psychological scars, leaving him to assume "there would be no human being who would ever want to get close to me…. If someone tries to get close, I get away" (Greene, 2020).

Trauma, Abuse, and Poverty

Most children growing up under adversity (including child survivors of the Holocaust) are *resilient*—they withstand the trauma and become well-adjusted adults (Helmreich, 1992; Masten, 2001). So do most survivors of childhood sexual abuse (Clancy, 2010). Hardship short of trauma often boosts mental toughness (Seery, 2011). Children who have coped with some adversity become hardier when facing future stresses, much like children's immunity to disease builds from exposure to germs (Ellis et al., 2017).

But many who experience enduring abuse don't bounce back so readily. The Harlows' monkeys raised in total isolation, without even an artificial mother, bore lifelong scars. As adults, when placed with other monkeys their age, they either cowered in fright or lashed out in aggression. When they reached sexual maturity, most were incapable of mating. If artificially impregnated, the female monkeys often were neglectful, abusive, even murderous toward their first-born. Another primate experiment confirmed the abuse-breeds-abuse phenomenon: 9 of 16 female monkeys who had been abused by their mothers became abusive parents, as did *none* of the females raised by a nonabusive mother (Maestripieri, 2005).

In humans, too, the abused may become the abusers. Most abusive parents—and many condemned murderers—have reported being neglected or battered as children (Kempe & Kempe, 1978; Lewis et al., 1988). Some 30 percent of people who have been abused later abuse their children—four times the U.S. national rate of child abuse

(Dumont et al., 2007; Widom, 1989). And abusive parents tend to abuse their own children in the ways they were abused as children, such as through neglect, emotional abuse, physical abuse, or sexual abuse (Madigan et al., 2019).

Although most abused children do *not* later become violent criminals or abusive parents, extreme early trauma may nevertheless leave footprints on the brain (McLaughlin et al., 2019). Like battle-stressed soldiers, abused children's brains respond to angry faces with heightened activity in threat-detecting areas (McCrory et al., 2011). In conflict-plagued homes, even sleeping infants' brains show heightened reactivity to hearing angry speech (Graham et al., 2013). As adults, abused children are more uncomfortable when touched (Maier et al., 2020). Abused children tend to struggle in adulthood to regulate their negative emotions. They exhibit stronger startle responses, and are twice as likely to attempt suicide (Angelakis et al., 2019; Jovanovic et al., 2009; Lavi et al., 2019).

If repeatedly threatened and attacked while young, normally placid golden hamsters grow up to be cowards when caged with same-sized hamsters, or bullies when caged with weaker ones (Ferris, 1996). Such animals show changes in the brain chemical serotonin, which calms aggressive impulses. A similarly sluggish serotonin response has been found in abused children who become aggressive teens and adults. By sensitizing the stress response system, early stress can permanently heighten reactions to later stress and increase stress-related disease (Fagundes & Way, 2014; van Zuiden et al., 2012; Wei et al., 2012). Child

abuse can also leave epigenetic marks—chemical tags—that can alter normal gene expression (Lutz et al., 2017; McKinney, 2017).

Such findings help explain why young children who have survived severe or prolonged physical abuse, sexual abuse, bullying, or wartime atrocities are at increased risk for health problems, psychological disorders, substance abuse, criminality, and, for women, earlier death (E. Chen et al., 2016; Jakubowski et al., 2018; J. Schaefer et al., 2018). Among 135,000 adolescents in 48 countries, those who were bullied had triple the normal rate of attempted suicide (Koyanagi et al., 2019). In one national study of 43,093 U.S. adults, 8 percent reported experiencing physical abuse at least fairly often before age 18 (Sugaya et al., 2012). Among these, 84 percent had experienced at least one psychiatric disorder. Moreover, the greater the abuse, the greater the odds of anxiety, depression, substance use disorder, and attempted suicide. Childhood abuse survivors also experience more troubled adult romantic relationships (Labella et al., 2018).

Childhood abuse survivors have a tripled risk of adult depression (Nelson et al., 2017). Abuse survivors are at especially heightened risk for depression if they carry a gene variation that spurs stress-hormone production (Bradley et al., 2008). As we will see again and again, behavior and emotion arise from a particular environment interacting with particular genes.

Children raised in poverty face unique hardships. They complete less schooling, and as adolescents and adults commit more crimes and have more problems with anxiety, depression, substance abuse, and getting a job (Akee et al., 2010; National Academy of Sciences, 2019). The Covid-19 pandemic increased unemployment and closed schools, which led to more child poverty and child hunger (Sinha et al., 2020).

We adults also suffer when our attachment bonds are severed. Whether through death or separation, a break produces a predictable sequence. Agitated preoccupation with the lost partner is followed by deep sadness and, eventually, the beginnings of emotional detachment and a return to normal living (Hazan & Shaver, 1994). Newly separated couples who have long ago ceased feeling affection are sometimes surprised at their desire to be near the former partner. Detaching is a process, not an event.

Developing a Self-Concept

LOQ 15-8

How do children's self-concepts develop?

Infancy's major social achievement is attachment. *Childhood's* major social achievement is a positive sense of self. By the end of childhood, at about age 12, most children have developed a **self-concept**—an understanding and assessment of who they are. Parents often wonder

when and how this sense of self develops. “Is my baby aware of herself—does she know she is a person distinct from everyone else?”

Of course we cannot ask the baby directly, but we can again capitalize on what she can do—letting her *behavior* provide clues to the beginnings of her self-awareness. In 1877, biologist Charles Darwin offered one idea: Self-awareness begins when we recognize ourselves in a mirror. To see whether a child recognizes that the girl in the mirror is indeed herself, researchers sneakily dabbed color on her nose. At about 6 months, children reach out to touch their mirror image as if it were another child (Courage & Howe, 2002; Damon & Hart, 1982, 1988, 1992). By 15 to 18 months, they begin to touch their own noses when they see the colored spot in the mirror (Butterworth, 1992; Gallup & Suarez, 1986). Apparently, 18-month-olds have a schema of how their face should look, and they wonder, “What is that spot doing on *my* face?”



Kate Nurre

Self-awareness Mirror images fascinate infants from the age of about 6 months. Only at about 18 months, however, does the child recognize that the image in the mirror is “me.”

By school age, children’s self-concept has blossomed. It now includes their gender identity, group memberships, psychological traits, and similarities and differences compared with other children (Newman & Ruble, 1988; Stipek, 1992). They come to see themselves as good and skillful in some ways but not others. They form a concept of which traits, ideally, they would like to have. By age 8 or 10, their self-image is quite stable.

Children’s views of themselves affect their actions. Children who form a positive self-concept are more confident, independent, optimistic, assertive, and sociable (Maccoby, 1980). So how can parents encourage a positive yet realistic self-concept?

Parenting Styles

LOQ 15-9

What are the four main parenting styles?

Some parents spank; others reason. Some are strict; others are lax. Some show little affection; others liberally hug and kiss. How do parenting-style differences affect children?

> **"Before I got married I had six theories about bringing up children; now I have six children and no theories."** — attributed to John Wilmot, 2nd Earl of Rochester (1647–1680)

The most heavily researched aspect of parenting has been how, and to what extent, parents seek to control their children. Parenting styles can be described as a combination of two traits: how *responsive* and how *demanding* parents are (Kakinami et al., 2015). Investigators have identified four parenting styles (Baumrind, 1966, 1989, 1991; Maccoby & Martin, 1983; Steinberg et al., 1994):

1. ***Authoritarian*** parents are *coercive.* They impose rules and expect obedience: "Don't interrupt." "Keep your room clean." "Don't stay out late or you'll be grounded." "Why? Because I said so."
2. ***Permissive*** parents are *unrestraining.* They make few demands, set few limits, and use little punishment.
3. ***Neglectful*** parents are *uninvolved.* They are neither demanding nor responsive. They are careless, inattentive, and do not seek a close relationship with their children.
4. ***Authoritative*** parents are *confrontive.* They are both demanding and responsive. They exert control by setting rules, but, especially with older children, they encourage open discussion and allow exceptions.



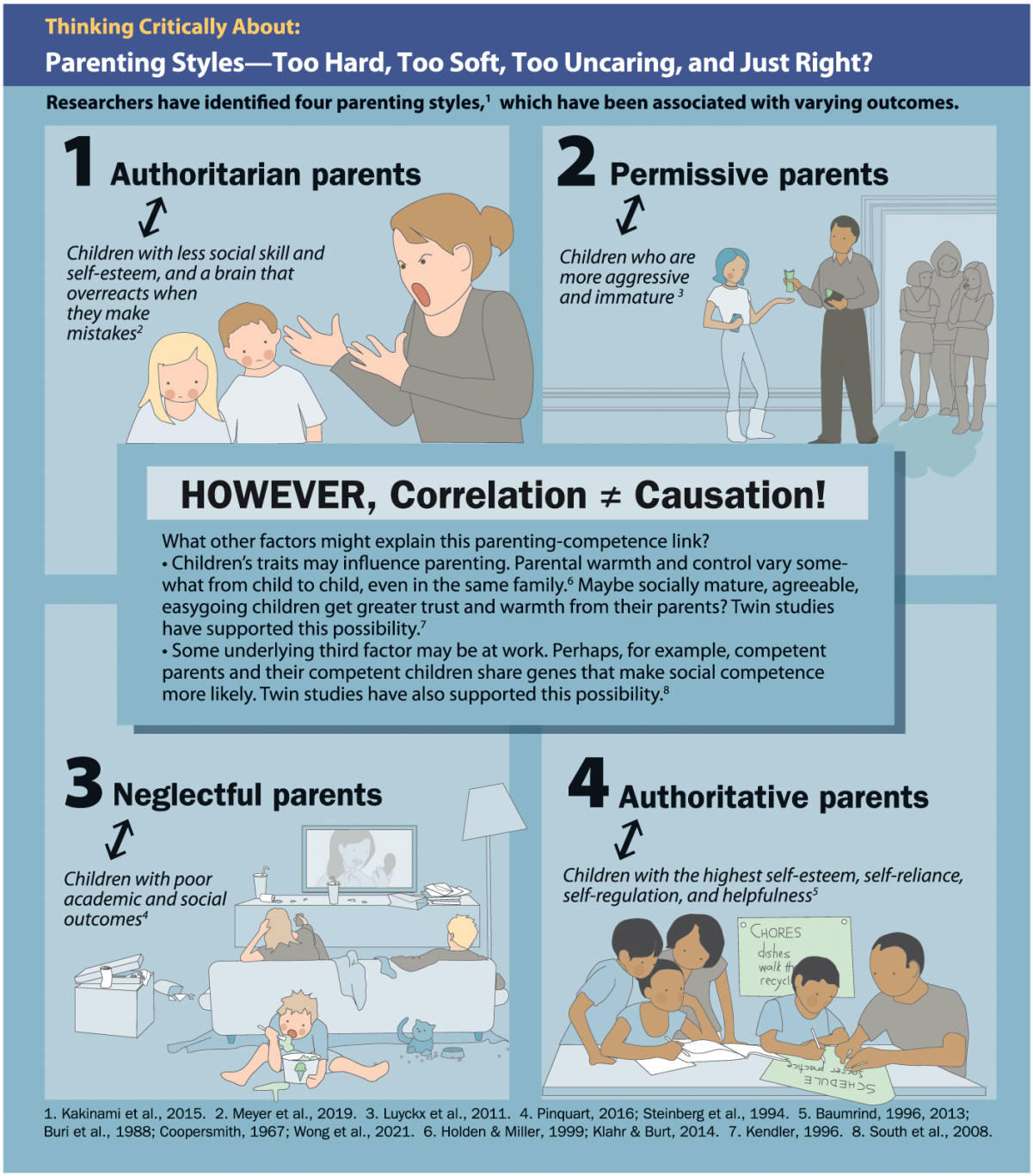
William Haefeli/Cartoon Stock

"We've created a safe, nonjudgmental environment that will leave your child ill-prepared for real life."

For more on parenting styles and their associated outcomes, see Thinking Critically About: Parenting Styles.

LOQ 15-10

What outcomes are associated with each parenting style?



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Parents who struggle with conflicting advice should remember that *all advice reflects the advice-giver's values.* For parents who prize unquestioning obedience, or whose children live in dangerous

environments, an authoritarian style may have the desired effect. For those who value children's sociability and self-reliance, there is wisdom in authoritative firm-but-open parenting.

The investment in raising a child buys many years of joy and love, but also of worry and irritation. Yet for most people who become parents, a child is one's legacy—one's personal investment in the human future. To paraphrase psychiatrist Carl Jung, we reach backward into our parents and forward into our children, and through their children into a future we will never see, but about which we must therefore care.

"You are the bows from which your children as living arrows are sent forth." — Kahlil Gibran, *The Prophet,* 1923

Ask Yourself

What mistakes do you think parents of the past most often made? What mistakes do you think today's parents might be making, and that as a parent you would want to (or already try to) avoid?

Retrieval Practice

RP-6 For those who value children's self-reliance, the four parenting styles may be described as "too hard, too soft, too uncaring, and just right." Which parenting style

goes with each of these descriptions, and how do children benefit from the "just right" style?

ANSWERS IN APPENDIX E

REVIEW

MODULE 15: Infancy and Childhood

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 15-1: During infancy and childhood, how do the brain and motor skills develop?

LOQ 15-2: How did Piaget broaden our understanding of the way a child's mind develops, and how have today's researchers built on his work?

LOQ 15-3: How did Vygotsky view children's cognitive development?

LOQ 15-4: What does it mean to develop a *theory of mind,* and how is this impaired in those with autism spectrum disorder?

LOQ 15-5: How do caregiver-infant attachment bonds form?

LOQ 15-6: How have psychologists studied attachment differences, and what have they learned?

LOQ 15-7: How does experiencing adversity affect children's social development?

LOQ 15-8: How do children's self-concepts develop?

LOQ 15-9: What are the four main parenting styles?

LOQ 15-10: What outcomes are associated with each parenting style?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

maturation
cognition
schema
assimilation
accommodation
sensorimotor stage
object permanence
preoperational stage
egocentrism

concrete operational stage
conservation
formal operational stage
scaffold
theory of mind
stranger anxiety
attachment
critical period
imprinting
basic trust
self-concept

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. Between ages 3 and 6, the human brain experiences the greatest growth in the _____ lobes, which enable reasoning and planning.

2. Which of the following is true of motor-skill development?
   a. It is determined solely by genetic factors.
   b. The sequence, but not the timing, is universal.
   c. The timing, but not the sequence, is universal.

MODULE 16: Adolescence and Emerging Adulthood

LOQ 16-1

How is *adolescence* defined, and how do physical changes affect developing teens?

Many psychologists once believed that childhood sets our traits. Today's developmental psychologists see development as lifelong. As this *developmental life-span perspective* emerged, psychologists began to look at how maturation and experience shape us not only in infancy and childhood, but also—after we are no longer handed the children's menu—in adolescence and beyond. **Adolescence**—the years spent morphing from child to adult—starts with the physical beginnings of sexual maturity and ends with social independence. Thus, adolescence hardly exists in cultures where post-pubertal teens are self-supporting (Schlegel & Barry, 1991). And in Western cultures, where sexual maturation occurs earlier and independence later, adolescence is lengthening and can happen anywhere between the ages of 10 and 19 (Sawyer et al., 2018; Worthman & Trang, 2018).

> **"Somewhere between the ages of 10 and 13 (depending on how hormone-enhanced their beef was), children entered adolescence, a.k.a. 'the de-cutening.'"** — Jon Stewart et al., *Earth (The Book),* 2010

In industrialized countries, what are the teen years like? In Leo Tolstoy's *Anna Karenina,* the teen years were "that blissful time when childhood is just coming to an end, and out of that vast circle, happy and gay, a path takes shape." But another teenager, Anne Frank, writing in her diary while hiding from the Nazis, described tumultuous teen emotions:

> My treatment varies so much. One day Anne is so sensible and is allowed to know everything; and the next day I hear that Anne is just a silly little goat who doesn't know anything at all and imagines that she's learned a wonderful lot from books.... Oh, so many things bubble up inside me as I lie in bed, having to put up with people I'm fed up with, who always misinterpret my intentions.

G. Stanley Hall (1904), one of the first psychologists to describe adolescence, believed that this tension between biological maturity and social dependence creates a period of "storm and stress."

It's a time of diminishing parental control (Lionetti et al., 2019). It's also a time when teens crave social acceptance, but often feel socially disconnected. Three in four U.S. friendships started in seventh grade dissolve by the end of eighth grade (Hartl et al., 2015). Such social disconnection hits adolescents hard—increasing their risk for substance abuse and depressive and anxiety symptoms (Hussong et al., 2020; McLaughlin & King, 2015). No wonder that, after age 30, many who grow up in independence-fostering Western cultures look back on their teenage years as a time they would not want to relive—a time when their peers' social approval was imperative, their sense of

direction in life was in flux, and their feeling of alienation from their parents was deepest (Arnett, 1999; Macfarlane, 1964). For those who grow up in non-Western Latinx cultures fostering more interdependence, adolescence may be a time of increased family responsibilities (Fuligni & Pederson, 2002). Adolescents in Japan, who are now raised at the intersection of traditional Japanese collectivism and growing Western-world influences, may focus on making decisions on their own while also considering the perspective of a parent or teacher (Sugimura, 2020).

But for others, adolescence is a time of vitality without the cares of adulthood—a time of rewarding friendships, heightened idealism and defining one's identity, and a growing sense of life's exciting possibilities. Adolescence is complicated.

Ask Yourself

How do you look back on your early teen years? What would you change, and what would you keep the same?

Physical Development

Adolescence begins with **puberty**, the time when we mature sexually. Puberty follows a surge of hormones, which may intensify moods and trigger the bodily changes discussed in the Cultural and Gender Diversity module. I [JG] remember being confronted with a changing female body that felt confusing and even foreign at first. Suddenly my

female peers were buying bras and talking about their body size and shape. Ideas about what becoming a woman meant came to life in school hallway conversations. The transition for me and many of my friends was complex, confusing, and full of questions.

> **"Let me just say for the record that I think middle school is the dumbest idea ever invented. You got kids like me who haven't hit their growth spurt yet mixed in with these gorillas who need to shave twice a day."** — Jeff Kinney, *Diary of a Wimpy Kid* (2010)

The Timing of Puberty

Just as in the earlier life stages, the *sequence* of physical changes in puberty (for example, breast buds and visible pubic hair before *menarche*—the first menstrual period) is far more predictable than their *timing* (when they first begin). Over recent decades, puberty worldwide has been starting earlier, with obesity, stress, and chemical exposure offered as possible explanations (Eckert-Lind et al., 2000; Ghorayshi, 2022). Some girls start their puberty at age 8 or 9, some boys as late as age 16.

Early maturation can be a challenge. Early maturing adolescents are at increased risk for mental health problems (Hamlat et al., 2022; Pfeifer & Allen, 2021; Ullsperger & Nikolas, 2017). This vulnerability is greatest for adolescents who experience childhood trauma (such as abuse) or who have emotionally reactive temperaments. For girls in

particular, physical development that outpaces emotional maturity can have lasting effects. In that case, girls may suffer teasing or sexual harassment, engage in harmful thinking, and bully or physically harm others (Nolen-Hoeksema et al., 2007; Skoog & Kapetanovic, 2022).

The Teenage Brain

The adolescent brain is a mind-boggling mix of great strength and vulnerability. It's also a remarkable work in progress: Teen brains have ever increasing reasoning ability but their self-control lags.

Until puberty, brain cells increase their connections, like trees growing more roots and branches. Then during adolescence comes a *selective pruning* of unused neurons and connections (Blakemore, 2008). What we don't use, we lose. As teens mature, their frontal lobes also continue to develop. The continuing growth of *myelin* (the fatty tissue that forms around axons and speeds neurotransmission) and *glial cells* (providing an immune defense of the central nervous system) enables better communication with other brain regions and aids cognitive development (Schalbetter et al., 2022; Whitaker et al., 2016). These developments bring improved judgment, impulse control, emotion regulation, and long-term planning. A landmark study following 11,000 youth from late childhood to early adulthood is examining influences on teens' brain development, such as drugs, screen time, and sleep (NIMH, 2019; Wadman, 2018).

Frontal lobe maturation nevertheless lags behind the emotion-controlling limbic system's development. Puberty's hormonal surge and this developing brain imbalance help explain teens' occasional impulsiveness, risky behaviors, and emotional extremes—slamming doors, and turning up the music (Casey, 2015; Smith, 2018; Steinberg & Icenogle, 2019). This developmental imbalance increases during the teenage years and then tapers off after that (FIGURE 16.1).

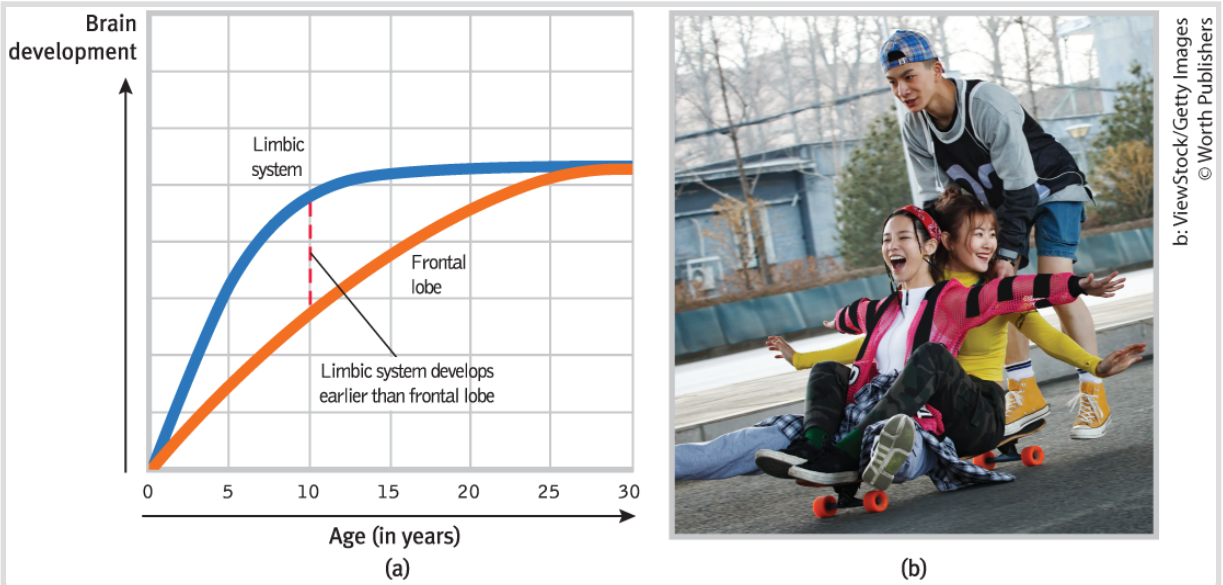


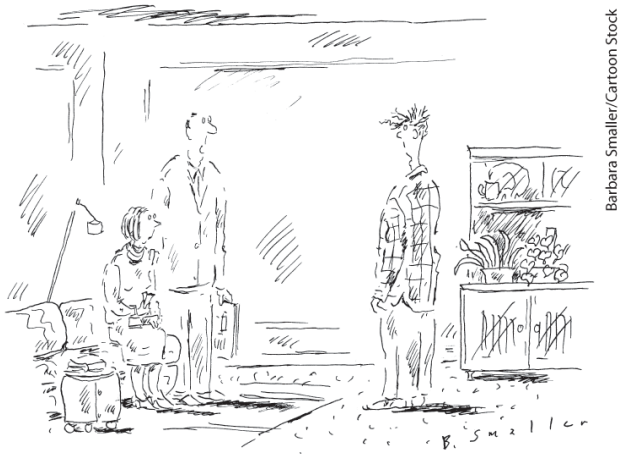
Figure 16.1 Riding on the edge Our brain's emotion-controlling limbic system develops earlier than the future-thinking frontal lobes. No wonder young teens (whose frontal lobes are still developing) are more likely to succumb to the lure of risky behaviors.

Information from: Casey (2015).

Teens don't underestimate the risks of vaping, drinking, fast driving, or unprotected sex. But their brains are attuned toward immediate rewards, which helps explain why teens worldwide struggle with self-control (Hansen et al., 2019; Steinberg et al., 2018). The teenage brain

is like a car with a forceful accelerator and unreliable brakes (Dahl, 2004).

So, when a teen drives recklessly and academically self-destructs, should their parents reassure themselves that "they can't help it; their frontal cortex isn't yet fully grown"? Parents can at least take hope: Brain changes underlie teens' new self-consciousness about what others are thinking as well as their valuing of risky rewards (Barkley-Levenson & Galván, 2014; Somerville et al., 2013). Parental warmth and support help teenagers become more emotionally resilient (Butterfield et al., 2021). And the brain with which youths begin their teens differs from the brain with which they will end their teens. Unless they slow their brain development with heavy alcohol use—making them more prone to impulsivity and addiction—their frontal lobes will continue maturing until about age 25 (Crews et al., 2007; Giedd, 2015). They will also become better connected with the limbic system, enabling better emotion regulation (Cohen et al., 2016; Steinberg, 2012).



Barbara Smaller/Cartoon Stock

"Young man, go to your room and stay there until your cerebral cortex matures."

In 2004, the American Psychological Association (APA) joined seven other medical and mental health associations in filing U.S. Supreme Court briefs arguing against the death penalty for 16- and 17-year-olds. The briefs documented the teen brain's immaturity "in areas that bear upon adolescent decision making." Brain scans of young teens reveal that frontal lobe immaturity is most evident among juvenile offenders and drug users (Shannon et al., 2011; Whelan et al., 2012). Thus, teens are "less guilty by reason of adolescence," suggested psychologist Laurence Steinberg and law professor Elizabeth Scott (2003; Steinberg et al., 2009). Some researchers have argued that teenagers, whose brains are still developing, should not incur the same penalties that adults do when they are convicted of a crime (Casey, 2015). In 2005, by a 5-to-4 margin, the Court concurred, declaring juvenile death penalties unconstitutional. In 2012, the APA offered similar arguments against sentencing juveniles to life without parole (Banville, 2012; Steinberg, 2013). Once again, the Court, by a narrow 5-to-4 vote, concurred.



BJ Casey

Betty Jo (BJ) Casey This influential developmental neuroscientist uses neuroimaging to explore the mysteries of the teen brain. Courts have used Casey's research when sentencing adolescents convicted of a crime.

Cognitive Development

LOQ 16-2

How did Piaget, Kohlberg, and later researchers describe adolescent cognitive and moral development?

During the early teen years, *egocentrism* endures, and reasoning is often self-focused. Capable of thinking about their own and others' thinking, teens also begin imagining what others think about *them* and develop an intense awareness of this *imaginary audience.* (They might worry less if they understood their peers' similar self-focus: Few people will remember our awkward moments because they're too

busy remembering their own.) Teens also tend to develop a *personal fable*—believing that they are unique and special and what happens to "most people" would never happen to them. "I vape for fun; I would never become addicted to nicotine."

> **"When the pilot told us to brace and grab our ankles, the first thing that went through my mind was that we must all look pretty stupid."** — Jeremiah Rawlings, age 12, after surviving a plane crash in Sioux City, Iowa

Developing Reasoning Power

When adolescents achieve the intellectual summit that Jean Piaget called *formal operations,* they apply their new abstract reasoning tools to the world around them. They may think about what is possible and compare that with the imperfect reality of their society, their parents, friends, and themselves. They may debate human nature, good and evil, truth and justice. Their sense of what's fair changes from simple equality to equity—to what's proportional to merit (Almås et al., 2010). Having left behind the concrete images of early childhood, they may search for spirituality and the deeper meaning of life (Boyatzis, 2012; Elkind, 1970). They assess their social worth and place in society, figuring out who their friends are and what they want to do with their life (Choudhury et al., 2006). Reasoning hypothetically and deducing consequences also enables adolescents to detect inconsistencies and spot hypocrisy in others' reasoning. This can lead to heated family

debates and silent vows to never lose sight of their own ideals (Peterson et al., 1986).



Samuel Corum/Anadolu Agency/Getty Images

A generation fed up with firearms Hundreds of thousands of teens have participated in school walkouts and marches to protest gun violence, demonstrating their ability to think logically about abstract topics and to voice their ideals. According to Piaget, these teens are in the final cognitive stage, formal operations.

Developing Morality

Two crucial tasks of childhood and adolescence are discerning right from wrong and developing character—the psychological muscles for controlling impulses. Children learn to empathize with others, an ability that continues to develop in adolescence. To be a moral person is to *think* morally and *act* accordingly. Jean Piaget and Lawrence Kohlberg proposed that moral reasoning guides moral actions. A newer view builds on psychology's game-changing recognition that

much of our functioning occurs not on the "high road" of deliberate, conscious thinking but on the "low road," unconscious and automatic.

> **"I helped a so-called friend commit armed robbery and murder.... I was just 17 years old.... Been in prison for over 20 years ... longer than I was ever free.... I am among the 300 plus "Juvenile Lifers" in Michigan prisons. I learned and matured a lot since my time incarcerated. I experience great remorse and regret over the tragedy that I ashamedly participated in. But I salvage this experience by learning and growing from it."** — M. H., Michigan prison inmate, personal correspondence, 2015

Moral Reasoning

Piaget (1932) believed that children's moral judgments build on their cognitive development. Agreeing with Piaget, Lawrence Kohlberg (1981, 1984) described the development of *moral reasoning,* the thinking that occurs as we consider right and wrong. Kohlberg posed moral dilemmas (for example, whether a person should steal medicine to save a loved one's life) and asked children, adolescents, and adults whether the action was right or wrong. His analysis of their answers led him to propose three basic levels of moral thinking: *preconventional, conventional,* and *postconventional* (**TABLE 16.1**). Kohlberg claimed these levels form a moral ladder. As with all stage theories, the sequence is unvarying. We begin on the bottom rung and rise to varying heights. Infants recognize right and wrong, preferring moral over immoral action (Cowell & Decety, 2015). Preschoolers, typically identifying with their cultural group, conform to and enforce

its moral norms (Tomasello, 2019; Yudkin et al., 2019). When those norms reward kind actions, preschoolers help others (Carragan & Dweck, 2014). From a young age, we seem hard-wired to dislike unfairness and to value morally good or kind characters (Elenbaas, 2019; Hamlin et al., 2007).

TABLE 16.1 Kohlberg's Levels of Moral Thinking

Kohlberg posed moral dilemmas, such as: "Is it okay to steal medicine to save a loved one?"		
Level (approximate age)	**Focus**	**Example of Moral Reasoning**
Preconventional morality (before age 9)	Self-interest; obey rules to avoid punishment or gain concrete rewards.	"If you steal the medicine, you'll go to jail."
Conventional morality (early adolescence)	Uphold laws and rules to gain social approval or maintain social order.	"If you steal the medicine, everyone will think you're a criminal."
Postconventional morality (adolescence and beyond)	Actions reflect belief in basic rights and self-defined ethical principles.	"People's right to live matters more than property or profits."

Kohlberg's critics have noted that the postconventional stage is culturally limited. It appears mostly among people from large *individualist* societies that prioritize personal goals, rather than from *collectivist* societies that place more value on social or group goals (Barrett et al., 2016; Eckensberger, 1994). In more collectivist India, morality is less a matter of personal choice and more a role-related duty (Miller et al., 2017). Some also view Kohlberg's theory as male-

focused, given women's tendency to emphasize care for others in need over what is "fair" (Gilligan, 1982, 2015).



Ramon Espinosa/AP Photo

Moral reasoning Bahamians faced a moral dilemma in 2019 when Hurricane Dorian devastated their northern islands. As many took in family and friends who now had no home, their reasoning likely reflected different levels of moral thinking, even if they behaved similarly.

Moral Intuition

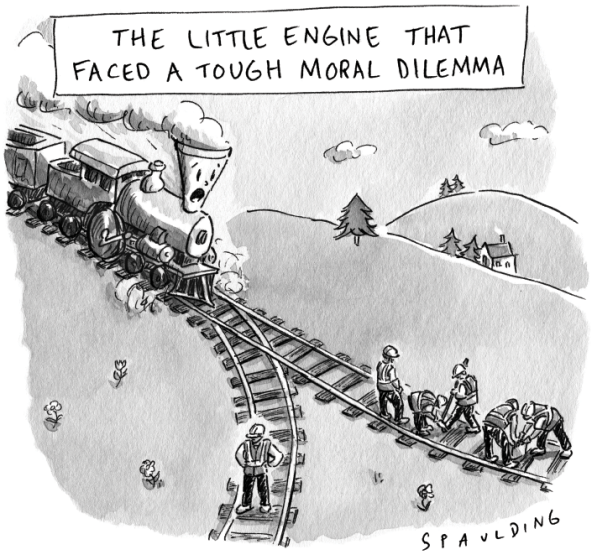
Psychologist Jonathan Haidt [pronounced HITE] (2001) believes that much of our morality is rooted in *moral intuitions*—"quick gut feelings." According to this intuitionist view, the mind makes moral judgments quickly and automatically, relying largely on feelings. Feelings of disgust or of elation trigger moral reasoning (Inbar & Pizarro, 2022).

One woman recalled traveling through her snowy neighborhood with three young men as they passed "an elderly woman with a shovel in

her driveway.… [O]ne of the guys … asked the driver to let him off there.… [M]y mouth dropped in shock as I realized that he was offering to shovel her walk for her." Witnessing this unexpected goodness triggered elevation: "I felt like jumping out of the car and hugging this guy. I felt like singing and running, or skipping and laughing. I felt like saying nice things about people" (Haidt, 2000).

"Could human morality really be run by the moral emotions," Haidt wonders, "while moral reasoning struts about pretending to be in control?" Consider the desire to punish. Laboratory games reveal that the desire to punish wrongdoing is mostly driven not by reason (such as an objective calculation that punishment deters crime) but rather by emotional reactions, such as moral outrage and the pleasure of revenge (Chester & DeWall, 2016; Crockett, 2017). After the emotional fact, moral reasoning—our mind's press secretary—aims to convince us and others of the logic of what we have intuitively felt.

This intuitionist perspective on morality finds support in a study of moral paradoxes. Imagine seeing a runaway trolley headed for five people. All will certainly be killed unless you throw a switch that diverts the trolley onto another track, where it will kill one person. Should you throw the switch? Most say *Yes*. Kill one, save five.



Trevor Spaulding/Cartoon Stock

Now imagine the same dilemma, with one change. You must save the five this time by pushing a large male stranger onto the tracks, where he will die as his body stops the trolley. In both versions of this famous "trolley problem," the logic is the same—kill one, save five. But worldwide, half say *No* in this second dilemma (Awad et al., 2020). One brain-imaging study showed that only the body-pushing type of moral dilemma activated emotion-relevant brain responses (Greene et al., 2001). Thus, our moral judgments provide another example of the two-track mind—of dual processing (Feinberg et al., 2012). We may liken our moral cognition to our phone's camera settings. Usually, we rely on the default settings. Yet sometimes, we use reason to override those settings manually or to adjust the resulting image (Greene, 2010; May, 2019).

Moral Action

Our moral thinking and feeling surely affect our moral talk. But sometimes talk is cheap and emotions are fleeting. Morality involves *doing* the right thing; what we do also depends on social influences. As political theorist Hannah Arendt (1963) observed, many Nazi concentration camp guards during World War II were ordinary "moral" people corrupted by a powerfully evil situation.

Today's character education programs focus on the whole moral package—thinking, feeling, and *doing* the right thing. In service-learning programs, teens have tutored, cleaned up their neighborhoods, and assisted older adults. The result? The teens' sense of competence and desire to serve has increased, school absenteeism and dropout rates have fallen, and violent behavior has diminished (Andersen, 1998; Heller, 2014; Piliavin, 2003). *Moral action* feeds moral attitudes.

These programs also teach the self-discipline needed to restrain one's own impulses. Those who have learned to *delay gratification*—to live with one eye on the future—have become more socially responsible, academically successful, and productive (Daly et al., 2015; Sawyer et al., 2015). A preference for large-later rather than small-now rewards also minimizes one's risk of problem gambling and delinquency (Callan et al., 2011; Lee et al., 2017).

In one of psychology's best-known experiments, Walter Mischel (2014) gave 4-year-olds a choice between one marshmallow now, or two marshmallows when he returned a few minutes later. The children who delayed gratification went on to have higher college completion rates and incomes, and less often suffered addiction problems. A replication of this famous study found a more modest effect (Watts et al., 2018; Watts & Duncan, 2020). But the big idea remains: Maturity and life success grow from the ability to spurn small pleasures now in favor of greater pleasures later (Baird et al., 2021; Robson et al., 2020; Yanaoka et al., 2022). Think of it this way: Immediate gratification makes today easy but tomorrow difficult; self-discipline—delayed gratification—makes today difficult and tomorrow easy. Marshmallows—and so much more—come to those who wait.

"The best time to plant a tree was 20 years ago. The second best time is now." — Chinese proverb

Ask Yourself

Think about a difficult decision you had to make in early adolescence and later regretted. What did you do? How would you do things differently now?

Retrieval Practice

RP-1 According to Kohlberg, _____ morality focuses on self-interest, _____ morality focuses on self-defined ethical principles, and _____ morality focuses on upholding laws and social rules.

RP-2 How has Kohlberg's theory of moral reasoning been criticized?

ANSWERS IN APPENDIX E

Social Development

LOQ 16-3

What are the social tasks and challenges of adolescence?

Psychologist Erik Erikson (1963) contended that each stage of life has its own *psychosocial* task, a crisis that needs resolution. Young children wrestle with issues of *trust,* then *autonomy* (independence), then *initiative.* School-age children strive for *competence,* feeling able and productive. The adolescent's task is to synthesize past, present, and future possibilities into a clearer sense of self (TABLE 16.2). Adolescents wonder, "Who am I as an individual? What do I want to do with my life? What values should I live by? What do I believe in?" Erikson called this quest the adolescent's *search for identity.*

TABLE 16.2 Erikson's Stages of Psychosocial Development

Stage (approximate age)	Issue	Description of Task



Competence vs. inferiority

Infancy (to 1 year)	Trust vs. mistrust	If needs are dependably met, infants develop a sense of basic trust.
Toddlerhood (1 to 3 years)	Autonomy vs. shame and doubt	Toddlers learn to exercise their will and do things for themselves, or they doubt their abilities.
Preschool (3 to 6 years)	Initiative vs. guilt	Preschoolers learn to initiate tasks and carry out plans, or they feel guilty about their efforts to be independent.
Elementary school (6 years to puberty)	Competence vs. inferiority	Children learn the pleasure of applying themselves to tasks, or they feel inferior.
Adolescence (teen years into 20s)	Identity vs. role confusion	Teenagers work at refining a sense of self by testing roles and then integrating them to form a single identity, or they become confused about who they are.
Young adulthood (20s to early 40s)	Intimacy vs. isolation	Young adults learn to form close relationships and gain the capacity for intimate love, or they feel socially isolated.
Middle adulthood (40s to 60s)	Generativity vs. stagnation	Middle-aged people discover a sense of contributing to the world, usually through family and work, or they may feel a lack of purpose.

Late adulthood (late 60s and up)	Integrity vs. despair	Reflecting on their lives, older adults may feel a sense of satisfaction or failure.	

As sometimes happens in psychology, Erikson's interests were bred by his own life experience. As the son of a Jewish mother and a Danish Gentile father, Erikson was "doubly an outsider," reported Morton Hunt (1993, p. 391). He was "scorned as a Jew in school but mocked as a Gentile in the synagogue because of his blond hair and blue eyes." Such episodes fueled his interest in the adolescent struggle for identity.

Forming an Identity

Erikson noticed that some adolescents forge their identity by adopting their parents' values and expectations. Other adolescents may adopt the identity of a particular peer group—as an athlete or an artist, a tech geek or a science fiction buff. Traditional, collectivist cultures teach adolescents to adopt a certain identity, rather than encouraging them to decide on their own.

Adolescents in individualist cultures usually try out different "selves" to refine their sense of identity. They may act out one self at home, another with friends, another online, and still another at school. If two situations overlap—as when a teenager brings new friends home—the discomfort can be considerable (Klimstra et al., 2015). The teen often wonders, "Which self should I be? Which is the real me?" The

eventual resolution is a self-definition that unifies the various selves into a consistent and comfortable sense of who one is—an **identity**. In collectivist cultures such as Japan, where less emphasis is placed on individual identity, teens spend more time in adolescence and are less certain about who they are (Hatano et al., 2020; Sugimura, 2020). In such cultures, adolescents who are immigrants (or the children of immigrants) form complex identities as they adopt new languages and integrate group memberships (Aumann et al., 2022; Marks et al., 2011).



Tony Anderson/DigitalVision/Getty Images

Who shall I be today? By varying the way they look, adolescents try out different "selves." Although we eventually form a consistent and stable sense of identity, the self we present may change with the situation.

"I don't think any of us like to be reduced to just one label." — Actor Riz Ahmed, 2016

For adolescents and adults, group identities are often formed by how we differ from those around us—in gender identity and sexual orientation, age and relative wealth, abilities and beliefs. When living in Britain, I [DM] became conscious of my Americanness. When spending time in Hong Kong, I [ND] became conscious of my White race. When I [JG] joined this all-male author team, I became conscious of being a woman. For international students, for those of a minority ethnic or religious group, for members of the LGBTQ community, or for people with a disability, a **social identity** often forms around their distinctiveness. (Stay tuned for more on social identity and prejudice in the Social Psychology modules.)

Most young people develop a sense of contentment with their lives. Which statement best describes you: "I would choose my life the way it is right now" or "I wish I were somebody else"? When American teens answered, 81 percent picked the first, and 19 percent the second (Lyons, 2004). Reflecting on their existence, 76 percent of U.S. college and university students say they "discuss religion/spirituality" with friends (Stolzenberg et al., 2019). This would not surprise researchers who have contended that a key task of adolescence is to achieve a purpose—a desire to accomplish something personally meaningful that contributes to the world beyond oneself (Fuligni, 2019; Sumner et al., 2018).

Interventions that aim to boost adolescents' health and well-being work best when appealing to their desires for self-esteem, status, and respect (Yeager et al., 2018). Rather than saying "Eating well is

important for your health," a more effective message would be "Buying junk food gives money to rich adults who disrespect you by thinking you don't know better."

During the early teen years, self-esteem typically falls and, for girls, depression often increases (Kwong et al., 2019; Salk et al., 2017). Teen depression and suicide rates have also increased since the spread of social media and the peer comparisons they enable (more on this in the Affiliation and Achievement module). To sustain mental health, hanging out with friends beats scrolling through Instagram (Twenge, 2022). But there's good news: Self-image rebounds during the late teens and twenties, and self-esteem gender differences shrink (Orth et al., 2021; Zuckerman et al., 2016). Agreeableness and emotional stability scores also increase in late adolescence (Klimstra et al., 2009).

These are the years when many people in industrialized countries begin exploring new opportunities by attending college or working full time. Many college and university seniors have achieved a clearer identity and a more positive self-concept than they had as first-year students (Jones & Abes, 2013; Waterman, 1988). Those who have a clear sense of identity are less prone to alcohol misuse (Bishop et al., 2005).

Erikson contended that adolescent identity formation (which continues into adulthood) is followed in young adulthood by a developing capacity for **intimacy**, the ability to form emotionally close relationships. When Mihaly Csikszentmihalyi [chick-SENT-me-hi] and

Jeremy Hunter (2003) used a beeper to sample the daily experiences of U.S. teens, they found them unhappiest when alone and happiest when with friends. Romantic relationships, which tend to be emotionally intense, are reported by two in three North American 17-year-olds, but by fewer in collectivist countries such as China (Collins et al., 2009; Li et al., 2010). Those who enjoy high-quality (intimate, supportive) relationships with family and friends also tend to enjoy similarly high-quality romantic relationships in adolescence, which set the stage for healthy adult relationships and fewer behavior problems (Aikins et al., 2010). Such relationships are, for most of us, a source of great pleasure. As Aristotle long ago recognized, we humans are "the social animal." We have a deep need to belong. Relationships matter.

Parent and Peer Relationships

LOQ 16-4

How do parents and peers influence adolescents?

Adolescence is typically a time of diminishing parental influence and growing peer influence (Blakemore, 2018). The preschooler who can't be close enough to her mother, who loves to touch and cling to her, becomes the 14-year-old who wouldn't be caught dead holding hands with Mom in front of their friends. The transition occurs gradually (**FIGURE 16.2**). As children, we recognize adult faces more readily than other children's faces; by adolescence, we display superior

recognition for our peers' faces (Picci & Scherf, 2016; Somerville et al., 2011). Puberty alters attachments and primes perceptions.

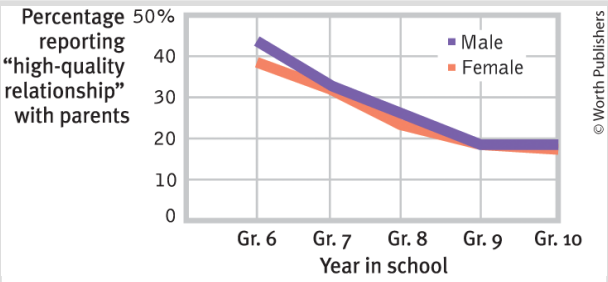


FIGURE 16.2 The changing parent-child relationship In a large national study of Canadian families, the typically close, warm relationships between children and their parents loosened as they became teens (Pepler & Craig, 2012).



"She says she's someone from your past who gave birth to you, and raised you, and sacrificed everything so you could have whatever you wanted."

By adolescence, parent-child arguments occur more often, usually over mundane things—household chores, bedtime, homework

(Steinberg & Morris, 2001; Tesser et al., 1989). Conflict during the transition to adolescence tends to be greater with first-born than with second-born children, and greater with mothers than with fathers (Burk et al., 2009; Shanahan et al., 2007).

For a minority of parents and their adolescent children, differences lead to real splits and great stress (Steinberg & Morris, 2001). But many disagreements are at the level of harmless bickering about relationships. With sons, the issues are often about behavior problems, such as acting out or hygiene; for daughters, the issues commonly involve relationships, such as dating and friendships (Schlomer et al., 2011). In a survey of nearly 6000 adolescents in 10 countries—from Australia to Bangladesh to Turkey—most said they like their parents (Offer et al., 1988). "We usually get along but …," adolescents often reported (Galambos, 1992; Steinberg, 1987).

Positive parent-teen relations and positive peer relations often go hand in hand. High school girls who have the most affectionate relationships with their mothers also tend to enjoy the most intimate friendships with girlfriends (Gold & Yanof, 1985). And teens (including transgender teens) who feel close to their parents have tended to be healthy and happy and to do well in school (Olson et al., 2016; Resnick et al., 1997). Of course, we can state this correlation the other way: Misbehaving teens are more likely to have tense relationships with parents and other adults.

Heredity does much of the heavy lifting in forming individual temperament and personality differences, and peer influences do much of the rest. When with peers, teens discount the future and focus more on immediate rewards (O'Brien et al., 2011). Most teens are herd animals. They talk, dress, and act more like their peers than their parents. They often become what their friends are, and what "everybody's doing," they usually do. Teens' social media use illustrates the power of peer influence. Compared to photos with few likes, teens prefer photos with many likes. Moreover, when viewing many-liked photos, teens' brains become more active in areas associated with reward processing and imitation (Sherman et al., 2016). Liking and doing what everybody else likes and does feels good.

The pain is acute for those who feel excluded and bullied by their peers, both online and face-to-face. Most excluded "students suffer in silence.... A small number act out in violent ways against their classmates" (Aronson, 2001). The pain of exclusion also persists. In large longitudinal studies, those who were bullied as children showed poorer physical health, greater psychological distress, and an increased risk of dying by suicide several decades later (Geoffrey et al., 2022; Takizawa et al., 2014).

Ask Yourself

What are the most positive and the most negative things you remember about your own adolescence? Who do you credit or blame more—your parents or your peers?

Emerging Adulthood

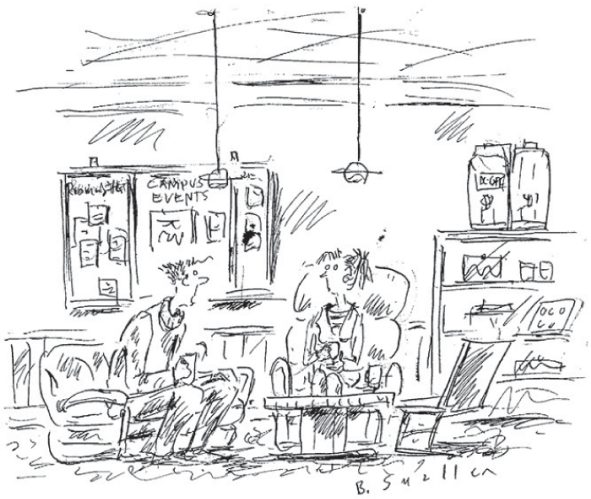
LOQ 16-5

What is *emerging adulthood?*

In the Western world, adolescence now roughly corresponds to the teen years. At earlier times, and in other parts of the world today, this slice of life has been much smaller (Baumeister & Tice, 1986). Shortly after sexual maturity, young people would assume adult responsibilities and status. The event might be celebrated with an elaborate initiation—a public rite of passage. The new adult would then work, partner, and have children.

When schooling became compulsory in many Western countries, independence was put on hold until after graduation. Adolescents are now taking more time to establish themselves as adults. Today's adolescents are less likely to work for pay, drive, or have romantic attachments (Twenge & Park, 2019). In the United States, the average age at first marriage has increased more than 5 years since 1960, to 29 for men, and 27 for women. In 1960, three in four women and two in three men had, by age 30, finished school, left home, become financially independent, married, and had a child. In the early twenty-first century, this was true for fewer than half of 30-year-old women and one-third of 30-year-old men (Henig, 2010). In 2016, 15 percent of 25- to 35-year-old Americans—double the 1981 proportion—were living in their parents' home (Fry, 2017).

We noted that later independence and earlier sexual maturity have widened the once-brief interlude between biological maturity and social independence. In prosperous communities, the time from age 18 to the mid-twenties is an increasingly not-yet-settled phase of life, now often called **emerging adulthood** (Arnett, 2006, 2007; Reitzle, 2006). No longer adolescents, these emerging adults—having not yet assumed full adult responsibilities and independence—feel "in between." Those furthering their education or working may manage their own time and priorities. Yet they may be doing so from their parents' home, unable to afford their own place and perhaps still emotionally dependent (Fry, 2017). Recognizing today's more gradually emerging adulthood, the U.S. government now allows dependent children up to age 26 to remain on their parents' health insurance (HHS, 2020). Research suggests that emerging adulthood may be shorter or nonexistent in non-Western cultures that may emphasize a swifter transition to adulthood (Arnett, 2015; Nelson & Chen, 2007).



Barbara Smaller/Cartoon Stock

"I just don't know what to do with myself in that long stretch after college but before social security."

"Emerging adulthood is a time of life when many different directions remain possible, when little about the future has been decided for certain, when the scope of independent exploration of life's possibilities is greater for most people than it will be at any other period of the life course." — Psychologist Jeffrey Jensen Arnett, 2000

Ask Yourself

What do you think makes a person an adult? Do you feel like an adult? Why or why not?

Retrieval Practice

RP-3 Match the psychosocial development stage below (i–viii) with the issue that Erikson believed we wrestle with at that stage (a–h).

i. Infancy	a. Generativity vs. stagnation
ii. Toddlerhood	b. Integrity vs. despair
iii. Preschool	c. Initiative vs. guilt
iv. Elementary school	d. Intimacy vs. isolation
v. Adolescence	e. Identity vs. role confusion
vi. Young adulthood	f. Competence vs. inferiority
vii. Middle adulthood	g. Trust vs. mistrust
viii. Late adulthood	h. Autonomy vs. shame and doubt

ANSWERS IN APPENDIX E

REVIEW

MODULE 16: Adolescence and Emerging Adulthood

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 16-1: How is *adolescence* defined, and how do physical changes affect developing teens?

LOQ 16-2: How did Piaget, Kohlberg, and later researchers describe adolescent cognitive and moral development?

LOQ 16-3: What are the social tasks and challenges of adolescence?

LOQ 16-4: How do parents and peers influence adolescents?

LOQ 16-5: What is *emerging adulthood?*

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

adolescence
puberty
identity
social identity
intimacy
emerging adulthood

MODULE 17: Adulthood

The unfolding of our lives continues across the life span. It is, however, more difficult to generalize about adulthood stages than about life's early years. If you know that James is a 1-year-old and Jamal is a 10-year-old, you could say a great deal about each child. Not so with adults who differ by a similar number of years. The boss may be 30 or 60; the marathon runner may be 20 or 50; the 19-year-old may be a parent who supports a child or a child who receives an allowance. Yet our life courses are in some ways similar. Physically, cognitively, and especially socially, we differ at age 50 from our 25-year-old selves. In the discussion that follows, we recognize these differences and use three terms: *early adulthood* (roughly twenties and thirties), *middle adulthood* (to age 65), and *late adulthood* (the years after 65). Within each of these stages, people vary widely in physical, psychological, and social development.



Billy Bennight/The Photo Access/Alamy Stock Photo and Impress/United Archives GmbH/Alamy Stock Photo

To live is to age Actor Tom Hanks hanging out with his younger self.

Ask Yourself

Imagining the future, how do you think you might change? How might you stay the same? In what ways do you most want to grow as a person?

Physical Development

LOQ 17-1

What physical changes occur during middle and late adulthood?

Like the declining daylight after the summer solstice, our physical abilities—muscular strength, reaction time, sensory keenness, and cardiac output—all begin an almost imperceptible decline in our mid-twenties. Athletes are often the first to notice. Baseball players peak at about age 27—with 60 percent of Major League Baseball's Most Valuable Player awardees since 1985 coming within 2 years of that age (Silver, 2012). But most of us—especially those of us whose daily lives do not require top physical performance—hardly perceive the early signs of decline.



Rick Doyle/Getty Images

Adult abilities vary widely George Blair was, at age 92, the world's oldest barefoot water skier. He is shown here in 2002 when he first set the record, at age 87. (He died at age 98.)

Physical Changes in Middle Adulthood

Athletes over 40 know all too well that physical decline gradually accelerates. As a lifelong basketball player, I [DM] am playing less often and no longer racing for that loose ball. But even diminished vigor is sufficient for typical activities. During early and middle adulthood, physical vigor has less to do with age than with a person's health and exercise habits. Many physically fit 50-year-olds run 4 miles with ease, while sedentary 25-year-olds find themselves huffing and puffing up two flights of stairs.

Aging also brings a gradual decline in fertility, especially for women. For a 35- to 39-year-old woman, the chance of getting pregnant after a single act of intercourse is half that of a woman aged 19 to 26 (Dunson et al., 2002). **Menopause** (when menstrual cycles end) usually occurs within a few years of age 50. Worldwide, early menopause increases women's risk for depression (Georgakis et al., 2016; Zeng et al., 2019). Men experience a gradual decline in sperm count, testosterone level, and speed of erection and ejaculation. With declining virility and changing appearance, some people may experience distress. Seeing their first gray hairs, they may just want to dye.



The New Yorker Collection, 1999 Tom Cheney/The Cartoon Bank

"Happy fortieth. I'll take the muscle tone in your upper arms, the girlish timbre of your voice, your amazing tolerance for caffeine, and your ability to digest french fries. The rest of you can stay."

Sexual activity remains satisfying, though less frequent, after middle age. This was true of 70 percent of Canadians surveyed (ages 40 to 64) and 75 percent of Finns (ages 65 to 74) (Kontula & Haavio-Mannila, 2009; Wright, 2006). In an American Association of Retired Persons sexuality survey, it was not until age 75 or older that most women and

nearly half of men reported little sexual desire (DeLamater, 2012; DeLamater & Sill, 2005). As Alex Comfort (2002, p. 226) jested, "The things that stop you having sex with age are exactly the same as those that stop you riding a bicycle (bad health, thinking it looks silly, no bicycle)."

Physical Changes in Late Adulthood

Is old age "more to be feared than death" (Juvenal, *The Satires*)? Or is life "most delightful when it is on the downward slope" (Seneca, *Epistulae ad Lucilium*)? What is it like to grow old?

Life Expectancy

From 1950 to 2015, worldwide life expectancy at birth increased from 50 to 73 years (Dicker et al., 2018). (See **FIGURE 17.1**.) What a gift—two decades more of life! In China, the United States, the United Kingdom, Canada, and Australia (to name some countries where students read this book), life expectancy had by 2019 (World Bank, 2019) risen to 76, 79, 81, 82, and 82, respectively (though the opioid epidemic and Covid-19 pandemic have reduced some of those gains). This increasing life expectancy (humanity's greatest achievement, say some) combines with decreasing birthrates: Older adults are a growing population segment, creating an increasing demand for hearing aids, retirement villages, and nursing homes. Today, 13 percent of people worldwide are 60 or older. The United Nations (2017) projects that proportion will more than double by 2100.

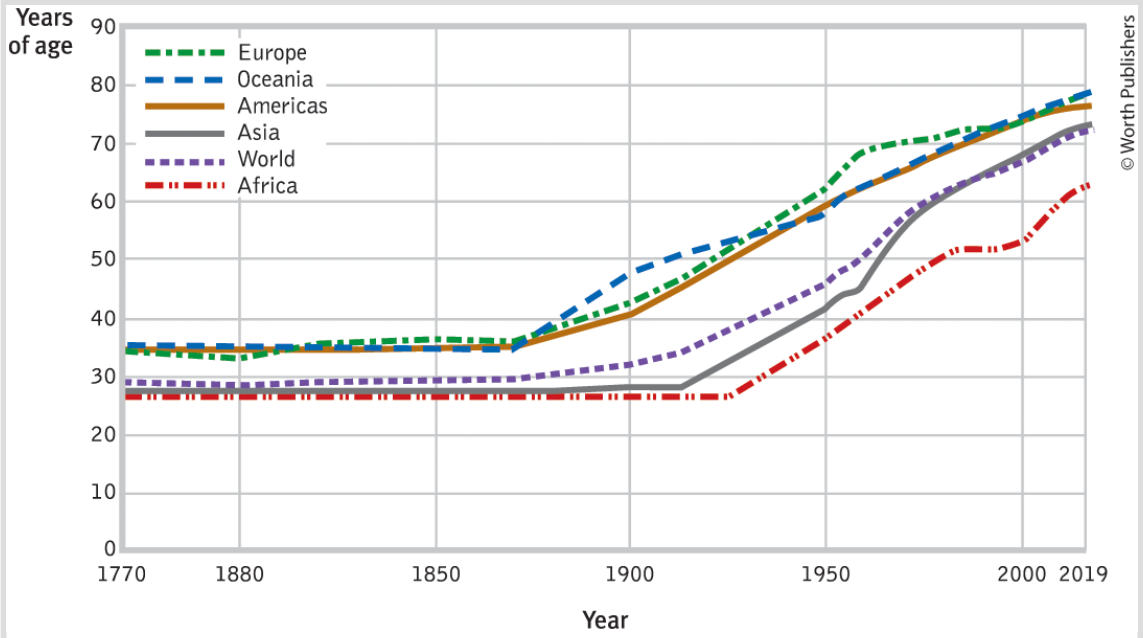


FIGURE 17.1 Life expectancy since 1770, by world regions With improved sanitation, modern medicine, and the introduction of antibiotics, infant mortality declined during the twentieth century and life expectancy increased (Roser, 2019).

Throughout the life span, males are more prone to dying. Although 126 male embryos begin life for every 100 females, the sex ratio is down to 105 males for every 100 females at birth (Strickland, 1992). During the first year, male infants' death rates exceed females' by one-fourth. Worldwide, women outlive men by 4.4 years (WHO, 2019). By age 100, women outnumber men 5 to 1.





Left and right: Pascal Parrot/Getty Images

World record for longevity? French woman Jeanne Calment, the oldest human in history with authenticated age, died in 1998 at age 122 (Robine & Allard, 1999). At age 100, she was still riding a bike.

But few of us live to 100. Disease strikes. The body ages. Its cells stop reproducing. It becomes frail and vulnerable to tiny insults—hot weather, a fall, a mild infection—that at age 20 would have been trivial. Tips of chromosomes, called *telomeres,* wear down, much as the tip of a shoelace frays. This wear is accelerated by smoking, obesity, or stress. Breast-fed children have longer telomeres, while those who suffer frequent abuse or bullying exhibit the biological scars of shortened telomeres (Shalev et al., 2013). As telomeres shorten, aging cells may die without being replaced with perfect genetic replicas (Epel, 2009).

Chronic anger and depression increase our risk of premature death. But low stress and good health habits enable longevity, as does a positive spirit. Researchers have even observed an intriguing *death-deferral* phenomenon (Shimizu & Pelham, 2008). Across one 15-year

period, 2000 to 3000 more Americans died on the 2 days after Christmas than on Christmas and the 2 days before. The death rate also increases when people reach their birthdays, and when they survive until after other milestones, like the first day of the new millennium.

Sensory Abilities, Strength, and Stamina

Although physical decline begins in early adulthood, we are not usually acutely aware of it until later in life, when the stairs get steeper, the print gets smaller, and other people seem to mumble more. Visual sharpness diminishes, as does distance perception and adaptation to light-level changes. Muscle strength, reaction time, and stamina also diminish, as do smell, hearing, and touch. In Wales, teens' loitering around a convenience store has been discouraged by a device that emits an aversive high-pitched sound that almost no one over 30 can hear (Lyall, 2005).

With age, the eye's pupil shrinks and its lens becomes less transparent, reducing the amount of light reaching the retina. A 65-year-old retina receives only about one-third as much light as its 20-year-old counterpart (Kline & Schieber, 1985). Thus, to see as well as a 20-year-old when reading or driving, a 65-year-old needs three times as much light—a reason for buying cars with untinted windshields. This also explains why older people sometimes ask younger people, "Don't you need better light for reading?"

> **"For some reason, possibly to save ink, the restaurants had started printing their menus in letters the height of bacteria."** — Dave Barry, *Dave Barry Turns Fifty,* 1998

Health

As people age, they care less about what their bodies look like and more about how their bodies function. For those growing older, there is both bad and good news about health. The bad news: The body's disease-fighting immune system weakens, making older adults more susceptible to life-threatening ailments such as cancer and Covid-19. The good news: Thanks partly to a lifetime's accumulation of antibodies, people over 65 suffer fewer short-term ailments, such as common flu and cold viruses. One study found they were half as likely as 20-year-olds and one-fifth as likely as preschoolers to suffer upper respiratory infections each year (National Center for Health Statistics, 1990).

The Aging Brain

Up to the teen years, we process information with greater and greater speed (Fry & Hale, 1996; Kail, 1991). But compared with teens and young adults, older people take a bit more time to react, to solve perceptual puzzles, even to remember names (Bashore et al., 1997; Verhaeghen & Salthouse, 1997). At video games, most 70-year-olds are no match for a 20-year-old. This processing lag can also have deadly consequences (Aichele et al., 2016). As **FIGURE 17.2** indicates, fatal

accident rates per mile driven increase sharply after age 75. By age 85, they exceed the 16-year-old level. Older drivers appear to focus well on the road ahead, but attend less to other vehicles approaching from the side (Pollatsek et al., 2012).

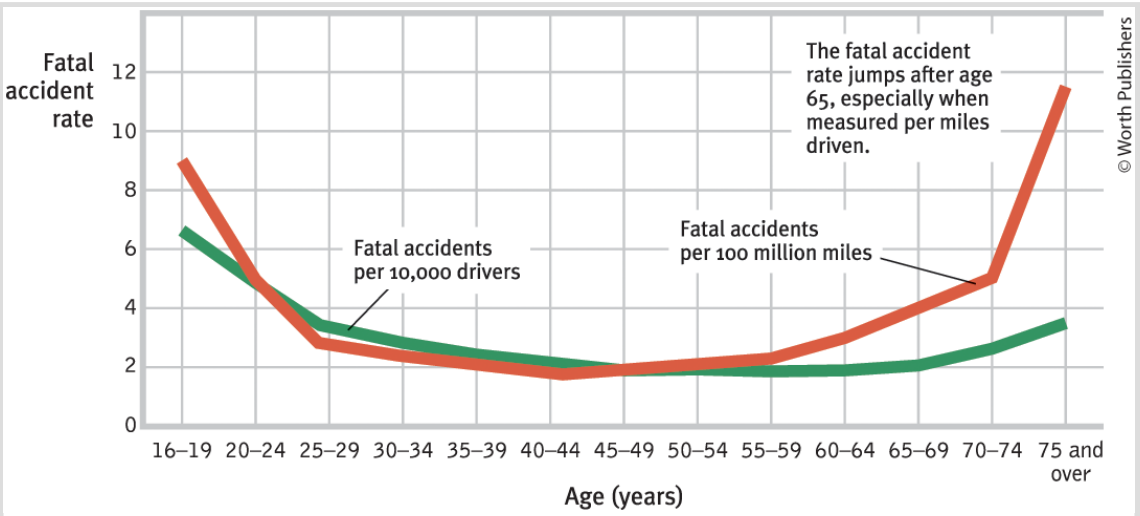


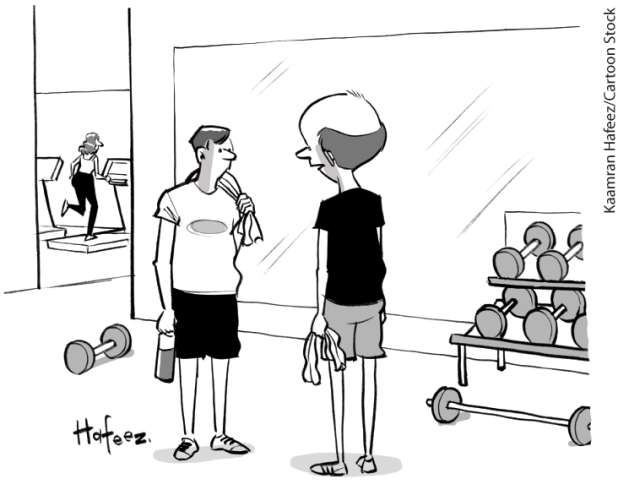
FIGURE 17.2 Age and driver fatalities Slowing reactions contribute to increased accident risk among those 75 and older, and older adults' greater fragility increases their risk of death when accidents happen (NHTSA, 2000). Would you favor driver exams based on performance, not age, to screen out those whose slow reactions or sensory impairments indicate accident risk?

Brain regions important to memory begin to atrophy during aging (Fraser et al., 2015; Ritchie et al., 2015). The blood-brain barrier also breaks down, beginning in the hippocampus, which furthers cognitive decline (Montagne et al., 2015). No wonder older adults feel even older after taking a memory test: It's like "aging 5 years in 5 minutes," joked one research team (Hughes et al., 2013). In early adulthood, a small, gradual net loss of brain cells begins, contributing by age 80 to a

brain-weight reduction of 5 percent or so. We know that our frontal lobes help us override undesirable urges—their slow development (not fully mature until about age 25) helps account for teen impulsivity. Late in life, some of that impulsiveness often returns as those same frontal lobes begin to atrophy, seemingly explaining older people's occasional blunt questions ("Have you put on weight?") or inappropriate comments (von Hippel, 2007, 2015). But good news: There is still some *neuroplasticity* in the aging brain, which partly compensates for what it loses by recruiting and reorganizing neural networks (Park & McDonough, 2013). During memory tasks, for example, the left frontal lobes are especially active in young adult brains, while older adult brains use both left and right frontal lobes.

Exercise and Aging

And more good news: Exercise slows aging, as shown in studies of identical twin pairs in which only one twin exercised (Iso-Markku et al., 2016; Rottensteiner et al., 2015). Older adults who exercise more tend to be mentally quick (Sinha et al., 2021). Physical exercise not only increases blood flow to the brain and enhances physical health, it maintains the *telomeres* that protect the chromosome ends and can slow the progression of Alzheimer's disease (Kivipelto & Håkansson, 2017; Loprinzi et al., 2015; Smith et al., 2014).



Kaamran Hafeez/Cartoon Stock

"I've been working out for six months, but all my gains have been in cognitive function."

Exercise also appears to stimulate *neurogenesis*—the development of new brain cells—and neural connections, thanks perhaps to increased oxygen and nutrient flow (Ansere & Freeman, 2020; Wang, 2020). Sedentary older adults randomly assigned to aerobic exercise programs exhibited enhanced memory, sharpened judgment, and reduced risk of severe cognitive decline (Northey et al., 2018; Raji et al., 2016; G. Smith, 2016). In the aging brain, exercise reduces brain shrinkage (Domingos et al., 2021). And it increases the cellular mitochondria that help power both muscles and brain cells (Steiner et al., 2011). We are more likely to rust from disuse than to wear out from overuse. Fit bodies support fit minds.

Cognitive Development

Aging and Memory

LOQ 17-2

How does memory change with age?

Among the most intriguing developmental psychology questions is whether adult cognitive abilities, such as memory, intelligence, and creativity, parallel the gradually accelerating decline of physical abilities.

> **"I am still learning."** — Michelangelo, 1560, at age 85

As we age, we remember some things well. Looking back in later life, adults asked to recall the one or two most important events over the last half-century tend to name events from their teens or twenties (Conway et al., 2005; Rubin et al., 1998). They also display this "reminiscence bump" when asked to name their all-time favorite music, movies, and athletes (Janssen et al., 2012). Whatever people experience around this time—the Vietnam War, the space shuttle *Challenger* explosion, the Covid-19 pandemic—becomes pivotal (Pillemer, 1998; Schuman & Scott, 1989). Our teens and twenties hold

so many memorable “firsts”—first kiss, first job, first day at college or university, first apartment.

> If you are within 5 years of 20, what experiences from the past year will you likely never forget? (This is the time of your life you may best remember when you are 50.)

Early adulthood is indeed a peak time for some types of learning and remembering. In one test of recall, people watched video clips as 14 strangers said their names, using a common format: “Hi, I’m Larry” (Crook & West, 1990). As **FIGURE 17.3** shows, even after a second and third replay of the introductions with more personal information, younger adults consistently remembered more names than older adults did. How well older people remember depends, in part, on the task. In another experiment, when asked to *recognize* 24 words they had earlier tried to memorize, older adults showed no memory decline. When asked to *recall* that information without clues, however, the decline was greater (**FIGURE 17.4**).

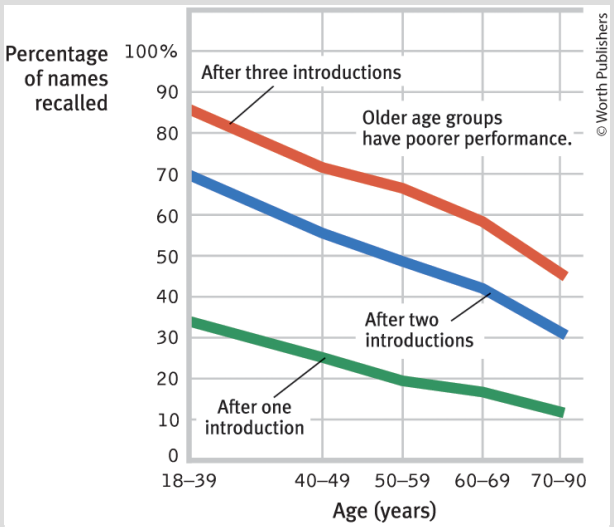


FIGURE 17.3 Tests of recall Recalling new names introduced once, twice, or three times is easier for younger adults than for older ones. (Data from Crook & West, 1990.)

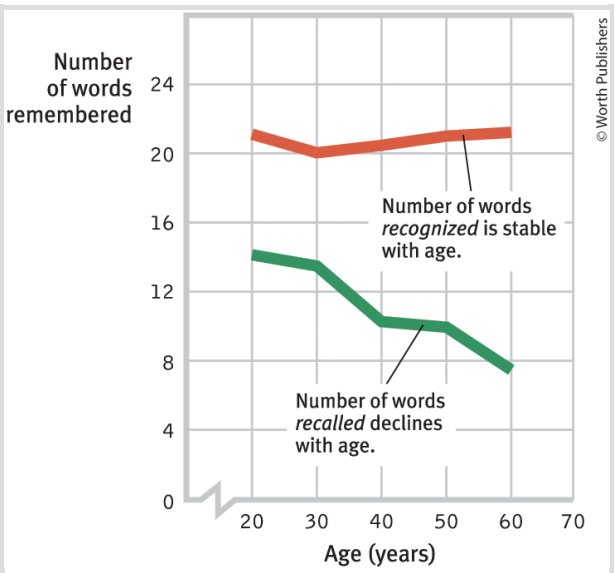


FIGURE 17.4 Recall and recognition in adulthood In this experiment, the ability to *recall* new information declined during early and middle adulthood, but the ability to

recognize new information did not. (Data from Schonfield & Robertson, 1966.)

Teens and young adults surpass both young children and 70-year-olds at *prospective memory* ("Remember to …") (Zimmermann & Meier, 2006). But older people's prospective memory remains strong when events help trigger a memory (as when walking by a convenience store triggers "Pick up milk!"). Time-based tasks ("Client meeting at 3:00 P.M.") and especially habitual tasks ("Take medications at 9:00 A.M., 2:00 P.M., and 6:00 P.M.") can be challenging (Einstein & McDaniel, 1990; Einstein et al., 1995, 1998). To minimize such problems, older adults rely more on time management and reminder cues, such as notes to themselves, and Alexa and other reminder apps (Henry et al., 2004). This might have helped John Basinger, who, at age 76, memorized all 12 volumes of John Milton's epic poem *Paradise Lost* and became the subject of a psychology journal article (Seamon et al., 2010; Weir, 2010). A local paper scheduled an interview with Basinger, which he forgot to attend. Calling the reporter to apologize, he noted the irony of forgetting his interview about memory!

In our capacity to learn and remember, as in other areas of development, we show individual differences. Younger adults vary in their abilities to learn and remember, but 70-year-olds vary much more. "Differences between the most and least able 70-year-olds become much greater than between the most and least able 50-year-olds," reported Oxford researcher Patrick Rabbitt (2006). Some 70-

year-olds perform below nearly all 20-year-olds; other 70-year-olds match or outdo the average 20-year-old.

No matter how quick or slow we are, remembering seems also to depend on the type of information we are trying to retrieve. If the information is meaningless—nonsense syllables or unimportant events or experiences—then the older we are, the more errors we are likely to make (Ward et al., 2020). If the information is *meaningful,* as was *Paradise Lost* for John Basinger, older people's rich web of existing knowledge will help them to hold it. But they may take longer than younger adults to *produce* the words and things they know. Older adults also more often experience *tip-of-the-tongue* forgetting (Ossher et al., 2012). Quick-thinking game show winners have usually been young or middle-aged adults (Burke & Shafto, 2004).

Maintaining Mental Abilities

More education earlier in life predicts better cognitive ability late in life (Lövdén et al., 2020). Psychologists who study the aging mind therefore debate whether computer-based "brain fitness" training programs can simulate education, by building mental muscles that stave off cognitive decline. Our brain remains plastic throughout life (Gutchess, 2014). So, can exercising our brains on a "cognitive treadmill"—with memory, visual tracking, and problem-solving exercises—help us avoid losing our minds? One analysis of cognitive training programs showed that they consistently improved scores on

tests related to their training (Simons et al., 2016). Video game playing may also enhance people's attention (Bediou et al., 2018).

Based on such findings, some computer game makers have been marketing daily brain-exercise programs for older adults. But researchers, after reviewing all the available studies, advise skepticism (Horne et al., 2021; Sala et al., 2021). Across more than 200 studies, brain-exercise programs improved performance on closely related tasks but not on unrelated tasks (Basak et al., 2020). As researcher Zach Hambrick (2014) explains, "Play a video game and you'll get better at that video game, and maybe at very similar video games"—but not at driving a car or filling out your tax return.



Markian Lozowchuk/Redux Pictures

Smart centenarian "I am very curious.... I wouldn't still be working if I didn't find it exciting," said pioneering neuropsychologist Brenda Milner (2017). Her landmark contributions to cognitive psychology continued at age 103 in her McGill University lab.

The Intelligence modules explore another dimension of cognitive development. As we will see, *cross-sectional studies* and *longitudinal studies* have identified mental abilities that do and do not change as people age. Age is less a predictor of memory and intelligence than is proximity to a natural death, which does give a clue to someone's mental ability. In the last three or four years of life, and especially as death approaches, cognitive decline typically accelerates (Vogel et al., 2013; Wilson et al., 2007). Researchers call this near-death drop *terminal decline* (Backman & MacDonald, 2006). Our goals also shift: We're driven less to learn and more to connect socially (Carstensen, 2011).

> **"The sudden knowledge of the fragility of his life narrowed his focus and altered his desires.... It made him visit with his grandchildren more often, put in an extra trip to see his family in India, and tamp down new ventures."** — Atul Gawande, *Being Mortal: Medicine and What Matters in the End,* 2014, describing his father's terminal condition

Neurocognitive Disorders and Alzheimer's Disease

LOQ 17-3

How do neurocognitive disorders and Alzheimer's disease affect cognitive ability?

Most people who live into their nineties do so with clear minds. Some, unfortunately, suffer substantial psychological decline that is *not* typical aging. Among older adults, hearing loss, and its associated social isolation, predicts risk of depression and accelerated mental decline (Lin et al., 2011a,b, 2013; Loughrey et al., 2018). Compared with people with good hearing, those with hearing loss show declines in memory, attention, and learning about three years earlier—but less if they get hearing aids (Maharani et al., 2018). A series of small strokes, a brain tumor, or alcohol use disorder can progressively damage the brain, causing that mental erosion we call a **neurocognitive disorder (NCD,** also called *dementia*). Heavy midlife smoking more than doubles later risk of the disorder (Rusanen et al., 2011). A common cause of NCDs is the feared brain ailment **Alzheimer's disease,** which strikes 3 percent of the world's population by age 75. Up to age 95, the incidence of mental disintegration doubles roughly every 5 years.

Alzheimer's destroys even the brightest of minds. First memory deteriorates, then reasoning. (Occasionally forgetting where you laid the car keys—the sort of "episodic memory" that subsides with typical aging—is no cause for alarm. Forgetting how to get home may suggest Alzheimer's.) Robert Sayre (1979) recalled his father shouting at his afflicted mother to "think harder," while his mother, confused, embarrassed, on the verge of tears, randomly searched the house for lost objects. As the disease runs its course, after 5 to 20 years, the person becomes emotionally flat, then disoriented and disinhibited,

then incontinent, and finally mentally vacant—a sort of living death, a mere body stripped of its humanity.

Underlying the symptoms of Alzheimer's are a loss of brain cells and a deterioration of neurons that produce the neurotransmitter acetylcholine, which is vital to memory and thinking. An autopsy reveals two telltale abnormalities in these acetylcholine-producing neurons: shriveled protein filaments in the cell body, and clumps of a free-floating protein fragment that accumulate as plaque at neuron tips where synaptic communication typically occurs. Long before symptoms appear, new technologies can now test for the Alzheimer's susceptibility gene or check spinal fluid for the culprit protein fragments (De Meyer et al., 2010; Luciano et al., 2009). Such discoveries have stimulated a race to invent and test drugs that may forestall the disease, such as by reducing the activity of a memory-inhibiting neurotransmitter called GABA (Chen et al., 2014). The discovery of 21 associated genes may help (Lambert et al., 2013).

A diminishing sense of smell and slowed or wobbly walking may foretell Alzheimer's (Belluck, 2012; Wilson et al., 2007). In people at risk for Alzheimer's, brain scans (**FIGURE 17.5**) have also revealed—before symptoms appear—the degeneration of critical brain cells and diminished activity in Alzheimer's-related brain areas (Apostolova et al., 2006; Johnson et al., 2006; Wu & Small, 2006). When people memorized words, scans also showed diffuse brain activity in those with Alzheimer's, as if more exertion was required to achieve the same performance (Bookheimer et al., 2000).

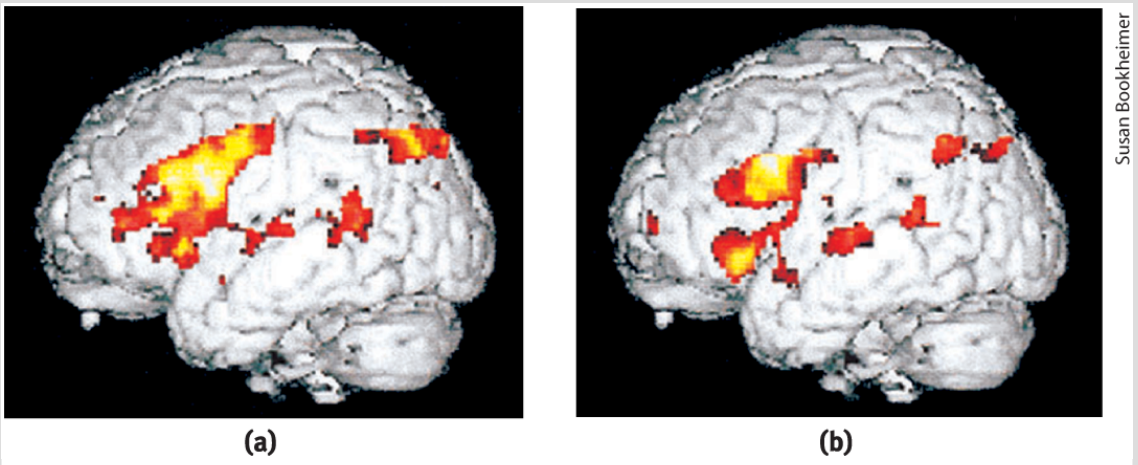


FIGURE 17.5 Predicting Alzheimer's disease During a memory test, MRI scans of the brains of people at risk for Alzheimer's (a) revealed more intense activity (yellow, followed by orange and red) when compared with healthy brains (b). As brain scans and genetic tests make it possible to identify those likely to suffer Alzheimer's, would you want to be tested? At what age?

Alzheimer's is somewhat less common among those who sleep well and who keep their minds and bodies active, through activities like reading, attending educational lectures, and running or lifting weights (Agrigoroaei & Lachman, 2011; Noble & Spires-Jones, 2019; Reynolds, 2019). In one four-decade-long study that followed nearly 1500 middle-aged Swedish women, a high fitness level delayed the onset of dementia by 9.5 years (Hörder et al., 2018). As with muscles, so with the brain: Those who use it less often lose it.

Social Development

LOQ 17-4

What themes and influences mark our social journey from early adulthood to death?

Try completing this statement five times: "I am _____."

In response, teens mostly describe their individual traits. Young adults more often define themselves in terms of their social roles, such as their occupation or being a parent (Hards et al., 2019). Many differences between teens, younger adults, and older adults are created by significant life events. A new job means new relationships, new expectations, and new demands. Marriage brings the joy of intimacy and the stress of merging two lives. The 3 years surrounding the birth of a child bring increased life satisfaction for most couples (Dyrdal & Lucas, 2011). The death of a loved one creates an irreplaceable loss. How do these life events shape the course of our adulthood?

Adulthood's Ages and Stages

As people enter their forties, they undergo a transition to middle adulthood, a time when they realize that life will soon be mostly behind instead of ahead of them. Some psychologists have argued that for many the *midlife transition* is a crisis, a time of great struggle, regret, or even feeling struck down by life. The popular image of the midlife crisis—an early-forties man who forsakes his family for a younger romantic partner and a hot sports car—is more a myth than reality. In surveys in many countries, unhappiness does *not* surge during the early forties (Galambos et al., 2020). One study of emotional instability in nearly 10,000 men and women found "not the

slightest evidence" that distress peaks anywhere in the midlife age range (McCrae & Costa, 1990).

For the 1 in 4 middle-aged adults who report experiencing a life crisis, the trigger is not age, but a major event, such as illness, divorce, or job loss (Lachman, 2004). Some middle-aged adults describe themselves as a "sandwich generation," simultaneously supporting their aging parents and their emerging adult children or grandchildren (Riley & Bowen, 2005). With others depending on their support, middle-aged adults become especially sensitive to their social status rising or falling (Weiss & Kunzmann, 2020). Later in life, status changes matter less for people's happiness.

Life events trigger transitions to new life stages at varying ages. The **social clock**—the definition of "the right time" to leave home, get a job, marry, have children, and retire—varies from era to era and culture to culture. The once-rigid sequence has loosened; the social clock still ticks, but people feel freer to keep their own time.



Rick Cruz/Pacific Daily News/AP Photo

Social-clock adjustment We don't always follow the social clock, as Genevie Chiguina and her daughter Genaray Chiguina made clear when they graduated from Guam Community College, together!

Even *chance events* can have lasting significance, by deflecting us down one road rather than another. Albert Bandura (1982, 2005) recalled the ironic true story of a book editor who came to one of Bandura's lectures on the "Psychology of Chance Encounters and Life Paths"—and ended up marrying the woman who happened to sit next to him. The sequence that led to my [DM's] authoring this book (which was not my idea) began with my being seated near, and getting to know, a distinguished colleague at an international conference. The road to my [ND's] co-authoring this book began in a similarly unplanned manner: After stumbling on an article about my professional life, DM invited me to visit his college. There, we began a conversation that resulted in our collaboration. Chance events can change our lives.

> **"The important events of a person's life are the products of chains of highly improbable occurrences."** — Joseph Traub, "Traub's Law," 2003

Adulthood's Commitments

Two basic aspects of our lives dominate adulthood. Erik Erikson called them *intimacy* (forming close relationships) and *generativity* (being productive and supporting future generations). Sigmund Freud

(1935/1960) put this more simply: The healthy adult, he said, is one who can *love* and *work*.

Love

More and more people live single lives, supported by close and loving friendships. Most eventually also pair up romantically. People typically flirt, fall in love, and commit—one person at a time. "Pair-bonding is a trademark of the human animal," observed anthropologist Helen Fisher (1993). From an evolutionary perspective, relatively monogamous pairing makes sense: Parents who cooperated to nurture their children to maturity were more likely to have their genes passed along to posterity than were parents who didn't.



Andersen Ross/Blend Images/Alamy Stock Photo

Love Intimacy, attachment, commitment—love by whatever name—is central to healthy and happy adulthood.

Adult bonds of love are most satisfying and enduring when marked by a similarity of interests and values, a sharing of emotional and material support, and intimate self-disclosure. And for better or for worse, our standards have risen over the years: We now hope not only for an enduring bond, but also for a mate who is a wage earner, caregiver, intimate friend, and warm and responsive lover (Finkel, 2017). There also appears to be "vow power." Straight and gay relationships sealed with commitment more often endure (Rosenfeld, 2014; Wilcox et al., 2019). Such bonds are especially likely to last when couples marry after age 20 and are well educated. Compared with their counterparts of 70 years ago, people in Western countries *are* better educated and marrying much later—7–8 years later for first marriages in the United States (U.S. Census Bureau, 2021). These trends may help explain why the U.S. divorce rate, which surged from 1960 to 1980, has since declined.

"Still married after all these years?
No mystery.
We are each other's habit,
And each other's history."
— Judith Viorst, "The Secret of Staying Married," 2007

Might test-driving life together minimize divorce risk? In Europe, Canada, and the United States, those who live together before marriage (and especially before engagement) have had *higher* rates of divorce and marital dysfunction than those who did not (Rosenfeld & Roesler, 2019, 2021). Across developed countries, cohabiting partners were more likely than married spouses to agree that they have had recent serious doubts their relationship will last (Wang & Wilcox, 2019). Three factors contribute. First, those who live together tend to be initially less committed to the idea of enduring marriage. Second, they may become even less marriage-supporting while living together. Third, it's more awkward to break up with a cohabiting partner than with a dating partner, leading some cohabiters to marry someone "they otherwise would have left behind" (Stanley & Rhoades, 2016a,b).

Although there is more variety in relationships today, the institution of marriage endures. In Western countries, what counts as a "very important" reason to marry? Among Americans, 31 percent say financial stability, and 93 percent say love (Cohn, 2013). And marriage is a predictor of happiness, sexual satisfaction, income, and physical and mental health (Scott et al., 2010; Wilcox & Wolfinger, 2017). Between 1972 and 2018, surveys of more than 60,000 Americans revealed that 40 percent of married adults were "very happy," compared with 23 percent of those never married (NORC, 2019). Gay and lesbian adults similarly report greater happiness if married. Moreover, neighborhoods with high marriage rates typically have low rates of social pathologies such as crime, delinquency, and emotional

disorders among children (Myers & Scanzoni, 2005; Wilcox et al., 2018).

> What do you think? Does marriage correlate with happiness because marital support and intimacy breed happiness, because happy people more often marry and stay married, or both?

Relationships that last are not always devoid of conflict. Some couples fight but also shower each other with affection. Other couples never raise their voices yet also seldom praise each other or nuzzle. Both styles can last. After observing the interactions of 2000 couples, John Gottman and Julie Gottman (2018) reported one indicator of marital success: at least *a five-to-one ratio of positive to negative interactions.* Stable marriages provide five times more instances of smiling, touching, complimenting, and laughing than of sarcasm, criticism, and insults. So, if you want to predict which couples will stay together, don't pay attention to how passionately they are in love. The pairs who make it are more often those who refrain from putting down their partners. To prevent a cancerous negativity, successful couples learn to fight fair (to state feelings without insulting) and to steer conflict away from chaos with comments like "I know it's not your fault" or "I'll just be quiet for a moment and listen."

Often, love bears children. For most people, this most enduring of life changes is a happy event—one that adds occasional stress but also meaning, joy (Nelson-Coffey et al., 2019; Witters, 2014). "I feel an

overwhelming love for my children unlike anything I feel for anyone else," said 93 percent of U.S. mothers in a national survey (Erickson & Aird, 2005). Many fathers feel the same. A few weeks after the birth of my first child I [DM] was suddenly struck by a realization: "So *this* is how my parents felt about me!"

> **"To understand your parents' love, bear your own children."** — Chinese proverb

When children begin to absorb time, money, and emotional energy, parents' satisfaction with their own relationship may decline (Doss et al., 2009). This is especially likely among employed women who, more than they expected, may also carry the burden of doing more chores at home. Putting effort into creating an equitable relationship can thus pay double dividends: greater satisfaction, which breeds better parent-child relations (Erel & Burman, 1995).

Eventually, children leave home. This departure is a significant and sometimes difficult event. But for most people, an empty nest is a happy place (Adelmann et al., 1989; Gorchoff et al., 2008). Many parents experience a "postlaunch honeymoon," especially if they maintain close relationships with their children (White & Edwards, 1990). As Daniel Gilbert (2006) said, "The only known symptom of 'empty nest syndrome' is increased smiling."

"Our love for children is so unlike any other human emotion. I fell in love with my babies so quickly and profoundly, almost completely independently of their particular qualities. And yet 20 years later I was (more or less) happy to see them go—I had to be happy to see them go. We are totally devoted to them when they are little and yet the most we can expect in return when they grow up is that they regard us with bemused and tolerant affection." — Developmental psychologist Alison Gopnik, "The Supreme Infant," 2010

Work

For many adults, the answer to "Who are you?" depends a great deal on the answer to "What do you do?" Choosing a career path is difficult, especially during uncertain economic times. Even in the best of times, few students in their first 2 years of college or university can predict their later careers.





Left: © Jose Luis Pelaez Inc/Blend Images/Corbis; right: Hill Street Studios/Getty Images

Job satisfaction and life satisfaction Work can provide us with a sense of identity and competence, and opportunities for accomplishment. Perhaps this is why challenging and interesting occupations enhance people's happiness. For more on work, including discovering your own strengths, see Appendix C, Psychology at Work.

In the end, happiness is about having work that fits your interests and provides you with a sense of competence and accomplishment. It is giving generously of your time and resources (Mogilner & Norton, 2016; Whillans et al., 2016). It is having a close, supportive companion, or family and friends, who notice and cheer your accomplishments (Campos et al., 2015). And for some, it includes having children who love you and whom you love and feel proud of.

Retrieval Practice

RP-1 Freud defined the healthy adult as one who is able to _____ and to _____.

ANSWERS IN APPENDIX E

Well-Being Across the Life Span

LOQ 17-5

How does our well-being change across the life span?

To live is to grow older. This moment marks the oldest you have ever been and the youngest you will henceforth be. That means we all can look back with satisfaction or regret, and forward with hope or dread. When asked what they would have done differently if they could relive their lives, people's most common answer has been "taken my education more seriously and worked harder at it" (Kinnier & Metha,

1989; Roese & Summerville, 2005). Other regrets—"I should have told my father I loved him," "I regret that I never went to Europe"—have also focused less on mistakes made than on the things one *failed* to do (Gilovich & Medvec, 1995).

Cultures differ in their expectations for old age. Older adults from a Western cultural tradition tend to live independently and to seek experiences, such as ticking off items on their "bucket list" (Kitayama et al., 2020; Tsai et al., 2018). My [ND] own grandmother fit this mold, by living independently until age 97. In East Asian cultures, older adults more often live with family and help care for grandkids.

Until the very end, the over-65 years are not notably unhappy. Self-esteem and psychological well-being remain stable (Jebb et al., 2020). Gallup asked 952,739 people in 150 countries to rate their lives on a ladder from 0 ("the worst possible life") to 10 ("the best possible life"). Age—from 15 to over 90 years—gave no clue to life satisfaction (Joshanloo & Jovanović, 2021). Positive feelings, supported by enhanced emotional control, tend to grow after midlife, and negative feelings subside (Stone et al., 2010; Urry & Gross, 2010). Compared with younger Chinese and U.S. adults, for example, older adults are *more* attentive to positive news (Isaacowitz, 2012; J. Wang et al., 2015). And while young adults' depression levels rose during the Covid-19 pandemic, older adults were more emotionally resilient (Daly et al., 2021; Klaiber et al., 2021; Pierce et al., 2020).

Like people of all ages, older adults are happiest when not alone (FIGURE 17.6). Compared with teens and young adults, older adults do tend to have a smaller social network, with fewer friendships and greater loneliness (Luhmann & Hawkley, 2016; Wagner et al., 2016). Older adults become less extraverted with a shrinking social network (Dunbar, 2021; Oltmanns et al., 2020), but they experience fewer problems in their relationships—less attachment anxiety, stress, and anger (Chopik et al., 2013; Fingerman & Charles, 2010). With age, we become more trusting, more helpful, and more generous (Bailey & Leon, 2019; Mayr & Freund, 2020; Sparrow et al., 2021).

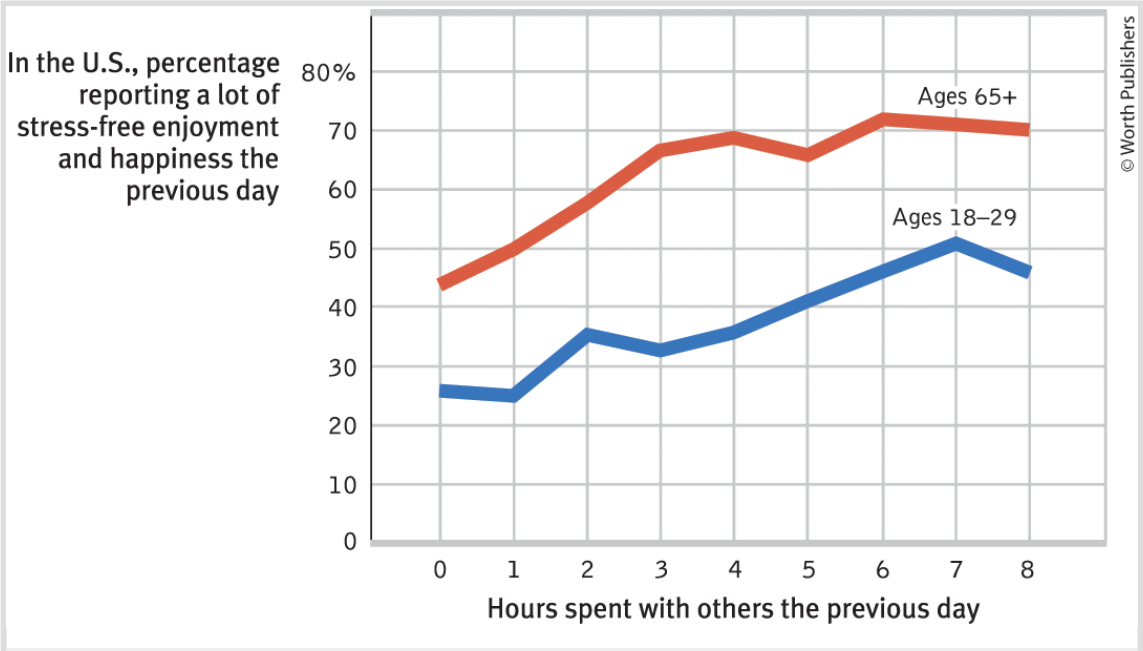


FIGURE 17.6 We are social creatures Both younger and older adults report greater happiness when spending time with others. (Note: This correlation could also reflect happier people being more social.) (Gallup survey data reported by Crabtree, 2011.)

The aging brain may help nurture positive feelings. Brain scans of older adults show that the amygdala, a neural processing center for emotions, responds less actively to negative events, but still responds to positive events (Mather et al., 2004). Brain-wave reactions to negative images also diminish with age (Kisley et al., 2007). As we reach the later chapters of our lives, our brain enables a contented culmination (Mather, 2016).

> **"When you were born, you cried and the world rejoiced. Live your life in a manner so that when you die the world cries and you rejoice."** — Cherokee proverb

Moreover, unlike younger people, older adults remember the good more than the bad events of their lives (Addis et al., 2010). This happy phenomenon leaves most older people with the comforting feeling that life, on balance, has been mostly good. Biological, psychological, and social-cultural influences help explain why more and more people flourish into later life (**FIGURE 17.7**).

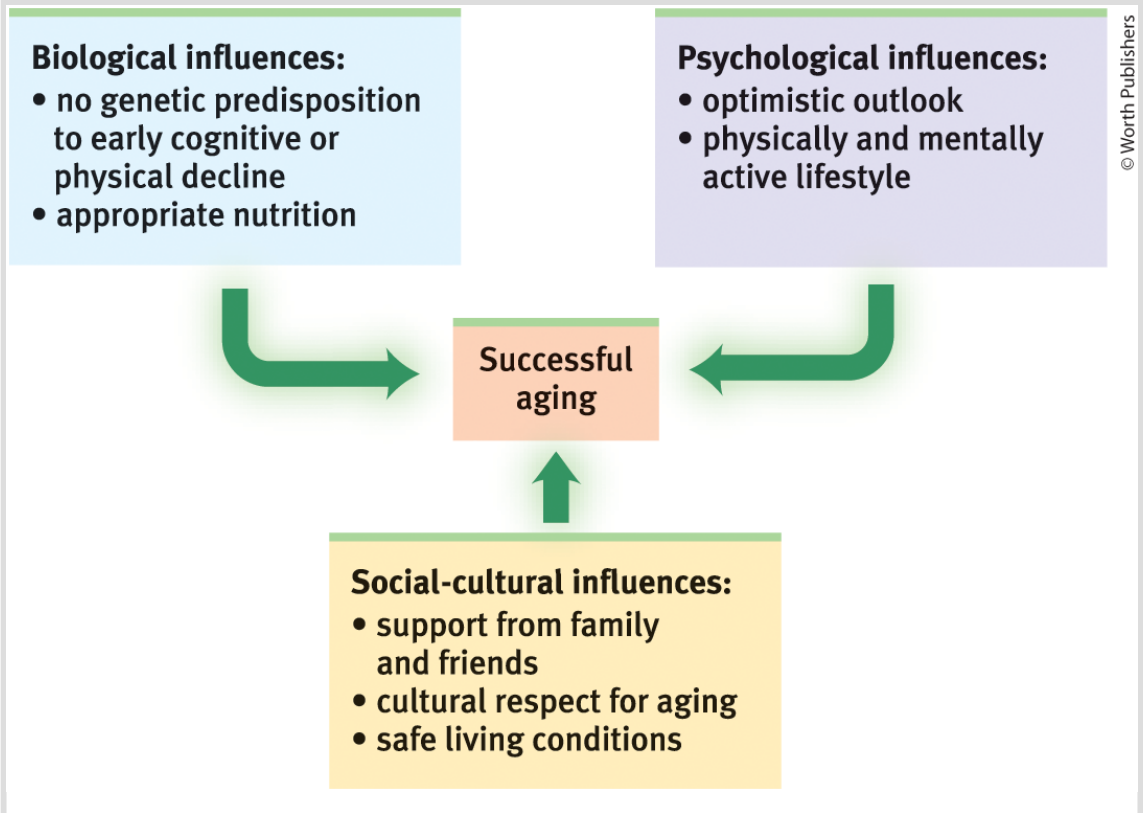


FIGURE 17.7 Biopsychosocial influences on successful aging

"At 70, I would say the advantage is that you take life more calmly. You know that 'this, too, shall pass'!" — Eleanor Roosevelt, 1954

The resilience of well-being across the life span obscures some interesting age-related emotional differences. As the years go by, feelings mellow (Brose et al., 2015). Highs become less high, lows less low. Compliments provoke less elation and criticisms less despair, as both become merely additional feedback atop a mountain of

accumulated praise and blame. As we age, life therefore becomes less of an emotional roller coaster.

> **"The best thing about being 100 is *no peer pressure.*"** — Lewis W. Kuester, 2005, on turning 100

Retrieval Practice

RP-2 What are some of the most significant challenges and rewards of growing old?

ANSWERS IN APPENDIX E

Death and Dying

LOQ 17-6

What range of reactions does a loved one's death trigger?

"Time is a great teacher," noted the nineteenth-century composer Hector Berlioz, "but unfortunately it kills all its pupils" (Citron, 1989).

Most of us will also cope with the deaths of relatives and friends. Typically, the most difficult separation a person experiences is the death of a partner—a loss suffered by four times more women than men. That's because it's common for women to marry men who are

older than them, and also because, as noted earlier, women worldwide outlive men by more than 4 years (Ritchie, 2019; WHO, 2019).

Maintaining everyday engagements and relationships increases resilience in the face of such a loss (Infurna & Luthar, 2016). But grief is the price of love. And for some, grief is severe, especially when a loved one's death comes suddenly and before its expected time on the social clock. I [ND] experienced this when a tragic accident claimed the life of my mother at age 60. Such tragedies may trigger a year or more of memory-laden mourning, especially for those with few close, supportive relationships (Lehman et al., 1987; Smith et al., 2020).

Some losses can be unbearable. For example, one Danish long-term study of more than 1 million people found that about 17,000 of them had suffered the death of a child under 18. In the 5 years following that death, 3 percent of them had a first psychiatric hospitalization—a 67 percent higher rate than among other parents (Li et al., 2005).

Reactions to a loved one's death range more widely than most suppose. Some cultures encourage public weeping and wailing; others hide grief. Within any culture, individuals differ. Given similar losses, some people grieve hard and long, others less so (Ott et al., 2007). Some popular misconceptions persist, however:

- ***Are there stages of grieving?*** Terminally ill and bereaved people do not go through identical predictable stages, such as denial

before anger (Friedman & James, 2008; Nolen-Hoeksema & Larson, 1999).

- ***Should we purge our grief?*** Those who express the strongest grief immediately do not purge their grief more quickly (Bonanno & Kaltman, 1999; Wortman & Silver, 1989). But grieving parents who try to protect their partner by "staying strong" and not discussing their child's death may actually prolong the grieving (Stroebe et al., 2013).
- ***Is therapy needed?*** Bereavement therapy and self-help groups offer support, but there is similar healing power in the passing of time, the support of friends, and the act of giving support and help to others (Baddeley & Singer, 2009; Brown et al., 2008; Neimeyer & Currier, 2009). Grieving spouses who talk often with others or receive grief counseling adjust about as well as those who grieve more privately (Bonanno, 2004; Stroebe et al., 2005).
- ***Is impending death terrifying?*** Compared to what people *imagine* they would feel when facing death, those actually facing imminent death due to terminal illness are more positive and less sad and despairing. After studying terminally ill patients' blog posts and death row inmates' last words, Amelia Goranson and her colleagues (2017) concluded that "Meeting the grim reaper may not be as grim as it seems."

Facing death with dignity and openness helps people complete the life cycle with a sense of life's meaningfulness and unity—the sense that their existence has been good and that life and death are parts of an ongoing cycle. Although death may be unwelcome, life itself can be

affirmed even at death. This is especially so for people who review their lives not with despair but with what Erik Erikson called a sense of *integrity*—a feeling that one's life has been meaningful and worthwhile.

"When you're young and strong and healthy, and life stretches ahead of you, living isn't really important at all.... But old people know how valuable life is and how interesting." — Agatha Christie's Miss Marple, in *A Caribbean Mystery,* 1964

REVIEW

MODULE 17: Adulthood

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 17-1: What physical changes occur during middle and late adulthood?

LOQ 17-2: How does memory change with age?

LOQ 17-3: How do neurocognitive disorders and Alzheimer's disease affect cognitive ability?

LOQ 17-4: What themes and influences mark our social journey from early adulthood to death?

LOQ 17-5: How does our well-being change across the life span?

LOQ 17-6: What range of reactions does a loved one's death trigger?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

menopause
neurocognitive disorders (NCDs)
Alzheimer's disease
social clock

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. By age 65, a person would be most likely to experience a cognitive decline in the ability to
   a. recall and list all the important terms and concepts in a text module.
   b. select the correct definition in a multiple-choice question.
   c. recall their own birth date.
   d. practice a well-learned skill, such as knitting.

2. Freud defined the healthy adult as one who is able to love and work. Erikson agreed, observing that the adult struggles to attain intimacy and _____.

3. Contrary to what many people assume,
   a. older people are significantly less happy than adolescents are.
   b. people become less happy as they move from their teen years into midlife.
   c. positive feelings tend to grow after midlife.
   d. those whose children have recently left home—the empty nesters—have the lowest level of happiness of all groups.

CHAPTER 6
Sensation and Perception (Modules 18–20)



E+/Getty Images

MODULE 18 Basic Concepts of Sensation and Perception

Processing Sensations and Perceptions

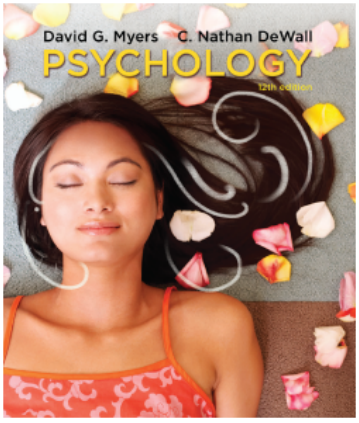
Transduction

Thresholds

THINKING CRITICALLY ABOUT: Subliminal Stimulation and Subliminal Persuasion
Sensory Adaptation
Perceptual Set
Context, Motivation, and Emotion
MODULE 19 Vision: Sensory and Perceptual Processing
Light Energy and Eye Structures
Information Processing in the Eye and Brain
Perceptual Organization
Perceptual Interpretation
MODULE 20 Hearing, Skin, Chemical, and Body Senses
Hearing
Skin, Chemical, and Body Senses
Sensory Interaction
Perception Without Sensation?

Indiana Adams awoke on New Year's Day in 2020, wanting to buy her husband exercise equipment. As she scrolled through the social media marketplace, a used psychology textbook cover caught her attention. Adams' vision is perfect, but her perception is not. A former model and actor, Adams noted that the woman on the textbook cover wore clothes that evoked memories of one of her photoshoots. But Adams has *prosopagnosia*—face blindness—which means she can't even recognize her own face.

She went into her bedroom and showed her husband the picture. "That's you!" he said. And we [DM and ND] were that textbook's authors.



Could that be me?

People with face blindness sometimes struggle socially. On one occasion, Adams was shopping and complimented another woman on her cute clothes. When the woman didn't respond, Adams quickly realized she was actually looking at herself in the mirror—and talking to her own reflection! Others with face blindness report experiencing distress when they confuse coworkers and strangers with loved ones. Face blind people sometimes pretend to recognize people, just in case they turn out to be someone they know. One woman found a way to use her face blindness to build friendships (Dingfelder, 2019). "When I was walking to class, if someone seemed to look my way, I smiled. If they smiled, I stopped to chat," she said. "Before long, the whole campus was brimming with close, personal friends of mine."

Unlike people with face blindness, most of us have a functioning area on the underside of our brain's right hemisphere that helps us recognize a familiar human face, including our own, as soon as we detect it—in only one-seventh of a second (Jacques & Rossion, 2006).

Our remarkable ability illustrates a broader principle: *Nature's sensory gifts enable each animal to obtain essential information.* Other examples:

- Human ears are most sensitive to sound frequencies that include human voices, especially a baby's cry.
- Frogs, which feed on flying insects, have cells in their eyes that fire only in response to small, dark, moving objects. A frog could starve to death knee-deep in motionless flies. But let one zoom by and the frog's "bug detector" cells snap awake. (As Kermit the Frog said, "Time's fun when you're having flies.")
- Male silkworm moths' odor receptors can detect one-billionth of an ounce of chemical sex attractant per second, released by a female silkworm one mile away (Sagan, 1977). That is why there continue to be silkworms.

In these modules, we'll look at what psychologists have learned about how we sense and perceive our world. Module 18 begins by considering some basic principles. In Module 19, we take a close look at sensory and perceptual processes in vision. Finally, Module 20 reviews our hearing, skin, chemical, and body senses.

MODULE 18: Basic Concepts of Sensation and Perception

How do we create meaning from the blizzard of sensory stimuli that bombards our bodies 24 hours a day? In its silent, cushioned, inner world, our brain floats in utter darkness. By itself, it sees nothing. It hears nothing. It feels nothing. *So, how does the world out there get in?* To phrase the question scientifically: How do we construct our representations of the external world? How do a campfire's flicker, crackle, heat, and smoky scent activate neural connections? And how, from this living neurochemistry, do we create our conscious experience of the fire's motion and temperature, its aroma and beauty?

Processing Sensations and Perceptions

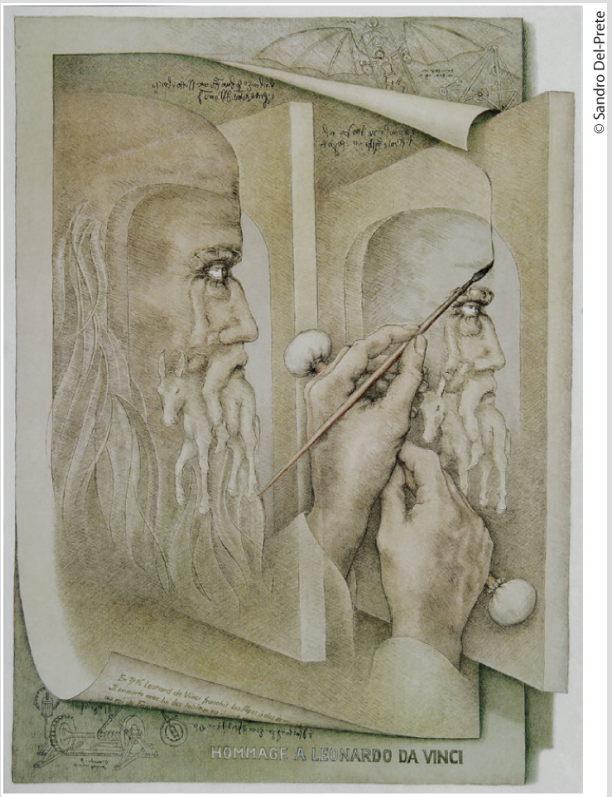
Learning Objective Question LOQ 18-1

What are *sensation* and *perception?* What do we mean by *bottom-up processing* and *top-down processing?*

Indiana Adams' curious mix of "perfect vision" and face blindness illustrates the distinction between *sensation* and *perception.* When she looks at a friend, her **sensation** is normal. Her **sensory receptors**

detect the same information any sighted person's would, and her nervous system transmits that information to her brain. Her **perception**—the processes by which her brain organizes and interprets sensory input—is *almost* normal. Thus, she may recognize people from their hair, gait, voice, or particular physique, just not from their face. Her experience is much like the struggle any human would have trying to recognize a specific penguin.

Under normal circumstances, sensation and perception blend into one continuous process. As your brain absorbs the information in **FIGURE 18.1**, **bottom-up processing** enables your sensory systems to detect the lines, angles, and colors that form the images. Using **top-down processing**, you interpret what your senses detect. Our perceived world is our brain's explanation of incoming sensations.



© Sandro Del-Prete

FIGURE 18.1 What's going on here? Our sensory and perceptual processes work together to help us sort out complex images, including the hidden donkey rider in Sandro Del-Prete's drawing, *Homage to Leonardo da Vinci.*

Transduction

LOQ 18-2

What three steps are basic to all of our sensory systems?

Your sensory systems perform an amazing feat: They convert outside energy into a form our brain can use. Vision processes light energy. Hearing processes sound waves. All our senses

- ***receive*** sensory stimulation, often using specialized receptor cells,
- ***transform*** that stimulation into neural impulses, and
- ***deliver*** the neural information to our brain.

The process of converting one form of energy into another that our brain can use is called **transduction.** Transduction is rather like translation—of a physical energy such as light waves into the brain's electrochemical language. **Psychophysics** studies the relationships between the physical energy we can detect and its effects on our psychological experiences.

How do we see? Hear? Feel pain? Taste? Smell? Keep our balance? In each case, one of our sensory systems receives, transforms, and delivers the information to our brain. And our senses work together.

Let's first explore some strengths and weaknesses in our ability to detect and interpret stimuli in the sea of energy around us.

Retrieval Practice

RP-1 What is the rough distinction between sensation and perception?

ANSWERS IN APPENDIX E

Thresholds

LOQ 18-3

How do *absolute thresholds* and *difference thresholds* differ?

At this moment, we are being struck by X-rays and radio waves, ultraviolet and infrared light, and sound waves of very high and very low frequencies. To all of these we are blind and deaf. Other animals with differing needs detect a world that lies beyond our experience. Migrating birds stay on course aided by an internal magnetic compass. Bats and dolphins locate prey using sonar, bouncing echoing sound off objects. Bees navigate on cloudy days by detecting invisible (to us) polarized light.

Our senses open the shades just a crack, allowing us a restricted awareness of this vast sea of energy. But for our needs, this is enough.

Absolute Thresholds

To some stimuli we are exquisitely sensitive. Standing atop a mountain on an utterly dark, clear night, most of us could see a candle flame atop another mountain 30 miles (nearly 50 kilometers) away. We could feel the wing of a bee falling on our cheek. We could

smell a single drop of perfume in a three-room apartment (Galanter, 1962).

German scientist and philosopher Gustav Fechner (1801–1887) studied the edge of our awareness of these faint stimuli, which he called an **absolute threshold.** To test your absolute threshold for sounds, a hearing specialist would send tones, at varying levels, into each of your ears and record whether you could hear each tone (FIGURE 18.2). The test results would show the point where, for any sound frequency, half the time you could detect the sound and half the time you could not. That 50-50 point would define your absolute threshold.

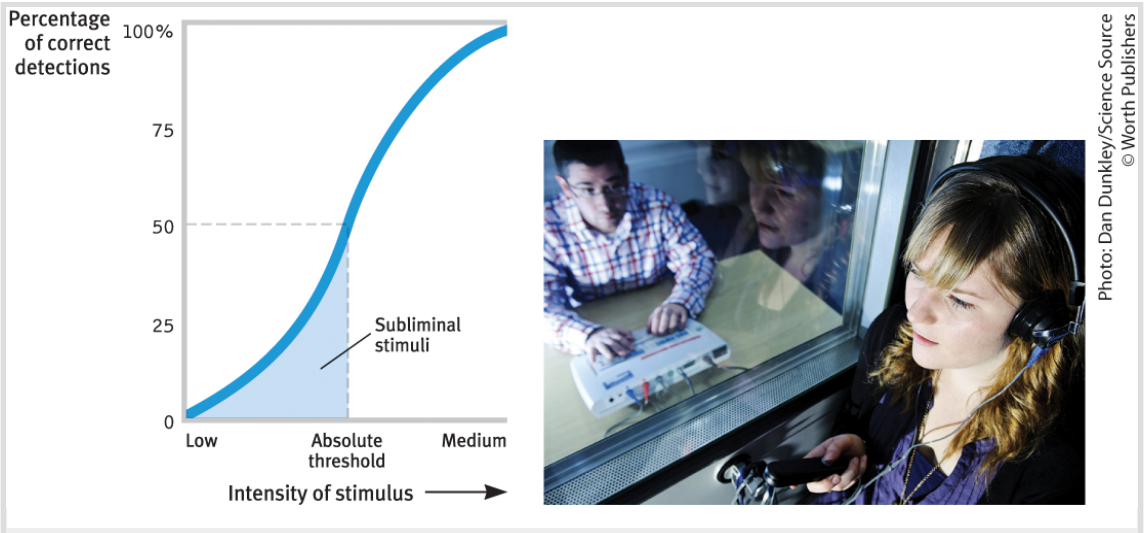


FIGURE 18.2 Threshold detected Hearing tests locate our thresholds for various sound frequencies.

Detecting a weak stimulus, or signal (such as a hearing-test tone), depends not only on its strength but also on our psychological state—our experience, expectations, motivation, and alertness. Signal

detection theory predicts when we will detect weak signals (measured as our ratio of "hits" to "false alarms"). Signal detection theorists seek to understand why people respond differently to the same stimuli, and why the same person's reactions vary as circumstances change.



Tamara Collins/Delphinus Medical Technologies, Inc.

Signal success When reading mammograms, health professionals seek to detect the presence of a faint cancer stimulus *(signal)* amid background stimulation *(noise),* and without raising false alarms. New 3-D ultrasound breast-imaging technologies aim to clarify the signal and reduce the rate of false positive results.

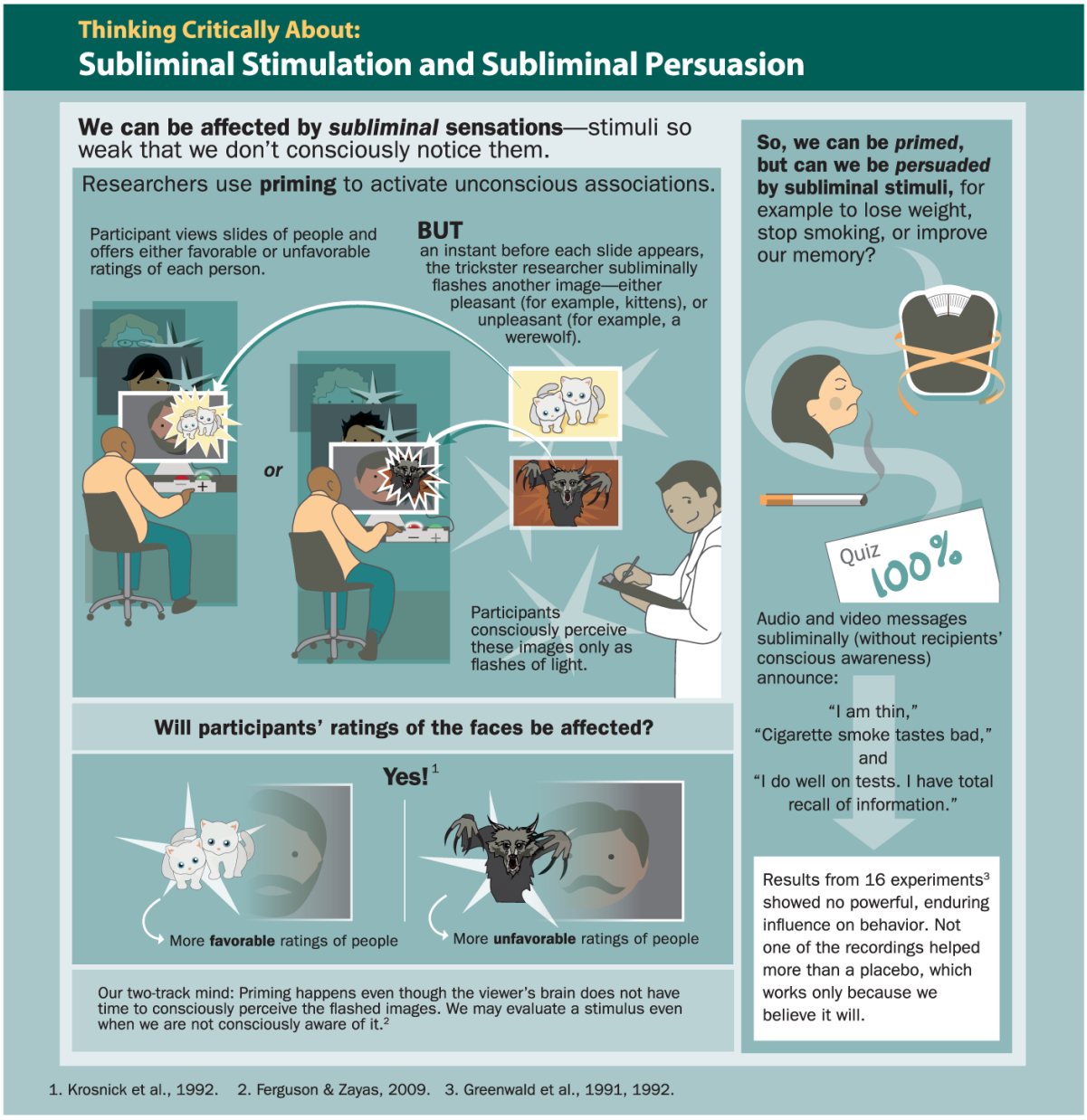
Stimuli you cannot consciously detect 50 percent of the time are **subliminal**—below your absolute threshold (Figure 18.2). One experiment using subliminal stimuli illustrated the deep reality of sexual orientation. As people gazed at the center of a screen, a nude person's photo was flashed on one side and a scrambled version of the photo on the other side (Jiang et al., 2006). Because a colored checkerboard immediately masked the nude images, viewers

consciously perceived nothing but flashes of color and so were unable to state on which side the nude had appeared. To test whether this unseen image had unconsciously attracted their attention, the experimenters then flashed a geometric figure on one side or the other. This, too, was quickly followed by a masking stimulus. When asked to give the figure's angle, straight men guessed more accurately when it appeared where a nude *woman* had been a moment earlier. Gay men and straight women guessed more accurately when the geometric figure replaced a nude *man*. Though not consciously perceived, the more appealing sexual image had drawn their attention.

This experiment indicates that sexual orientation is something deeper than a conscious choice. And it illustrates how the unconscious mind is like the wind: We don't see it, but we see its effects. When your own face appears on a screen faster than you can perceive it consciously, researchers can nevertheless detect your brain's response (Wójcik et al., 2019). The brain knows what the conscious mind doesn't. So, can we be *controlled* by subliminal messages? (See Thinking Critically About: Subliminal Stimulation and Subliminal Persuasion.)

LOQ 18-4

How are we affected by subliminal stimulation?



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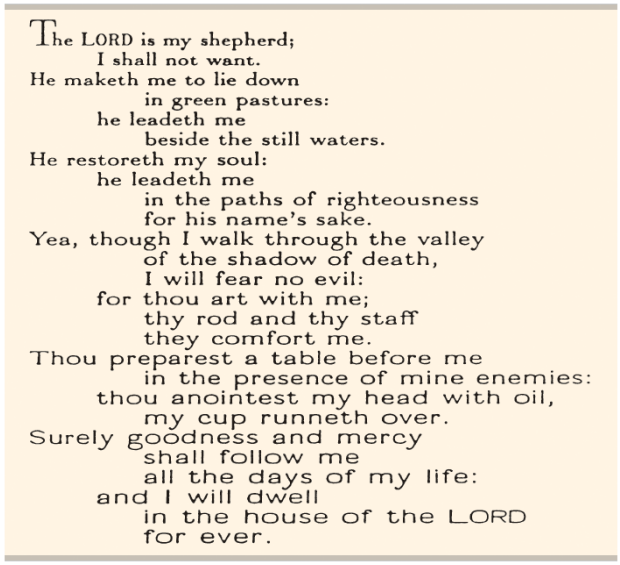
Difference Thresholds

To function effectively, we need absolute thresholds low enough to allow us to detect important sights, sounds, textures, tastes, and smells. We also need to detect small differences among stimuli. A

musician must detect minute discrepancies when tuning an instrument. Parents must detect the sound of their own child's voice amid other children's voices. Even after 2 years of living in Scotland, all lamb *baa*s sounded alike to my [DM's] ears. But not to lamb mothers. After shearing, I observed, each ewe would streak directly to the *baa* of *her* lamb amid the chorus of other distressed lambs.



The **difference threshold** (or the *just noticeable difference [jnd]*) is the minimum stimulus difference a person can detect half the time. That detectable difference increases with the size of the stimulus. If we listen to our music at 40 decibels, we might barely detect an added 5 decibels (the jnd). But if we increase the volume to 110 decibels, we probably won't detect an additional 5-decibel change.



The difference threshold In this copy of the Twenty-third Psalm, each line of the typeface increases in size slightly. How many lines are required for you to experience a just noticeable difference?

In the late 1800s, German physician Ernst Weber described a principle so simple and so widely applicable that we still refer to it as **Weber's law:** For an average person to perceive a difference, two stimuli must differ by a constant minimum *percentage* (not a constant *amount*). The exact percentage varies, depending on the stimulus. Two lights, for example, must differ in intensity by 8 percent. Two objects must differ in weight by 2 percent. And two tones must differ in frequency by only 0.3 percent (Teghtsoonian, 1971).

Retrieval Practice

RP-2 Using sound as your example, explain how these concepts differ: *absolute threshold, subliminal stimulation,* and *difference threshold.*

ANSWERS IN APPENDIX E

Sensory Adaptation

LOQ 18-5

What is the function of sensory adaptation?

It's one of life's little curiosities: You may not notice a fan's noise until it's turned off. The same is true for odors. Sitting down on the bus, you are struck by your seatmate's heavy perfume. You wonder how they endure it, but within minutes you no longer notice. **Sensory adaptation** has come to your rescue. When constantly exposed to an unchanging stimulus, we become less aware of it because our nerve cells fire less frequently. (To experience sensory adaptation, put a rubber band around your wrist. You will feel it—but only for a few moments.)

"We need above all to know about changes; no one wants or needs to be reminded 16 hours a day that [their] shoes are on." — Neuroscientist David Hubel (1979)

Why, then, if we stare at an object without flinching, does it *not* vanish from sight? Because, unnoticed by us, our eyes are always moving. This continual flitting from one spot to another ensures that stimulation on the eyes' receptors continually changes (FIGURE 18.3).



FIGURE 18.3 The jumpy eye Our gaze jumps from one spot to another every third of a second or so. Eye-tracking equipment recorded a person's eye movements while they looked at this photograph of Edinburgh's Princes Street Gardens (Henderson, 2007). The circles represent visual fixations, and the numbers indicate the time of fixation in milliseconds (300 milliseconds = 3/10ths of a second).

What if we actually could stop our eyes from moving? Would sights seem to vanish, as odors do? To find out, psychologists have devised ingenious instruments that maintain a constant image on the eye's inner surface. Imagine that we have fitted a volunteer, Mary, with such an instrument—a miniature projector mounted on a contact lens. When Mary's eye moves, the image from the projector moves as well. So everywhere that Mary looks, the scene is sure to go. Can you guess the weird result? (See **FIGURE 18.4**.)

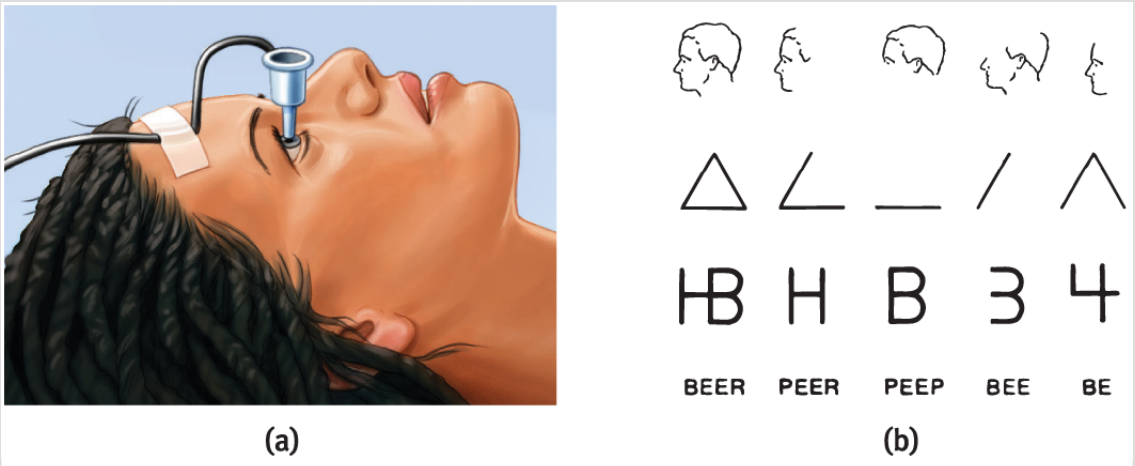


FIGURE 18.4 Sensory adaptation: Now you see it, now you don't! (a) A projector mounted on a contact lens makes the projected image move with the eye. (b) Initially, the person sees the stabilized image. But thanks to sensory adaptation, her eye soon becomes accustomed to the unchanging stimulus. Rather than the full image, she begins to see fragments fading and reappearing.

Although sensory adaptation reduces our sensitivity, it offers an important benefit: freedom to focus on our environment's informative changes. Technology companies understand the attention-grabbing power of changing stimulation: Our phone's notifications are hard to

ignore. If we're performing other tasks, these intrusions can harm our performance (Stothart et al., 2015).

The point to remember: Our sensory system is alert to novelty; bore it with repetition and it frees our attention for more important things. *We perceive the world not exactly as it is, but as it is useful for us to perceive it.*

Ask Yourself

In the last day, what types of sensory adaptation have you experienced?

Retrieval Practice

RP-3 Why is it that after wearing shoes for a while, you cease to notice them (until questions like this draw your attention back to them)?

ANSWERS IN APPENDIX E

Perceptual Set

LOQ 18-6

How do our expectations, contexts, motivation, and emotions influence our perceptions?

To see is to believe. As we less fully appreciate, to believe is to see. Through experience, we come to expect certain results. Those expectations may give us a **perceptual set**, a set of mental tendencies and assumptions that affects, top-down, what we hear, taste, feel, and see. Consider **FIGURE 18.5**.

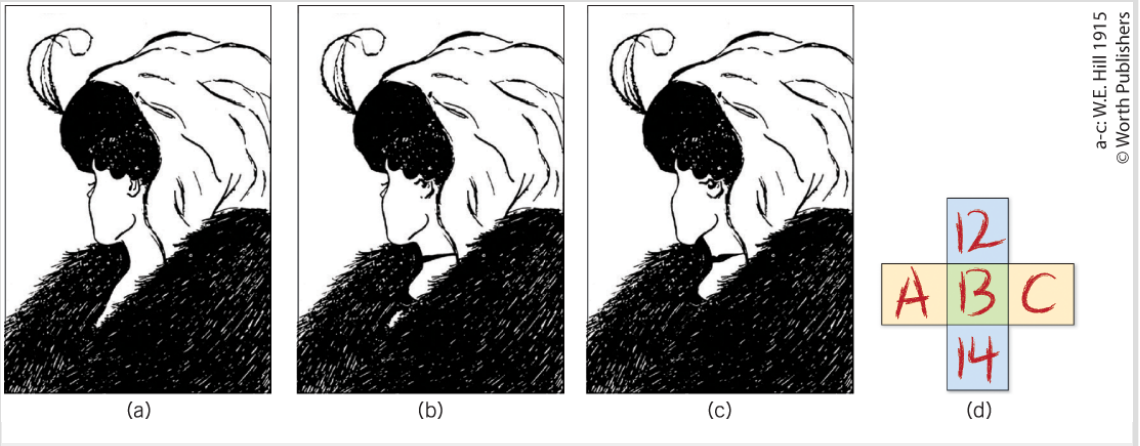


FIGURE 18.5 Two examples of perceptual set Show a friend *either* image (a) or image (c). Then show image (b) and ask, "What do you see?" Whether your friend reports seeing an old woman's face or young woman's profile may depend on which of the other two drawings they viewed first. In images (a) and (c), the meaning is clear, and it will establish perceptual expectations (Boring, 1930). In image (d), do you perceive a number or letter in the middle? If you read from left to right, you likely perceive a letter. But if you read from top to bottom, you may perceive the same center image as a number.

Everyday examples abound of perceptual set—of "mind over mind." In 1972, a British newspaper published unretouched photographs of a "monster" in Scotland's Loch Ness, proclaiming them "the most amazing pictures ever taken." If this information creates in you the same expectations it did in most of the paper's readers, you, too, will see the monster in a similar photo in **FIGURE 18.6**. But when a

skeptical researcher approached the original photos with different expectations, he saw a curved tree limb—as had others the day that photo was shot (Campbell, 1986). What a difference a new perceptual set makes.



Keystone/Hulton Archive/Getty Images

FIGURE 18.6 Believing is seeing What do you perceive? Is this Nessie, the Loch Ness monster, or a log?

Perceptual set also affects what we hear—"stuffy nose" or "stuff he knows"? Consider the kindly airline pilot who, on a takeoff run, looked over at his sad co-pilot and said, "Cheer up." Expecting to hear the usual "Gear up," the co-pilot promptly raised the wheels—before they left the ground (Reason & Mycielska, 1982). Or ask the little boy who loved the prelude to Major League Baseball games when people rose to sing to him: "José, can you see?" Or tell people about a couple who suffered from their experience with some "bad sects" and (depending on what's on their mind) they may hear something quite different ("bad sex").

Our expectations can influence our taste perceptions, too. In one experiment, by a 6-to-1 margin, preschool children thought french fries tasted better when served in a McDonald's bag rather than a plain white bag (Robinson et al., 2007). Another experiment invited campus bar patrons at Massachusetts Institute of Technology to sample free beer (Lee et al., 2006). When researchers added a few drops of vinegar to a brand-name beer and called it "MIT brew," the tasters preferred it—unless they had been told they were drinking vinegar-laced beer. In that case, they expected, and usually experienced, a worse taste.



Will Santino/CartoonStock

"Can I see your I.D? Wait, never mind. Wait—yeah, I need to see your I.D? Wait—"

What determines our perceptual set? Through experience, we form concepts, or *schemas,* that organize and interpret unfamiliar information. Our preexisting schemas for monsters and tree limbs influence how we apply top-down processing to interpret ambiguous sensations.

In everyday life, stereotypes—about culture, ethnicity, gender identity, sexual orientation, income, age, abilities, and more—can color perception. People (especially children) have, for example, perceived new baby "David" as bigger and stronger than when the same infant was called "Diana" (Stern & Karraker, 1989). Some differences, it seems, exist merely in the eyes of their beholders.

Context, Motivation, and Emotion

Perceptual set influences how we interpret stimuli. But our immediate context, and the motivation and emotion we bring to a situation, also affect our interpretations.

Context

Social psychologist Lee Ross invites us to recall our own perceptions in different contexts: "Ever notice that when you're driving you hate … the way [pedestrians] saunter through the crosswalk, almost daring you to hit them, but when you're walking you hate drivers?" (Jaffe, 2004). Our expectations influence our perceptions constantly: Why is that person standing so close while speaking to me *(is this a threat, or just a cultural difference)*? Or so far away *(is it disinterest, or just their usual behavior)*?



Inti St. Clair/Getty Images

Hearing hype Why do people pay millions of dollars for old Italian violins? Many people believe the sound quality is unmatched. But a recent study showed that, under blind conditions, expert violin soloists generally preferred the sound of less expensive, modern violins over expensive, old Italian violins (C. Fritz et al., 2017).

Some other examples of the power of context:

- Imagine that you are exposed to only part of a conversation and hear the words "eel is on the wagon." Likely, you would actually perceive the first word as *wheel.* If, however, you'd heard the words "eel is on the orange," you would more likely perceive the first word as *peel.* In each case, the context creates an expectation that, top-down, influences our perception (Grossberg, 1995).
- Cultural context helps inform our perceptions, so it's not surprising that people's varying cultures may cause them to view things differently, as in **FIGURE 18.7**.
- How is the woman in **FIGURE 18.8** feeling? The context provided in **FIGURE 18.9** will leave no doubt.



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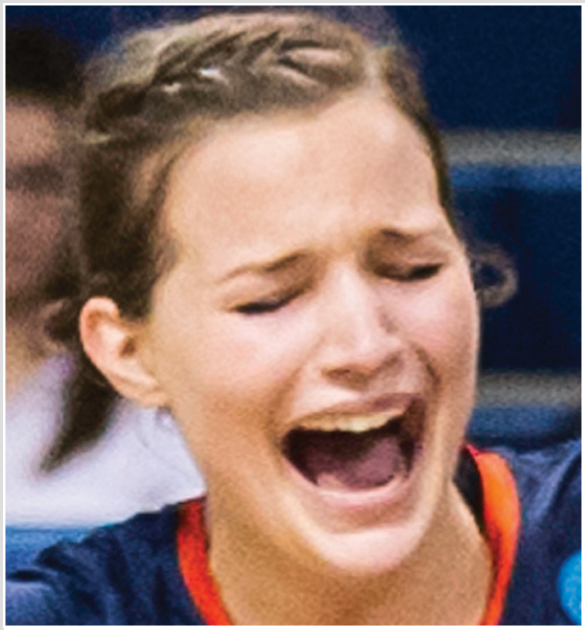
FIGURE 18.7 Culture and context effects What is above the woman's head? In one classic study, most rural East Africans questioned said the woman was balancing a metal box or can on her head (a typical way to carry water at that time). They also perceived the family as sitting under a tree. Westerners, used to tap water and box-like homes with corners, were more likely to perceive the family as being indoors, with the woman sitting under a window (Gregory & Gombrich, 1973).



Craig Klomparens/Hope College

FIGURE 18.8 What emotion is this? (See Figure 18.9)

Ask Yourself

Can you think of a time when your expectations caused you to misperceive the intentions of a person or a group? How might you use awareness of *context effects* to modify your expectations next time?

Retrieval Practice

RP-4 Does *perceptual set* involve bottom-up or top-down processing? Why?

ANSWERS IN APPENDIX E



Craig Klomparens/Hope College

FIGURE 18.9 Context makes clearer The Hope College volleyball team celebrates its national championship-winning moment.

Motivation

Motives give us energy as we work toward a goal. Like context, they can bias our interpretations of neutral stimuli:

- Desirable objects, such as a water bottle viewed by a thirsty person, seem closer than they really are (Balcetis & Dunning, 2010). And closeness can increase desire itself. Straight men, for example, find women who are physically closer more desirable than those who are further away (Shin et al., 2019).
- A to-be-climbed hill can seem steeper when we are carrying a heavy backpack, and a walking destination further away when we are feeling tired (Burrow et al., 2016; Philbeck & Witt, 2015; Proffitt, 2006a,b). When heavy people lose weight, hills and stairs no longer seem so steep (Taylor-Covill & Eves, 2016).

- A softball appears bigger when you're hitting well, as researchers observed after asking players to choose a circle the size of the ball they had just hit well or poorly. There's also a reciprocal phenomenon: Seeing a target as bigger—as happens when athletes focus directly on a target—improves performance (Witt et al., 2012).

> **"When you're hitting the ball, it comes at you looking like a grapefruit. When you're not, it looks like a black-eyed pea."** — Former Major League Baseball player George Scott

Emotion

Other studies have demonstrated that emotions can shove our perceptions in one direction or another:

- Hearing sad music can predispose people to perceive a sad meaning in spoken homophonic words—*mourning* rather than *morning, die* rather than *dye, pain* rather than *pane* (Halberstadt et al., 1995). And hearing major-key (bright, cheery-sounding) music, such as Beyoncé's "Single Ladies," speeds up identification of happy emotion words (Tay & Ng, 2019).
- When angry, people more often perceive neutral objects as guns (Baumann & DeSteno, 2010). When hungry, people tend to find larger bodies more attractive (Saxton et al., 2020).
- Worry about a panic attack (as with panic disorder) leads people to misperceive common physical sensations (heart pounding,

breathlessness) as a panic attack (Maisto et al., 2021).
- When made to feel mildly upset by subliminal exposure to a scowling face, people perceive a neutral face as less attractive and less likable (Anderson et al., 2012).

The point to remember: Much of what we perceive comes not just from what's "out there," but also from what's behind our eyes and between our ears. Our experiences, assumptions, expectations—and even our context, motivation, and emotions—can shape and color our views of reality through top-down processing.

REVIEW

Module 18: Basic Concepts of Sensation and Perception

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 18-1: What are *sensation* and *perception?* What do we mean by *bottom-up processing* and *top-down processing?*

LOQ 18-2: What three steps are basic to all our sensory systems?

LOQ 18-3: How do *absolute thresholds* and *difference thresholds* differ?

LOQ 18-4: How are we affected by subliminal stimulation?

LOQ 18-5: What is the function of sensory adaptation?

LOQ 18-6: How do our expectations, contexts, motivation, and emotions influence our perceptions?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

sensation
sensory receptors
perception
bottom-up processing
top-down processing
transduction
psychophysics
absolute threshold
signal detection theory
subliminal stimulation
priming
difference threshold

Weber's law
sensory adaptation
perceptual set

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. Sensation is to _____ as perception is to _____.
   a. absolute threshold; difference threshold
   b. bottom-up processing; top-down processing
   c. interpretation; detection
   d. grouping; priming

2. The process by which we organize and interpret sensory information is called _____.

3. Subliminal stimuli are
   a. too weak to be processed by the brain.
   b. consciously perceived more than 50 percent of the time.
   c. strong enough to affect our behavior at least 75 percent of the time.
   d. below our absolute threshold for conscious awareness.

4. Another term for *difference threshold* is the _____ _____ _____.

5. Weber's law states that for a difference to be perceived, two stimuli must differ by
   a. a fixed or constant energy amount.
   b. a constant minimum percentage.
   c. a constantly changing amount.
   d. more than 7 percent.

6. Sensory adaptation helps us focus on
   a. visual stimuli.
   b. auditory stimuli.
   c. constant features of the environment.
   d. important changes in the environment.

7. Our perceptual set influences what we perceive. This mental tendency reflects our
   a. experiences, assumptions, and expectations.
   b. sensory adaptation.
   c. priming ability.
   d. difference thresholds.

MODULE 19: Vision: Sensory and Perceptual Processing

For those of us with vision, our eyes receive light energy and *transduce* (transform) it into neural messages. Our brain—in one of life's greatest wonders—then creates what we consciously see. How does such a taken-for-granted yet extraordinary thing happen?

Light Energy and Eye Structures

LOQ 19-1

What are the characteristics of the energy that we see as visible light? What structures in the eye help focus that energy?

The Stimulus Input: Light Energy

When those with vision look at a bright red tulip, the stimuli striking the eyes are not particles of the color red, but pulses of electromagnetic energy that the visual system *perceives* as red. What we see as visible light is but a thin slice of the wide spectrum of electromagnetic energy, ranging from imperceptibly short gamma waves to the very long waves of radio transmission (**FIGURE 19.1**).

Other portions are visible to other animals. Bees, for instance, cannot see what we perceive as red, but they can see ultraviolet light.

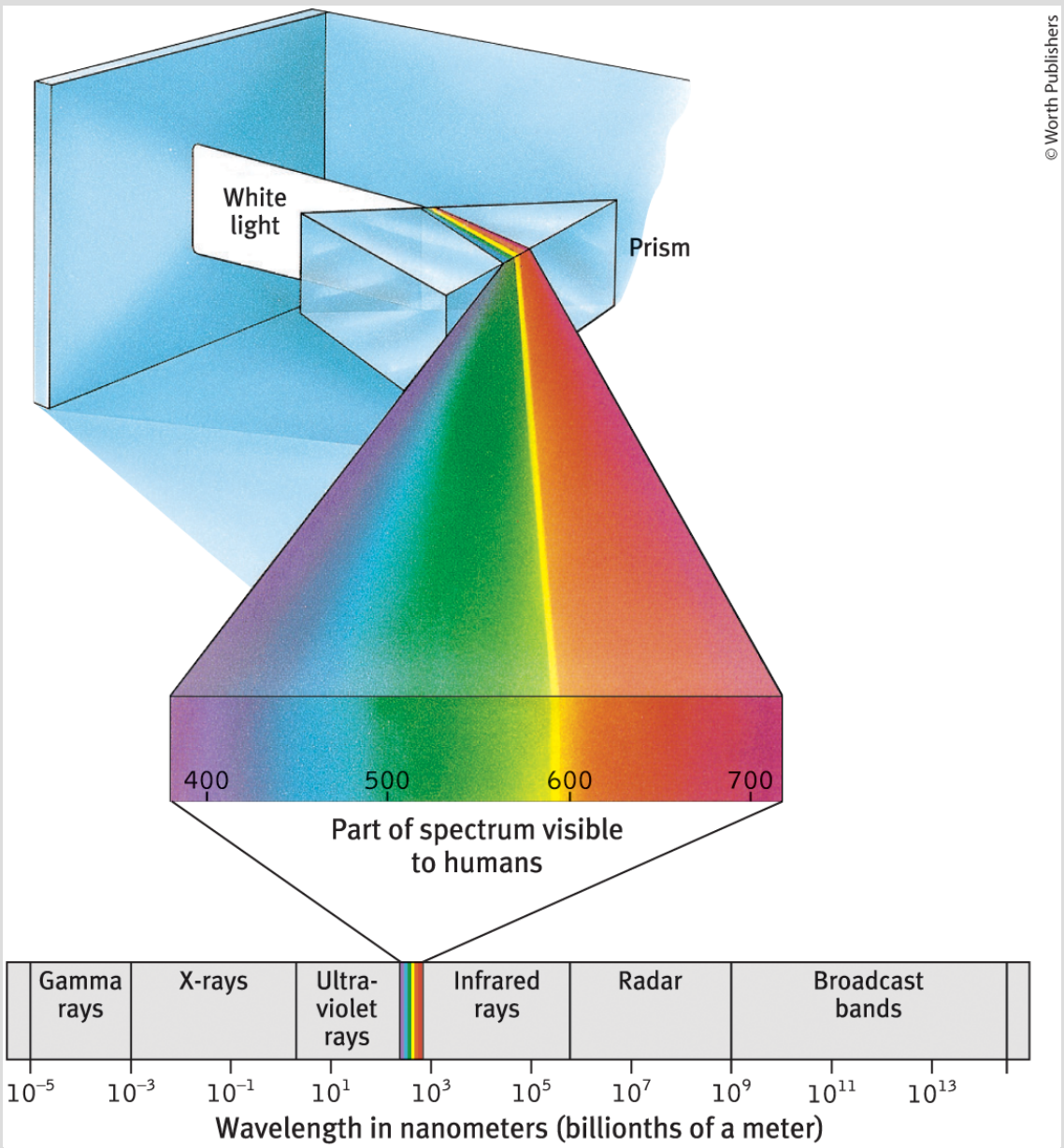


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FIGURE 19.1 The wavelengths we see The wide spectrum of electromagnetic energy ranges from gamma rays as short as the diameter of an atom to radio waves as long as 62 miles (100 kilometers). The wavelengths visible to the human eye (shown enlarged), for those with vision, extend from the shorter blue-violet light waves to the longer waves of red light.

Light travels in waves, and the shape of those waves influences what we see. Light's **wavelength** is the distance from one wave peak to the next (**FIGURE 19.2a**). Wavelength determines **hue**, the color we experience, such as the tulip's red petals or green leaves. A light wave's *amplitude,* or height, determines its **intensity**—the amount of energy the wave contains. Intensity influences *brightness* (**FIGURE 19.2b**).

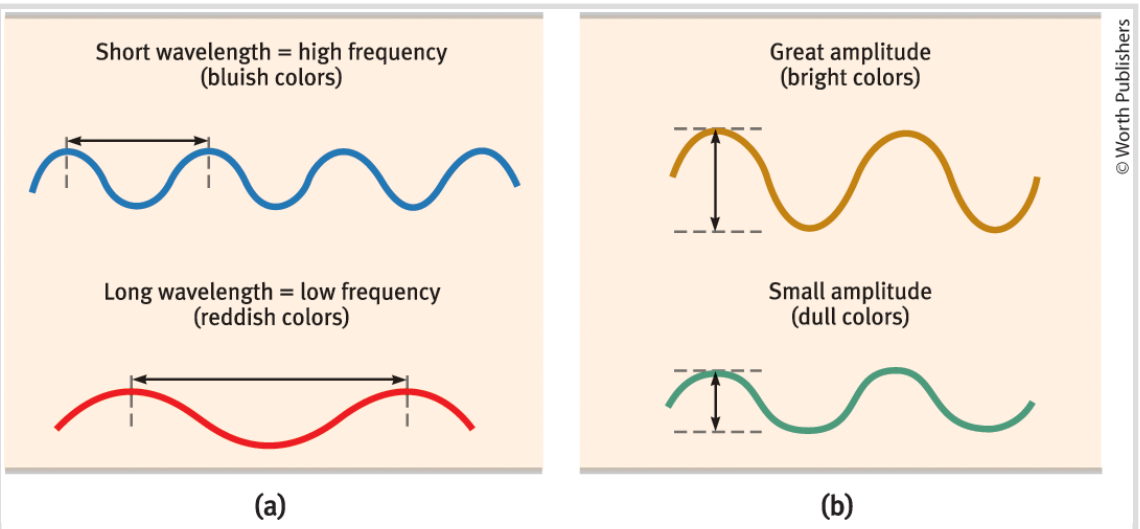

FIGURE 19.2 The physical properties of waves (a) Waves vary in *wavelength* (the distance between successive peaks). *Frequency,* the number of complete wavelengths that can pass a point in a given time, depends on the wavelength. The shorter the wavelength, the higher the frequency. Wavelength determines the perceived *color* of light. (b) Waves also vary in *amplitude* (the height from peak to trough). Wave amplitude influences the perceived *brightness* of colors.

The Eye

Light enters the eye through the *cornea,* which bends light to help provide focus. The light then passes through the *pupil,* a small adjustable opening. Surrounding the pupil and controlling its size is the *iris,* a colored muscle that dilates or constricts in response to light intensity. Each iris is so distinctive that iris-scanning technology can often confirm your identity.

The iris responds to our cognitive and emotional states. If you have vision, imagine a sunny sky and your iris will constrict, making your pupil smaller; imagine a dark room and it will dilate, enlarging your pupil (Laeng & Sulutvedt, 2014). The iris also constricts when we are about to answer *No* to a question, or when we feel disgust (de Gee et al., 2014; Goldinger & Papesh, 2012). And when we're feeling amorous or trusting, our telltale dilated pupils subtly signal our feelings (Attard-Johnson et al., 2016, 2017; Kret & De Dreu, 2019; Prochanzkova et al., 2018).

After passing through our pupil, light hits the transparent *lens* in our eye. The lens then focuses the light rays into an image on our **retina**, the multilayered tissue lining the back inner surface of the eyeball. To focus the rays, the lens changes its curvature and thickness in a process called **accommodation**. If the lens focuses the image on a point in front of the retina, we see near objects clearly but not distant objects. This nearsightedness—*myopia*—can be remedied with glasses, contact lenses, or surgery.

For centuries, scientists knew that an image of a candle passing through a small opening will cast an inverted mirror image on a dark wall behind. If the image passing through the pupil casts this sort of upside-down image on the retina, as in **FIGURE 19.3**, how can we see the world right side up? The ever-curious Leonardo da Vinci had an idea: Perhaps the eye's watery fluids bend the light rays, reinverting the image to an upright position as it reaches the retina. Unfortunately for da Vinci, that idea was disproved in 1604, when the astronomer and optics expert Johannes Kepler showed that the retina *does* receive upside-down images of the world (Crombie, 1964). So how could we understand such a world? "I leave it," said the befuddled Kepler, "to natural philosophers."

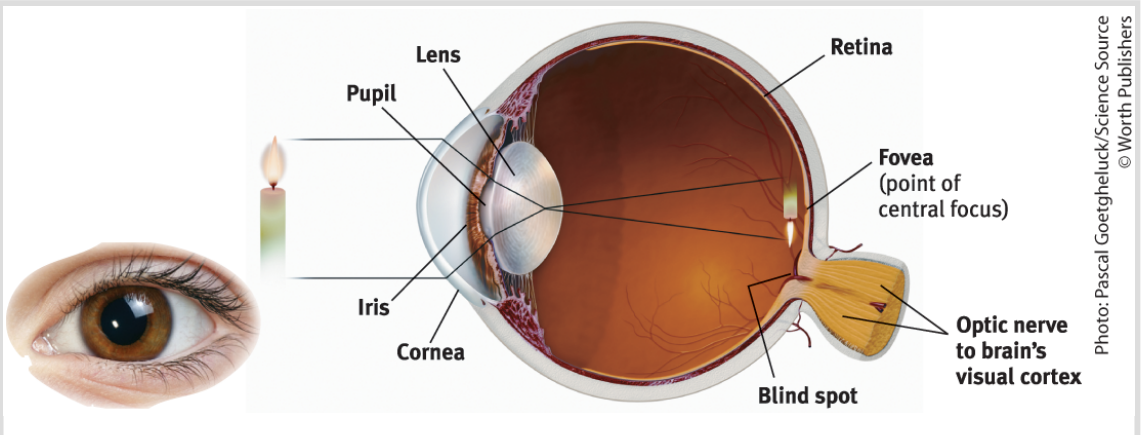

FIGURE 19.3 The eye Light rays reflected from a candle pass through the cornea, pupil, and lens. The curvature and thickness of the lens change to bring nearby or distant objects into focus on the retina. Rays from the top of the candle strike the bottom of the retina, and those from the left side of the candle strike the right side of the retina. The candle's image on the retina thus appears upside down and reversed.

Today's answer: The retina doesn't "see" a whole image. Consider the four-tenths of a second a baseball batter takes to respond to a pitcher's fastball. The retina's millions of receptor cells convert the particles of light energy into neural impulses and forward those to the brain, which reassembles them, right side up, into what the batter perceives —incoming fastball! Visual information processing percolates through progressively more abstract levels, all at astonishing speed.

Information Processing in the Eye and Brain

LOQ 19-2

How do the rods and cones process information, and what is the path information travels from the eye to the brain?

The Eye-to-Brain Pathway

Imagine that you could follow a single light-energy particle after it reached the retina. First, you would thread your way through the retina's sparse outer layer of cells. Then, reaching the very back of the eye, you would encounter the retina's nearly 130 million buried photoreceptor cells, the **rods** and **cones** (**FIGURE 19.4**). There, you would see the light energy trigger chemical changes. That chemical reaction would spark neural signals in nearby *bipolar cells.* You could then watch the bipolar cells activate neighboring *ganglion cells,* whose axons twine together like the strands of a rope to form the **optic**

nerve. After a momentary stopover at the thalamus, the information would fly on to the final destination, the visual cortex, in the occipital lobe at the back of the brain.

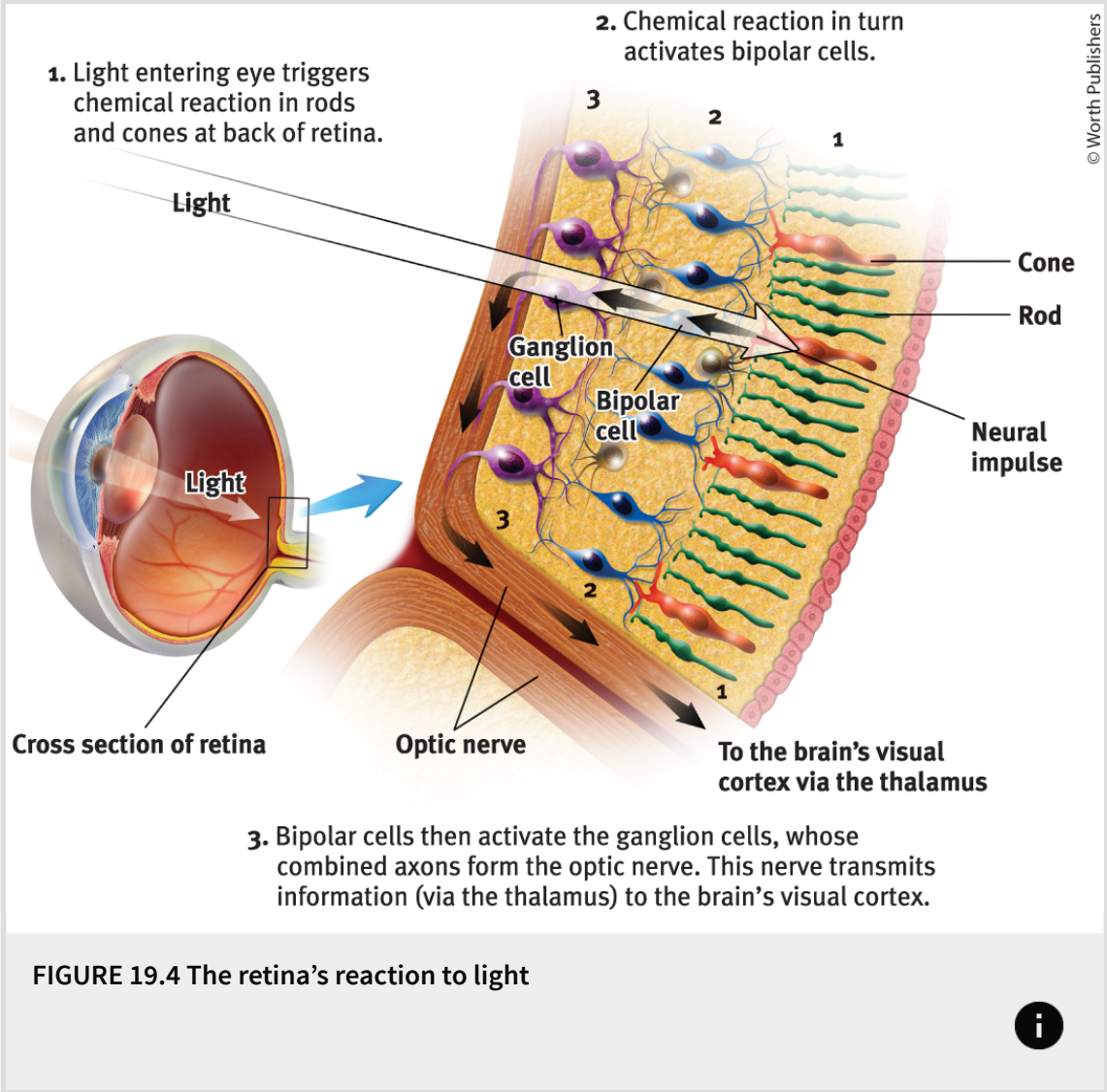

FIGURE 19.4 The retina's reaction to light

The optic nerve is an information highway from the eye to the brain. This nerve can send nearly 1 million messages at once through its nearly 1 million ganglion fibers. (The auditory nerve, which enables hearing, carries much less information through its mere 30,000

fibers.) We pay a price for this high-speed connection. Our eye has a **blind spot**, with no receptor cells, where the optic nerve leaves the eye (FIGURE 19.5). If you have vision, close one eye. Do you see a black hole? *No*—because without seeking your approval, your brain fills in the hole.

RETRIEVAL PRACTICE



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FIGURE 19.5 The blind spot

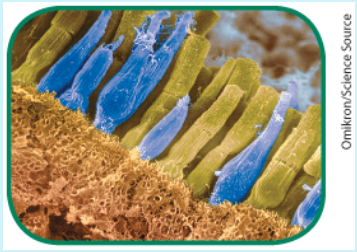
RP-1 There are no receptor cells where the optic nerve leaves the eye. This creates a blind spot if you have vision. To demonstrate, close your left eye, stare at the black dot, and slowly move the image closer to and then further from your face until one of the cars briefly disappears. (Which one do you predict it will be?) Repeat with your right eye closed—and note that now the other car disappears. Can you explain why?

ANSWERS IN APPENDIX E

Rods and cones differ in where they're found and in what they do (TABLE 19.1). *Cones* cluster in and around the **fovea**, the retina's area of central focus (Figure 19.3). Many cones have their own hotline to the brain: One cone transmits its message to a single bipolar cell, which relays the message to the visual cortex (where a large area receives input from the fovea). These direct connections preserve the cones' precise information, making them better able to detect fine

detail. Cones can detect white and enable us to perceive color—but not at night (Sabesan et al., 2016).

TABLE 19.1 Receptors in the Human Eye: Rod-Shaped Rods and Cone-Shaped Cones

	Cones	Rods	
Number	6 million	120 million	
Location in retina	Center	Periphery	
Sensitivity in dim light	Low	High	
Color sensitivity	High	Low	
Detail sensitivity	High	Low	

Rods, which (unlike cones) reside in the retina's periphery, remain sensitive in dim light, and they enable black-and-white vision. Rods have no hotline to the brain. If cones are soloists, rods perform as a chorus. Several rods pool their faint energy output and funnel it onto a single bipolar cell, which sends the combined message to our brain.

Cones and rods each provide a special sensitivity—cones to detail and color, and rods to faint light and peripheral motion. Stop for a minute and experience this rod–cone difference. If you have vision, pick a word in this sentence and stare directly at it, focusing its image on the cones in your fovea. Notice that words distant from it appear blurred? They lack detail because their image is striking your retina's outer regions, where rods predominate. Thus, when you drive or bike, rods

help you detect a car in your peripheral vision well before you perceive its details. How many of the black dots can you see at once in **FIGURE 19.6**?

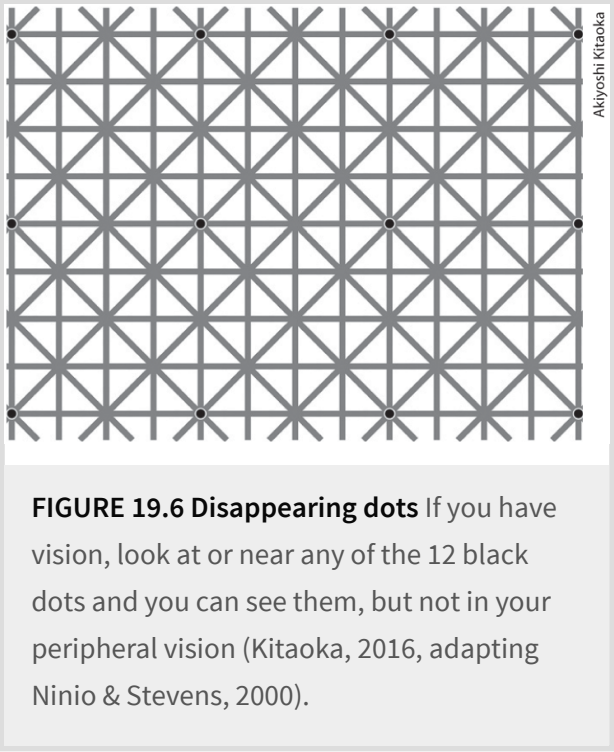


FIGURE 19.6 Disappearing dots If you have vision, look at or near any of the 12 black dots and you can see them, but not in your peripheral vision (Kitaoka, 2016, adapting Ninio & Stevens, 2000).

When we enter a darkened theater or turn off the light at night, our pupils dilate to allow more light to reach our retina. Our eyes adapt, but fully adapting typically takes 20 minutes or more. This period of dark adaptation matches the average natural twilight transition between the Sun's setting and darkness. How wonderfully made we are.

At the entry level, the retina's neural layers don't just pass along electrical impulses; they also help to encode and analyze sensory information. (The third neural layer in a frog's eye, for example,

contains those “bug detector” cells that fire only in response to moving fly-like stimuli.) In human eyes, any given retinal area relays its information to a corresponding location in the visual cortex, in the occipital lobe. The brain’s peculiar wiring means that half of each eye’s sensory information arrives in the opposite side of the brain, by crossing the X-shaped *optic chiasm* (FIGURE 19.7).

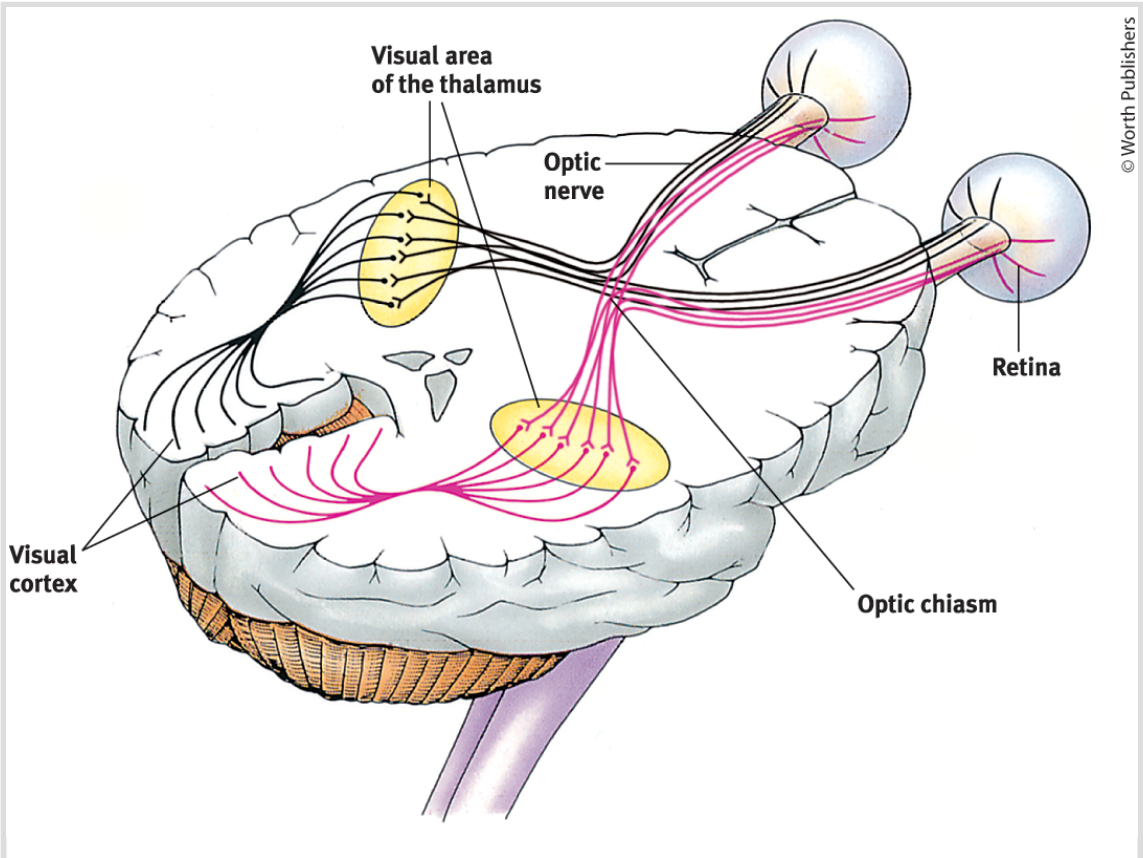


FIGURE 19.7 Pathway from the eyes to the visual cortex The retina’s ganglion axons form the optic nerve. It runs to the thalamus, where the axons synapse with neurons that run to the visual cortex.

The same sensitivity that enables retinal cells to fire messages can lead them to misfire, as you can demonstrate. If you have typical vision, turn your eyes to the left, close them, and then gently rub the right side of your right eyelid with your fingertip. Note the patch of light to the left, moving as your finger moves. Why do you see light? Why at the left? This happens because the retinal cells are so responsive that even pressure triggers them. And the brain interprets their firing as light. Moreover, it interprets the light as coming from the left—the normal direction of light that activates the right side of the retina.

Ask Yourself

Consider your activities in the last day. If you have vision, which of them relied on your rods? Which relied on your cones? How would these activities be different—or impossible—without these cells' different abilities?

Retrieval Practice



RP-2 Some nocturnal animals, such as toads, mice, rats, and bats, have impressive night vision thanks to having many more _____ (rods/cones) than _____ (rods/cones) in their retinas. These creatures probably have very poor _____ (color/black-and-white) vision.

RP-3 Cats are able to open their _____ much wider than we can, which allows more light into their eyes so they can see better at night.

ANSWERS IN APPENDIX E

Color Processing

LOQ 19-3

How do we perceive color in the world around us?

Those of us with typical color vision talk as though objects possess color: "A tomato is red." Recall the old question, "If a tree falls in the forest and no one hears it, does it make a sound?" We can ask the same of color: If no one sees the tomato, is it red?

The answer is *No.* First, the tomato is everything *but* red, because it *rejects* (reflects) the long wavelengths of red. Second, the tomato's color is our mental construction. As Sir Isaac Newton (1704) noted, "The [light] rays are not colored." Like all aspects of vision, perception of color resides not in the object itself but in the theater of the brain; even while dreaming, those of us with color vision usually perceive things in color. Likewise, air molecules striking the eardrum are silent and scent molecules have no smell. Our brain creates experiences of sight, sound, and smell.

> **"It is in the brain that the poppy is red, that the apple is odorous, that the skylark sings."** — Oscar Wilde, love letter to Alfred Douglas, 1896

One of vision's most basic and intriguing mysteries is how we see the world in color. How, from the light energy striking the retina, does our brain construct our experience of such a multitude of colors?

Modern detective work on the mystery of color vision began in the nineteenth century, when German scientist Hermann von Helmholtz built on the insights of an English physicist, Thomas Young. They knew that any color can be created by combining the light waves of three primary colors—red, green, and blue. So Young and von Helmholtz's research led to a hypothesis: The eye must have three corresponding types of color receptors.

Researchers later confirmed the **Young-Helmholtz trichromatic (three-color) theory** by measuring the response of various cones to different color stimuli. The retina does indeed have three types of color receptors, each especially sensitive to the wavelengths of red, green, or blue. When light stimulates combinations of these cones, we see other colors. For example, the retina has no separate receptors especially sensitive to yellow. But when red and green wavelengths stimulate both red-sensitive and green-sensitive cones, we see yellow. Said differently, when our eyes see red and green without blue, our brain says *yellow.*

In Singapore, yellow taxis—which are strikingly visible—have had 9 percent fewer accidents than blue taxis (Ho et al., 2017).

Worldwide, about 1 in 12 men and 1 in 200 women have the genetically sex-linked condition of *color-deficient vision.* Most are not entirely "color blind": They simply lack functioning red- or green-sensitive cones, or sometimes both. Their vision—perhaps unknown to them, because their lifelong vision *is* normal to them—is monochromatic (one-color) or dichromatic (two-color) instead of trichromatic, making it impossible to distinguish the red and green in FIGURE 19.8 (Boynton, 1979). Dogs, too, lack receptors for the wavelengths of red, giving them only limited, dichromatic color vision (Neitz et al., 1989).



(a) (b)

BEN SOLOMON/The New York Times/Redux Pictures

FIGURE 19.8 Color-deficient vision The photo in image (a) shows how people with red-green deficiency perceived a 2015 Buffalo Bills versus New York Jets football game. "For the 8 percent of Americans like me that are red-green colorblind, this game is a nightmare to watch," tweeted one fan. "Everyone looks like they're on the same team," said another. The photo in image (b) shows how the game looked for those with typical color vision.

But why do people blind to red and green often still see yellow? And why does yellow appear to be a pure color and not a mixture of red and green, the way purple is a blend of red and blue? As physiologist Ewald Hering—a contemporary of von Helmholtz—noted, trichromatic theory leaves some parts of the color vision mystery unsolved.

Hering found a clue in *afterimages.* If a person with color vision stares at a green shape for a while and then looks at a white sheet of paper, they will see red, green's *opponent color.* If they stare at a yellow shape, its opponent color, blue, will appear on the white paper (**FIGURE 19.9**). Hering formed another hypothesis: Color vision must involve two *additional* color processes, one responsible for red-versus-green perception, and one for blue-versus-yellow perception.

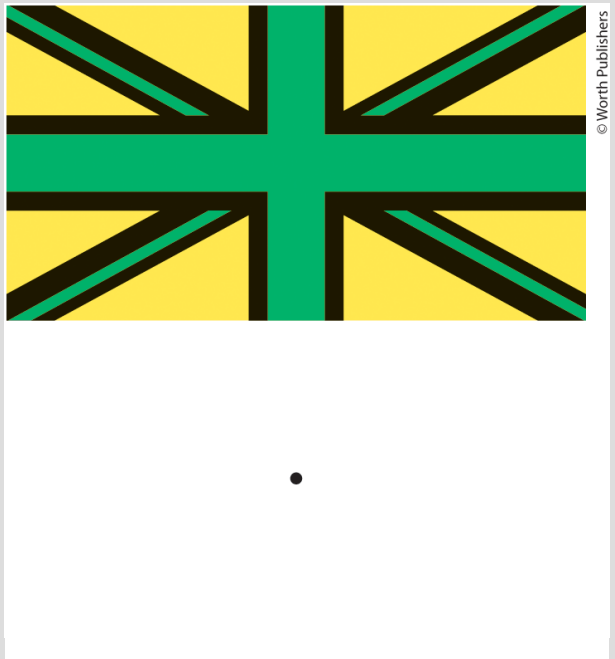


FIGURE 19.9 Afterimage effect If you have full color vision, stare at the center of the flag

for a minute and then shift your eyes to the dot in the white space below it. What do you see? (After tiring your neural response to black, green, and yellow, you should see their opponent colors.) Stare at a white wall and note how the size of the flag grows with the projection distance.

Indeed, a century later, researchers also confirmed Hering's hypothesis, now called the **opponent-process theory**. This concept is tricky, but here is the gist: Color vision depends on three sets of opposing retinal processes—*red-green, blue-yellow,* and *white-black.* As impulses travel to the visual cortex, some neurons in both the retina and the thalamus are turned "on" by red but turned "off" by green. Others are turned on by green but off by red (DeValois & DeValois, 1975). Like red and green marbles sent down a narrow tube, "red" and "green" messages cannot both travel simultaneously. Those with color vision see either red or green, not a reddish-green mixture. But red and blue travel in separate channels, so we *can* see a reddish-blue magenta.

So how does opponent-process theory help us understand negative afterimages, as in the flag demonstration? Here's the answer (for the green changing to red): First, we stared at green bars, which tired our green response. Then we stared at a white area. White contains all colors, including red. Because we had tired our green response, only the red part of the green-red pairing fired normally.

The present solution to the mystery of color vision is roughly this: *Color processing occurs in two stages.*

1. The retina's red-, green-, and blue-sensitive cones respond in varying degrees to different color stimuli, as the Young-Helmholtz trichromatic theory suggested.
2. The cones' responses are then processed by opponent-process cells, as Hering's opponent-process theory proposed.

Ask Yourself

Does it surprise you to learn that, for those of us with color vision, colors don't "live" in the objects we perceive—that in fact, these objects are everything but the color we experience? If someone had asked you, "Is grass green?" before you read this section, how would you have responded?

Retrieval Practice

RP-4 What are two key theories of color vision? Are they contradictory or complementary? Explain.

ANSWERS IN APPENDIX E

Feature Detection

LOQ 19-4

Where are feature detectors located, and what do they do?

Scientists once likened the brain to a movie screen on which the eye projected images. Then along came David Hubel and Torsten Wiesel (1979), who showed that our visual processing deconstructs visual images and then reassembles them. Hubel and Wiesel received a Nobel Prize for their work on **feature detectors**, nerve cells in the occipital lobe's visual cortex that respond to a scene's specific visual features—to particular edges, lines, angles, and movements.

Using microelectrodes, they had discovered that some neurons fired actively when cats were shown lines at one angle, while other neurons responded to lines at a different angle. They surmised that these specialized neurons, now known as feature detectors, receive information from individual ganglion cells in the retina. Feature detectors pass this specific information to other cortical areas, where teams of cells *(supercell clusters)* respond to more complex patterns.

For biologically important objects and events, monkey brains (and surely ours as well) have a "vast visual encyclopedia" distributed as specialized cells (Perrett et al., 1990, 1992, 1994). These cells respond to one type of stimulus, such as a specific gaze, head angle, posture, or body movement. Other supercell clusters integrate this information

and fire only when the cues collectively indicate the direction of someone's attention and approach. This instant analysis, which aided our ancestors' survival, also helps a hockey player anticipate where to shoot the puck, and a driver to anticipate a pedestrian's next movement.



Patrick McDermott/Getty Images

Supercells score In this National Hockey League game, Alex Ovechkin (in red) instantly processed visual information about the positions and movements of three opponents. By using his pattern-detecting supercells, Ovechkin somehow managed to get the puck into the net.

One temporal lobe area by our right ear (FIGURE 19.10) typically enables us to perceive faces and, thanks to a specialized neural network, to recognize them from varied viewpoints (Connor, 2010). This *fusiform face area* helps us recognize friends (Wiese et al., 2019). If you have vision and your fusiform face area were stimulated, you might spontaneously see faces. One participant reported to an experimenter, "You just turned into someone else. Your face metamorphosed" (Koch, 2015).

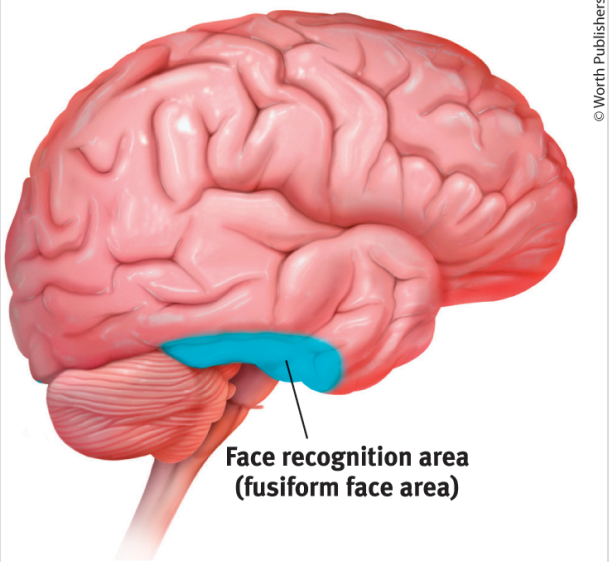


FIGURE 19.10 How our brain processes faces In social animals such as humans, a large right temporal lobe area (shown here in a right-facing brain) is dedicated to the crucial task of face recognition. Viewing famous people's faces, compared with famous buildings, increases activation in this fusiform face area (Gorno-Tempini & Price, 2001).

When researchers temporarily disrupt the brain's face-processing areas with magnetic pulses, people cannot recognize faces. But they can still recognize other objects, such as houses, because the brain's face perception occurs separately from its object perception (McKone et al., 2007; Pitcher et al., 2007). Thus, functional MRI (fMRI) scans have shown different brain areas activating when people viewed varied objects (Downing et al., 2001). Brain activity is so specific that, with the help of brain scans, researchers can tell whether people are

"looking at a shoe, a chair, or a face, based on the pattern of their brain activity" (Haxby, 2001).

Parallel Processing

LOQ 19-5

How does the brain use parallel processing to construct visual perceptions?

Our brain achieves these and other remarkable feats by **parallel processing:** doing many things at once. To analyze a visual scene, the brain processes its subdimensions—motion, form, depth, color—simultaneously.

To recognize a face, our brain integrates information projected by our retinas to several visual cortex areas and compares it with stored information, thus enabling our fusiform face area to recognize the face: *Grandma!* Scientists have debated whether this stored information is contained in a single cell or, as now seems more likely, distributed over a network of cells that build a facial image bit by bit (Tsao, 2019). But some supercells—actually nicknamed *"grandmother cells"*—do appear to respond very selectively to 1 or 2 faces in 100 (Bowers, 2009; Quiroga et al., 2013). The whole face-recognition process involves connections between visual, memory, social, and auditory networks (Ramot et al., 2019). Supercells require super-sized brain power.

Destroy or disable the neural workstation for a visual subtask, and something peculiar results, as happened to "Mrs. M." (Hoffman, 1998). After a stroke damaged areas near the rear of both sides of her brain, she could not perceive motion. People in a room seemed "suddenly here or there but I [had] not seen them moving." Pouring tea into a cup was a challenge because the fluid appeared frozen—she could not perceive it rising in the cup.

After stroke or surgery has damaged the brain's visual cortex, others have experienced *blindsight* (see The Biology of Mind modules). Shown a series of sticks, they report seeing nothing. Yet when asked to guess whether the sticks are vertical or horizontal, their visual intuition typically offers the correct response. When told, "You got them all right," they are astounded. There is, it seems, a second "mind"—a parallel processing system—operating unseen. These separate visual systems for perceiving and for acting illustrate once again the astonishing dual processing of our two-track mind.

> **"I am … wonderfully made."** — King David, Psalm 139:14

***

Think about the wonders of visual processing. If you have vision, as you read these words, the letters reflect light rays onto your retina, which triggers a process that sends formless nerve impulses to several areas of your brain, integrating the information and decoding its

meaning. The amazing result: We have transferred information across time and space, from our minds to yours (FIGURE 19.11). That all of this happens instantly, effortlessly, and continuously is indeed awesome. As Roger Sperry (1985) observed, the "insights of science give added, not lessened, reasons for awe, respect, and reverence."

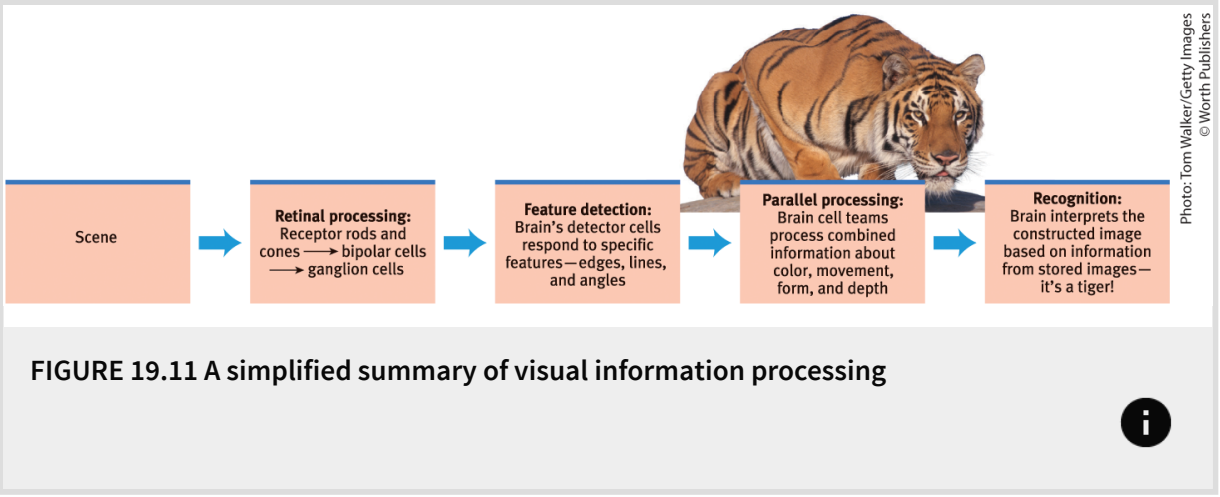


FIGURE 19.11 A simplified summary of visual information processing

Retrieval Practice

RP-5 What is the rapid sequence of events that occurs when those with vision see and recognize a friend?

ANSWERS IN APPENDIX E

Perceptual Organization

LOQ 19-6

How did the Gestalt psychologists understand perceptual organization, and how do figure-ground and grouping principles contribute to our perceptions?

How do those of us with vision organize and interpret sights so that they become *meaningful* perceptions—a rose in bloom, a familiar face, a sunset? Early in the twentieth century some German psychologists noticed that people tend to organize visual sensations into a **gestalt**, a German word meaning a "form" or a "whole." As we look straight ahead, we cannot separate the perceived scene into our left and right fields of view. Our conscious perception is, at every moment, a seamless scene—an integrated whole.

Consider **FIGURE 19.12**: The individual elements of this figure are really nothing but eight hexagons, each containing three converging white lines. What happens when we view these elements together? The resulting *Necker cube* nicely illustrates a favorite saying of Gestalt psychologists: *In perception, the whole may exceed the sum of its parts.*

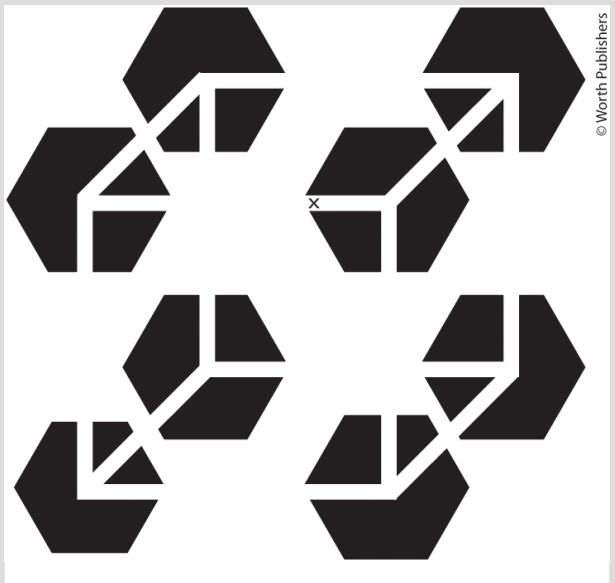


FIGURE 19.12 A Necker cube If you have vision, what do you see: hexagons with white lines, or a cube? If you stare at the cube, you may notice that it reverses location, moving the tiny X from the front edge to the back. At times, the cube may seem to float forward, with hexagons behind it. At other times, the hexagons may become holes through which the cube appears, as though it were floating behind them. There is far more to perception than meets the eye. (From Bradley et al., 1976.)

Over the years, the Gestalt psychologists demonstrated many principles we use to organize our sensations into perceptions (Wagemans et al., 2012a,b). Underlying all of them is a fundamental truth: *Our brain does more than register information about the world.* Perception is not a picture printing itself on the brain. We filter incoming information and *construct* perceptions. Mind matters.

Form Perception

You may be familiar with facial-recognition technology that can unlock your phone, or automatically tag your favorite people in photos. Newer phones' camera-software system, like our eye-brain system, recognizes faces at a glance. What abilities go into the design of these phone systems?

Figure and Ground

To start with, the camera-software system needs to perceive **figure-ground**—to separate faces from their backgrounds. In our eye-brain system, this is our first perceptual task—perceiving any object (the *figure*) as distinct from its surroundings (the *ground*). For sighted readers, the words are the figure; the white space is the ground. This perception applies for those listening to the text, too. If you listen in a noisy coffee shop, the text reading you are attending to becomes the figure; all other sounds are part of the ground. Sometimes the same stimulus can trigger more than one perception. In **FIGURE 19.13**, the figure-ground relationship continually reverses. First, we may see the vase (or the faces), then the faces (or the vase), but sighted viewers always organize the stimulus into a figure seen against a ground.

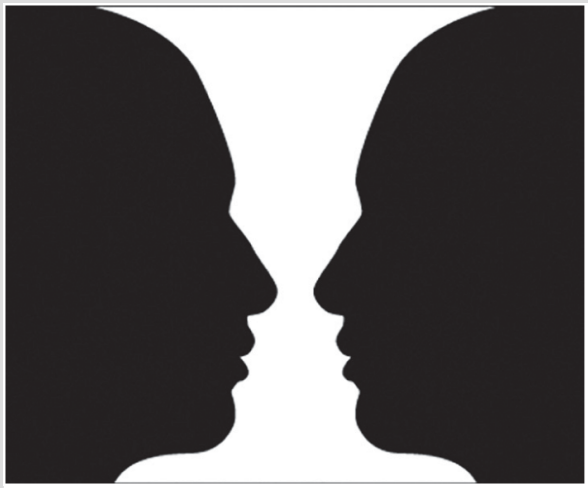


FIGURE 19.13 Reversible figure and ground

Grouping

Having discriminated figure from ground, we (and our camera-software system) must also organize the figure into a *meaningful* form. Some basic features of a scene—such as color, movement, and light-dark contrast—we typically process instantly and automatically (Parrish & Beran, 2021). Our mind brings order and form to other stimuli by following certain rules for **grouping**, also identified by the Gestalt psychologists. These rules, which we apply even as infants and even in our touch perceptions, illustrate how the perceived whole differs from the sum of its parts, rather as water differs from its hydrogen and oxygen parts (Gallace & Spence, 2011; Quinn et al., 2002; Rock & Palmer, 1990). See **FIGURE 19.14** for three examples.

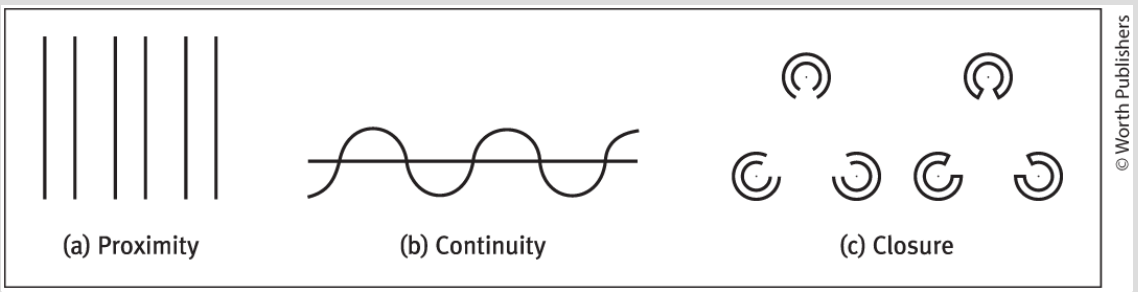


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FIGURE 19.14 Three principles of grouping (a) Thanks to *proximity,* we group nearby figures together. We see not six separate lines, but three sets of two lines. (b) Through *continuity,* we perceive smooth, continuous patterns rather than discontinuous ones. This pattern could be a series of alternating semicircles, but we perceive it as two continuous lines—one wavy, one straight. (c) Using *closure,* we fill in gaps to create a complete, whole object. Thus, we assume that the circles on the left are complete but partially blocked by the (illusory) triangle. Add nothing more than little line segments to close off the circles and your brain may stop constructing a triangle.

Such principles usually help us construct reality. Sometimes, however, they lead us astray, as when we look at the doghouse in **FIGURE 19.15**.

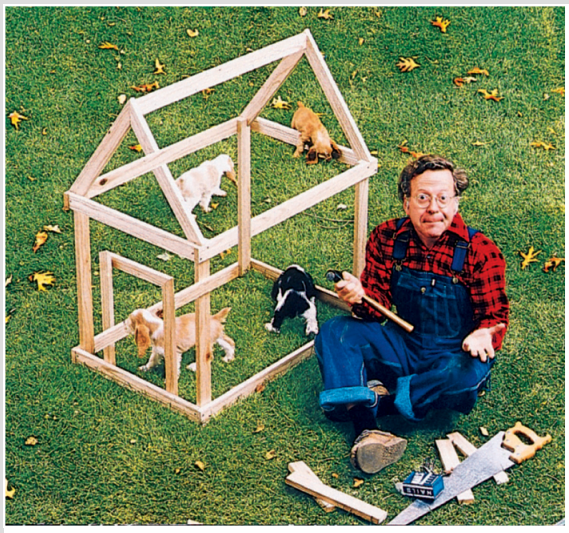


Photo by Walter Wick. Reprinted by permission from GAMES Magazine © 1983 PCS Games Limited Partnership

FIGURE 19.15 Great Gestalt! What's the secret to this impossible doghouse? If you have typical vision, you probably perceive

this doghouse as a gestalt—a whole (though impossible) structure. Actually, your brain imposes this sense of wholeness on the picture. As **FIGURE 19.19** shows, Gestalt grouping principles such as closure and continuity are at work here.

Retrieval Practice

RP-6 In terms of perception, a band's lead singer would be considered _____ (figure/ground), and the other musicians would be considered _____ (figure/ground).

RP-7 What do we mean when we say that, in perception, "the whole may exceed the sum of its parts"?

ANSWERS IN APPENDIX E

Depth Perception

LOQ 19-7

How do binocular and monocular cues enable three dimensional vision, and how does motion perception occur?

For those of us with typical vision, the eye-brain system performs many remarkable feats, among which is **depth perception.** From the two-dimensional images falling on our retinas, we somehow organize three-dimensional perceptions that, for example, let us estimate the

distance of an oncoming car. How do we acquire this ability? Are we born with it? Did we learn it?



Monika Skolimowska/picture-alliance/dpa/AP Photo

Creating three-dimensional perceptions from two dimensions Several of the world's cities slow traffic with illusory 3-D crosswalk paintings, thanks to artists Saumya Pandya Thakkar and Shakuntala Pandyaand, who created the first of these in India.

As psychologist Eleanor Gibson picnicked on the rim of the Grand Canyon, her scientific curiosity kicked in. She wondered: *Would a toddler peering over the rim perceive the dangerous drop-off and draw back?* To answer that question and others, Gibson and Richard Walk (1960) designed a series of experiments in their Cornell University laboratory using a **visual cliff**—a model of a cliff with a "drop-off" area that was actually covered by sturdy glass. They placed 6- to 14-month-old infants on the edge of the "cliff" and had a parent coax the infants

to lean over the glass or crawl out onto it (FIGURE 19.16). Most infants refused to do so, indicating that they could perceive depth.



FIGURE 19.16 Gibson and Walk's visual cliff

Had they *learned* to perceive depth? Learning appears also to be part of the human story. Years after Gibson and Walk's classic visual cliff studies, psychologist Karen Adolph continued to study infant motor development (Adolph & Hoch, 2019). Adolph and others showed that crawling, no matter when it begins, seems to increase an infant's wariness of heights (Adolph et al., 2014; Campos et al., 1992). Crawling infants tend to gaze downward, making it more likely for them to stare at possible hazards they are approaching (Kretch et al., 2014). They likely evolved this tendency because learning to avoid cliffs helped them survive. Mobile newborn animals—even those with no visual experience (including young kittens, a day-old goat, and newly

hatched chicks)—also refuse to venture across the visual cliff. Thus, biology prepares us to be wary of heights, and experience amplifies that fear.

If we were to build the ability to perceive depth into our camera-software system, what rules might enable it to convert two-dimensional images into a single three-dimensional perception? A good place to start would be the depth cues our brain receives from information supplied by one or both eyes.

Binocular Cues

People who see with two eyes perceive depth thanks partly to **binocular cues.** Here's a demonstration you might try: With both eyes open, hold two pens or pencils in front of you and touch their tips together. Now do so with one eye closed. A more difficult task, yes?

We use binocular cues to judge the distance of nearby objects. One such cue is *convergence,* the inward angle of the eyes focusing on a near object. Another is **retinal disparity.** Because there is space between our eyes, each retina receives a slightly different image of the world. By comparing these two images, our brain can judge how close an object is to us. The greater the disparity (difference) between the two retinal images, the closer the object. Try it. Hold your two index fingers about 5 inches (12 centimeters) in front of your eyes, with their tips half an inch (1 centimeter) apart. Your retinas will receive quite different views. If you close one eye and then the other, you can see the difference. Now look beyond your fingers and note the weird

result. Move your fingers out farther and the retinal disparity—and the finger sausage—will shrink (FIGURE 19.17).

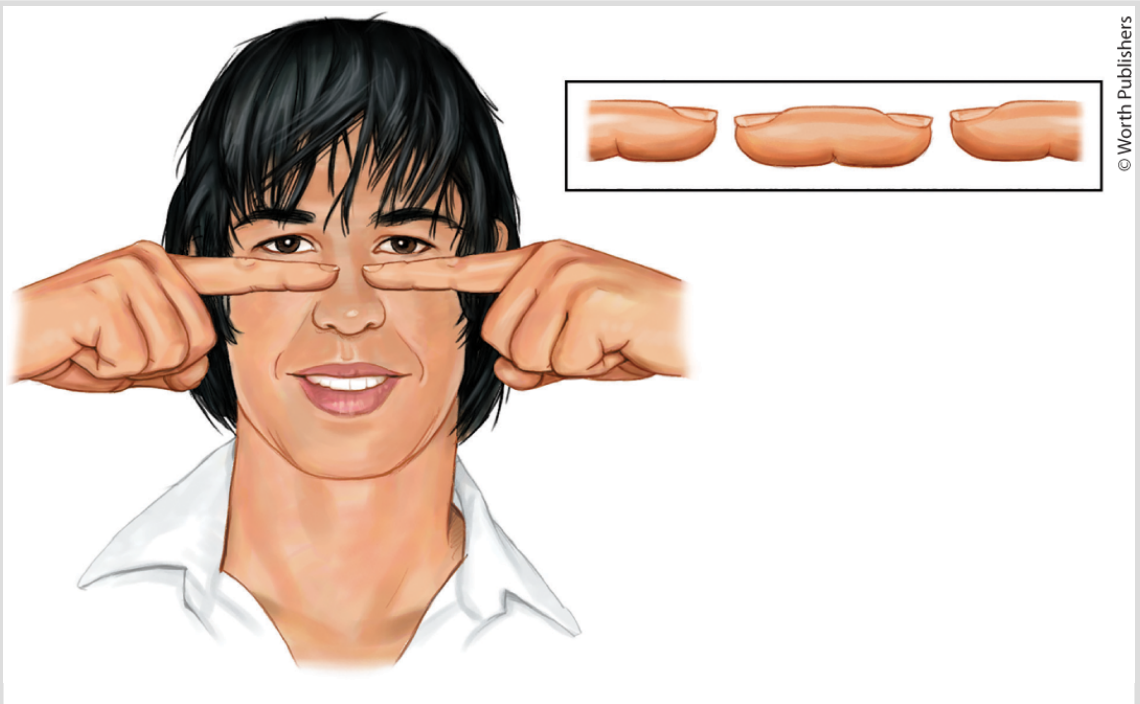


FIGURE 19.17 The floating finger sausage

We could easily include retinal disparity in our camera-software system. Movie directors sometimes film a scene through two lenses placed a small distance apart. Viewers then watch the film through glasses that allow the left eye to see only the image from the left camera, and the right eye to see only the image from the right camera. As 3-D movie fans know, the resulting effect mimics or exaggerates normal retinal disparity, giving the perception of depth. (And as someone who is *not* a fan of 3-D movies, I [ND] can confirm another, less pleasant effect: motion sickness.)

Monocular Cues

How do those of us with typical vision judge whether a person is 10 or 100 meters away? Retinal disparity won't help us here, because there won't be much difference between the images cast on our right and left retinas. At such distances, we depend on **monocular cues** (depth cues available to each eye separately). See **FIGURE 19.18** for some examples.



Relative height We perceive objects higher in our field of vision as farther away. Because we assume the lower part of a figure-ground illustration is closer, we perceive it as figure (Vecera et al., 2002). Invert this illustration and the black will become ground, like a night sky.

Relative size If we assume two objects are similar in size, *most* people perceive the one that casts the smaller retinal image as farther away.

Direction of passenger's motion →

Relative motion As we move, stable objects may also appear to move. If while riding on a bus you fix your gaze on some point—say, a house—the objects beyond the fixation point will appear to move with you. Objects in front of the point will appear to move backward. The farther an object is from the fixation point, the faster it will seem to move.

Linear perspective Parallel lines appear to meet in the distance. The sharper the angle of convergence, the greater the perceived distance.

Interposition If one object partially blocks our view of another, we perceive it as closer.

Top left: image courtesy of Shaun P. Vecera, Ph.D., adapted from stimuli that appeared in Vecera et al. 2002.; top center: BIZARRO © 2014 Dan Piraro, Dist. By King Features; bottom left: Rhymes with Oranges ©2010 Hilary B. Price. Distributed by King Features Syndicate, Inc.; bottom right: Philip Mugridge/Alamy Stock Photo © Worth Publishers

FIGURE 19.18 Monocular depth cues

Unlike carnivores, whose eyes enable forward focus on prey and offer binocular vision-enhanced depth perception, grazing herbivores typically have eyes on either side of their skull. Although lacking superior depth perception, herbivores have sweeping peripheral vision, all the better to detect predators.

Retrieval Practice

RP-8 How do people typically perceive depth?

ANSWERS IN APPENDIX E

Motion Perception

Imagine that, like Mrs. M. described earlier, you could perceive the world as having color, form, and depth but that you could not see motion. Not only would you be unable to bike or drive, you would have trouble writing, eating, and walking.

The brain typically computes motion based partly on its assumption that shrinking objects are retreating (not getting smaller) and enlarging objects are approaching. In young children, this ability to correctly perceive approaching (and enlarging) vehicles is not yet fully developed, which puts them at risk for pedestrian accidents (Wann et al., 2011). But it's not just children who have occasional difficulties with motion perception. Our adult brain is sometimes tricked into believing what it is not seeing. When large and small objects move at

the same speed, the large objects appear to move more slowly. Thus, trains seem to move slower than cars, and jumbo jets seem to land more slowly than little jets.

If you have vision, have you noticed how often you interrupt that vision with a 0.1 second blink—about 15 times per minute, or 15,000 unnoticed missing time slices per day (Grossman et al., 2019)? Probably not. Our brain perceives a rapid series of slightly varying images as continuous movement (a phenomenon called *stroboscopic movement*). As film animators know well, a superfast slide show of 24 still pictures a second will create an illusion of movement. We construct that motion in our head, just as we construct movement in blinking marquees and holiday lights. We perceive two adjacent stationary lights blinking on and off in quick succession as one single light jumping back and forth. Lighted signs exploit this **phi phenomenon** with a succession of lights that creates the impression of, say, a moving arrow.

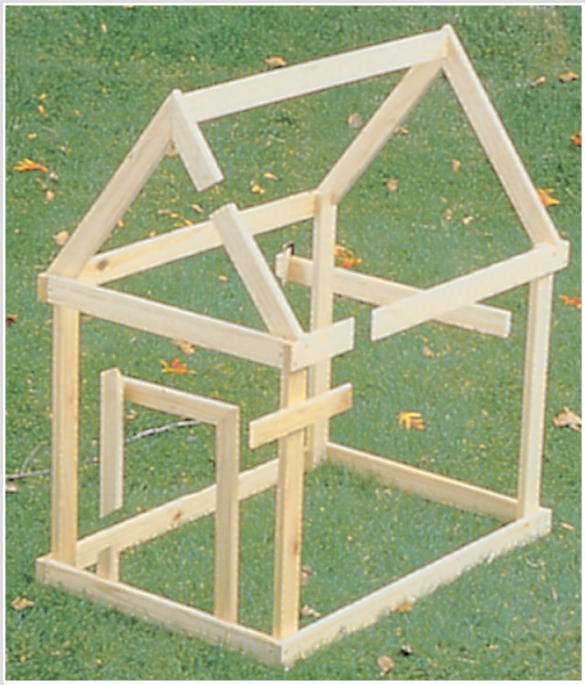


Photo by Walter Wick. Reprinted from GAMES Magazine ©1983 PCS Games Limited Partnership

FIGURE 19.19 The solution Another view of the impossible doghouse in Figure 19.15 reveals the secrets of this illusion. From the photo angle, the grouping principles of closure and continuity lead us to perceive the boards as continuous.

Perceptual Constancy

LOQ 19-8

How do perceptual constancies help us construct meaningful perceptions?

So far, we have noted that our camera-software system must perceive objects as we typically do—as having a distinct form, location, and motion. Its next task is to recognize objects without being deceived by

changes in their color, brightness, shape, or size—a *top-down* process called **perceptual constancy**. Regardless of the viewing angle, distance, and illumination, those of us with typical vision can identify people and things in less time than it takes to draw a breath. This feat is a huge challenge for a camera-software system.

Color and Brightness Constancies

James Gibson (1979) argued for an *ecological approach* to perception, in which our perceptions depend on an object's context. If you have full color vision, consider how you experience the color of a tomato—and how it would change if you viewed it through a paper tube over the course of a day. As the light—and thus the tomato's reflected wavelengths—changed, the tomato's color would also seem to change. But if you discarded the paper tube and viewed the tomato as one item in a salad bowl, its perceived color would remain constant, a consistent perception we call *color constancy*.

> **"From there to here, from here to there, funny things are everywhere."** — Dr. Seuss, *One Fish, Two Fish, Red Fish, Blue Fish,* 1960

Though we may take color constancy for granted, this ability is truly remarkable. Under indoor lighting, a blue poker chip reflects wavelengths that match those reflected by a sunlit gold chip (Jameson, 1985). Yet bring a goldfinch indoors and it won't look like a bluebird. The color is not in the bird's feathers. We see color thanks to our

brain's computations of the light reflected by an object *relative to the objects surrounding it.* For those with color vision, **FIGURE 19.20** dramatically illustrates the ability of a blue object to appear very different in three different contexts. Knowing the truth—that these disks are identically colored—does not diminish our perception that they are quite different. Because we construct our perceptions, we can simultaneously accept alternative objective and subjective realities.

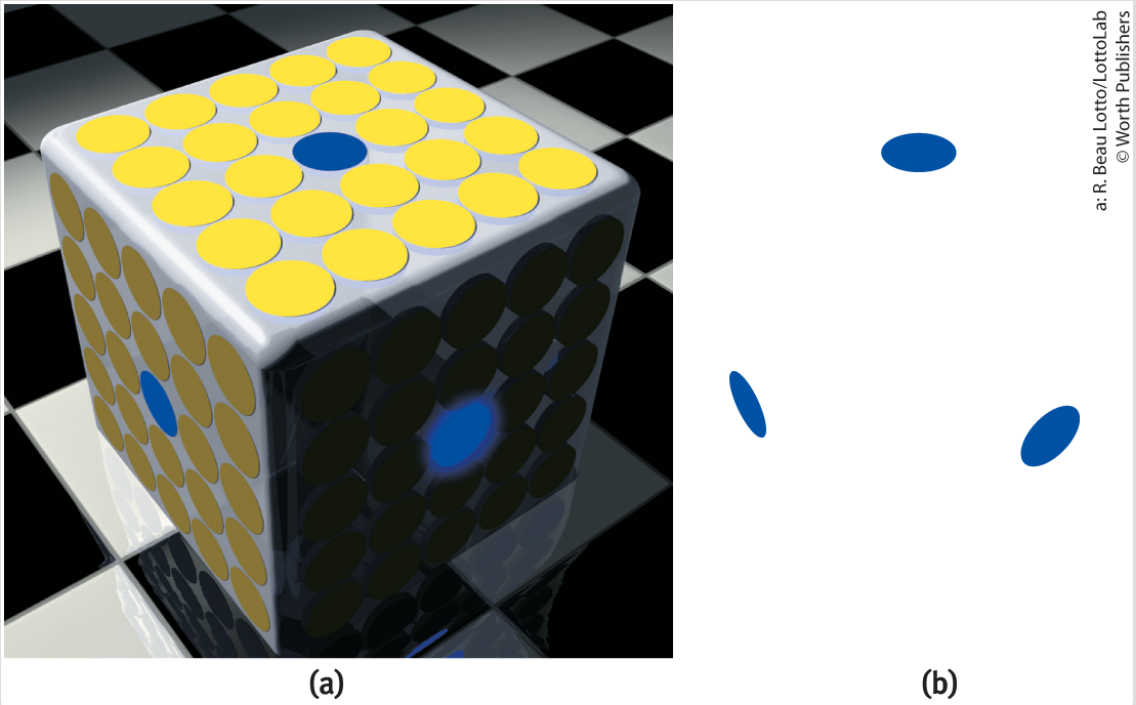


FIGURE 19.20 Color depends on context (a) Believe it or not, these three blue disks are identical in color. (b) Remove the surrounding context and see what results.

Brightness constancy (also called *lightness constancy*) similarly depends on context. If we have typical vision, we perceive an object as having a constant brightness even as its illumination varies. This perception of constancy depends on *relative luminance*—the amount of light an

object reflects *relative to its surroundings* (FIGURE 19.21). White paper reflects 90 percent of the light falling on it; black paper, only 10 percent. Although black paper viewed in sunlight may reflect 100 times more light than does white paper viewed indoors, it will still look black (McBurney & Collings, 1984). But try viewing sunlit black paper through a narrow tube moved just slightly away from the paper, but close enough so nothing else is visible. Now it may look gray, because in bright sunshine it reflects a fair amount of light. View it without the tube and it is again black, because it reflects much less light than the objects around it.

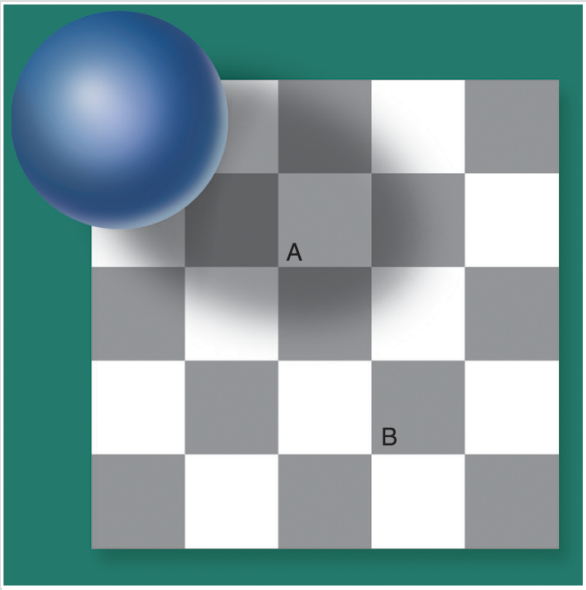


FIGURE 19.21 Relative luminance Because of its surrounding context, those with vision perceive Square A as lighter than Square B. But believe it or not, they are identical. To channel comedian Richard Pryor, "Who you gonna believe: me, or your lying eyes?" If you believe your lying eyes—actually, your lying brain—you can photocopy (or screen-capture

and print) the illustration, then cut out the squares and compare them. (Information from Edward Adelson.) Such human mistakes are so reliable that computer systems use them to identify human website users—knowing that computer spam robots answer *correctly.*

This principle—that we perceive objects not in isolation but in their environmental context—matters to artists, interior decorators, and clothing designers. Our perception of the color and brightness of a wall or of a streak of paint on a canvas is determined not just by the paint itself but by the surrounding colors. The take-home lesson: *Context governs our perceptions.*



Photo by Manuel Schmalstieg/Color Illusory color remix by Øyvind Kolås

Seeing color? Surprise! This is actually a black and white photo. If you have full color vision, did the colorful, overlaid grid lines trick your eyes, too?

Shape and Size Constancies

Thanks to *shape constancy,* those with typical vision perceive the form of familiar objects, such as the door in **FIGURE 19.22**, as constant even while the retinas receive changing images of them. The brain manages this feat because visual cortex neurons rapidly learn to associate different views of an object (Li & DiCarlo, 2008).

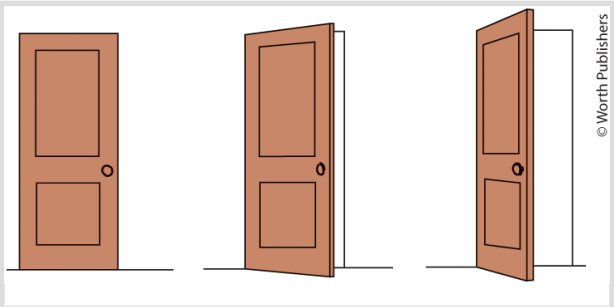


FIGURE 19.22 Shape constancy A door casts an increasingly trapezoidal image on our retinas as it opens. Yet we still perceive it as rectangular.

Thanks to *size constancy,* those with typical vision perceive an object as having an unchanging size, even while distance from it varies. We assume a bus is large enough to carry people, even when we see its tiny image from two blocks away. This assumption also illustrates the close connection between perceived *distance* and perceived *size.* Perceiving an object's distance gives us cues to its size. Likewise, knowing its general size—that the object is a bus—provides us with cues to its distance. To our distant ancestors, the similar-sized Sun and Moon likely seemed equally distant.

> **"Sometimes I wonder: Why is that Frisbee getting bigger? And then it hits me."** — Anonymous

Even in size-distance judgments, however, we consider an object's context. This interplay between perceived size and perceived distance helps explain several well-known illusions, including the *Moon illusion:* The Moon looks up to 50 percent larger when near the horizon than when high in the sky. Can you imagine why?

For at least 22 centuries, scholars have wondered (Hershenson, 1989). One reason is that monocular cues to an object's distance make the horizon Moon seem farther away. If it's farther away, our brain assumes, it must be larger than the Moon high in the night sky (Kaufman & Kaufman, 2000). But again, if we use a paper tube to take away the distance cue, the horizon Moon will immediately seem smaller.

Perceptual illusions reinforce a fundamental lesson: Perception is not merely a projection of the world onto our brain. Rather, our sensations are disassembled into information bits that our brain then reassembles into its own functional model of the external world. During this reassembly process, our assumptions—such as the usual relationship between distance and size—can lead us astray. *Our brain constructs our perceptions.*

***

Form perception, depth perception, motion perception, and perceptual constancies illuminate how we typically organize our visual experiences. Perceptual organization applies to our other senses, too. Listening to an unfamiliar language, those of us with hearing have trouble detecting where one word stops and the next one begins. Listening to our own language, we automatically hear distinct words. This, too, reflects perceptual organization. But it is more, for we even organize a string of letters—THEDOGATEMEAT—into words that make an intelligible phrase; it's more likely "The dog ate meat" than "The do gate me at" (McBurney & Collings, 1984). This process involves not only the organization we've been discussing, but also interpretation—discerning meaning in what we perceive.

Perceptual Interpretation

Philosophers have debated whether our perceptual abilities should be credited to our nature or our nurture. To what extent do we *learn* to perceive? German philosopher Immanuel Kant (1724–1804) maintained that knowledge comes from our *inborn* ways of organizing sensory experiences. Indeed, we typically come equipped to process sensory information. But British philosopher John Locke (1632–1704) argued that through our experiences we also *learn* to perceive the world. Indeed, we learn to link an object's distance with its size. So, just how important is experience? How radically does it shape our perceptual interpretations?

Experience and Visual Perception

LOQ 19-9

What does research on restored vision, sensory restriction, and perceptual adaptation reveal about the effects of experience on perception?

Restored Vision and Sensory Restriction

Writing to John Locke, William Molyneux wondered whether a person "*born* blind, and now adult, taught by … *touch* to distinguish between a cube and a sphere" could, if made to see, visually distinguish the two. Locke's answer was *No,* because the person would never have *learned* to see the difference.

> **"Let us then suppose the mind to be, as we say, white paper void of all characters, without any ideas: How comes it to be furnished? … To this I answer, in one word, from EXPERIENCE."** — John Locke, *An Essay Concerning Human Understanding,* 1690

Molyneux's hypothetical case has since been tested with people who, though blind from birth, later gained sight (Gandhi et al., 2017; Gregory, 1978; von Senden, 1932). Most were born with cataracts—clouded lenses that allowed them to see only diffused light, rather as a sighted person might see a foggy image through a table-tennis ball sliced in half. After cataract surgery, the patients could distinguish

figure from ground, differentiate colors, and distinguish faces from nonfaces—suggesting that these aspects of perception are innate. But much as Locke supposed, they often remained unable to visually recognize objects that were familiar by touch.



Marcio Jose Sanchez/AP Photo

Learning to see At age 3, Mike May lost his vision in an explosion. Decades later, after a new cornea restored vision to his right eye, he got his first look at his wife and children. Alas, although signals were now reaching his visual cortex, it lacked the experience to interpret them. May could not recognize expressions or faces, apart from features such as hair. Yet he can see an object in motion and has learned to navigate his world and to marvel at such things as dust floating in sunlight (Abrams, 2002; Gorlick, 2010; Huber et al., 2015).

Seeking to gain more control than is provided by clinical cases, researchers have outfitted infant kittens and monkeys with goggles through which they could see only diffuse, unpatterned light (Hubel & Wiesel, 1963). After infancy, when their vision was restored, the kittens behaved much like the humans born with cataracts. They could distinguish color and brightness, but not a circle from a square. Their eyes had not degenerated; their retinas still relayed signals to their visual cortex. But lacking early stimulation, their brain's cortical cells had failed to develop the necessary connections. Thus, the animals remained functionally blind to shape.

Surgery on children in India reveals that those who are blind from birth can benefit from removal of cataracts, and the younger they are, the more they benefit. But their visual acuity (sharpness) may never match the acuity of those born with full vision (Chatterjee, 2015; Gandhi et al., 2014). For sensory and perceptual development, there is a *critical period*—an optimal period when exposure to certain stimuli or experiences is required.

Once this critical period has passed, sensory restrictions later in life do no permanent harm. When researchers cover an adult animal's eye for several months, its vision will be unaffected after the eye patch is removed. When surgeons remove cataracts that developed during late adulthood, most people are thrilled at the return to full vision.

Perceptual Adaptation

Given a new pair of prescription eyeglasses, we may feel slightly disoriented, even dizzy. Within a day or two, we adjust. Our **perceptual adaptation** to changed visual input makes the world seem normal again. But if you are sighted, imagine wearing a far more dramatic new pair of glasses—one that shifts the apparent location of objects 40 degrees to the left. When you first toss a ball to a friend, it sails off to the left. Walking forward to shake hands with someone, you veer to the left.

Could you adapt to this distorted world? Not if you were a baby chicken. When fitted with such lenses, baby chicks continue to peck where food grains *seem* to be (Hess, 1956; Rossi, 1968). But we humans adapt to distorting lenses quickly. Within a few minutes your throws would again be accurate, your stride on target. Remove the lenses and you would experience an aftereffect: At first your throws would err in the *opposite* direction, sailing off to the right; but again, within minutes you would readapt.

Indeed, given an even more radical pair of glasses—one that literally turns the world upside down—you could still adapt. Psychologist George Stratton (1896) experienced this. He invented, and for 8 days wore, optical headgear that flipped left to right *and* up to down, making him the first person to experience a right-side-up retinal image while standing upright. The ground was up, the sky was down.



Courtesy of Hubert Dolezal

Perceptual adaptation "Oops, missed," thought researcher Hubert Dolezal as he attempted a handshake while viewing the world through inverting goggles. Yet, believe it or not, kittens, monkeys, and humans can adapt to an inverted world.

At first, when Stratton wanted to walk, he found himself searching for his feet, which were now "up." Eating was nearly impossible. He became nauseated and depressed. But he persisted, and by the eighth day he could comfortably reach for an object and, if his hands were in view, could walk without bumping into things. When Stratton finally removed the headgear, he readapted quickly. So did research participants who later wore such gear—while riding a motorcycle, skiing the Alps, or flying an airplane (Dolezal, 1982; Kohler, 1962). By

actively moving about in their topsy-turvy world, they adapted to their new context and learned to coordinate their movements.

So, do we learn to perceive the world? In part we do, as we constantly adjust to changing sensory input. Research on critical periods teaches us that early nurture sculpts what nature has provided. In less dramatic ways, nurture continues to do so throughout our lives. Radiologists, who spend their careers inspecting complex visual patterns, outperform novices in detecting unfamiliar visual information (Hussain, 2020). Likewise, portrait artists, who devote their careers to drawing faces, outperform nonartists on facial recognition tests (Hsia et al., 2021). Experience guides, sustains, and maintains the brain pathways that enable our perceptions.

Ask Yourself

Consider someone you know (could be yourself) who has a visual disability of some kind. What sort of disruption in the visual process might be causing that disability?

REVIEW

Module 19: Vision: Sensory and Perceptual Processing

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 19-1: What are the characteristics of the energy that we see as visible light? What structures in the eye help focus that energy?

LOQ 19-2: How do the rods and cones process information, and what is the path information travels from the eye to the brain?

LOQ 19-3: How do we perceive color in the world around us?

LOQ 19-4: Where are feature detectors located, and what do they do?

LOQ 19-5: How does the brain use parallel processing to construct visual perceptions?

LOQ 19-6: How did the Gestalt psychologists understand perceptual organization, and how do figure-ground and grouping principles contribute to our perceptions?

LOQ 19-7: How do binocular and monocular cues enable three-dimensional vision, and how does motion perception occur?

LOQ 19-8: How do perceptual constancies help us construct meaningful perceptions?

LOQ 19-9: What does research on restored vision, sensory restriction, and perceptual adaptation reveal about the effects of experience on perception?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

wavelength
hue
intensity
retina
accommodation
rods
cones
optic nerve
blind spot
fovea
Young-Helmholtz trichromatic (three-color) theory
opponent-process theory
feature detectors
parallel processing
gestalt

figure-ground
grouping
depth perception
visual cliff
binocular cue
retinal disparity
monocular cue
phi phenomenon
perceptual constancy
perceptual adaptation

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. The characteristic of light that determines the color we experience, such as blue or green, is its _____.

2. The amplitude of a light wave determines our perception of
   a. brightness.
   b. color.
   c. meaning.
   d. distance.

3. The blind spot in our retina is located where
   a. there are rods but no cones.
   b. there are cones but no rods.
   c. the optic nerve leaves the eye.
   d. the bipolar cells meet the ganglion cells.

4. Cones are the eye's receptor cells that are especially sensitive to _____ light and are responsible for our _____ vision.
   a. bright; black-and-white
   b. dim; color
   c. bright; color
   d. dim; black-and-white

5. Two theories together account for color vision. The Young-Helmholtz trichromatic theory shows that the eye contains _____, and Hering's theory accounts for the nervous system's having _____.
   a. opposing retinal processes; three pairs of color receptors
   b. opponent-process cells; three types of color receptors
   c. three pairs of color receptors; opposing retinal processes
   d. three types of color receptors; opponent-process cells

6. What mental processes allow sighted viewers to perceive a lemon as yellow?

7. The cells in the visual cortex that respond to certain lines, edges, and angles are called _____ _____.

8. The brain's ability to process many aspects of an object or a problem simultaneously is called _____ _____.

9. In listening to a concert, we attend to the solo instrument and perceive the orchestra as accompaniment. This illustrates the organizing principle of
   a. figure-ground.
   b. shape constancy.
   c. grouping.
   d. depth perception.

10. Our tendencies to fill in the gaps and to perceive a pattern as continuous are two different examples of the organizing principle called
    a. interposition.
    b. depth perception.
    c. shape constancy.
    d. grouping.

11. The visual cliff experiments suggest that
    a. infants have not yet developed depth perception.
    b. crawling human infants and very young animals perceive depth.
    c. we have no way of knowing whether infants can perceive depth.
    d. unlike other species, humans are able to perceive depth in infancy.

12. Depth perception underlies our ability to
    a. group similar items in a gestalt.
    b. perceive objects as having a constant shape or form.
    c. judge distances.
    d. fill in the gaps in a figure.

13. Two examples of _____ depth cues are interposition and linear perspective.

14. Perceiving a tomato as consistently red, despite lighting shifts, is an example of
    a. shape constancy.
    b. perceptual constancy.
    c. a binocular cue.
    d. continuity.

15. After surgery to restore vision, adults who had been blind from birth had difficulty
    a. recognizing objects by touch.
    b. recognizing objects by sight.
    c. distinguishing figure from ground.
    d. distinguishing between bright and dim light.

16. In experiments, people have worn glasses that turned their visual fields upside down. After a period of adjustment, they learned to function quite well. This ability is called _____ _____.

MODULE 20: Hearing, Skin, Chemical, and Body Senses

Although we describe our senses separately (and hearing, skin, chemical, and body senses are next up), we will learn that they interact—in interpreting the world, our brain blends their input.

Hearing

Like our other senses, our hearing—**audition**—helps us adapt and survive. Hearing provides information and enables relationships. Hearing humanizes: People seem more thoughtful, competent, and likable when we hear, not just read, their words (Schroeder & Epley, 2015, 2016). And hearing is pretty spectacular. It lets us communicate invisibly—by shooting unseen air waves across space and receiving the same from others. Hearing loss is the great invisible disability. To not catch someone's name, to not grasp what someone is asking, and to miss the hilarious joke is to be deprived of what others know, and sometimes to feel excluded. As a person with inherited hearing loss, I [DM] know the feeling and understand why adults with significant hearing loss experience increased risk of depression and anxiety (Blazer & Tucci, 2019; Scinicariello et al., 2019).

Most of us, however, can hear a wide range of sounds, and the ones we hear best are those in the range of the human voice. With normal

hearing, we are remarkably sensitive to faint sounds, such as a child's whimper. (If our ears were only slightly more sensitive, we would hear a constant hiss from the movement of air molecules.) Our distant ancestors' survival depended on this keen hearing when hunting or being hunted.

We are also remarkably attuned to sound variations. Among thousands of possible voices, we easily recognize an unseen friend's. Moreover, hearing is fast. "It might take you a full second to notice something out of the corner of your eye, turn your head toward it, recognize it, and respond to it," notes auditory neuroscientist Seth Horowitz (2012). "The same reaction to a new or sudden sound happens at least 10 times as fast." A fraction of a second after such events stimulate your ear's receptors, millions of neurons have simultaneously coordinated in extracting the essential features, comparing them with past experience, and identifying the stimulus (Freeman, 1991). For hearing, as for our other senses, we wonder: How do we do it?

The Stimulus Input: Sound Waves

LOQ 20-1

What are the characteristics of the air pressure waves that we hear as sound?

Draw a bow across a violin, and you will unleash the energy of sound waves. Air molecules, each bumping into the next, create waves of

compressed and expanded air, like the ripples on a pond circling out from a tossed stone. As we swim in our ocean of moving air molecules, our ears detect these brief air pressure changes.

Like light waves, sound waves vary in shape (FIGURE 20.1). The height, or *amplitude,* of sound waves determines their perceived *loudness.* Their **frequency** (measured in *hertz*) determines the **pitch** (the high or low tone) we experience. Long waves have low frequency—and low pitch. Short waves have high frequency—and high pitch. Sound waves produced by a soprano are much shorter and faster than those produced by a baritone singer.

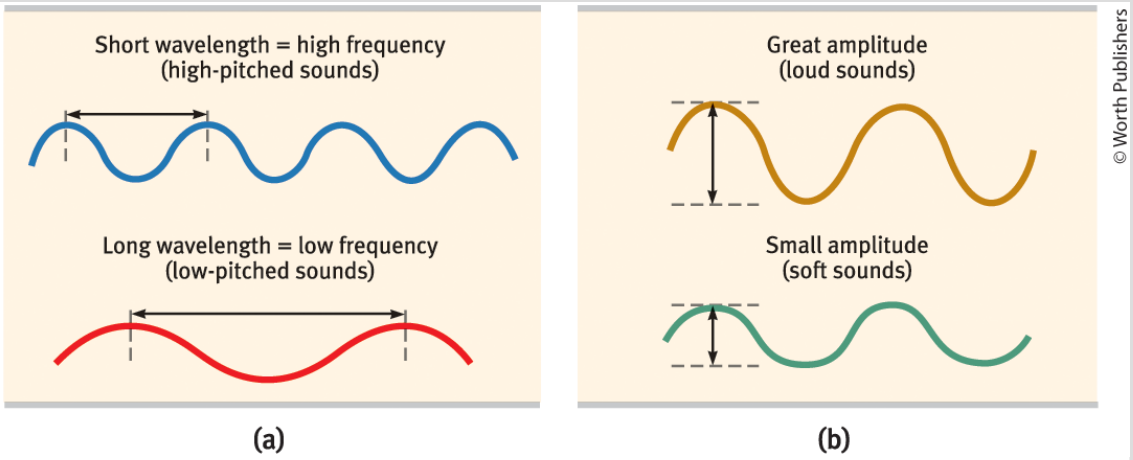


FIGURE 20.1 The physical properties of waves (a) Waves vary in *wavelength* (the distance between successive peaks). *Frequency,* the number of complete wavelengths that can pass a point in a given time, depends on the wavelength. The shorter the wavelength, the higher the frequency. Wavelength determines the *pitch* of sound. (b) Waves also vary in *amplitude* (the height from peak to trough). Wave amplitude influences sound *intensity.*





Left: Vereshchagin Dmitry/Shutterstock; right: Courtesy of Eric Richmond/The Chineke! Foundation

The sounds of music A violin's short, fast waves create a high pitch. The longer, slower waves of Chi-chi Nwanoku OBE's double bass create a lower pitch. Differences in the waves' height, or amplitude, also create differing degrees of loudness.

We measure sound intensity in *decibels,* with zero decibels representing the absolute threshold for hearing. Every 10 decibels corresponds to a tenfold increase in sound intensity. Thus, normal conversation (60 decibels) is 10,000 times more intense than a 20-decibel whisper. And a temporarily tolerable 100-decibel passing subway train is 10 billion times more intense than the faintest

detectable sound. If prolonged, exposure to sounds above 85 decibels can produce hearing loss. Tell that to basketball fans at the University of Kentucky who, in 2017, broke the Guinness World Record for the noisiest indoor stadium at 126 decibels (WKYT, 2017). Hear today, gone tomorrow.

The Ear

LOQ 20-2

How does the ear transform sound energy into neural messages?

How does vibrating air trigger nerve impulses that your brain can decode as sounds? The process begins when sound waves strike your *eardrum,* causing this tight membrane to vibrate (**FIGURE 20.2**).

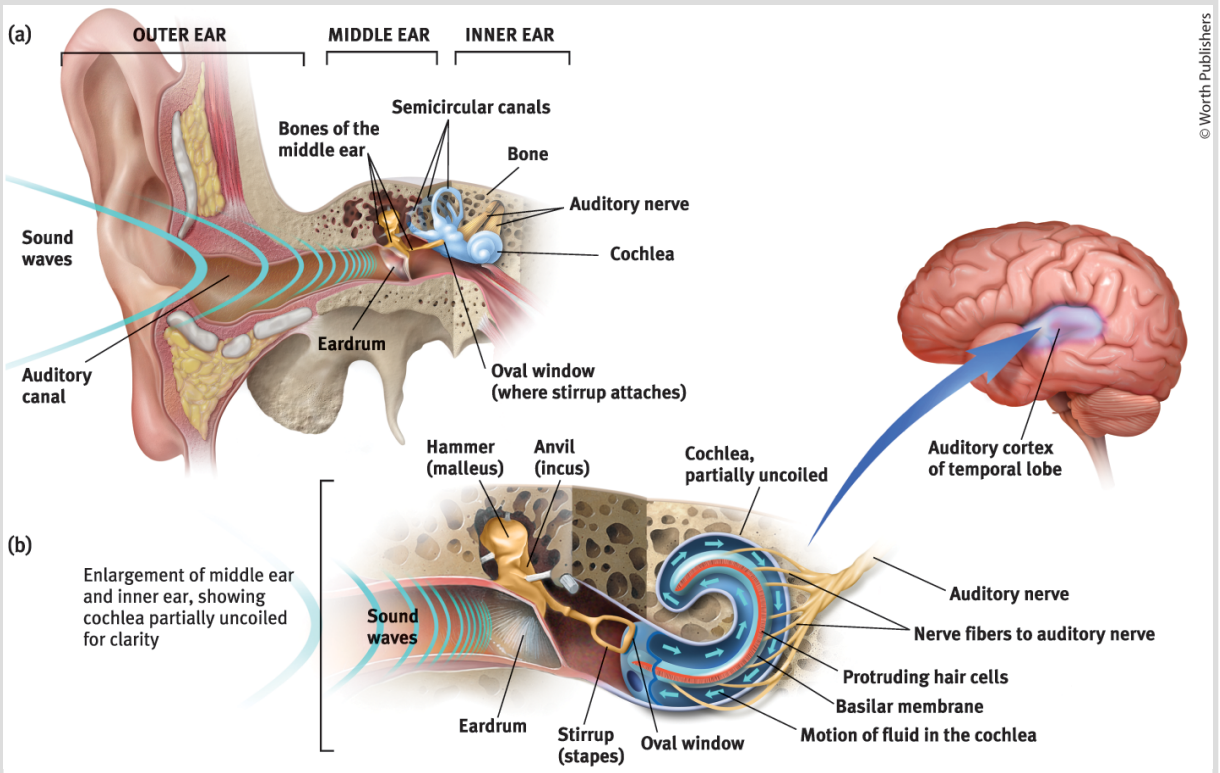


FIGURE 20.2 Hear here: How we transform sound waves into nerve impulses that our brain interprets (a) The outer ear funnels sound waves to the eardrum. The bones of the middle ear (malleus, incus, and stapes) amplify and relay the eardrum's vibrations through the oval window into the fluid-filled cochlea. (b) As shown in this detail of the middle ear and inner ear, the cochlear fluid's resulting pressure changes cause the basilar membrane to ripple, bending the hair cells on its surface. Hair cell movements trigger impulses at the nerve cells' base, whose fibers converge to form the auditory nerve. That nerve sends neural messages to the thalamus and on to the auditory cortex.

In your **middle ear**, a piston made of three tiny bones—the *hammer* (malleus), *anvil* (incus), and *stirrup* (stapes)—picks up the vibrations and transmits them to the **cochlea**, a snail-shaped tube in your **inner ear**.

The incoming vibrations then cause the cochlea's membrane-covered opening (the *oval window*) to vibrate, jostling the fluid inside the cochlea. This motion causes ripples in the *basilar membrane,* bending the *hair cells* lining its surface, rather like grass blades bending in the wind.

The hair cell movements in turn trigger impulses in adjacent nerve cells, whose axons converge to form the *auditory nerve*. The auditory nerve carries the neural messages to your thalamus and then on to the *auditory cortex* in your brain's temporal lobe. From vibrating air, to tiny moving bones, to fluid waves, to electrical impulses to the brain: Voila! You hear!

Perhaps the most intriguing part of the hearing process is the hair cells—"quivering bundles that let us hear" thanks to their "extreme sensitivity and extreme speed" (Goldberg, 2007). A cochlea has 16,000 of them, which sounds like a lot until we compare that with an eye's 130 million or so photoreceptors. But consider a hair cell's responsiveness. Deflect the tiny bundles of *cilia* on its tip by only the width of an atom, and the alert hair cell, thanks to a special protein, will trigger a neural response (Corey et al., 2004).

Worldwide, 1.57 billion people are challenged by hearing loss and about half a billion have a disabling hearing loss (Global Burden of Disease, 2021; Wilson et al., 2017). Damage to the cochlea's hair cell receptors or the auditory nerve can cause **sensorineural hearing loss** (or nerve deafness). With auditory nerve damage, people may hear

sound but have trouble discerning what someone is saying (Liberman, 2015). Sensorineural hearing loss is more common than **conduction hearing loss**, which is caused by damage to the mechanical system—the eardrum and middle ear bones—that conducts sound waves to the cochlea. Occasionally, disease damages hair cell receptors, but more often the culprit is biological changes linked with heredity and aging. I [DM] understand—as one who lives with severe hearing loss passed down from my grandmother and mother, thanks to a single gene mutation.

Toxic noise, such as prolonged exposure to ear-splitting music, is another culprit. The cochlea's hair cells have been likened to carpet fibers. Walk around on them and they will spring back. But leave a heavy piece of furniture on them and they may never rebound. As a general rule, any noise we cannot talk over (loud machinery, fans screaming at a concert or sports event, our daily music mix blasting at maximum volume) may be harmful, especially if prolonged and repeated (Roesser, 1998) (**FIGURE 20.3**). And if our ears ring after such experiences, we have been bad to our unhappy hair cells. As pain alerts us to possible bodily harm, ringing of the ears alerts us to possible hearing damage. It is hearing's equivalent of bleeding.

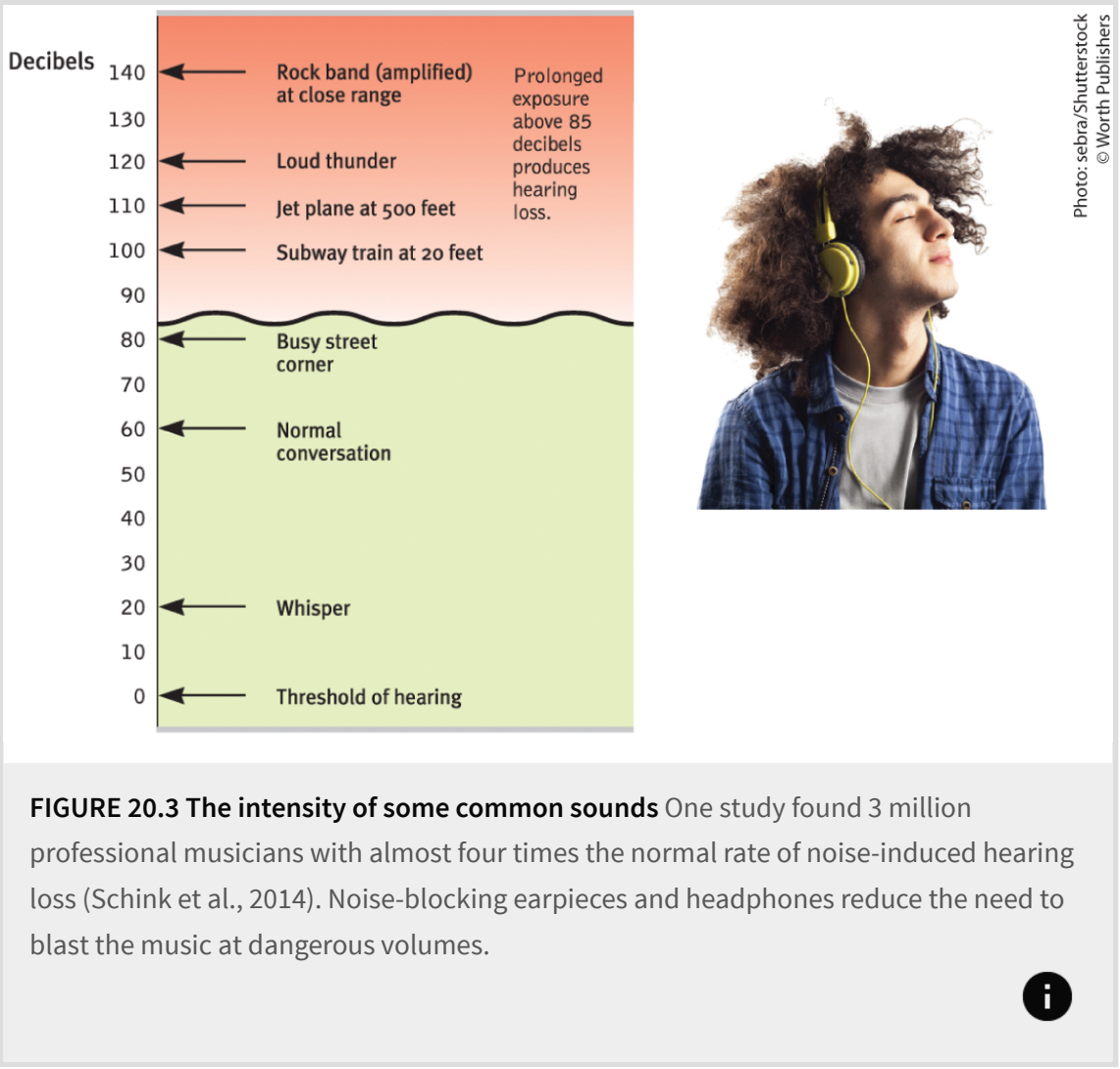


FIGURE 20.3 The intensity of some common sounds One study found 3 million professional musicians with almost four times the normal rate of noise-induced hearing loss (Schink et al., 2014). Noise-blocking earpieces and headphones reduce the need to blast the music at dangerous volumes.

Since the early 1990s, teen hearing loss has risen by a third, now affecting 1 in 6 teens (Shargorodsky et al., 2010; Weichbold et al., 2012). After three hours of a rock concert averaging 99 decibels, 54 percent of teens reported temporarily not hearing as well, and 1 in 4 had ringing in their ears (Derebery et al., 2012). Teen boys more than teen girls or adults blast themselves with loud volumes for long periods (Widén et al., 2017; Zogby, 2006). Greater noise exposure may help explain why men's hearing tends to be less acute than women's. People who spend many hours working in a noisy environment should

wear earplugs, or risk needing a hearing aid later (Zhou et al., 2021). “Condoms,” say sex educators. “Earplugs or walk away,” say hearing educators.

Nerve deafness cannot, as yet, be reversed. One way to restore hearing is a sort of bionic ear—a **cochlear implant.** The implants translate sounds into electrical signals that, wired into the cochlea’s nerves, convey information about sound to the brain (**FIGURE 20.4**). When given to deaf kittens and human infants, cochlear implants have seemed to trigger an “awakening” of the pertinent brain area (Klinke et al., 1999; Sireteanu, 1999). These devices can help children become proficient in oral communication (especially if they receive them as preschoolers or ideally before age 1) (Dettman et al., 2007; Schorr et al., 2005). Hearing, like vision, has a *critical period.* As I [DM] can attest, cochlear implants can help restore hearing for most adults, but only if their brain learned to process sound during childhood. The restored hearing can also reduce social isolation and the risk of depression (Mosnier et al., 2015).

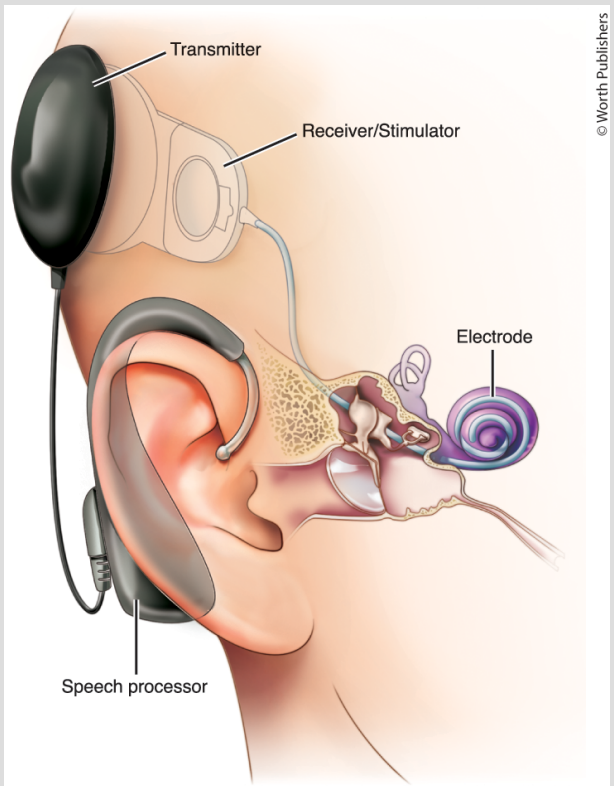


FIGURE 20.4 Hardware for hearing Cochlear implants work by translating sounds into electrical signals that are transmitted to the cochlea and, via the auditory nerve, relayed to the brain.

Retrieval Practice

RP-1 The amplitude of a sound wave determines our perception of _____ (loudness/pitch).

RP-2 The longer the sound waves, the _____ (lower/higher) their frequency and the _____ (higher/lower) their pitch.

ANSWERS IN APPENDIX E

Perceiving Loudness, Pitch, and Location

LOQ 20-3

How do we detect loudness, discriminate pitch, and locate sounds?

Responding to Loud and Soft Sounds

How do we detect loudness? If you guessed that it's related to the *intensity* of a hair cell's response, you'd be wrong. Rather, a soft, pure tone activates only the few hair cells attuned to its frequency. Given louder sounds, neighboring hair cells also respond. Thus, your brain interprets loudness from the *number* of activated hair cells.

If a hair cell loses sensitivity to soft sounds, it may still respond to loud sounds. This helps explain another surprise: Really loud sounds may seem loud to people with or without normal hearing. Given my hearing loss, I [DM] have wondered what really loud music must sound like to people with normal hearing. Now I realize it sounds much the same; where we differ is in our perception of soft sounds (and our ability to isolate one sound amid noise). This is why we hard-of-hearing people do not want *all* sounds (loud and soft) amplified. We like sound *compressed,* which means harder-to-hear sounds are amplified more than loud sounds (a feature of today's digital hearing aids).

Hearing Different Pitches

How do we know whether a sound is the high-frequency, high-pitched chirp of a bird or the low-frequency, low-pitched roar of a truck? Current thinking on how we discriminate pitch combines two theories.

- **Place theory** (also called *place coding*) presumes that we hear different pitches because different sound waves trigger activity at different places along the cochlea's basilar membrane. Thus, the brain determines a sound's pitch by recognizing the specific place (on the membrane) that is generating the neural signal. When Nobel laureate-to-be Georg von Békésy (1957) cut holes in the cochleas of guinea pigs and human cadavers and looked inside with a microscope, he discovered that the cochlea vibrated, rather like a shaken bedsheet, in response to sound. High frequencies produced large vibrations near the beginning of the cochlea's membrane. Low frequencies vibrated more of the membrane and were not so easily localized. So, there is a problem: Place theory can explain how we hear high-pitched sounds but not low-pitched sounds.
- **Frequency theory** (also called *temporal coding*) suggests another explanation that accounts for our ability to hear low-pitched sounds: The brain reads pitch by monitoring the frequency of neural impulses traveling up the auditory nerve. The whole basilar membrane vibrates with the incoming sound wave, triggering neural impulses to the brain at the same rate as the sound wave. If the sound wave has a frequency of 100 waves per

second, then 100 pulses per second travel up the auditory nerve. But frequency theory also has a problem: An individual neuron cannot fire faster than 1000 times per second. How, then, can we sense sounds with frequencies above 1000 waves per second (roughly the upper third of a piano keyboard)? Enter the *volley principle:* Like soldiers who alternate firing so that some can shoot while others reload, neural cells can alternate firing. By firing in rapid succession, they can achieve a *combined frequency* above 1000 waves per second.

So, place theory and frequency theory work together to enable our perception of pitch. Place theory best explains how we sense *high pitches.* Frequency theory, extended by the volley principle, explains how we sense *low pitches.* Finally, some combination of place and frequency theories likely explains how we sense *pitches in the intermediate range.*

Retrieval Practice

RP-3 Which theory of pitch perception would best explain a symphony audience's enjoyment of a high-pitched piccolo? How about a low-pitched cello?

ANSWERS IN APPENDIX E

Locating Sounds

Why don't we have one big ear—perhaps above our one nose? "All the better to hear you with," as the wolf said to Little Red Riding Hood. Thanks to the placement of our two ears, we enjoy stereophonic ("three-dimensional") hearing. Two ears are better than one for at least two reasons (FIGURE 20.5). If a car to your right honks, your right ear will receive a more *intense* sound, and it will receive the sound slightly *sooner* than your left ear.

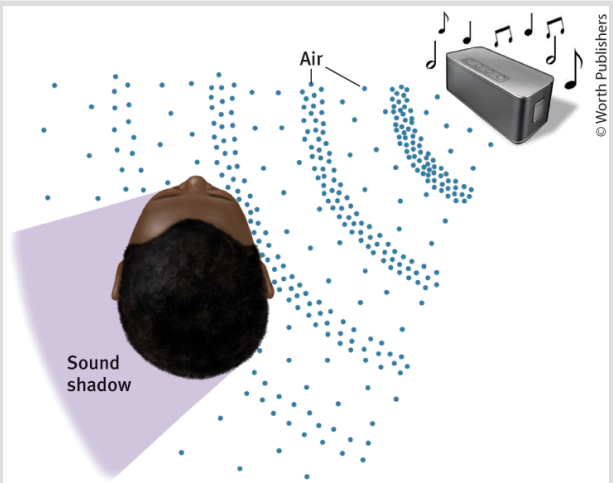


FIGURE 20.5 How we locate sounds Sound waves strike one ear sooner and more intensely than the other. From this information, our nimble brain can compute the sound's location. As you might therefore expect, people who lose all hearing in one ear often have difficulty locating sounds.

Because sound travels fast and human ears are not very far apart, the intensity difference and the time lag are extremely small. A *just*

noticeable difference in the direction of two sound sources corresponds to a time difference of just 0.000027 second! Lucky for us, our supersensitive auditory system can detect such minute differences and locate the sound (Brown & Deffenbacher, 1979; Middlebrooks & Green, 1991).

Skin, Chemical, and Body Senses

Sharks and dogs rely on their outstanding sense of smell, aided by large smell-related brain areas. Our human brain allocates more real estate to seeing and hearing. But extraordinary happenings also occur within our skin (touch and pain), chemical (taste and smell), and body (position and movement) senses. Without these other senses, we humans would be seriously hampered, and our capacity for enjoying the world would be greatly diminished.

Touch

LOQ 20-4

What are the four basic touch sensations, and how do we sense touch?

Touch, our tactile sense, is vital. From infancy to adulthood, affectionate touches promote our well-being (Jakubiak & Feeney, 2017). Right from the start, touch aids our development. Infant rats deprived of their mother's grooming produce less growth hormone and have a lower metabolic rate—a good way to keep alive until the

mother returns, but a reaction that stunts growth if prolonged. Infant monkeys that are allowed to see, hear, and smell—but not touch—their mother become desperately unhappy (Suomi et al., 1976). Premature human babies gain weight faster and go home sooner if they are stimulated by hand massage (Field et al., 2006). Coping with disaster or grieving a death, we may find comfort in a hug. As adults, we still yearn to touch—to kiss, to stroke, to snuggle.



© Jose Luis Pelaez/Blend Images/Corbis

The precious sense of touch As William James wrote in his *Principles of Psychology* (1890), "Touch is both the alpha and omega of affection."

Humorist Dave Barry (1985, p. 2) was perhaps right to jest that your skin "keeps people from seeing the inside of your body, which is repulsive, and it prevents your organs from falling onto the ground." But skin does much more. Touching various spots on the skin with a soft hair, a warm or cool wire, and the point of a pin reveals that some spots are especially sensitive to *pressure,* others to *warmth,* others to *cold,* still others to *pain.* Our "sense of touch" is actually a mix of these four basic and distinct skin senses, and our other skin sensations are variations of pressure, warmth, cold, and pain. For example, stroking adjacent pressure spots creates a tickle. Repeated gentle stroking of a pain spot creates an itching sensation. Touching adjacent cold and pressure spots triggers a sense of wetness (which you can experience by touching dry, cold metal).

Touch sensations involve more than tactile stimulation, however. A self-administered tickle produces less somatosensory cortex activation than does the same tickle from something or someone else (Blakemore et al., 1998). Likewise, a sensual leg caress evokes a different somatosensory cortex response when a heterosexual man believes it comes from an attractive woman rather than a man (Gazzola et al., 2012). Such responses reveal how quickly cognition influences our brain's sensory response.

Pain

LOQ 20-5

What biological, psychological, and social-cultural influences affect our experience of pain? How do placebos, distraction, and hypnosis help control pain?

Be thankful for occasional pain. Pain is your body's way of telling you something has gone wrong. Drawing your attention to a burn, a break, or a sprain, pain orders you to change your behavior—"Stay off that ankle!"

The rare people born without the ability to feel pain may experience pain-free childbirth, but also are at risk of severe injury or even early death (Habib et al., 2019). Without the discomfort that makes us shift position, their joints can fail from excess strain. Without the warnings of pain, infections can run wild and injuries can accumulate (Neese, 1991).



Photo by Jeff Riedel/Contour by Getty Images

"Pain is a gift." So said a doctor studying Ashlyn Blocker, who has a rare genetic mutation that prevents her from feeling pain. At birth, she didn't cry. As a child, she ran around for 2 days on a broken ankle. She has put her hands on a hot machine and burned the flesh off. And she has reached into boiling water to retrieve a dropped spoon. "Everyone in my class asks me about it, and I say, 'I can feel pressure, but I can't feel pain.' *Pain!* I cannot feel it!" (Heckert, 2012).

More numerous are those who live with chronic pain, which is like an alarm that won't shut off. Persistent backaches, arthritis, headaches,

and cancer-related pain prompt two questions: What is pain? How might we control it?

Understanding Pain

Our experience of pain reflects both *bottom-up* sensations and *top-down* cognition. Pain is a biopsychosocial phenomenon (Hadjistavropoulos et al., 2011). As such, pain experiences vary widely, from group to group and from person to person. Viewing pain from the biological, psychological, and social-cultural perspectives can help us better understand it, and also help us cope with it and treat it (FIGURE 20.6).

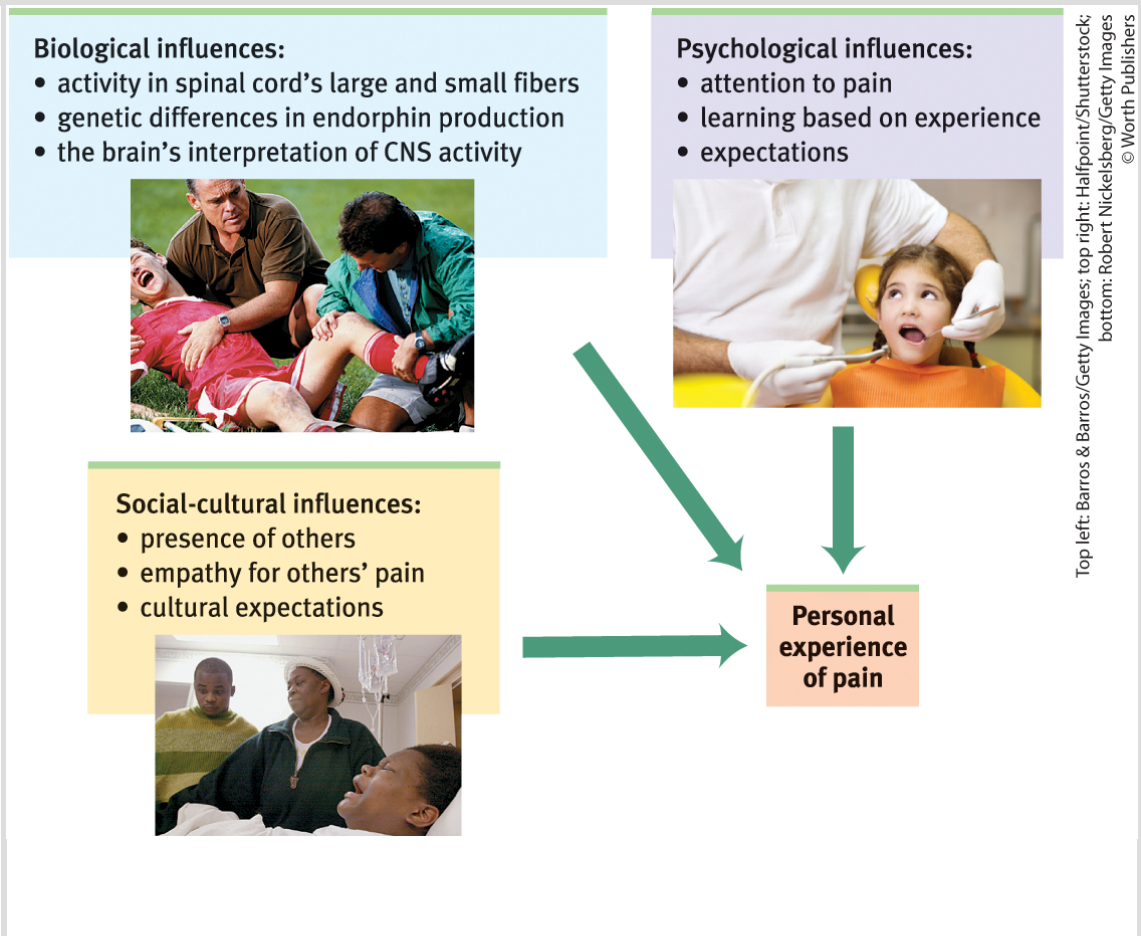


FIGURE 20.6 Biopsychosocial approach to pain Our experience of pain is much more than the neural messages sent to our brain.



Biological Influences

Pain is a physical event produced by your senses. But pain differs from some of your other sensations. No one type of stimulus triggers pain the way light triggers vision. And no specialized receptors process pain signals the way your retina receptors react to light rays. Instead, sensory receptors called *nociceptors*—mostly in your skin, but also in your muscles and organs—detect hurtful temperatures, pressure, or chemicals (**FIGURE 20.7**). Your brain's neural networks process these sensations and produce perceptions of pain (Tan & Kuner, 2021).

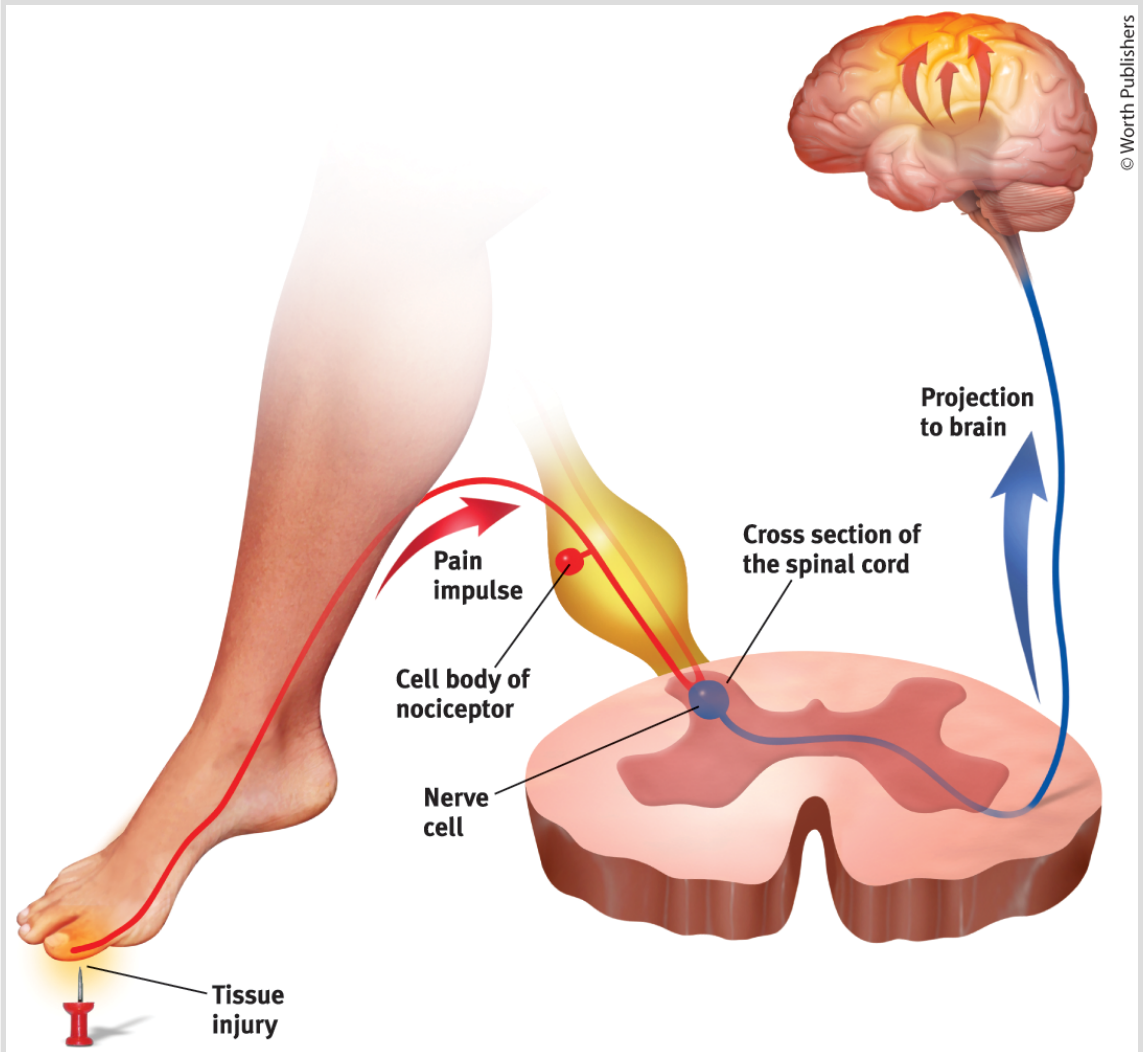


FIGURE 20.7 The pain circuit Sensory receptors *(nociceptors)* respond to potentially damaging stimuli by sending an impulse to the spinal cord, which passes the message to the brain, which interprets the signal as pain.

People's pain experiences differ. Those who *fear* pain the most tend to *feel* pain the most (Markfelder & Pauli, 2020). Your experience of pain depends in part on the genes you inherited and on your physical characteristics (Gatchel et al., 2007; Reimann et al., 2010). Women are

more sensitive to pain than men are (their senses of hearing and smell also tend to be more sensitive) (Ruau et al., 2012; Wickelgren, 2009).

No pain theory can explain all available findings. One useful model, **gate-control theory**, suggests that the spinal cord contains a neurological "gate" that controls the transmission of pain messages to the brain (Melzack & Katz, 2013; Melzack & Wall, 1965, 1983).

Small spinal cord nerve fibers conduct most pain signals. An injury activates the small fibers and opens the gate. The pain signals can then travel to your brain, and you feel pain. But large-fiber activity (stimulated by massage, electrical stimulation, or acupuncture) can close the pain gate by blocking pain signals. Brain-to-spinal-cord messages can also close the gate. Thus, chronic pain can be treated both by gate-closing stimulation, such as massage, and by mental activity, such as distraction (Wall, 2000).

We also benefit from our own natural painkillers, *endorphins,* which are released in response to severe pain or vigorous exercise. People who carry a gene that boosts the availability of endorphins are less bothered by pain, and their brain is less responsive to pain (Zubieta et al., 2003). Others, who carry a mutated gene that disrupts pain circuit neurotransmission, may not experience pain (Cox et al., 2006). Such discoveries point the way toward future pain medications that mimic these genetic effects.

Pain is not merely a physical phenomenon of injured nerves sending impulses to a definable brain or spinal cord area—like pulling on a rope to ring a bell. The brain can also create pain, as it does in *phantom limb sensations.* Without normal sensory input from a missing limb, the brain may misinterpret and amplify spontaneous but irrelevant central nervous system activity. As the dreamer sees with eyes closed, so 7 in 10 people who have undergone limb amputation feel pain or movement in nonexistent limbs (Melzack, 1992, 2005). Some may even try to lift a cup with a phantom hand, or step off a bed onto a phantom leg. Even those born without a limb sometimes perceive sensations from the absent arm or leg; the brain comes prepared to anticipate "that it will be getting information from a body that has limbs" (Melzack, 1998).

Phantoms may haunt other senses, too. People with hearing loss often experience the sound of silence. *Tinnitus,* the phantom sound of ringing in the ears, is not produced by vibrating air molecules but is accompanied by auditory brain activity (Sedley et al., 2015). Those who lose vision to glaucoma, cataracts, diabetes, or macular degeneration may experience phantom sights—nonthreatening hallucinations (Painter et al., 2018). Others with nerve damage in the tasting and smelling systems have experienced phantom tastes or smells, such as ice water that seems sickeningly sweet or fresh air that reeks of rotten food (Goode, 1999). *The point to remember:* We feel, see, hear, taste, and smell with our brain.

Psychological Influences

One powerful influence on our perception of pain is the attention we focus on it. Athletes, focused on winning, may perceive pain differently and play through it. Injured soldiers, caught up in battle, may feel little or no pain until they reach safety.



Reinhold Matay/AP Photo

Distracted from the pain After a tackle in the first half of a competitive game, Mohammed Ali Khan (here playing for BK Häcken in white) said he “had a bit of pain” but thought it was “just a bruise.” With his attention focused on the game, he played on. In the second half he was surprised to learn from an attending doctor that his leg was broken.

We also seem to edit our *memories* of pain, which often differ from the pain we actually experienced. In experiments, and after painful medical procedures or childbirth, people overlook a pain's duration. Instead, their memory snapshots record two factors: their pain's *peak* moment (which can lead them to recall variable pain, with peaks, as worse [Chajut et al., 2014; Stone et al., 2005]), and how much pain they felt at the *end.* In one experiment, people immersed one hand in painfully cold water for 60 seconds followed by a slightly less painful 30 seconds more (Kahneman et al., 1993). Which experience would you expect they recalled as most painful?

Curiously, when asked which trial they would prefer to repeat, most preferred the 90-second trial, with more net pain—but less pain at the end. Physicians have used this principle with patients undergoing sedation-free colon exams—lengthening the discomfort by a minute but lessening its intensity at the end (Kahneman, 1999). Imagine undergoing a painful procedure and having the doctor ask if you'd rather go home now or bear a few more minutes of milder discomfort. There's a case to be made for prolonging a tapered hurt.

The end of an experience can color our memory of pleasures, too. In one simple experiment, some people, on receiving a fifth and last piece of chocolate, were told it was their "next" one. Others, told it was their "last" piece, liked it better and rated the whole experiment as being more enjoyable (O'Brien & Ellsworth, 2012). Endings matter.

Social-Cultural Influences

Pain is a product of our attention, our expectations, and also our culture (Gatchel et al., 2007; Reimann et al., 2010). Not surprisingly, then, our perception of pain varies with our social situation and our cultural traditions. We tend to perceive more pain when others also seem to be experiencing pain (Symbaluk et al., 1997). This may help explain the apparent social aspects of pain, as when groups of Australian keyboard operators during the mid-1980s suffered outbreaks of severe pain while typing or performing other repetitive work—without any discernible physical abnormalities (Gawande, 1998). Sometimes the pain in a sprain is mainly in the brain—literally. When people feel empathy for another's pain, their own brain activity partly mirrors the activity of the actual brain in pain (Singer et al., 2004).

Controlling Pain

If pain is where body meets mind—if it is both a physical and a psychological phenomenon—then it should be treatable both physically and psychologically. Depending on the symptoms, pain control therapies may include drugs, surgery, acupuncture, electrical stimulation, massage, exercise, hypnosis, relaxation training, meditation, and thought distraction.



Xinhua/Alamy Stock Photo

Acupuncture: A jab well done Kawsar Ali Sardar began experiencing severe headaches in 2021 after having Covid. Acupuncture treatments, received near his home in Dhaka, Bangladesh, brought some relief.

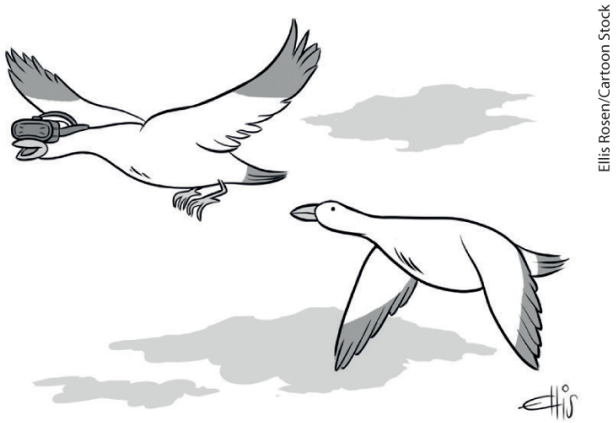
Placebos

Even *placebos* can help, by dampening the central nervous system's attention and responses to painful experiences—mimicking painkilling drugs (Eippert et al., 2009; Wager & Atlas, 2013). After being injected in the jaw with a stinging saltwater solution, men in one experiment received a placebo they had been told would relieve the pain. It did—they immediately felt better. "Nothing" worked. The men's belief in the fake painkiller triggered their brain to respond by dispensing endorphins, as revealed by activity in an area that releases natural painkilling opiates (Scott et al., 2007; Zubieta et al., 2005).

Distraction

Have you ever had a health care professional suggest that you focus on a pleasant image ("Think of a warm, comfortable environment")

during a procedure, or perform some distracting task ("Count backward by 3s") while receiving an unpleasant treatment? Drawing attention away from the painful stimulation is an effective way to activate brain pathways that inhibit pain and increase pain tolerance (Edwards et al., 2009). For burn victims receiving excruciating wound care, an even more effective distraction is escaping into virtual reality. Functional MRI (fMRI) scans have revealed that playing in a computer-generated 3-D world reduces the brain's pain-related activity (Hoffman, 2004). Because pain is in the brain, diverting the brain's attention may bring relief. Being "fully immersed in a virtual environment [is] like a 'brain hack,'" said one doctor who uses virtual reality to treat pain. "You can't be engaged in anything else" (Brody, 2019).



"It's like I'm actually walking."

"Pain is increased by attending to it." — Charles Darwin, *The Expression of the Emotions in Man and Animals,* 1872

Hypnosis

Better yet, research suggests, try maximizing pain relief by combining a placebo with distraction (Buhle et al., 2012) and amplifying their effects with **hypnosis.** Imagine you are about to be hypnotized. The hypnotist invites you to sit back, fix your gaze on a spot high on the wall, and relax. You hear a quiet, low voice suggest, "Your eyes are growing tired.... Your eyelids are becoming heavy ... now heavier and heavier.... They are beginning to close.... You are becoming more deeply relaxed.... Your breathing is now deep and regular.... Your muscles are becoming more and more relaxed.... Your whole body is beginning to feel like lead." After a few minutes of this *hypnotic induction,* you may experience hypnosis. Words can temporarily change your brain activity.

Hypnotists have no magical mind-control power; they merely focus people's attention on certain images or behaviors. To some extent, we are all open to suggestion. But highly hypnotizable people—such as the 20 percent who can carry out a suggestion not to react to an open bottle of smelly ammonia—are especially suggestible and imaginative (Barnier & McConkey, 2004; Silva & Kirsch, 1992). Their brain also displays altered activity when under hypnosis (Jiang et al., 2016).

Can hypnosis relieve pain? *Yes.* When unhypnotized people put their arm in an ice bath, they felt intense pain within 25 seconds (Elkins et al., 2012; Jensen, 2008). When hypnotized people did the same after being given suggestions to feel no pain, they indeed reported feeling

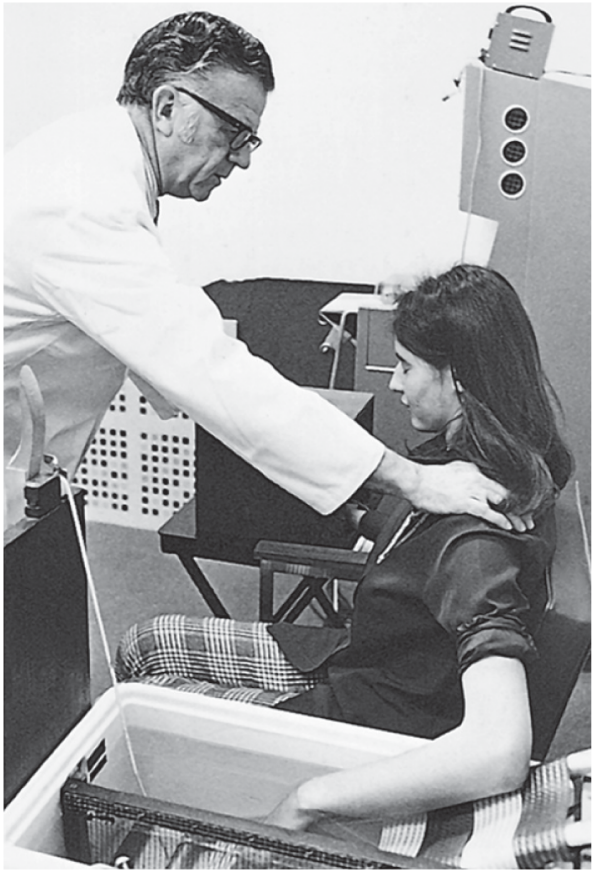
little pain. Hypnosis can also reduce some forms of chronic and disability-related pain (Adachi et al., 2014; Bowker & Dorstyn, 2016).

In surgical experiments, hypnotized patients have required less medication, recovered sooner, and left the hospital earlier than unhypnotized control patients (Askay & Patterson, 2007; Hammond, 2008; Spiegel, 2007). Nearly 10 percent of us can become so deeply hypnotized that even major surgery can be performed without anesthesia. Half of us can gain at least some pain relief from hypnosis. The surgical use of hypnosis has flourished in Europe, where one Belgian medical team has performed more than 5000 surgeries with a combination of hypnosis, local anesthesia, and a mild sedative (Facco, 2016; Song, 2006).

Psychologists have proposed two explanations for how hypnosis works:

- *Social influence theory* contends that hypnosis is a by-product of normal social and mental processes (Lynn et al., 1990, 2015; Spanos & Coe, 1992). In this view, hypnotized people, like actors caught up in a role, begin to feel and behave in ways appropriate for "good hypnotic subjects." They may allow the hypnotist to direct their attention away from pain.
- *Dissociation theory* proposes that hypnosis is a special dual-processing state of **dissociation**—a split between different levels of consciousness. Dissociation theory seeks to explain why, when no one is watching, previously hypnotized people may later carry out **posthypnotic suggestions** (Perugini et al., 1998). It also

explains why people hypnotized for pain relief may show brain activity in areas that receive sensory information, but not in areas that normally process pain-related information (Rainville et al., 1997).



Courtesy of Elizabeth Jecker

Dissociation or social influence? This hypnotized woman being tested by researcher Ernest Hilgard showed no pain when her arm was placed in an ice bath. She said the water felt cold, but not painful. But asked to press a key if some part of her felt the pain, she did so. Although Hilgard (1986, 1992) argued that this was evidence of "dissociation," the social influence perspective assumes that the woman was

simply caught up in playing the role of "good subject."

Selective attention (see the Consciousness and the Two-Track Mind modules) may also play a role in hypnotic pain relief. Brain scans show that hypnosis increases activity in frontal lobe attention systems (Oakley & Halligan, 2013). So, while hypnosis does not block sensory input itself, it may redirect our attention to other stimuli.

Ask Yourself

What methods of pain control do you usually turn to when you need it? Has learning about these ways to control pain given you some new ideas about other strategies to try?

Retrieval Practice

RP-4 Which of the following options has NOT been proven to reduce pain?

a. Distraction
b. Hypnosis
c. Phantom limb sensations
d. Endorphins

ANSWERS IN APPENDIX E

Chemical Senses: Taste and Smell

LOQ 20-6

In what ways are our senses of taste and smell similar, and how do they differ?

Taste

Like touch, **gustation**—our sense of taste—involves several basic sensations. Taste's sensations were once thought to be *sweet, sour, salty,* and *bitter,* with all others stemming from mixtures of these four (McBurney & Gent, 1979). Then, as investigators searched for specialized nerve fibers for the four taste sensations, they encountered a receptor for what we now know is a fifth—the savory, meaty taste of *umami,* best experienced as the flavor enhancer monosodium glutamate (MSG).

Tastes exist for more than our pleasure (see **TABLE 20.1**). Pleasureful tastes attracted our ancestors to energy- or protein-rich foods that enabled their survival. Aversive tastes deterred them from new foods that might be toxic. We see the inheritance of this biological wisdom in today's 2- to 6-year-olds, who are typically fussy eaters, especially when offered new meats or bitter-tasting vegetables, such as spinach and brussels sprouts (Cooke et al., 2003). Meat and plant toxins were both potentially dangerous sources of food poisoning for our ancestors, especially children. Given repeated small tastes of disliked but safe new foods, however, most children begin to accept them

(Wardle et al., 2003). We come to like what we eat. Compared with breast-fed babies, German babies bottle-fed vanilla-flavored milk grew up to be adults with a striking preference for vanilla flavoring (Haller et al., 1999). The taste-exposure phenomenon even extends to the womb. In one experiment, babies whose mothers drank carrot juice during the end of pregnancy and the early weeks of nursing developed a liking for carrot-flavored cereal (Mennella et al., 2001).

TABLE 20.1 The Survival Functions of Basic Tastes

Taste	Indicates
Sweet	Energy source
Salty	Sodium essential to physiological processes
Sour	Potentially toxic acid
Bitter	Potential poisons
Umami	Proteins to grow and repair tissue

Taste is a chemical sense. Inside each little bump on the top and sides of your tongue are 200 or more taste buds, each containing a pore that catches food chemicals and releases neurotransmitters (Roper & Chaudhari, 2017). In each taste bud pore, 50 to 100 taste receptor cells project antenna-like hairs that sense food molecules. Some receptors respond mostly to sweet-tasting molecules, others to salty-, sour-, umami-, or bitter-tasting ones. Each receptor transmits its message to a matching partner cell in your brain's temporal lobe (Barretto et al., 2015). Some people have more taste buds than others, enabling them

to experience more intense tastes. Psychologist Linda Bartoshuk (2000) has researched these *supertasters* and how they can taste some things that the rest of us cannot.



Macmillan Learning

Linda Bartoshuk As a student in the late 1950s era of gender discrimination, Bartoshuk (2010) abandoned her interest in astronomy when she learned that "women weren't allowed to use the big telescopes." This led her to *psychophysics*—the study of how physical stimuli, such as substances on the tongue, create our subjective experience. While studying taste experiences, she discovered *supertasters.*

For most people, it doesn't take much to trigger a taste response. If a stream of water is pumped across your tongue, the addition of a concentrated salty or sweet taste for but one-tenth of a second will get your attention (Kelling & Halpern, 1983). When a friend asks for "just

a taste" of your smoothie, a few drops from your straw is all they'll need.

Taste receptors reproduce themselves every week or two, so if you burn your tongue it hardly matters. However, as you grow older, the number of taste buds decreases, as does taste sensitivity (Cowart, 1981). (No wonder adults enjoy strong-tasting foods that children resist.) Smoking and alcohol use accelerate these declines. Those who have lost their sense of taste have reported that food tastes like "straw" and is hard to swallow (Cowart, 2005).

There's more to taste than meets the tongue. Wear a blindfold when eating a meal and you will attend more to (and savor) its taste (O'Brien & Smith, 2019). Expectations also influence taste. When told a sausage roll was "vegetarian," nonvegetarian people judged it decidedly inferior to its identical partner labeled "meat" (Allen et al., 2008). In another experiment, hearing that a wine cost $90 rather than its real $10 price made it taste better and triggered more activity in a brain area that responds to pleasant experiences (Plassmann et al., 2008). Contrary to Shakespeare's presumption (in *Romeo and Juliet*) that "A rose by any other name would smell as sweet," labels matter. And speaking of smell …

Smell

Inhale, exhale. Between birth's first inhale and death's last exhale, an average 500 million breaths of life-sustaining air bathe human nostrils in a stream of scent-laden molecules. The resulting experience of

smell—**olfaction**—is strikingly intimate. With every breath, you inhale something of whatever or whoever it is you smell.

> Impress your friends with your new word for the day: People unable to see are said to experience blindness. People unable to hear experience deafness. People unable to smell experience *anosmia.* The 1 in 7500 people born with anosmia not only have trouble cooking and eating, but also are somewhat more prone to depression, accidents, and relationship insecurity (Croy et al., 2012, 2013). The loss of smell and taste have been commonly reported symptoms of Covid-19.

Smell, like taste, is a chemical sense. We smell something when molecules of a substance carried in the air reach a tiny cluster of receptor cells at the top of each nasal cavity (**FIGURE 20.8**). By sniffing, you swirl air up to those receptors, enhancing the aroma. These 20 million olfactory receptors, waving like sea anemones on a reef, respond selectively—to the aroma of a cake baking, to a wisp of smoke, to a friend's fragrance. Instantly, they alert the brain through their axon fibers.

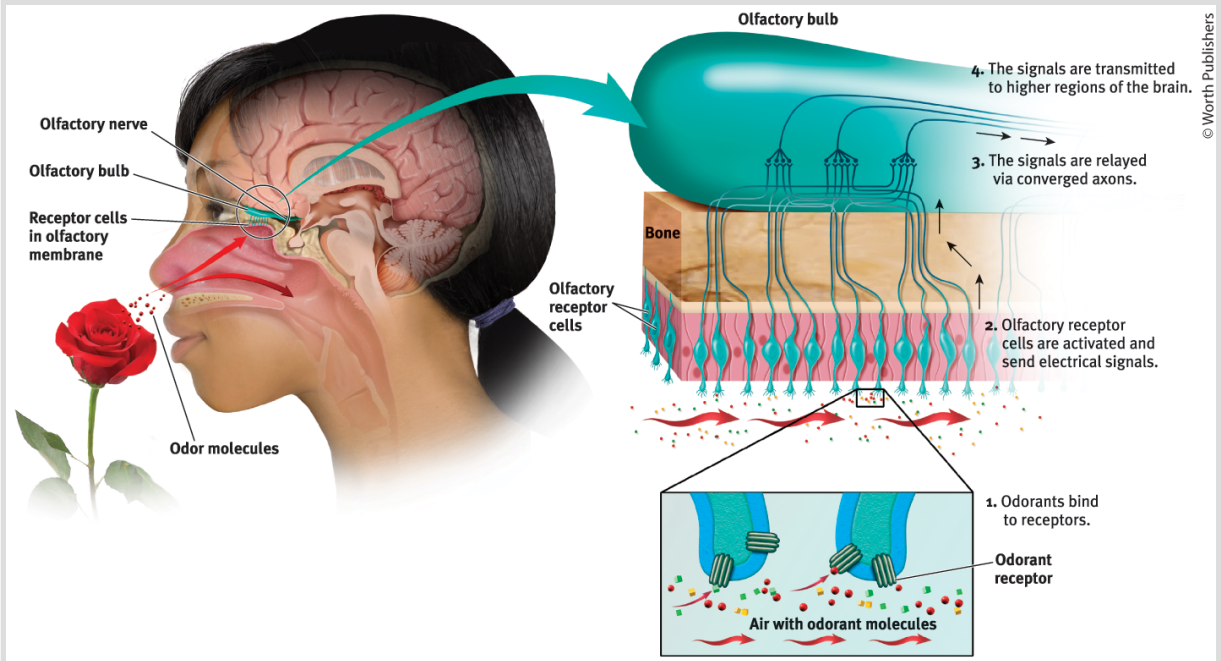


FIGURE 20.8 The sense of smell Olfactory receptor cells receive airborne molecules and then send messages to the brain's olfactory bulb, which then sends them to the temporal lobe's primary smell cortex and to the parts of the limbic system involved in memory and emotion.

Being part of an old, primitive sense, olfactory neurons bypass the brain's sensory control center, the thalamus. Eons before our cerebral cortex had fully evolved, our mammalian ancestors sniffed for food—and for predators. They also smelled molecules called *pheromones,* especially those secreted by other members of their species. Some pheromones now serve as sexual attractants. When straight men smelled ovulating women's T-shirts, the men became more sexually interested and experienced increased testosterone (Miller & Maner, 2010, 2011).

Odor molecules come in many shapes and sizes—so many, in fact, that it takes many different receptors to detect them. A large family of genes designs the 350 or so receptor proteins that recognize particular odor molecules (Miller, 2004). Linda Buck and Richard Axel (1991) discovered (in work for which they received a 2004 Nobel Prize) that these receptor proteins are embedded on the surface of nasal cavity neurons. As a key slips into a lock, so odor molecules slip into these receptors. Yet we don't seem to have a distinct receptor for each detectable odor. Odors trigger combinations of receptors, in patterns that are interpreted by the olfactory cortex. As the English alphabet's 26 letters can combine to form many words, so odor molecules bind to different receptor arrays, producing as many as 1 trillion odors that we could potentially discriminate (Bushdid et al., 2014). Neuroscientists have identified complex combinations of olfactory receptors that trigger different neural networks, allowing us to distinguish between delightful and disagreeable odors (Zou et al., 2016).

Animals that have many times more olfactory receptors than we do also use their sense of smell to survive, to communicate, and to navigate. Elephants can smell the difference between small and large amounts of food—letting them know whether they have enough to feed themselves or their herd (Plotnik et al., 2019). And long before a shark can see its prey, or a moth its mate, olfactory cues direct their way, as they also do for migrating salmon returning to their home stream. After being exposed in a hatchery to one of two odorant

chemicals, returning salmon will later seek whichever stream was spiked with the familiar smell (Barinaga, 1999).

Aided by smell, a mother fur seal returning to a beach crowded with pups will find her own. Human mothers and nursing infants also quickly learn to recognize each other's scents (McCarthy, 1986). When people in loving relationships catch a whiff of their romantic partner's scent, their stress hormone levels drop (Granqvist et al., 2019; Hofer et al., 2018). As any dog or cat with a good nose could tell us, we each have our own identifiable chemical signature. (One noteworthy exception: A dog will follow the tracks of one identical twin as though they had been made by the other person [Thomas, 1974].)



Layne Bailey/The Charlotte Observer/AP Photo

The nose knows Humans have some 20 million olfactory receptors. A bloodhound has 220 million (Herz, 2007).

The brain knows what the nose knows (Cook et al., 2017; Zou et al., 2016). When mice sniff a predator's scent, their brain instinctively sends signals to stress-related neurons (Kondoh et al., 2016). But smell

expert Rachel Herz (2001) has noted that a smell's appeal—or lack of it—also depends on cultural experiences. In North America, people associate the smell of wintergreen with candy and gum, and they tend to like it. In Britain, wintergreen often is associated with medicine, and people find it less appealing. Odors also evoked unpleasant emotions when researchers frustrated Brown University students with a rigged computer game in a scented room (Herz et al., 2004). Later, if exposed to the same odor while working on a verbal task, the students' frustration was rekindled and they gave up sooner than others exposed to a different odor or no odor.

Although important, our sense of smell is less acute than our senses of seeing and hearing. Looking out across a garden, we see its forms and colors in exquisite detail and hear a variety of birds singing, yet we miss some of a garden's scents unless we stick our nose into the blossoms. We can learn to identify subtle smell differences, but it isn't easy (Al Aïn et al., 2019). Compared with how we experience and remember sights and sounds, smells are harder to describe and recall (Richardson & Zucco, 1989; Zucco, 2003). Test it yourself: Which is easier, describing the *sound* of coffee brewing, or the *aroma* of coffee? For most people in Western cultures, it's the sound.

We might struggle to recall odors by name, but we have a remarkable capacity to recognize long-forgotten odors and their associated memories (Engen, 1987; Schab, 1991). Our brain's circuitry helps explain why the smell of the sea, the scent of a perfume, or an aroma of a favorite relative's kitchen can bring to mind a happy time. Other

odors remind us of traumatic events, activating brain regions related to fear (Kadohisa, 2013). Indeed, a hotline runs between the brain area receiving information from the nose and the brain's limbic centers associated with memory and emotion (FIGURE 20.9). Thus, when put in a foul-smelling room, people have expressed harsher judgments of other people and of immoral acts (such as lying or keeping a found wallet) (Inbar et al., 2012; Schnall et al., 2008). Exposed to a fishy smell, people became more suspicious (Lee et al., 2015; Lee & Schwarz, 2020). And when riding in a train car with the citrus scent of a cleaning product, people have left behind less trash (de Lange et al., 2012).

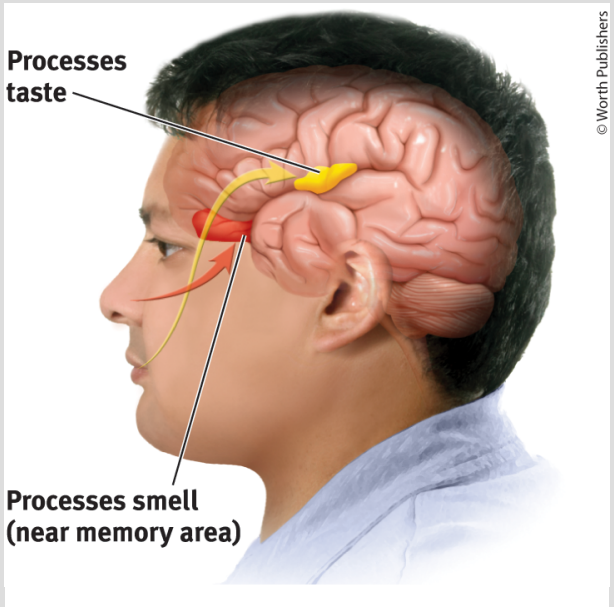


FIGURE 20.9 Taste, smell, and memory
Information from the taste buds travels to an area between the brain's frontal and temporal lobes (yellow arrow). It registers in an area not far from where the brain receives information from our sense of smell (red area), which interacts with taste. The brain's

circuitry for smell also connects with areas involved in memory storage, which helps explain why a smell can trigger a memory.

"[I] use my memory of how things smell and taste to recreate the experience, because otherwise I would not want to eat." — Meema Spadola, describing her loss of smell and taste after contracting Covid-19 (Zhang, 2021).

Gender, age, and expertise influence our ability to identify and remember scents. Women and young adults tend to have the best sense of smell (Wysocki & Gilbert, 1989). Physical condition also matters. Smokers and people with Alzheimer's disease, Parkinson's disease, or alcohol use disorder typically have a diminished sense of smell (Doty, 2001). Moreover, the smells we detect and the ways we experience them differ, thanks to our individual genes (Trimmer et al., 2019). The scent of a flower may be different for you than for a friend. For all of us, however, the sense of smell tends to peak in early adulthood and gradually declines thereafter (Doty, 2001; Wickelgren, 2009).

Retrieval Practice

RP-5 How does our system for sensing smell differ from our systems for touch and taste?

ANSWERS IN APPENDIX E

Body Position and Movement

LOQ 20-7

How do we sense our body's position and movement?

Without sensing your body's position and movement, you could not put food in your mouth, stand up, or reach out and touch someone. Nor could you perform the "simple" act of taking one step forward. That act requires feedback from, and instructions to, some 200 muscles, and it engages brain power that exceeds the mental activity involved in reasoning. Millions of position and motion sensors in muscles, tendons, and joints all over your body, called *proprioceptors,* provide constant feedback to your brain. This enables your sense of **kinesthesia**, which keeps you aware of your body parts' position and movement. Twist your wrist one degree and your brain receives an immediate update.

If you are able to experience sight and sound, you can momentarily imagine being blind and deaf by closing your eyes and plugging your ears to experience the dark silence. But what would it be like to live without touch or kinesthesia—without being able to sense the positions of your limbs when you wake during the night? Ian Waterman of Hampshire, England, knows. At age 19, Waterman contracted a rare viral infection that destroyed the nerves enabling his sense of light touch *and* of body position and movement. People with this condition report feeling disembodied, as though their body is

dead, not real, not theirs (Sacks, 1985). With prolonged practice, Waterman learned to walk and eat—by visually focusing on his limbs and directing them accordingly. But if the lights went out, he would crumple to the floor (Azar, 1998).

Vision interacts with kinesthesia for you, too. If you are able, stand with your right heel in front of your left toes. Easy. Now close your eyes and try again. Did you wobble?

A companion **vestibular sense** monitors your head's (and thus your body's) position and movement. The biological gyroscopes for this sense of equilibrium are two structures in your inner ear. The first, your fluid-filled *semicircular canals,* look like a three-dimensional pretzel (see Figure 20.2a). The second structure is the pair of calcium-crystal–filled *vestibular sacs.* When your head rotates or tilts, the movement of these organs stimulates hair-like receptors, which send nerve signals to your cerebellum at the back of your brain, enabling you to sense your body position and maintain your balance.



CHINE NOUVELLE/SIPA/Shutterstock

Twisting in space By using information from the inner ears, U.S. gymnast Simone Biles' brain expertly monitors her body position. In the 2020 Tokyo Olympics, Biles withdrew from

the vault competition after experiencing the "twisties," in which she felt unable to accurately sense and perceive her body position. "I had no idea where I was in the air," Biles said (Giamalvo, 2021).

If you twirl around and then come to an abrupt halt, neither the fluid in your semicircular canals nor your kinesthetic receptors will immediately return to their neutral state. The dizzy aftereffect fools your brain with the sensation that you're still spinning. This illustrates a principle that underlies perceptual illusions: *Mechanisms that normally give us an accurate experience of the world can, under special conditions, fool us.* Understanding how we get fooled provides clues to how our perceptual system works.

Your vestibular sense is super speedy. If you slip, your vestibular sensors automatically and instantly order your skeletal response, well before you have consciously decided how to right yourself. You might try this: Hold one of your thumbs in front of your face, then move it rapidly right to left and back. Notice how your thumb blurs (your vision isn't fast enough to track it). Now hold your thumb still and swivel your *head* from left to right—just as fast. Voila! Your thumb stays clear—because your vestibular system, which is monitoring your head position, speedily moves the eyes. Head moves right, eyes move left. Vision is fast, but the vestibular sense is faster.

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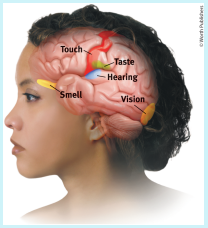
For a summary of our sensory systems, see **TABLE 20.2**.

TABLE 20.2 Summarizing the Senses

Sensory System	Source	Receptors	Key Brain Areas	
				

Vision	Light waves striking the eye	Rods and cones in the retina	Occipital lobes
Hearing	Sound waves striking the outer ear	Cochlear hair cells *(cilia)* in the inner ear	Temporal lobes
Touch	Pressure, warmth, cold, harmful chemicals	Receptors (including pain-sensitive *nociceptors*), mostly in the skin, which detect pressure, warmth, cold, and pain	Somatosensory cortex
Taste	Chemical molecules in the mouth	Basic taste receptors for sweet, sour, salty, bitter, and umami	Frontal/temporal lobe border
Smell	Chemical molecules breathed in through the nose	Millions of receptors at top of nasal cavities	Olfactory bulb
Kinesthesia—position and movement	Any change in position of a body part, interacting with vision	Kinesthetic sensors in joints, tendons, and muscles *(proprioceptors)*	Cerebellum

Vestibular sense—balance and movement	Movement of fluids in the inner ear caused by head/body movement	Hair-like receptors *(cilia)* in the ears' semicircular canals and vestibular sacs	Cerebellum

Retrieval Practice

RP-6 Where are the kinesthetic receptors and the vestibular sense receptors located?

ANSWERS IN APPENDIX E

Sensory Interaction

LOQ 20-8

How does *sensory interaction* influence our perceptions, and what is *embodied cognition?*

We have seen that vision and kinesthesia interact. Actually, none of our senses act alone. All our senses—seeing, hearing, tasting, smelling, touching—eavesdrop on one another, and our brain blends their inputs to interpret the world (Rosenblum, 2013). This is **sensory interaction** at work. One sense can influence another.

Consider how smell sticks its nose into the business of taste. Hold your nose, close your eyes, and have someone feed you various foods. A slice of apple may be indistinguishable from a chunk of raw potato. A cracker may taste like cardboard. Without their smells, a cup of cold coffee may be hard to distinguish from a glass of red wine.

Contrary to Aristotle's presumption that taste sensors were only on the tongue, our taste experience is also affected by inhaling a substance's aroma through our nose—a scientific fact not understood until 1812 (Bartoshuk et al., 2019). Like smoke rising in a chimney, food molecules released by chewing rise into our nasal cavity. This is why food tastes bland when you have a bad cold. Smell can also change our perception of taste: A drink's strawberry odor enhances our perception of its sweetness. Even touch can influence our taste. Depending on its texture, a potato chip "tastes" fresh or stale (Smith, 2011). Smell + texture + taste = flavor. Yet perhaps you have noticed: Flavor *feels* located in the mouth (Stevenson, 2014).

Vision and hearing may similarly interact. Baseball umpires' vision informs their hearing of when the ball hits a player's glove, influencing their judgments of whether baserunners are safe or out (Krynen & McBeath, 2019). Likewise, a weak flicker of light becomes more visible when accompanied by a short burst of sound (Kayser, 2007). The reverse is also true: Soft sounds are more easily heard when paired with a visual cue. If I [DM], as a person with hearing loss, watch a video with on-screen captions, I have no trouble hearing the words I am seeing. But if I then decide I don't need the captions and

turn them off, I quickly realize I do need them. The eyes guide the ears (FIGURE 20.10).



FIGURE 20.10 Sensory interaction Seeing the speaker forming the words in video chats—better yet reading captions of the conversation—helps people with hearing loss understand.

So, our senses do not function in isolation; they interact. But what happens if they disagree? What if our eyes *see* a speaker form one sound but our ears *hear* another sound? Surprise: Our brain may perceive a third sound that blends both inputs. Seeing mouth movements for *ga* while hearing *ba,* we may perceive *da.* This phenomenon is known as the *McGurk effect,* after Scottish psychologist

Harry McGurk, who, with his assistant John MacDonald, discovered the effect (1976). For most of us, lip reading is part of hearing, which is why mask wearing during the Covid-19 pandemic has made communication more challenging (Spitzer, 2020).

We have seen that our perceptions have two main ingredients: Our bottom-up sensations and our top-down cognitions (such as expectations, attitudes, thoughts, and memories). In everyday life, sensation and perception are two points on a continuum. It's not surprising, then, that the brain circuits processing our physical sensations sometimes interact with brain circuits responsible for cognition. The result is **embodied cognition.** We think from within a body. A few examples:

- ***Judgments may mimic body sensations.*** Sitting at a wobbly desk and chair may make relationships seem less stable (Forest et al., 2015; Kille et al., 2013).
- ***Hard chair, hard on crime.*** People who sat in a hard chair, compared with a soft chair, gave harsher punishments to people convicted of a crime (M. Schaefer et al., 2018).
- ***Upright is honorable.*** Chinese and American participants associated honor-related phrases ("maintains honor" and "respects me") with arrows pointing up (↑) and right (→) (Lin & Oyserman, 2021).

As we attempt to decipher our world, our brain blends inputs from multiple channels. For example, more than 100 studies reveal captioned videos don't just boost speech comprehension among those

with hearing loss, they benefit everyone (Gernsbacher, 2015). Captions help hearing children learn to read (by connecting sound to text). They enhance comprehension for those who are not native speakers of that language. And they boost attention and memory—of both TV commercials and course lectures.

But in a few select individuals, the brain circuits for two or more senses become joined in a phenomenon called *synesthesia,* where the stimulation of one sense triggers an experience of another (**FIGURE 20.11**). Early in life, "exuberant neural connectivity" produces some arbitrary associations among the senses, which later are normally—but not always—pruned (Wagner & Dobkins, 2011). In a brain that blends sensations, hearing music may activate color-sensitive cortex regions and trigger a sensation of color (Brang et al., 2008; Hubbard et al., 2005). Seeing a number may evoke a taste or color sensation (Newell & Mitchell, 2016; Ranzini & Girelli, 2019). People with synesthesia experience such sensory blends.

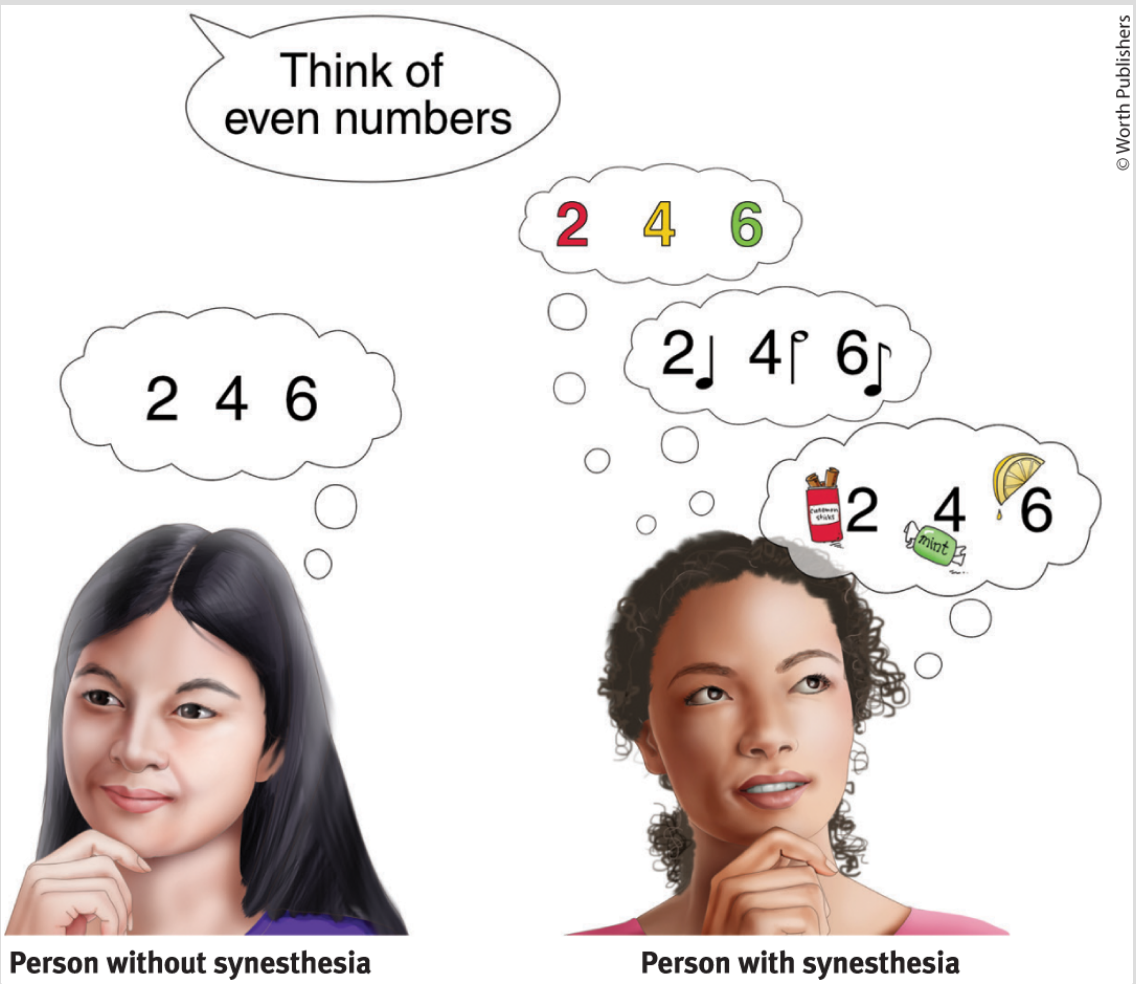


FIGURE 20.11 Synesthesia's symphony A person with synesthesia experiences blended sensations. For example, hearing numbers may evoke an experience of specific colors or smells or musical notes.

Ask Yourself

When have you experienced a feeling that you think could be explained by embodied cognition?

Perception Without Sensation?

LOQ 20-9

What are the claims of ESP, and what have most research psychologists concluded after putting these claims to the test?

The river of perception is fed by sensation, cognition, and emotion. If perception is the product of these three sources, what can we say about **extrasensory perception (ESP)**, which claims that perception can occur without sensory input? Are there indeed people—any people—who can read minds, see through walls, or foretell the future? Nearly half of Americans surveyed believe we are capable of ESP, and 41 percent believe in psychics (Gecewicz, 2018; Kim et al., 2015).

If ESP is real, we would need to overturn the scientific understanding that we are creatures whose minds are tied to our physical brains and whose perceptual experiences of the world are built of sensations. The most testable and, for this discussion, most relevant ESP claims are

- ***telepathy:*** mind-to-mind communication.
- ***clairvoyance:*** perceiving remote events, such as a house on fire across the country.
- ***precognition:*** perceiving future events, such as an unexpected death in the next month.

Closely linked to these ESP claims is *psychokinesis,* or "mind moving matter," such as levitating a table or controlling the roll of a die. (The claim, also called *telekinesis,* is illustrated by the wry request, "Will all those who believe in psychokinesis please raise my hand?") In Britain, psychologists created a "mind machine" to see if festival visitors could influence or predict a coin toss (Wiseman & Greening, 2002). Participants were given four attempts to call heads or tails, playing against a computer. By the time the experiment ended, nearly 28,000 people had predicted 110,959 tosses—with 49.8 percent correct, almost exactly as chance would predict.



Jon Carter/Cartoon Stock

Most psychological scientists are skeptical that paranormal phenomena exist. But in several reputable universities, **parapsychology** researchers search for possible ESP phenomena by performing scientific experiments (Cardeña, 2018; Storm et al.,

2010a,b; Turpin, 2005). Before seeing how they conduct their research, let's consider some popular beliefs.

Premonitions or Pretensions?

Can psychics see into the future? No greedy—or charitable—psychic has been able to make billions on the stock market. Where were the psychics the day before the 9/11 terrorist attacks? Why could no psychics help locate Osama bin Laden afterward? Why did none of them prepare us for the Covid-19 pandemic?

Psychic visions offered to police departments have been no more accurate than guesses made by others (Nickell, 2005; Palmer, 2013; Radford, 2010). But their sheer volume increases the odds of an occasional correct guess, which psychics can then report to the media. Such visions can sound amazingly correct when later retrofitted to match events. Nostradamus, a sixteenth-century French psychic, explained in an unguarded moment that his ambiguous prophecies "could not possibly be understood till they were interpreted after the event and by it." Shoot, and then call whatever you hit the target.

A headline you've never seen: "Psychic wins lottery."

Are everyday people's "visions" any more accurate than psychic predictions? Do our dreams foretell the future, as people from both

Eastern and Western cultures tend to believe (Morewedge & Norton, 2009)? Or do they only seem to do so when we recall or reconstruct them in light of what has already happened? Are our remembered visions merely revisions? After famed aviator Charles Lindbergh's baby son was kidnapped and murdered in 1932, but before the body was discovered, two Harvard psychologists invited people to report their dreams about the child (Murray & Wheeler, 1937). How many visionaries replied? 1300. How many accurately envisioned the child dead? Five percent. How many also correctly anticipated the body's location—buried among trees? Only 4. Although this number was surely no better than chance, to those 4 dreamers, the accuracy of their apparent precognitions must have seemed uncanny.

Given countless daily events, and given enough days, some stunning coincidences are bound to occur. By one careful estimate, chance alone would predict that more than a thousand times per day, someone on Earth will think of another person and then, within the next 5 minutes, learn of that person's death (Charpak & Broch, 2004). Thus, when explaining an astonishing event, we should "give chance a chance" (Lilienfeld, 2009). With enough time and people, the improbable becomes inevitable.

"A person who talks a lot is sometimes right." — Spanish proverb

> **"It's not *impossible,* my dear. It's just a very remarkable coincidence—and remarkable coincidences do happen."** — Agatha Christie's Miss Marple in *Sleeping Murder,* 1976

Putting ESP to Experimental Test

When faced with claims of mind reading or out-of-body travel or communication with the dead, how can we separate fiction from strange-but-true fact? Psychological science offers a simple answer: *Test claims to see if they work.* If they do, so much the better for the ideas. If they don't, so much the better for our skepticism.

Both believers and skeptics agree that what parapsychology needs is a reproducible phenomenon and a theory to explain it. Parapsychologist Rhea White (1998) spoke for many in saying that "the image of parapsychology that comes to my mind, based on nearly 44 years in the field, is that of a small airplane [that] has been perpetually taxiing down the runway of the Empirical Science Airport since 1882 … its movement punctuated occasionally by lifting a few feet off the ground only to bump back down on the tarmac once again. It has never taken off for any sustained flight."

How might we test ESP claims in a controlled, reproducible experiment? An experiment differs from a staged demonstration. In the laboratory, the experimenter controls what the "psychic" sees and

hears. On stage, the psychic controls what the audience sees and hears.

Daryl Bem, a respected social psychologist, once quipped that "a psychic is an actor playing the role of a psychic" (1984). Yet this one-time skeptic reignited hopes for replicable evidence of ESP with nine experiments that seemed to show people anticipating future events (Bem, 2011). In one, when an erotic scene was about to appear on a screen in one of two randomly selected positions, Cornell University participants guessed the right placement 53.1 percent of the time (beating chance by a small but statistically significant margin).

Despite Bem's research surviving critical reviews by a top-tier journal, critics found Bem's methods and statistical analyses "badly flawed" and "biased" (Alcock, 2011; Wagenmakers et al., 2011). And so, conclude parapsychology's critics, after "nearly 150 years of efforts" to document ESP, "there has been, literally, no progress" (Reber & Alcock, 2020). Anticipating such skepticism, Bem made his research materials available to anyone who wished to replicate his studies. Multiple attempts have met with minimal success and continuing controversy (Bem et al., 2015; Ritchie et al., 2012; Wagenmakers, 2014). Regardless, science is doing its work:

- It has been open to a finding that challenges its own assumptions.
- Through follow-up research, it has assessed the reliability and validity of that finding.

And that is how science sifts crazy-sounding ideas, leaving most on the historical waste heap while occasionally surprising us.

> **"At the heart of science is an essential tension between two seemingly contradictory attitudes—an openness to new ideas, no matter how bizarre or counterintuitive they may be, and the most ruthless skeptical scrutiny of all ideas, old and new."** — Carl Sagan (1987)

For 19 years, the late skeptic and magician James Randi offered $1 million "to anyone who proves a genuine psychic power under proper observing conditions" (Randi, 1999; Thompson, 2010). French, Australian, and Indian groups have made similar offers of up to 200,000 euros (CFI, 2003). Large as these sums are, the scientific seal of approval would be worth far more. To refute those who say there is no ESP, one need only produce a single person who can demonstrate a single, reproducible ESP event. (To refute those who say pigs can't talk would take but one talking pig.) So far, after more than a thousand aspirants, no such person (or pig) has emerged (Fox, 2020).

Retrieval Practice

RP-7 If an ESP event did occur under controlled conditions, what would be the next step to confirm that ESP really exists?

ANSWERS IN APPENDIX E

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To feel awe, mystery, and a deep reverence for life, we need look no further than our own perceptual system and its capacity for organizing formless nerve impulses into colorful sights, vivid sounds, and evocative smells. As Shakespeare's Hamlet recognized, "There are more things in Heaven and Earth, Horatio, than are dreamt of in your philosophy." Within our ordinary sensory and perceptual experiences lies much that is truly extraordinary—surely much more than has so far been dreamt of in our psychology.

REVIEW

Module 20: Hearing, Skin, Chemical, and Body Senses

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 20-1: What are the characteristics of the air pressure waves that we hear as sound?

LOQ 20-2: How does the ear transform sound energy into neural messages?

LOQ 20-3: How do we detect loudness, discriminate pitch, and locate sounds?

LOQ 20-4: What are the four basic touch sensations, and how do we sense touch?

LOQ 20-5: What biological, psychological, and social-cultural influences affect our experience of pain? How do placebos, distraction, and hypnosis help control pain?

LOQ 20-6: In what ways are our senses of taste and smell similar, and how do they differ?

LOQ 20-7: How do we sense our body's position and movement?

LOQ 20-8: How does *sensory interaction* influence our perceptions, and what is *embodied cognition?*

LOQ 20-9: What are the claims of ESP, and what have most research psychologists concluded after putting these claims to the test?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

audition
frequency
pitch
middle ear
cochlea [KOHK-lee-uh]
inner ear
sensorineural hearing loss
conduction hearing loss
cochlear implant
place theory
frequency theory
gate-control theory
hypnosis
dissociation
posthypnotic suggestion
gustation
olfaction
kinesthesia [kin-ehs-THEE-zhuh]
vestibular sense
sensory interaction
embodied cognition
extrasensory perception (ESP)
parapsychology

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. The snail-shaped tube in the inner ear, where sound waves are converted into neural activity, is called the _____.

2. What are the basic steps in transforming sound waves into perceived sound?

3. _____ theory explains how we hear high-pitched sounds, and _____ theory, extended by the _____ principle, explains how we hear low-pitched sounds.

4. The sensory receptors that are found mostly in the skin and that detect painful temperatures, pressure, or chemicals are called _____.

5. The gate-control theory of pain proposes that
   a. special pain receptors send signals directly to the brain.
   b. the pain gate is controlled by the thalamus.
   c. small spinal cord nerve fibers conduct most pain signals, but large-fiber activity can close access to those pain signals.

CHAPTER 7
Learning (Modules 21–23)



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MODULE 21 Basic Learning Concepts and Classical Conditioning

How Do We Learn?

Classical Conditioning

MODULE 22 Operant Conditioning

Skinner's Experiments

Skinner's Legacy
Contrasting Classical and Operant Conditioning
MODULE 23 Biology, Cognition, and Learning
Biological Constraints on Conditioning
Cognition's Influence on Conditioning
Learning by Observation
THINKING CRITICALLY ABOUT: The Effects of Viewing Media Violence

In the early 1940s, University of Minnesota graduate students Marian Breland and Keller Breland witnessed the power of an exciting new learning technique. Their mentor, B. F. Skinner, would become famous for *shaping* rat and pigeon behaviors by delivering well-timed rewards as the animals inched closer and closer to a desired behavior. Impressed by Skinner's results, the Brelands began shaping the behavior of cats, chickens, parakeets, turkeys, pigs, ducks, and hamsters (Bailey & Gillaspy, 2005). The company they formed spent the next half-century training more than 15,000 animals from 140 species. Their efforts helped pave the way for training animals to assist police officers and people with vision loss.

Like other animals, humans learn from experience. Indeed, nature's most important gift may be our *adaptability*—our capacity to learn new behaviors that help us cope with our changing world. We can learn how to build grass huts or snow shelters, submarines, or space stations, thereby adapting to almost any environment.

Oprah Winfrey is a living example of adaptability. Growing up in poverty with her grandmother, Winfrey wore dresses made of potato sacks. She experienced constant racism and was molested by a cousin, an uncle, and a family friend, beginning at age 9. Winfrey ran away from home at age 13 and became pregnant at age 14, but her son died shortly after birth.

To overcome such tremendous adversity, Winfrey learned how to adapt to new situations. She joined her high school speech team and used this talent to win a college scholarship. After graduating, she moved to Chicago and took over as the host of a struggling television show, transforming it into the most popular daytime talk show in America. Winfrey continues to influence the world as a media executive, philanthropist, and political activist. “Education,” said Winfrey, “is the key to unlocking the world, a passport to freedom.”

Learning breeds hope. What is learnable we may be able to teach—a fact that encourages animal trainers, and also parents, educators, and coaches. What has been learned we may be able to change by new learning—an assumption underlying stress management and counseling programs. No matter how unhappy or unsuccessful or unloving we are, that need not be the end of our story. Our species’ success lies in our ability to learn, and to pass our learning on to others.

Here in Modules 21–23, we examine the heart of learning: classical conditioning, operant conditioning, the effects of biology and cognition on learning, and learning by observation.

MODULE 21: Basic Learning Concepts and Classical Conditioning

No topic is closer to the heart of psychology than learning. Psychologists study infants' learning, and the learning of visual perceptions, of a drug's expected effect, and of gender roles. They also consider how learning shapes our thoughts and language, our motivations and emotions, our personalities, and attitudes.

How Do We Learn?

Learning Objective Question LOQ 21-1

How do we define *learning,* and what are some basic forms of learning?

By **learning,** we humans adapt to our environments. We learn to expect and prepare for significant events such as the arrival of food or pain *(classical conditioning).* We learn to repeat acts that bring rewards and avoid acts that bring unwanted results *(operant conditioning).* We learn new behaviors by observing events and people, and through language, we learn things we have neither experienced nor observed *(cognitive learning).* But *how* do we learn?

One way we learn is by *association.* Our mind naturally connects events that occur in sequence. Learned associations feed our habitual behaviors (Urcelay & Jonkman, 2019; Wood, 2017). Habits can form when we repeat behaviors in a given context—sleeping in a certain position in bed, biting our nails when taking an exam, or switching off the lights when leaving a room. As behavior becomes linked with the context, our next experience of that context will evoke our habitual response. That's true of both good habits (eating fruit) and bad (overindulging in alcohol) (Graybiel & Smith, 2014). To increase your self-control, and to achieve your academic goals, the key is to form helpful habits (Fiorella, 2020).

How long does it take to form a beneficial habit? To find out, one British research team asked 96 university students to choose a healthy behavior (such as running before dinner or eating fruit with lunch), to do it daily for 84 days, and to record whether the behavior felt automatic (something they did without thinking and would find it hard not to do). On average, behaviors became habitual after about 66 days (Lally et al., 2010). Is there something you'd like to make a routine or essential part of your life? Just do it every day for two months, or a bit longer for exercise, and you likely will find yourself with a new habit. This happened for two of your authors—with a midday workout [DM] and a late afternoon guitar practice session [ND] having long ago become an automatic daily routine.

Other animals also learn by association. Disturbed by a squirt of water, the sea slug *Aplysia* protectively withdraws its gill. If the squirts

continue, as happens naturally in choppy water, the withdrawal response diminishes. But if the sea slug repeatedly receives an electric shock just after being squirted, its protective response to the squirt instead grows stronger. The animal has associated the squirt with the impending shock.

Complex animals can learn to associate their own behavior with its outcomes. An aquarium seal will repeat behaviors, such as slapping and barking, that prompt people to toss it a herring. After five speech-imitating African gray parrots were adopted and housed together at England's Lincolnshire Wildlife Park, they started using obscenities, which put the park staff into hysterics. The birds' "fowl" language prompted moving them from public display. "The more they swear, the more you usually laugh, which then triggers them to swear again," explained the park manager (Franklin & Merrifield, 2020).

By linking two events that occur close together, sea slugs, seals, and parrots are exhibiting **associative learning.** The sea slug associates the squirt with an impending shock; the seal associates slapping and barking with a herring treat; and the parrot associates uttering an obscenity with a positive reaction from humans. Each animal has learned something important to its survival: anticipating the immediate future.

Most of us could not list in order the songs on our favorite album or playlist. Yet hearing the end of one piece cues (by association) an anticipation of the next. Likewise, when singing your national anthem, you associate the end of each line with

the beginning of the next. (Pick a line out of the middle and notice how much harder it is to recall the *previous* line.)

This process of learning associations is *conditioning.* It takes two main forms:

- In *classical conditioning* (**FIGURE 21.1**), we learn to associate two stimuli and thus to anticipate events. (A **stimulus** is any event or situation that evokes a response.) We learn that a flash of lightning signals an impending crack of thunder; when lightning flashes nearby, we start to brace ourselves. We associate stimuli that we do not control, and we respond automatically (exhibiting **respondent behavior**).
- In *operant conditioning,* we learn to associate a response (our behavior) and its consequence. Thus, we (and other animals) learn to repeat acts followed by good results (**FIGURE 21.2**) and avoid acts followed by bad results. These associations produce **operant behaviors** (which operate on the environment to produce consequences).

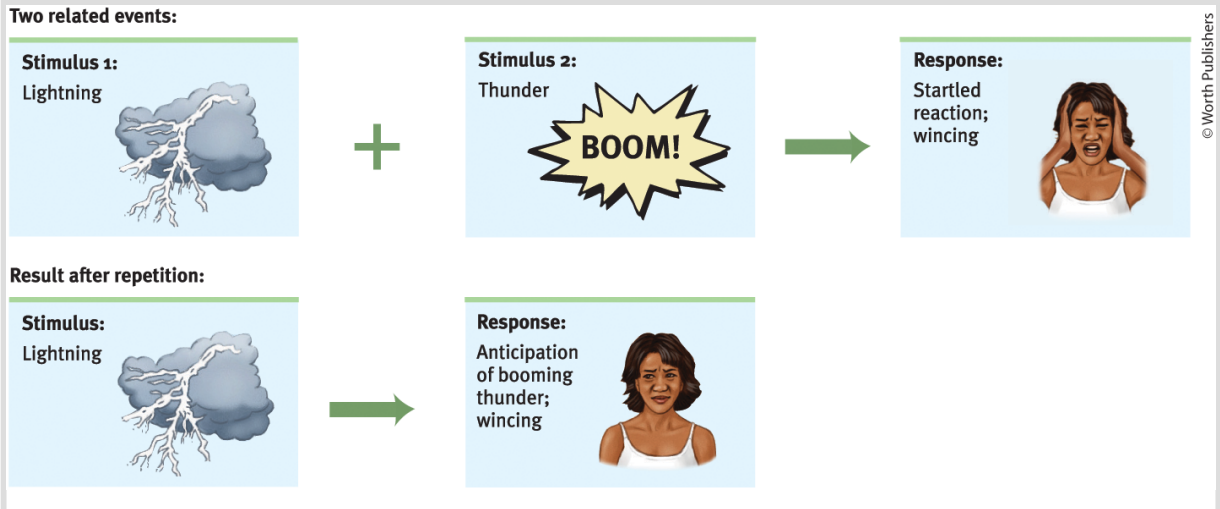
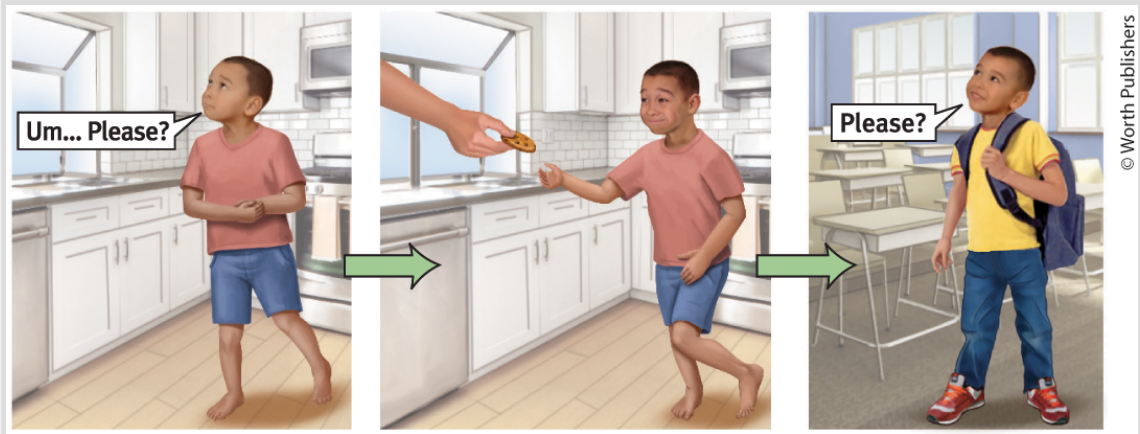


FIGURE 21.1 Classical conditioning



(a) Behavior: Being polite (b) Consequence: Getting a treat (c) Behavior strengthened

FIGURE 21.2 Operant conditioning

To simplify, we will explore these two types of associative learning separately. Often, though, they occur together, as on one Japanese cattle ranch, where the clever rancher outfitted his herd with electronic pagers, which he called from his cell phone. After a week of

training, the animals learned to associate two stimuli—the beep of their pager and the arrival of food (classical conditioning). But they also learned to associate their hustling to the food trough with the pleasure of eating (operant conditioning), which simplified the rancher's work. Classical conditioning + operant conditioning did the trick.

Conditioning is not the only form of learning. Through **cognitive learning,** we acquire mental information that guides our behavior. *Observational learning,* one form of cognitive learning, lets us learn from others' experiences. Chimpanzees, for example, sometimes learn behaviors merely by watching other chimpanzees perform them. If one animal sees another solve a puzzle and gain a food reward, the observer may perform the trick more quickly. So, too, in humans: We look and we learn.

Retrieval Practice

RP-1 Why are habits, such as having something sweet with that cup of coffee, so hard to break?

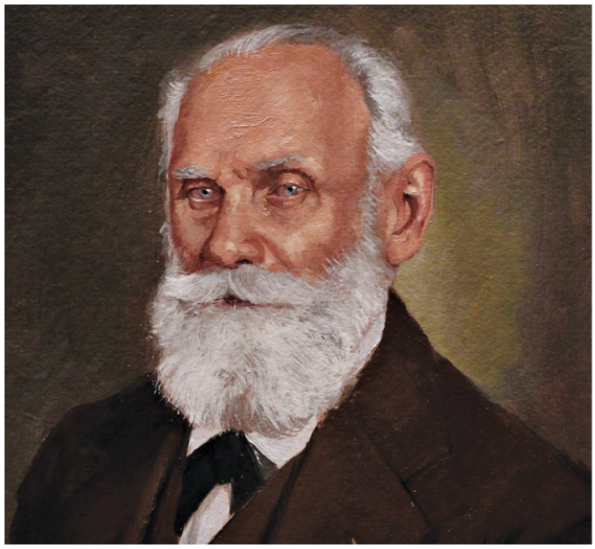
ANSWERS IN APPENDIX E

Classical Conditioning

LOQ 21-2

What is behaviorism's view of learning?

For many people, the name Ivan Pavlov (1849–1936) rings a bell. The Russian physiologist's early twentieth-century experiments—now psychology's most famous research—are classics, and the phenomenon he explored we justly call **classical conditioning**.



Macmillan Learning

Ivan Pavlov "Experimental investigation … should lay a solid foundation for a future true science of psychology" (1927).

Pavlov's work laid the foundation for many of psychologist John B. Watson's ideas. In searching for laws underlying learning, Watson (1913) urged his colleagues to discard reference to inner thoughts,

feelings, and motives. The science of psychology should instead study how organisms respond to stimuli in their environments, said Watson: "Its theoretical goal is the prediction and control of behavior. Introspection forms no essential part of its methods." Simply said, psychology should be an objective science—based on observable behavior.



Macmillan Learning

John B. Watson Watson (1924) admitted to "going beyond my facts" when offering his famous boast: "Give me a dozen healthy infants, well-formed, and my own specified world to bring them up in and I'll guarantee to take any one at random and train him to become any type of specialist I might select—doctor, lawyer, artist, merchant-chief, and, yes, even beggar-man and thief, regardless of his talents, penchants, tendencies, abilities, vocations, and race of his ancestors."

This view, which Watson called **behaviorism**, influenced North American psychology, especially during the first half of the twentieth century. Pavlov and Watson came to share both a disdain for "mentalistic" concepts (such as consciousness) and a belief that the basic laws of learning were the same for all animals—whether sea slugs or dogs or humans. Few researchers today agree that psychology should ignore mental processes, but most do agree that classical conditioning is a basic form of learning by which all organisms adapt to their environments.

Pavlov's Experiments

LOQ 21-3

Who was Pavlov, and what are the basic components of classical conditioning?

Pavlov was driven by a lifelong passion for research. After setting aside his initial plan to follow his father into the Russian Orthodox priesthood, Pavlov earned a medical degree at age 33 and spent the next two decades studying dogs' digestive system. This work earned him, in 1904, Russia's first Nobel Prize. But Pavlov's novel experiments on learning, which consumed the last three decades of his life, earned this feisty, intense scientist his place in history (Todes, 2014).

Pavlov's new direction came when his creative mind seized on an incidental observation. Without fail, putting food in a dog's mouth caused the animal to salivate. Moreover, the dog began salivating not

only to the taste of the food, but also to the mere sight of the food, or the food dish, or the person delivering the food, or even the sound of that person's approaching footsteps. At first, Pavlov considered these "psychic secretions" an annoyance—until he realized they pointed to a simple but fundamental form of learning.

Pavlov and his team of researchers—over half of whom were women (Hill, 2019)—tried to imagine what the dog was thinking and feeling as it drooled in anticipation of the food. This only led them into fruitless debates. So, to explore the phenomenon more objectively, they experimented. To eliminate other possible influences, they isolated the dog in a small room, secured it in a harness, and attached a device to divert its saliva to a measuring instrument (**FIGURE 21.3**). From the next room, they presented food—first by sliding in a food bowl, later by blowing meat powder into the dog's mouth at a precise moment. They then paired various **neutral stimuli (NS)**—events the dog could see or hear but didn't associate with food—with food in the dog's mouth. If a sight or sound regularly signaled the arrival of food, would the dog learn the link? If so, would it begin salivating in anticipation of the food?

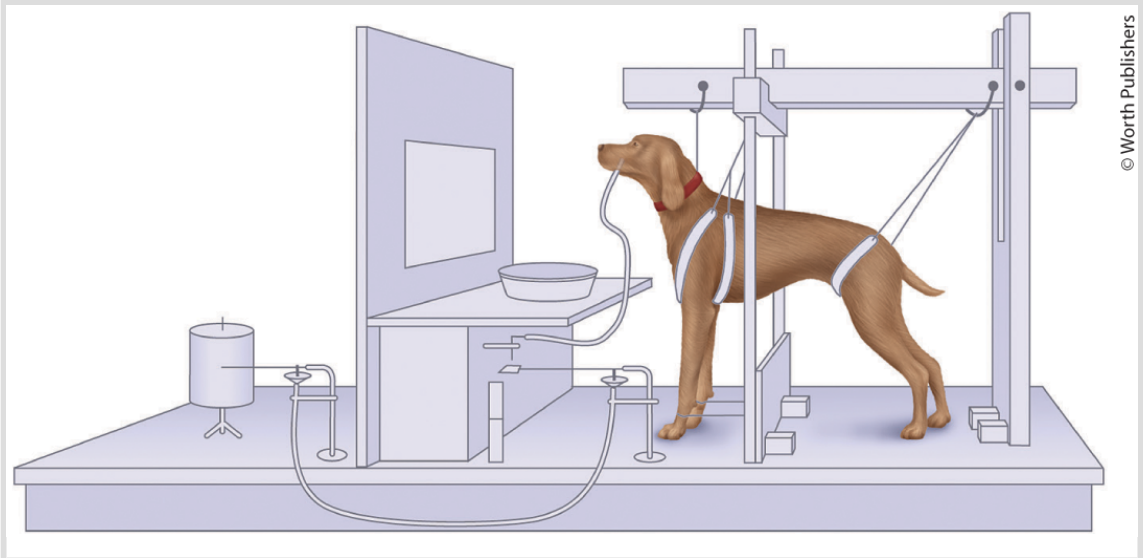


FIGURE 21.3 Pavlov's device for recording salivation A tube in the dog's cheek collects saliva, which is measured in a cylinder outside the chamber.

The answers proved to be *Yes* and *Yes.* Just before placing food in the dog's mouth to produce salivation, Pavlov sounded a tone. After several pairings of tone and food, the dog, now anticipating the meat powder, began salivating to the tone alone. In later experiments, a buzzer,[1] a light, a touch on the leg, even the sight of a circle set off the drooling. (This procedure works with people, too. When hungry young Londoners viewed abstract figures before smelling peanut butter or vanilla, their brain soon responded in anticipation to the abstract images alone [Gottfried et al., 2006].)

A dog does not learn to salivate in response to food in its mouth. Rather, food in the mouth automatically, *unconditionally,* triggers a dog's salivary reflex (**FIGURE 21.4**). Thus, Pavlov called this drooling an **unconditioned response (UR)**. And he called the food an **unconditioned stimulus (US)**.

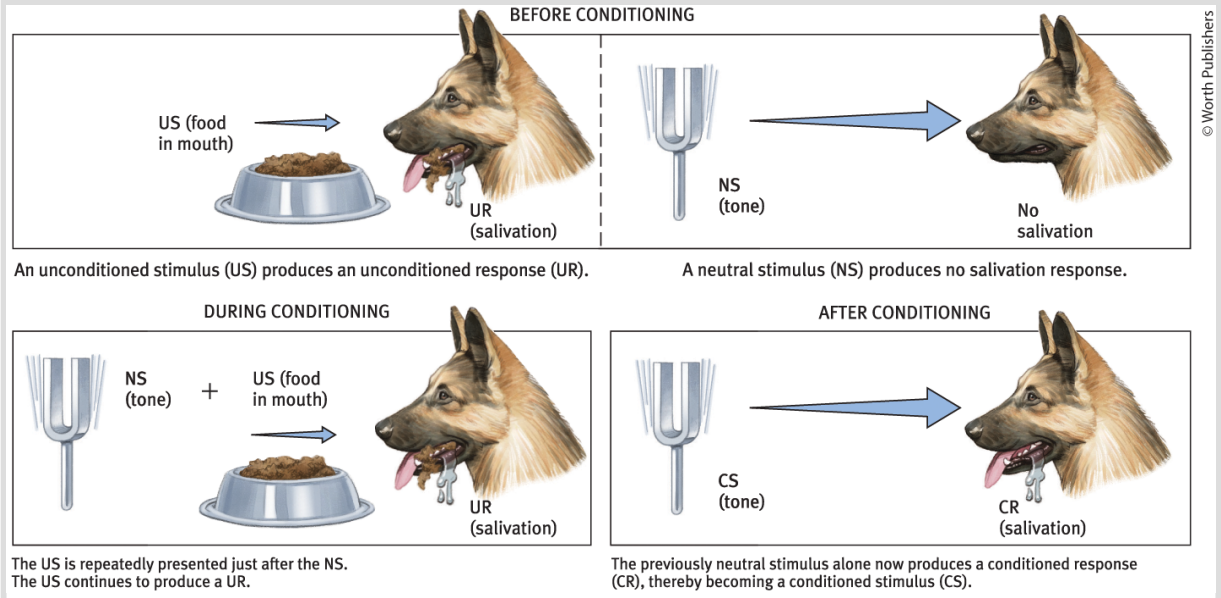


FIGURE 21.4 Pavlov's classic experiment Pavlov presented a neutral stimulus (a tone) just before an unconditioned stimulus (food in mouth). The neutral stimulus then became a conditioned stimulus, producing a conditioned response.



Salivation in response to a tone, however, is learned. It is *conditional* upon the dog's associating the tone with the food. Thus, we call this response the **conditioned response (CR)**. The stimulus that used to be neutral (in this case, a previously meaningless tone that now triggers

salivation) is the **conditioned stimulus (CS)**. Distinguishing these two kinds of stimuli and responses is easy: conditioned = learned; *un*conditioned = *un*learned.

If Pavlov's demonstration of associative learning was so simple, what did he do for the next three decades? What discoveries did his research factory publish in his 532 papers on salivary conditioning (Windholz, 1997)? He and his associates explored five major conditioning processes: *acquisition, extinction, spontaneous recovery, generalization,* and *discrimination.*

Retrieval Practice

RP-2 An experimenter sounds a tone just before delivering an air puff that causes your eye to blink. After several repetitions, you blink to the tone alone. What is the NS? The US? The UR? The CS? The CR?

ANSWERS IN APPENDIX E

Acquisition

LOQ 21-4

In classical conditioning, what are the processes of *acquisition, extinction, spontaneous recovery, generalization,* and *discrimination?*

To understand the **acquisition**, or initial learning, of the stimulus-response relationship, Pavlov and his associates wondered: How much time should elapse between presenting the NS (the tone, the light, and the touch) and the US (the food)? In most cases, not much—half a second usually works well.

What do you suppose would happen if the food (US) appeared before the tone (NS) rather than after? Would conditioning occur? Not likely. Conditioning usually won't occur when the NS follows the US. Remember: *Classical conditioning is biologically adaptive because it helps humans and other animals prepare for good or bad events.* To Pavlov's dogs, the originally neutral tone became a CS after signaling an important biological event—the arrival of food (US). To deer in the forest, a snapping twig (CS) may signal a predator's approach (US).

Research on male Japanese quail shows how a CS can signal another important biological event (Domjan, 1992, 1994, 2005). Just before presenting a sexually approachable female quail, the researchers turned on a red light. Over time, as the red light continued to herald the female's arrival, the light alone caused the male quail to become excited. They developed a preference for their cage's red-light district, and when a female appeared, they mated with her more quickly and released more semen and sperm (Matthews et al., 2007). This capacity for classical conditioning supports reproduction.

In humans, too, objects, smells, sounds, and sights associated with sexual pleasure—even a geometric figure, in one experiment—can

become conditioned stimuli for sexual arousal (Byrne, 1982; Hoffman, 2012, 2017). Onion breath, for example, is an NS—it does not typically produce sexual arousal. But when repeatedly paired with a passionate kiss, it can become a CS and do just that (FIGURE 21.5).

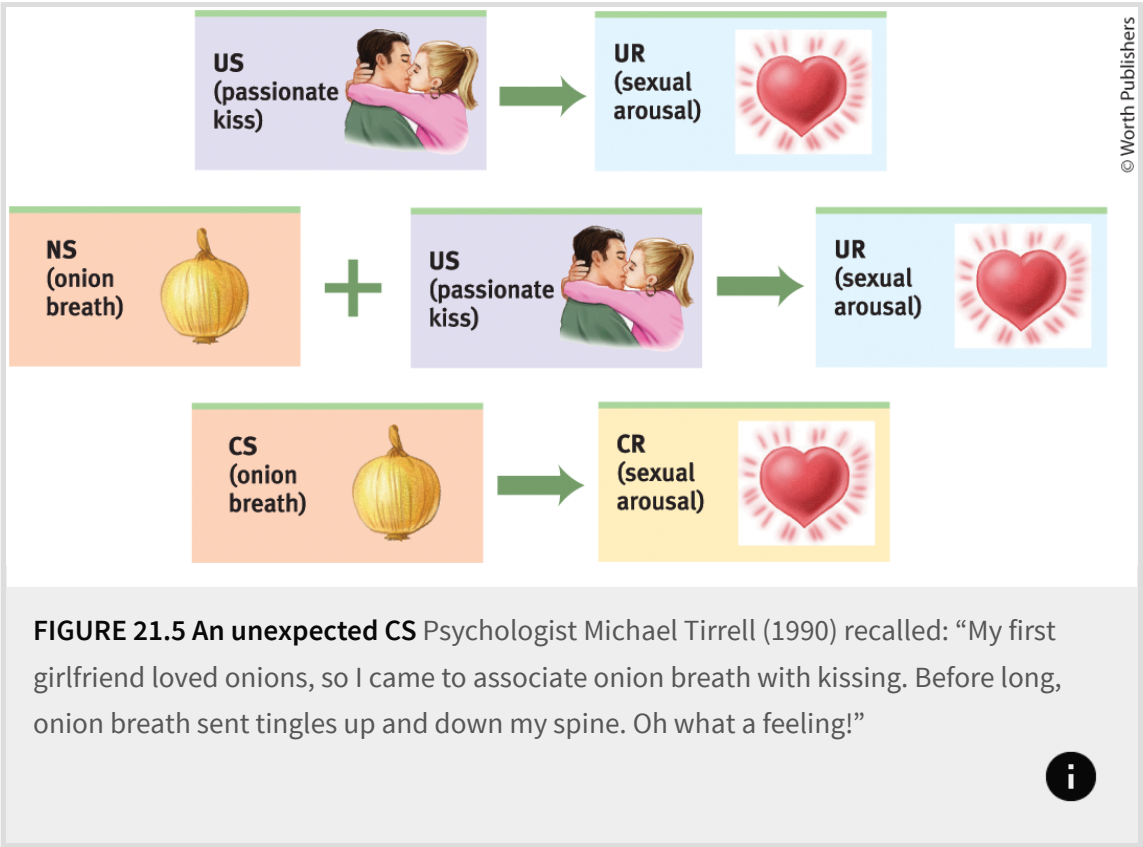


FIGURE 21.5 An unexpected CS Psychologist Michael Tirrell (1990) recalled: "My first girlfriend loved onions, so I came to associate onion breath with kissing. Before long, onion breath sent tingles up and down my spine. Oh what a feeling!"

The larger lesson: *Conditioning helps an animal survive and reproduce—by responding to cues that help it gain food, avoid dangers, locate mates, and produce offspring* (Hollis, 1997). Learning makes for yearning.

Through **higher-order conditioning**, a new NS can become a new CS without the presence of a US. All that's required is for it to become associated with a previously conditioned stimulus. If a tone regularly signals food and produces salivation, then a light that becomes

associated with the tone (light → tone → food) may also begin to trigger salivation. Although this higher-order conditioning (also called *second-order conditioning*) tends to be weaker than first-order conditioning, it influences our everyday lives. If a dog bites you, just the sound of a barking dog may later make you feel afraid.

Remember:
NS = Neutral Stimulus
US = Unconditioned Stimulus
UR = Unconditioned Response
CS = Conditioned Stimulus
CR = Conditioned Response

Ask Yourself

A psychologist recalled coming to associate his girlfriend's onion breath with arousal. Can you remember ever experiencing something that would normally be neutral (or even unpleasant) but came to mean something special to you?

Extinction and Spontaneous Recovery

What would happen, Pavlov wondered, if, after conditioning, the CS occurred repeatedly without the US? If the tone sounded again and again, but no food appeared, would the tone still trigger salivation? The answer was mixed. The dogs salivated less and less, a reaction known as **extinction**. Extinction is diminished responding that occurs when the CS (tone) no longer signals an impending US (food). But if

Pavlov sounded the tone again after several hours' delay, the dogs drooled in response (FIGURE 21.6). This spontaneous recovery—the reappearance of a (weakened) CR after a pause—suggested to Pavlov that extinction was suppressing the CR rather than eliminating it.

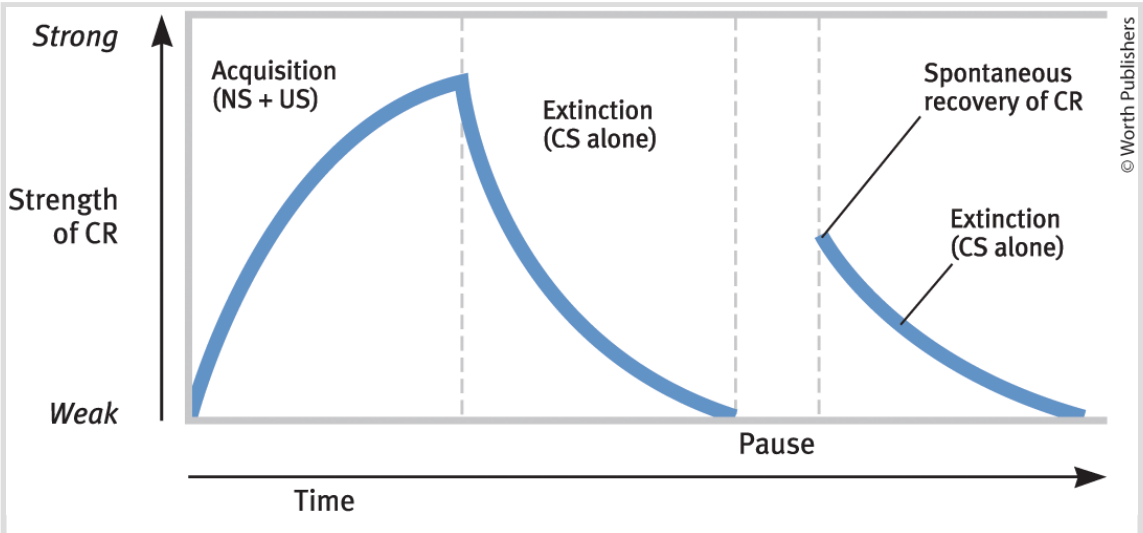


FIGURE 21.6 Idealized curve of acquisition, extinction, and spontaneous recovery The rising curve shows the CR rapidly growing stronger as the NS becomes a CS due to repeated pairing with the US *(acquisition).* The CR then weakens rapidly as the CS is presented alone *(extinction).* After a pause, the (weakened) CR reappears *(spontaneous recovery).*

Retrieval Practice

RP-3 A baker loves the taste and aroma of apple pie. Every time the baker sees a photo of apple pie, he salivates. In this situation, what is the US? The CS? The CR?

RP-4 The first step of classical conditioning, when an NS becomes a CS, is called _____. When a US no longer follows the CS, and the CR becomes weakened, this is called _____.

ANSWERS IN APPENDIX E

GENERALIZATION

Pavlov and his students noticed that a dog conditioned to the sound of one tone also responded somewhat to the sound of a new and different tone. Likewise, a dog conditioned to salivate when rubbed would also drool a bit when scratched (Windholz, 1989) or when touched on a different body part (FIGURE 21.7). This tendency to respond to stimuli similar to the CS is called **generalization** (or *stimulus generalization*).

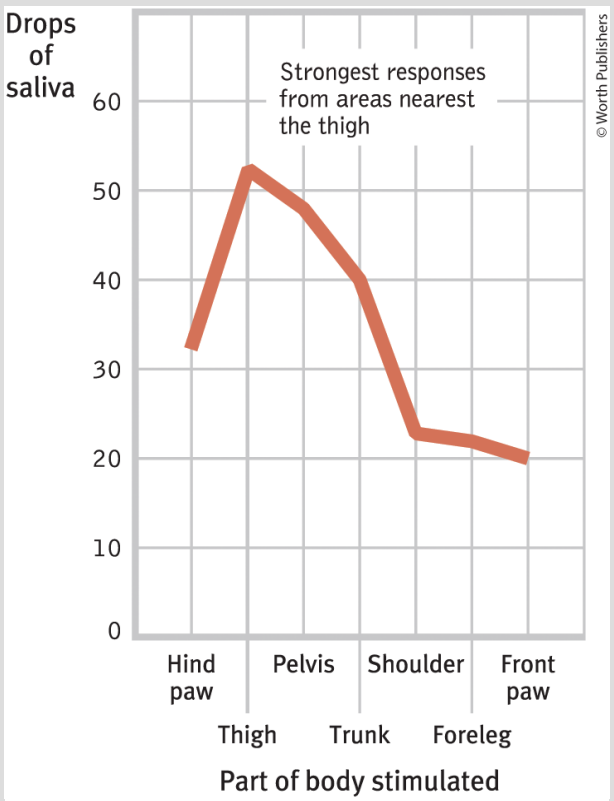


FIGURE 21.7 Generalization Pavlov demonstrated generalization by attaching

miniature vibrating devices to various parts of a dog's body. After conditioning salivation to stimulation of the thigh, he stimulated other areas. The closer a stimulated spot was to the dog's thigh, the stronger the conditioned response. (Data from Pavlov, 1927.)

Generalization can be adaptive, as when toddlers who learn to fear moving cars also become afraid of moving trucks and motorcycles. And generalized fears can linger, sticking in our memory (Simon-Kutscher et al., 2019; Stout et al., 2018). For two months after being in a car collision, sensitized young drivers are less vulnerable to repeat collisions (O'Brien et al., 2017). Years after being tortured in an Argentinean prison, one journalist reported still flinching with fear at the sight of black shoes—his first glimpse of his torturers as they approached his cell (Timerman, 1980). Generalized anxiety reactions have been demonstrated in laboratory studies comparing children who have been abused with children who have not (**FIGURE 21.8**).

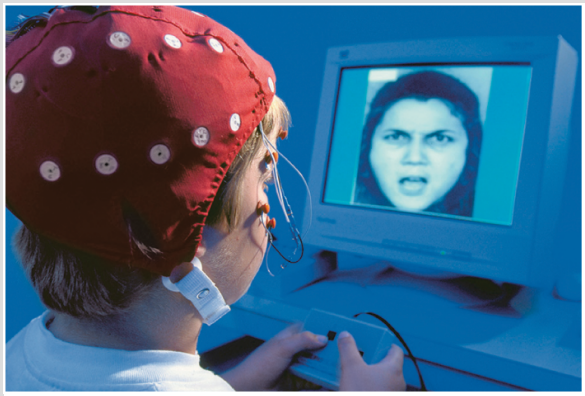


FIGURE 21.8 Child abuse leaves tracks in the brain Abused children's sensitized brains react more strongly to angry faces (Pollak et al., 1998). This generalized anxiety response may help explain their greater risk of psychological disorder.

Stimuli related to naturally disgusting or morally objectionable objects will, by association, also evoke some physical or moral disgust. Would most people eat otherwise desirable fudge shaped to resemble dog feces? Or hold an English dictionary apparently owned and used by Adolf Hitler? Or wrap themselves in a blanket thought to be previously owned by members of the al-Qaeda terrorist group? *No, No,* and *No.* These situations cause people to feel repulsed (Fedotova & Rozin, 2018; Rozin et al., 1986, 2015). These examples show how people's emotional reactions to one stimulus can generalize to other, related stimuli.

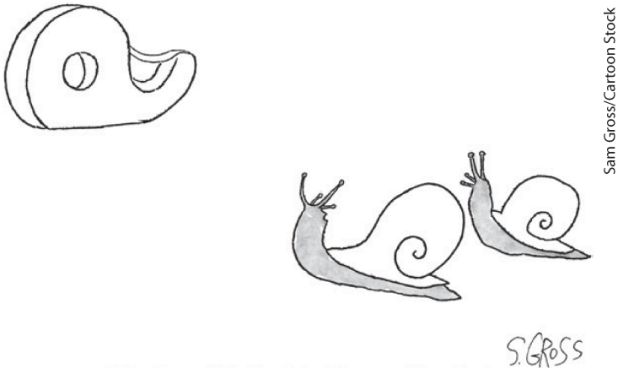
Discrimination

Pavlov's dogs also learned to respond to the sound of a particular tone and *not* to other tones. One stimulus (tone) predicted the US, and the others did not. This learned ability to *distinguish* between a conditioned stimulus (which predicts the US) and other, irrelevant stimuli is called **discrimination.** Being able to recognize differences is adaptive: Slightly different stimuli can cause vastly different consequences. After eating a butterfly that makes them sick, birds will generalize—they will avoid preying on similar butterflies. But they will

also discriminate such butterflies from other butterfly species that are edible (Sims, 2018). Kenyan elephants flee the scent of Maasai hunters, whom they have learned to fear, but not the scent of the nonthreatening Kamba people (Rhodes, 2017). Facing a guard dog, your heart may race; facing a guide dog, it probably will not.

Retrieval Practice

RP-5 What conditioning principle is influencing the snail's affections?



"I don't care if she's a tape dispenser. I love her."

ANSWERS IN APPENDIX E

Pavlov's Legacy

LOQ 21-5

Why does Pavlov's work remain so important?

What remains today of Pavlov's ideas? A great deal. Most psychologists now agree that classical conditioning is a basic form of learning. Modern neuroscience has also supported Pavlov's ideas—by identifying neural circuits that link a conditioned stimulus (warning signal) with an impending unconditioned stimulus (threat) (Harnett et al., 2016; Yau & McNally, 2018). Other researchers have applied Pavlov's ideas to shopping. Conditioning neutral brand logos with positive or negative images can cause people to like or loathe those brands (Alves et al., 2020). Judged with today's knowledge of the interplay of our biology, psychology, and social-cultural environment, some of Pavlov's ideas were incomplete. But if we see further than Pavlov did, it is because we stand on his shoulders.

Why does Pavlov's work remain so important? If he had merely taught us that old dogs can learn new tricks, his experiments would long ago have been forgotten. Why should we care that dogs can be conditioned to salivate to the sound of a tone? The importance lies first in the finding that *many other responses to many other stimuli can be classically conditioned in many other organisms*—in fact, in every species tested, from microscopic creatures to earthworms to fish to dogs to monkeys to people (Schwartz, 1984; S. Zhou et al., 2019). Thus, classical conditioning is one way that virtually all organisms learn to adapt to their environment.

Second, *Pavlov showed us how a process such as learning can be studied objectively.* He was proud that his methods involved virtually no subjective judgments or guesses about what went on in a dog's mind.

The salivary response is a behavior measurable in cubic centimeters of saliva. Pavlov's success suggested a scientific model for how the young discipline of psychology might proceed—by isolating the basic building blocks of complex behaviors and studying them with objective laboratory procedures.

Retrieval Practice

RP-6 Companies often pay to make their products visible in popular movies and television shows—such as when beloved characters drive particular car brands. (Have you noticed that the Avengers all drive Audis?) Based on classical conditioning principles, what might be an effect of this pairing?

ANSWERS IN APPENDIX E

Applications of Classical Conditioning

LOQ 21-6

What have been some applications of Pavlov's work to human health and well-being? How did Watson apply Pavlov's principles to learned fears?

In many areas of psychology, including consciousness, motivation, emotion, health, psychological disorders, and therapy, Pavlov's principles are used to influence human health and well-being. Three examples:

- ***Drug cravings:*** Classical conditioning may inform treatments for *substance use disorder.* People who formerly misused drugs often feel a craving when they are again in the drug-using context, because their brain has become conditioned to associate that context with a drug's reward (X. Wang et al., 2018; Wilar et al., 2019). Breaking this association can reduce cravings (Ananth et al., 2019; Martínez-Rivera et al., 2019). Many drug counselors advise clients to steer clear of the people and settings associated with previous highs (NIDA, 2017; Siegel, 2005). (The Therapy modules illustrate how behavior therapists apply classical conditioning to treat other psychological disorders.)
- ***Food cravings:*** Classical conditioning makes avoiding sweets difficult. Sugary substances evoke sweet sensations. Researchers have conditioned healthy volunteers to experience cravings after only one instance of eating a sweet food (Blechert et al., 2016). So, the next time you think "I can definitely eat just one cookie," you might be wise to think twice.
- ***Immune responses:*** Classical conditioning even works on the body's disease-fighting immune system. When a particular taste accompanies a drug that influences immune responses, the taste by itself may come to produce an immune response (Ader & Cohen, 1985).

Pavlov's work also provided a basis for Watson's (1913) idea that human emotions and behaviors, though biologically influenced, are mainly a bundle of conditioned responses. Working with an 11-month-old, Watson and his graduate student Rosalie Rayner (1920;

Harris, 1979) showed how specific fears might be conditioned. Like most infants, "Little Albert" feared loud noises but not white rats. Watson and Rayner presented a white rat and, as Little Albert reached to touch it, struck a hammer against a steel bar just behind his head. After seven repeats of seeing the rat and hearing the frightening noise, Albert burst into tears at the mere sight of the rat. Five days later, he reportedly generalized this startled fear reaction to the sight of a rabbit, a dog, and even a furry coat. A modern reanalysis questioned Watson's evidence for Albert's conditioning, but the case remains legendary (Powell & Schmaltz, 2021).

People later wondered what became of Watson. After losing his Johns Hopkins professorship over an affair with Rayner (whom he later married), he joined an advertising agency as the company's resident psychologist. There, he used his knowledge of associative learning to conceive many successful advertising campaigns, including one for Maxwell House that helped make the "coffee break" an American custom (Hunt, 1993).

Critics have questioned the strength and reliability of Watson and Rayner's findings (Ginsburg et al., 2020; Powell & Schmaltz, 2021). (These experiments would also be unethical by today's standards, making replication studies difficult.) Nevertheless, the case remains legendary. Little Albert's learned fears led many psychologists to wonder whether each of us might be a walking warehouse of conditioned emotions. If so, might extinction procedures or new conditioning help us change our unwanted responses to emotion-

arousing stimuli? Psychologist Mary Cover Jones (1924) was the first to extend Watson and Rayner's results by showing how conditioning can also reduce children's fear.



Macmillan Learning

Mary Cover Jones (1897–1987) At a time when men dominated the field of psychology, Jones' pioneering behavior therapy research made her a rare female contributor. In her most famous study, she used conditioning to help a 3-year-old named Peter to overcome his fear of white rabbits.

Therapists began using conditioning to reduce their clients' fears. One person used his therapist's conditioning strategy to treat a longtime fear of entering an elevator. For 10 days, the client entered 20 elevators a day. By the end of the treatment, the client's fear of elevators had nearly vanished (Ellis & Becker, 1982). Comedian-writer Mark Malkoff extinguished his fear of flying by taking 135 flights in 30

days, spending 14 hours a day in the air (NPR, 2009). After a week and a half, his fears had faded, and he began playing games with fellow passengers. His favorite was the "toilet paper experiment": Put one end of a roll in the toilet, unroll the rest down the aisle, and flush, sucking down the whole roll in three seconds! In the Therapy modules, we see more examples of how psychologists use behavioral techniques such as *counterconditioning* to treat psychological disorders and promote personal growth.

Retrieval Practice

RP-7 In Watson and Rayner's experiments, "Little Albert" learned to fear a white rat after repeatedly experiencing a loud noise as the rat was presented. In these experiments, what was the US? The UR? The NS? The CS? The CR?





Archives of the History of American Psychology, The Center for the History of Psychology, The University of Akron

ANSWERS IN APPENDIX E

REVIEW

Module 21: Basic Learning Concepts and Classical Conditioning

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 21-1: How do we define *learning,* and what are some basic forms of learning?

LOQ 21-2: What is behaviorism's view of learning?

LOQ 21-3: Who was Pavlov, and what are the basic components of classical conditioning?

LOQ 21-4: In classical conditioning, what are the processes of *acquisition, extinction, spontaneous recovery, generalization,* and *discrimination?*

LOQ 21-5: Why does Pavlov's work remain so important?

LOQ 21-6: What have been some applications of Pavlov's work to human health and well-being? How did Watson apply Pavlov's principles to learned fears?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

learning
associative learning
stimulus
respondent behavior
operant behavior
cognitive learning
classical conditioning
behaviorism
neutral stimulus (NS)
unconditioned response (UR)
unconditioned stimulus (US)
conditioned response (CR)
conditioned stimulus (CS)
acquisition
higher-order conditioning
extinction
spontaneous recovery
generalization
discrimination

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. Learning is defined as "the process of acquiring through experience new and relatively enduring _____ or _____."

2. Two forms of associative learning are classical conditioning, in which the organism associates _____, and operant conditioning, in which the organism associates _____.
   a. two or more responses; a response and its consequence
   b. two or more stimuli; two or more responses
   c. two or more stimuli; a response and its consequence
   d. two or more responses; two or more stimuli

3. In Pavlov's experiments, the tone started as a neutral stimulus, and then became a(n) _____ stimulus.

4. Dogs have been taught to salivate to a circle but not to a square. This process is an example of _____.

5. After Watson and Rayner classically conditioned Little Albert to fear a white rat, the child later showed fear in response to a rabbit, a dog, and a furry coat. This illustrates

a. extinction.
b. generalization.
c. spontaneous recovery.
d. discrimination between two stimuli.

6. “Sex sells!” is a common assumption in advertising. Using classical conditioning terms, explain how sexual images in advertisements can condition your response to a product.

MODULE 22: Operant Conditioning

LOQ 22-1

What is *operant conditioning?*

It's one thing to classically condition a dog to salivate to the sound of a tone, or a child to fear moving cars. But to teach an elephant to **learn** to walk on its hind legs or a child to say *please,* we turn to operant conditioning.

Classical conditioning and operant conditioning are both forms of **associative learning**, yet their differences are straightforward:

- *Classical conditioning* forms associations between **stimuli** (a CS and the US it signals). It also involves **respondent behavior**—automatic responses to a stimulus (such as salivating in response to meat powder and later in response to a tone).
- In **operant conditioning**, organisms associate their own actions with consequences. Actions followed by reinforcers increase; those followed by punishments often decrease. Behavior that *operates* on the environment to produce rewarding or punishing stimuli is called **operant behavior**.

Retrieval Practice

RP-1 With classical conditioning, we learn associations between events we _____ (do/do not) control. With operant conditioning, we learn associations between our behavior and _____ (resulting/random) events.

ANSWERS IN APPENDIX E

Skinner's Experiments

LOQ 22-2

Who was Skinner, and how is operant behavior reinforced and shaped?

B. F. Skinner (1904–1990), initially a college English major and aspiring writer, went on to become modern behaviorism's most influential and controversial figure. Skinner's work elaborated on what psychologist Edward L. Thorndike (1874–1949) called the **law of effect**: Rewarded behavior tends to recur (**FIGURE 22.1**). Using Thorndike's law of effect as a starting point, Skinner developed a behavioral technology that revealed principles of *behavior control.* Working from a rooftop office in a Minneapolis flour mill in 1943, Skinner and his students Keller Breland and Norman Guttman looked at the flocks of pigeons sitting on the windowsills and jokingly wondered, "Could we teach a pigeon how to bowl?" (Goddard, 2018; Skinner, 1960). By shaping pigeons' natural walking and pecking

behaviors, they did just that (Peterson, 2004). Skinner later used his new learning principles to teach pigeons other unpigeon-like behaviors, including how to walk in a figure 8, play table tennis, and keep a missile on course by pecking at a screen target.

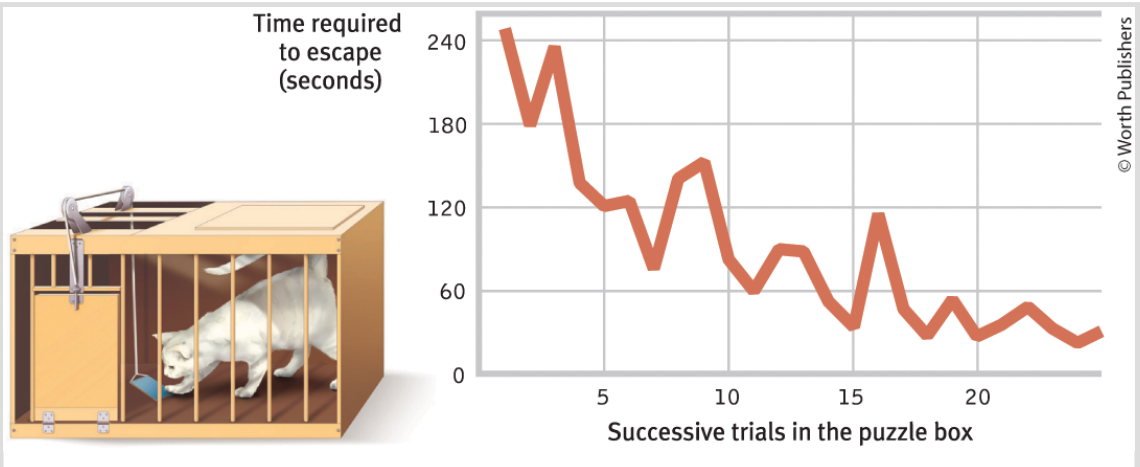


FIGURE 22.1 Cat in a puzzle box Thorndike used a fish reward to entice cats to find their way out of a puzzle box through a series of maneuvers. The cats' performance tended to improve with successive trials, illustrating Thorndike's *law of effect.* (Data from Thorndike, 1898.)

For his pioneering studies, Skinner designed an **operant chamber**, popularly known as a *Skinner box* (**FIGURE 22.2**). The box has a bar (a lever) that an animal presses—or a key (a disc) the animal pecks—to release a reward of food or water. It also has a device that records these responses. This creates a stage on which rats and other animals act out Skinner's concept of **reinforcement**: any event that strengthens (increases the frequency of) a preceding response. What is reinforcing depends on the animal and the conditions. For some people, it may be praise, attention, or a paycheck. For others, it may

be drugs that reduce distress or produce euphoria (Bechara et al., 2019). For hungry and thirsty rats, food and water work well. Skinner's experiments have done far more than teach us how to pull habits out of a rat. They have explored the precise conditions that foster efficient and enduring learning.

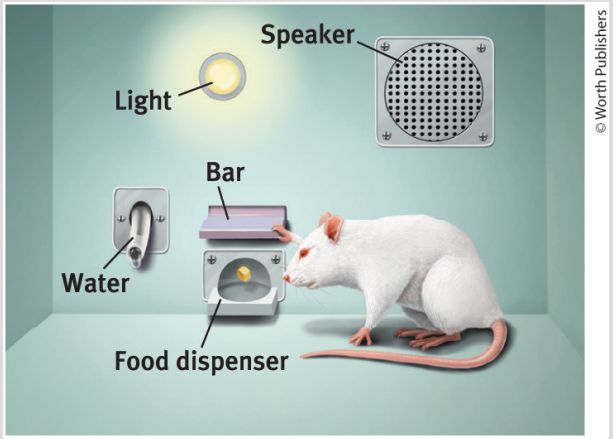
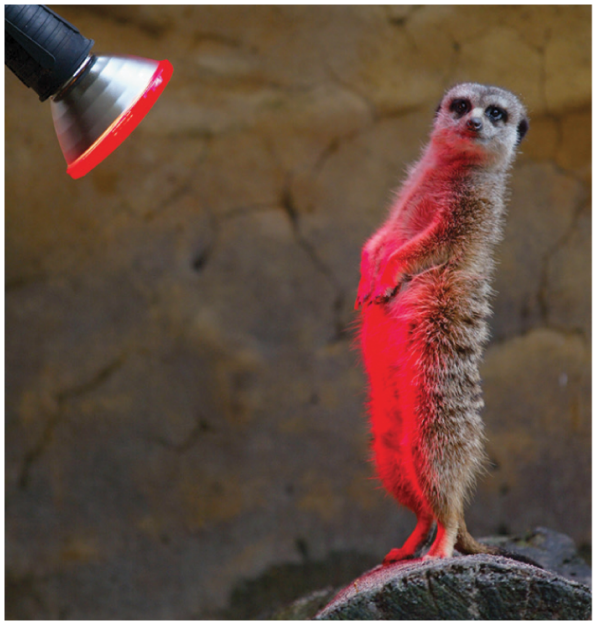


FIGURE 22.2 A Skinner box Inside the box, the rat presses a bar for a food reward. Outside, measuring devices (not shown here) record the animal's accumulated responses.

Shaping Behavior

Imagine that you wanted to condition a hungry rat to press a bar. Like Skinner, you could tease out this action with **shaping**, gradually guiding the rat's actions toward the desired behavior. First, you would observe the animal's natural behavior in order to build on its existing behaviors. You might give the rat a bit of food each time it approaches the bar. Once the rat is approaching regularly, you would give the food only when it moves close to the bar, then closer still. Finally, you

would require it to touch the bar to get food. By rewarding *successive approximations,* you reinforce responses that are ever-closer to the final desired behavior, and you ignore all other responses. By making rewards contingent on desired behaviors, researchers and animal trainers gradually shape complex behaviors.



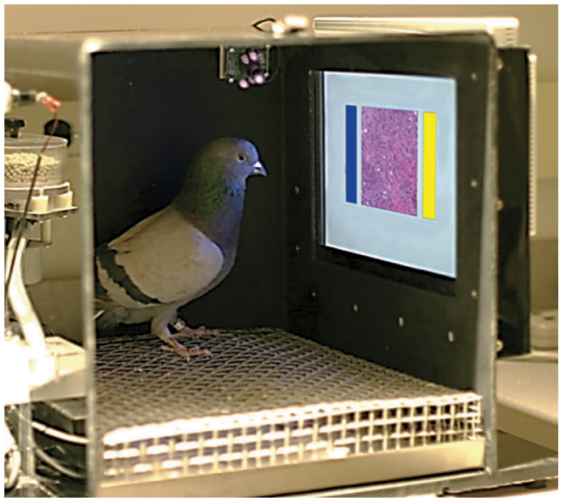
Will Burgess/Reuters/Newscom

Reinforcers vary with circumstances What is reinforcing (a heat lamp) to one animal (a cold meerkat) may not be to another (an overheated bear). What is reinforcing in one situation (a cold snap at the Taronga Zoo in Sydney) may not be in another (a sweltering summer day). Reinforcers also vary among humans. A chocolate treat that is reinforcing to Clarice might not be to Clarence, who prefers vanilla.

We can also shape our own behavior. Let's say you want to train for your first 5K race. You set up a daily plan with a mixture of walking

and running. At each stage, you give yourself a nice reward—perhaps first for a 15-minute walk, then for walking and jogging that distance, then for running it, then for running a bit more each week—rewarding successive approximations of your target behavior.

Shaping can also help us understand what nonverbal organisms can perceive. Can a dog distinguish red and green? Can a baby hear the difference between lower- and higher-pitched tones? If we can shape them to respond to one stimulus and not to another, then we know they can perceive the difference. Such experiments have even shown that some nonhuman animals can form concepts. When experimenters reinforced pigeons for pecking after seeing a human face, but not after seeing other images, the pigeons' behavior showed that they could recognize human faces (Herrnstein & Loveland, 1964). In this experiment, the human face was a *discriminative stimulus.* Like a green traffic light, discriminative stimuli signal that a response will be reinforced. After being trained to discriminate among classes of events or objects—flowers, people, cars, and chairs—pigeons can usually identify the category in which a new pictured object belongs (Bhatt et al., 1988; Wasserman, 1993). They have even been trained to discriminate between the music of Bach and Stravinsky (Porter & Neuringer, 1984).



Levenson RM, Krupinski EA, Navarro VM, Wasserman EA (2015) Pigeons (Columba livia) as Trainable Observers of Pathology and Radiology Breast Cancer Images. PLoS ONE 10(11): e0141357.

Bird brains spot tumors After being rewarded with food when correctly spotting breast tumors in scans, pigeons became as skilled as humans at discriminating cancerous from healthy tissue (Levenson et al., 2015). Other animals have been shaped to sniff out explosives and drugs or to locate people amid rubble (La Londe et al., 2015).

Skinner noted that we continually reinforce and shape others' everyday behaviors, though we may not mean to do so. Erlinda's nagging annoys her mom, for example, but consider how Mom typically responds:

ERLINDA: *Could you take me to the store?*

MOM: *(Continues checking her phone.)*

ERLINDA: *Mom, I need to go to the store.*

MOM: *Uh, yeah, in a few minutes.*

ERLINDA: *MOM! The store!*

MOM: *Show some manners! Okay, where are my keys …*

Erlinda's nagging is reinforced, because she gets something desirable—a drive to the store. Mom's response is reinforced, because it gets rid of something aversive—Erlinda's nagging.

Or consider a teacher who sticks gold stars on a wall chart beside the names of children scoring 100 percent on spelling tests. As everyone can then see, some children consistently do perfect work. The others, who may have worked harder than the academic all-stars, get no rewards. The teacher would be better advised to apply the principles of operant conditioning—to reinforce all spellers for gradual improvements (successive approximations toward perfect spelling of words they find challenging).

ASK YOURSELF

Can you recall a time when a teacher, coach, family member, or employer helped you learn something by shaping your behavior in little steps until you achieved your goal?

Types of Reinforcers

LOQ 22-3

How do positive and negative reinforcement differ, and what are the basic types of reinforcers?

Until now, we've mainly been discussing **positive reinforcement**, which strengthens responding by *presenting* a typically *pleasurable* stimulus immediately after a response. But, as the rude Erlinda story illustrates, there are two basic kinds of reinforcement (TABLE 22.1). **Negative reinforcement** strengthens a response by *reducing or removing* something *negative.* Erlinda's nagging was *positively* reinforced, because Erlinda got something desirable—a ride to the store. Her mom's response (doing what Erlinda wanted) was *negatively* reinforced, because it ended an aversive event—Erlinda's nagging. Similarly, taking aspirin may relieve your headache, giving your dog a treat may silence its barking, and fastening your car seat belt will silence the annoying sound. These welcome results provide negative reinforcement and increase the odds that you will repeat these behaviors. For those with an opioid addiction, the negative reinforcement of ending withdrawal pangs can be a compelling reason to resume using (Pantazis et al., 2021). It is very important to understand and remember that *negative reinforcement is not punishment.* Rather, negative reinforcement—psychology's most misunderstood concept—*removes* a punishing (aversive) event. Think of negative reinforcement as something that provides relief—from that bad headache, yapping dog, or annoying seat belt alert.

TABLE 22.1 Ways to Increase Behavior

Operant Conditioning Term	Description	Examples

Positive reinforcement	Add a desirable stimulus	Pet a dog that comes when you call it; pay someone for work done.
Negative reinforcement	Remove an aversive stimulus	Take painkillers to end pain; fasten seat belt to end loud beeping.

Sometimes negative and positive reinforcement coincide. Imagine a worried student who, after goofing off and getting a bad exam grade, studies harder for the next exam. This increased effort may be *negatively* reinforced by reduced anxiety, and *positively* reinforced by a better grade. We reap the rewards of escaping the aversive stimulus, which increases the chances that we will repeat our behavior. *The point to remember:* Whether it works by reducing something aversive, or by providing something desirable, *reinforcement is any consequence that strengthens behavior.*

Retrieval Practice

RP-2 How is operant conditioning at work in this cartoon?



ANSWERS IN APPENDIX E

Primary and Conditioned Reinforcers

Getting food when hungry or having a painful headache go away is innately satisfying. These **primary reinforcers** are unlearned. **Conditioned reinforcers,** also called *secondary reinforcers,* get their power through learned association with primary reinforcers. If a rat in a Skinner box learns that a light reliably signals a food delivery, the rat will work to turn on the light (see Figure 22.2). The light has become a conditioned reinforcer. Our lives are filled with conditioned reinforcers—money, good grades, approving words, and social media "likes" (Lindström et al., 2021).

Immediate and Delayed Reinforcers

Let's return to the imaginary shaping experiment in which you were conditioning a rat to press a bar. In addition to performing this "wanted" behavior, the hungry rat will engage in other "unwanted" behaviors—scratching, sniffing, and moving around. If you present food immediately after any one of these behaviors, the rat will likely repeat that rewarded behavior. But what if the rat presses the bar while you are distracted, and you delay giving the reinforcer? If the delay lasts longer than about 30 seconds, the rat will not learn to press the bar (Austen & Sanderson, 2019; Cunningham & Shahan, 2019). Delays also decrease human learning. Students learn class material better when they complete frequent quizzes that provide them with

immediate feedback (Healy et al., 2017). Immediate feedback produces immediate learning.

But unlike rats, humans *can* respond to delayed reinforcers: the paycheck at the end of the week, the good grade at the end of the term, and the trophy at the end of the sports season. Indeed, to function effectively we must accomplish the difficult task of delaying gratification. In one of psychology's most famous studies, some 4-year-olds showed this ability. In choosing a piece of candy or a marshmallow, these impulse-controlled children preferred having a big one tomorrow to munching on a small one right away. The children who delayed gratification tended to become socially competent and high-achieving adults (Mischel, 2014). Later studies showed a similar (though weaker) relationship between delay of gratification and achievement later (Watts et al., 2018). Learning to control our impulses in order to earn more valued future rewards reduces later likelihood of committing impulsive crimes (Åkerlund et al., 2016; Logue, 1998a,b). *The bottom line:* It pays to delay.

To our detriment, small but immediate pleasures (late-night binge-watching) are sometimes more alluring than big but delayed rewards (feeling rested for a big exam tomorrow). For many teens, the immediate gratification of risky, unprotected sex in passionate moments prevails over the delayed gratifications of safe or saved sex. And for many people, the immediate rewards of today's gas-guzzling vehicles and air conditioning prevail over the bigger future

consequences of the global climate crisis, with rising seas and extreme weather.

Reinforcement Schedules

LOQ 22-4

How do different reinforcement schedules affect behavior?

In most of our examples, the desired response has been reinforced every time it occurs. But **reinforcement schedules** vary. With **continuous reinforcement**, learning occurs rapidly, which makes it the best choice for acquiring a behavior. But extinction also occurs rapidly. When reinforcement stops—when we stop delivering food after the rat presses the bar—the behavior soon stops (is *extinguished*). If a normally dependable vending machine fails to deliver a chocolate bar twice in a row, we stop putting money into it (although a week later we may exhibit *spontaneous recovery* by trying again).

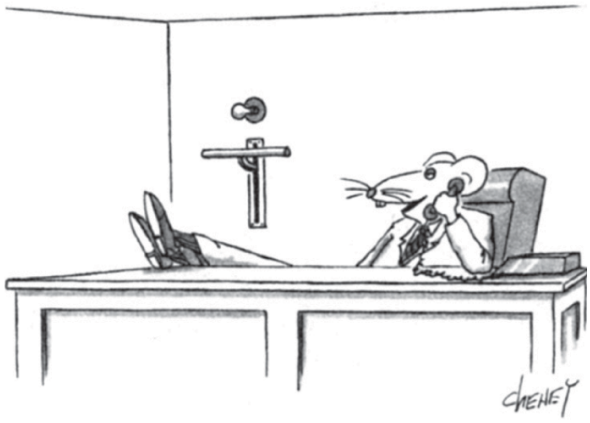
Real life rarely provides continuous reinforcement. Salespeople do not make a sale with every pitch. But they persist because their efforts are occasionally rewarded. This persistence is typical with **partial (intermittent) reinforcement schedules**, in which responses are sometimes reinforced, sometimes not. Learning is slower to appear, but *resistance to extinction* is greater than with continuous reinforcement. Imagine a pigeon that has learned to peck a key to obtain food. If you gradually phase out the food delivery until it occurs

only rarely, in no predictable pattern, the pigeon may peck 150,000 times without a reward (Skinner, 1953). Slot machines reward gamblers in much the same way—occasionally and unpredictably. And like pigeons, slot players keep trying, time and time again. With intermittent reinforcement, hope springs eternal.

Lesson for parents: Whether intended or not, partial reinforcement also works with children. *Occasionally* giving in to children's tantrums for the sake of peace and quiet intermittently reinforces the tantrums. This is the very best procedure for making a behavior persist!

Skinner (1961) and his collaborators compared four schedules of partial reinforcement and their effects on behavior:

Fixed-ratio schedules reinforce behavior after a set number of responses. Coffee shops may reward us with a free coffee after every 10 purchased. Once conditioned, rats may be reinforced on a fixed ratio of, say, one food pellet for every 30 responses. Once conditioned, animals will pause only briefly after a reinforcer before returning to a high rate of responding.



The New Yorker Collection, 1993, Tom Cheney/The Cartoon Bank

"Oh, not bad. The light comes on, I press the bar, they write me a check. How about you?"

Variable-ratio schedules provide reinforcers after a seemingly unpredictable number of responses. This unpredictable reinforcement is what slot-machine players and anglers experience, and it's what makes gambling and fishing so hard to extinguish even when they don't produce the desired results. Because reinforcers increase as the number of responses increases, variable-ratio schedules produce high rates of responding.

Fixed-interval schedules reinforce a response after a fixed time period. Animals on this type of schedule tend to respond more frequently as the anticipated time for reward draws near. People check more frequently for the mail as the delivery time approaches. Pigeons peck keys more rapidly as the time for reinforcement draws closer. This produces a choppy stop-start pattern rather than a steady rate of response (**FIGURE 22.3**).

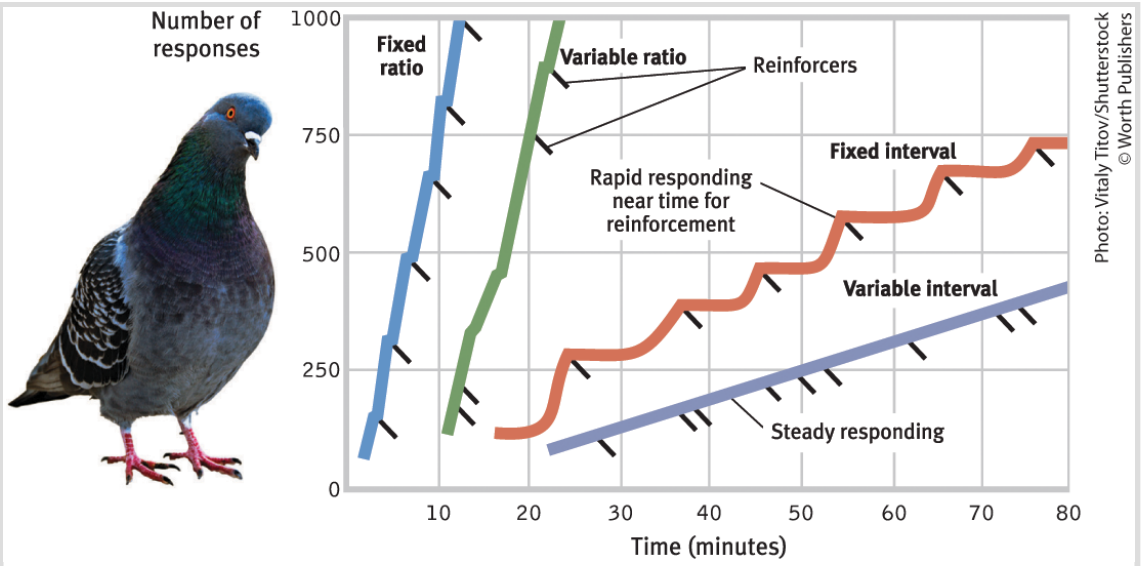


FIGURE 22.3 Intermittent reinforcement schedules Skinner's laboratory pigeons produced these response patterns to each of four reinforcement schedules. (Reinforcers are indicated by diagonal marks.) For people, as for pigeons, reinforcement linked to number of responses (a *ratio* schedule) produces a higher response rate than reinforcement linked to amount of time elapsed (an *interval* schedule). But the predictability of the reward also matters. An unpredictable *(variable)* schedule produces more consistent responding than does a predictable *(fixed)* schedule. (Data from Skinner, 1961.)

Variable-interval schedules reinforce the first response after *varying* time intervals. At unpredictable times, a food pellet rewarded Skinner's pigeons for persistence in pecking a key. Like the longed-for message that finally rewards persistence in checking our phone, variable-interval schedules tend to produce slow, steady responding. This makes sense, because there is no knowing when the waiting will be over (TABLE 22.2). Pigeons keep pecking—and we keep checking—hoping that *this time* we'll get the reward.

TABLE 22.2 Schedules of Partial Reinforcement

	Fixed	Variable
Ratio	*Every so many:* reinforcement after every *nth* behavior, such as "buy 10 coffees, get 1 free" offer, or paying workers per product unit produced	*After an unpredictable number:* reinforcement after a random number of behaviors, as when playing slot machines or fishing
Interval	*Every so often:* reinforcement for behavior after a fixed time, such as Tuesday discount prices	*Unpredictably often:* reinforcement for behavior after a random amount of time, as when checking for a social media update

In general, response rates are higher when reinforcement is linked to the number of responses (a ratio schedule) rather than to time (an interval schedule). But responding is more consistent when reinforcement is unpredictable (a variable schedule) than when it is predictable (a fixed schedule). (See Figure 22.3.) Animal behaviors differ, yet Skinner (1956) contended that the reinforcement principles of operant conditioning are universal. It matters little, he said, what response, what reinforcer, or what species. The effect of a given reinforcement schedule is pretty much the same: "Pigeon, rat, monkey, which is which? It doesn't matter.... Behavior shows astonishingly similar properties."

Retrieval Practice

RP-3 People who send spam email are reinforced by which schedule? Home bakers checking the oven to see if the cookies are done are reinforced on which schedule?

Sandwich shops that offer a free sandwich after every 10 purchased are using which reinforcement schedule?

ANSWERS IN APPENDIX E

Punishment

LOQ 22-5

How does punishment differ from negative reinforcement, and how does punishment affect behavior?

Reinforcement increases a behavior; punishment does the opposite. A *punisher* is any consequence that *decreases* the frequency of the behavior it follows (TABLE 22.3). **Positive punishment** is punishing by adding (administering) an unpleasant stimulus. **Negative punishment** is punishing by subtracting (taking away) a rewarding stimulus. Swift and sure punishers can powerfully restrain unwanted behavior. The rat that is shocked after touching a forbidden object and the child who is burned by touching a hot stove will learn not to repeat those behaviors.

TABLE 22.3 Ways to Decrease Behavior

Type of Punisher	Description	Examples
Positive punishment	Administer an aversive stimulus.	Spray water on a barking dog; give a traffic ticket for speeding.

Negative punishment	Withdraw a rewarding stimulus.	Take away a misbehaving teen's driving privileges; block a rude commenter on social media.

Criminal behavior, much of it impulsive, is also influenced more by swift and sure punishers than by the threat of severe sentences (Darley & Alter, 2013). Thus, when Arizona introduced an exceptionally harsh sentence for first-time drunk drivers, the drunk-driving rate changed very little. But when Kansas City police started patrolling a high crime area to increase the swiftness and sureness of punishment, that city's crime rate dropped dramatically.

What do punishment studies imply for parenting? One analysis of over 160,000 children found that physical punishment rarely corrects unwanted behavior (Gershoff & Grogan-Kaylor, 2016). A second analysis of 131,000 children from 49 countries found that, even after accounting for other family differences such as economic status, children who were hit and spanked fared more poorly (Cuartas, 2021). With support from an American Psychological Association resolution on the ineffectiveness and potential harm of physical punishment, psychologists have noted five major drawbacks (APA, 2019; Finkenauer et al., 2015; Gershoff et al., 2018, 2019; Marshall, 2002):

1. ***Punished behavior is suppressed, not forgotten. This temporary state may (negatively) reinforce parents' punishing behavior.*** The child swears, the parent swats, the child stops swearing when the parent is nearby, so the parent believes the punishment successfully stopped the behavior. No wonder spanking is a hit

with so many parents—with more than two in three children in less developed countries spanked or otherwise physically punished (UNICEF, 2020).

2. ***Physical punishment does not replace the unwanted behavior.*** Physical punishment may reduce or even eliminate unwanted behavior, but it does not provide direction for appropriate behavior. A child who is slapped for screaming in the car may stop yelling but continue to throw her food or steal her brother's toys.
3. ***Punishment teaches discrimination among situations.*** In operant conditioning, *discrimination* occurs when an organism learns that certain responses, but not others, will be reinforced. Did the punishment effectively end the child's swearing? Or did the child simply learn that it's not okay to swear in front of parents?
4. ***Punishment can teach fear.*** In operant conditioning, *generalization* occurs when an organism's response learned in one situation occurs in other, similar situations. A punished child may associate fear not only with the undesirable behavior but also with the person who delivered the punishment or where it occurred. Thus, children may learn to fear a punishing teacher and try to avoid school, or may become anxious (Gershoff et al., 2010). For such reasons, most European countries and 31 U.S. states now ban hitting children in public schools (EndCorporalPunishment.org). As of 2021, 62 countries had outlawed all corporal punishment of children, including in the home. A large survey in Finland, the second country to pass such

a law, revealed that children born after the law passed were, indeed, less often slapped and beaten (Österman et al., 2014).

5. ***Physical punishment may increase aggression by modeling violence as a way to cope with problems.*** Studies find that spanked children are at increased risk for aggression (MacKenzie et al., 2013). We know, for example, that many aggressive adults come from abusive families (Fitton et al., 2020).

Some researchers question this logic. Physically punished children may be more aggressive, they say, for the same reason that people who have undergone psychotherapy are more likely to experience depression—because they had preexisting problems that triggered the treatments (Ferguson, 2013; Larzelere, 2000; Larzelere et al., 2019). So, does spanking cause misbehavior, or does misbehavior trigger spanking? Or do physically aggressive parents give their children aggression-disposing genes? Correlations don't hand us an answer.

How *should* parents and caregivers discipline children? Many psychologists encourage *time-out from positive reinforcement:* removing a misbehaving child from access to desired stimuli such as siblings' and parents' attention (Dadds & Tully, 2019). Effective time-outs come with clear expectations for replacing problem behavior (hitting siblings) with alternative positive behaviors (telling siblings they have hurt your feelings) (O'Leary et al., 1967; Patterson et al., 1968). Children learn that time-out helps the family enjoy positive and caring interactions.

Some parents may not know how to discourage bad behavior without screaming, hitting, or threatening their children with punishment (Patterson et al., 1982). Training programs can help transform dire threats ("You clean up your room this minute or no dinner!") into positive incentives ("You're welcome at the dinner table after you get your room cleaned up"). Stop and think about it. Aren't many threats of punishment just as forceful, and perhaps more effective, when rephrased positively? Thus, "If you don't get your homework done, there'll be no car" could be phrased more positively as …

In classrooms, too, teachers can give feedback by saying, "No, but try this …" and "Yes, that's it!" Such responses reduce unwanted behavior while reinforcing more desirable alternatives. Other studies show that people learn and grow more from feedback that tells them where they've succeeded rather than where they have failed (Eskreis-Winkler & Fishbach, 2019). Remember: *Punishment tells you what not to do; reinforcement tells you what to do.* Thus, punishment trains a particular sort of morality—one focused on prohibition (what *not* to do) rather than positive obligations (Sheikh & Janoff-Bulman, 2013).

> **"A pat on the back, though only a few vertebrae removed from a kick in the pants, is miles ahead in results."** — Attributed to publisher Bennett Cerf (1898–1971)

What punishment often teaches, said Skinner, is how to avoid it. *The bottom line:* Most psychologists now favor an emphasis on reinforcement: Focus on what people do right and praise them for it.

Retrieval Practice

RP-4 Fill in the blanks with one of the following terms: positive reinforcement (PR), negative reinforcement (NR), positive punishment (PP), or negative punishment (NP). We have provided the first answer (PR) for you.

Type of Stimulus	Give It	Take It Away
Desired (for example, a teen's use of the car)	1. PR	2.
Undesired/aversive (for example, an insult)	3.	4.

ANSWERS IN APPENDIX E

Skinner's Legacy

LOQ 22-6

Why did Skinner's ideas provoke controversy, and how might his operant conditioning principles be applied?

B. F. Skinner stirred a hornet's nest with his outspoken beliefs. He repeatedly insisted that external influences, not internal thoughts and feelings, shape behavior. He argued that brain science isn't needed for psychological science, saying that "a science of behavior is independent of neurology" (Skinner, 1938/1966, pp. 423–424). And he urged people to use operant conditioning principles to influence others' behavior at school, work, and home. Knowing that behavior is

shaped by its results, he argued that we should use rewards to evoke more desirable behavior.



Macmillan Learning

B. F. Skinner "I am sometimes asked, 'Do you think of yourself as you think of the organisms you study?' The answer is yes. So far as I know, my behavior at any given moment has been nothing more than the product of my genetic endowment, my personal history, and the current setting" (1983).

Skinner's critics objected, saying that he dehumanized people by neglecting their personal freedom and by seeking to control their actions. Skinner's reply: External consequences already haphazardly control people's behavior. Why not administer those consequences toward human betterment? Wouldn't reinforcers be more humane than the punishments used in homes, schools, and prisons? And if it is humbling to think that our history has shaped us, doesn't this very

idea give us hope that we can apply operant conditioning to shape our future?

Applications of Operant Conditioning

Psychologists apply operant conditioning principles to help people improve their health or gain social skills. Reinforcement techniques are also at work in schools, sports, computer programs, workplaces, and homes, and these principles can support our self-improvement as well (Flora, 2004).

At School

More than 50 years ago, Skinner and others envisioned a day when "machines and textbooks" would shape learning in small steps, by immediately reinforcing correct responses. Such machines and textbooks, they said, would revolutionize education and free teachers to focus on each student's special needs. "Good instruction demands two things," said Skinner (1989). "Students must be told immediately whether what they do is right or wrong and, when right, they must be directed to the step to be taken next."

Skinner might be pleased to know that many of his ideals for education are now possible. Teachers used to find it difficult to pace material to each student's learning rate and provide prompt feedback. Online adaptive quizzing, such as the LearningCurve system in Achieve available with this text, do both. Students move through quizzes at their own pace, according to their own level of

understanding. And they get immediate feedback on their efforts, including personalized study plans.

In Sports

The key to shaping behavior in athletic performance, as elsewhere, is first reinforcing small successes and then gradually increasing the challenge. Golf students can learn putting by starting with very short putts, and then, as they build competence, stepping back farther and farther. Novice batters can begin with half swings at an oversized ball pitched from 10 feet away, giving them the immediate pleasure of smacking the ball. As the hitters' confidence builds with their success and they achieve competence at each level, the pitcher gradually moves back and eventually introduces a standard baseball. Compared with children taught by conventional methods, those trained by this behavioral method have shown faster skill improvement (Simek & O'Brien, 1981, 1988).



Chuck Burton/AP Photo

Immediate reinforcement Muffet McGraw, the coach of Notre Dame's 2018 national championship women's basketball team, spent her career focusing on catching her players doing something right and applauding them for it on the spot.

In Video Games

Game developers use reinforcement principles to create computer programs that mimic human learning. Such *artificial intelligence (AI)* programs perform actions—playing chess, poker, or a multiplayer videogame—enabling the programs to quickly learn to repeat reinforced actions (what leads to winning) and avoid punished

responses (what leads to losing) (Botvinick et al., 2019; Jaderberg et al., 2019).

At Work

How might managers successfully motivate their employees? People do respond to delayed positive and negative reinforcement, but it's better to make the reinforcement *immediate.* It's also better to reward specific, achievable behaviors rather than vaguely defined "merit." General Motors CEO Mary Barra understood this. In 2015, she observed workers' high performance and awarded record bonuses (Vlasic, 2015). But rewards don't have to be monetary. An effective manager may simply chime in on group chats, sincerely praising people for good work.

In Parenting

As we have seen, parents can learn from operant conditioning practices. Parent-training researchers remind us that by saying, "Get ready for bed" and then caving in to protests or defiance, parents reinforce such whining and arguing (Wierson & Forehand, 1994). Exasperated, they may then yell or gesture menacingly. When the child, now frightened, obeys, that reinforces the parent's angry behavior. Over time, a destructive parent-child relationship develops.

To disrupt this cycle, parents should remember the basic rule of shaping: *Notice people doing something right and affirm them for it.* Give children attention and other reinforcers when they are behaving *well.*

If you want your teen to drive safely, reward them for safe driving (Hinnant et al., 2019). Target a specific behavior, reward it, and watch it increase. Ask your child to make their bed, say "thank you" and smile when they make it, and they may make the bed more often on their own. When children misbehave, don't yell at them or hit them. Use punishment gently to reduce future unwanted behavior. Simply explain the misbehavior and take away their screen time, remove a misused toy, or give a brief time-out.

To Change Your Own Behavior

Finally, we can use operant conditioning in our own lives. To reinforce your own desired behaviors (perhaps to improve your study habits) and extinguish the undesired ones (to stop vaping, for example), psychologists suggest taking these steps:

1. ***State a realistic goal in measurable terms and announce it.*** You might, for example, aim to boost your study time by an hour a day. To increase your commitment and odds of success, share that goal with friends.
2. ***Decide how, when, and where you will work toward your goal.*** Plan when and where you will complete assigned reading and other homework. From North American undergraduates to Swedish entrepreneurs, those who specify how they will implement goals become more focused on those goals and more likely to fulfill them (Gollwitzer & Oettingen, 2012; van Gelderen et al., 2018).

3. ***Monitor how often you engage in your desired behavior.*** You might log your current study time, noting under what conditions you do and don't study. See how many days in a row you can meet your study goal. (When we began writing textbooks, we each logged our time and were amazed to discover how much time we were wasting.)
4. ***Reinforce the desired behavior.*** People's persistence toward long-term goals is powered mostly by immediate rewards (Woolley & Fishbach, 2017). So, to increase your study time, reward yourself (a snack, a nap, or 15 minutes goofing off online) only after you finish your extra hour of study. Use apps that reward your progress toward desired goals, whether to meditate regularly, get more sleep, or drink more water. Agree to join your friends for weekend activities only if you have met your realistic weekly studying goal.
5. ***Reduce the rewards gradually.*** As your new behaviors become more habitual, separate the behaviors from the rewards. Give yourself a mental pat on the back instead of a cookie.

Ask Yourself

Think of a personal bad habit you'd like to break. How could you use operant conditioning to break it?

Retrieval Practice

RP-5 Joslyn constantly misbehaves at preschool even though her teacher scolds her repeatedly. Why does Joslyn's misbehavior continue, and what can her teacher do to stop it?

ANSWERS IN APPENDIX E

Contrasting Classical and Operant Conditioning

LOQ 22-7

How does operant conditioning differ from classical conditioning?

Both classical and operant conditioning are forms of *associative learning*. Both involve *acquisition, extinction, spontaneous recovery, generalization,* and *discrimination.* But these two forms of learning also differ. Through classical (Pavlovian) conditioning, we associate different stimuli we do not control, and we respond automatically *(respondent behaviors)* (TABLE 22.4). Through operant conditioning, we associate our own behaviors—which act on our environment to produce rewarding or punishing stimuli *(operant behaviors)*—with their consequences.

TABLE 22.4 Comparison of Classical and Operant Conditioning

	Classical Conditioning	Operant Conditioning
Basic idea	Learning associations between events we do not control.	Learning associations between our behavior and its consequences.
Response	Involuntary, automatic.	Voluntary, operates on environment.
Acquisition	Associating events; NS is paired with US and becomes CS.	Associating a response with a consequence (reinforcer or punisher).
Extinction	CR decreases when CS is repeatedly presented alone.	Responding decreases when reinforcement stops.
Spontaneous recovery	The reappearance, after a rest period, of a weakened CR.	The reappearance, after a rest period, of a weakened response.
Generalization	The tendency to respond to stimuli similar to the CS.	Responses learned in one situation occurring in other, similar situations.
Discrimination	Learning to distinguish between a CS and other stimuli that do not signal a US.	Learning that some responses, but not others, will be reinforced.

As we shall see next, our biology and cognitive processes influence both classical and operant conditioning.

> **"O! This learning, what a thing it is."** — William Shakespeare, *The Taming of the Shrew,* 1597

Retrieval Practice

RP-6 Salivating in response to a tone paired with food is a(n) _____ behavior; pressing a bar to obtain food is a(n) _____ behavior.

ANSWERS IN APPENDIX E

REVIEW

Module 22: Operant Conditioning

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 22-1: What is *operant conditioning?*

LOQ 22-2: Who was Skinner, and how is operant behavior reinforced and shaped?

LOQ 22-3: How do positive and negative reinforcement differ, and what are the basic types of reinforcers?

LOQ 22-4: How do different reinforcement schedules affect behavior?

LOQ 22-5: How does punishment differ from negative reinforcement, and how does punishment affect behavior?

LOQ 22-6: Why did Skinner's ideas provoke controversy, and how might his operant conditioning principles be applied?

LOQ 22-7: How does operant conditioning differ from classical conditioning?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

learning
associative learning
stimulus
respondent behavior
operant conditioning
operant behavior
law of effect
operant chamber
reinforcement
shaping
positive reinforcement
negative reinforcement
primary reinforcer

conditioned reinforcer
reinforcement schedule
continuous reinforcement schedule
partial (intermittent) reinforcement schedule
fixed-ratio schedule
variable-ratio schedule
fixed-interval schedule
variable-interval schedule
positive punishment
negative punishment

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. Thorndike's law of effect was the basis for _____'s work on operant conditioning and behavior control.

2. One way to change behavior is to reward natural behaviors in small steps, as the organism gets closer and closer to a desired behavior. This process is called _____.

3. Your dog is barking so loudly that it's making your ears ring. You clap your hands, the dog stops barking, your ears stop

ringing, and you think to yourself, “I’ll have to do that when she barks again.” The clapping was for your dog a

a. positive reinforcer.
b. negative reinforcer.
c. positive punishment.
d. negative punishment.

4. How do hungry babies negatively reinforce their caregivers to feed them?

5. Reinforcing a desired response only some of the times it occurs is called _____ reinforcement.

6. A restaurant delivery service is running a special deal. After you buy four meals at full price, you will get a free appetizer. This is an example of a _____-_____ schedule of reinforcement.

a. fixed-ratio
b. variable-ratio
c. fixed-interval
d. variable-interval

7. The partial reinforcement schedule that reinforces a response after unpredictable time periods is a _____-_____ schedule.

8. A medieval proverb notes that “a burnt child dreads the fire.” In operant conditioning, getting burned would be an example of a

MODULE 23: Biology, Cognition, and Learning

From drooling dogs, running rats, and pecking pigeons we have learned much about the basic processes of **learning.** But conditioning principles don't tell us the whole story. Today's learning theorists recognize that learning is the product of the interaction of biological, psychological, and social-cultural influences (FIGURE 23.1).

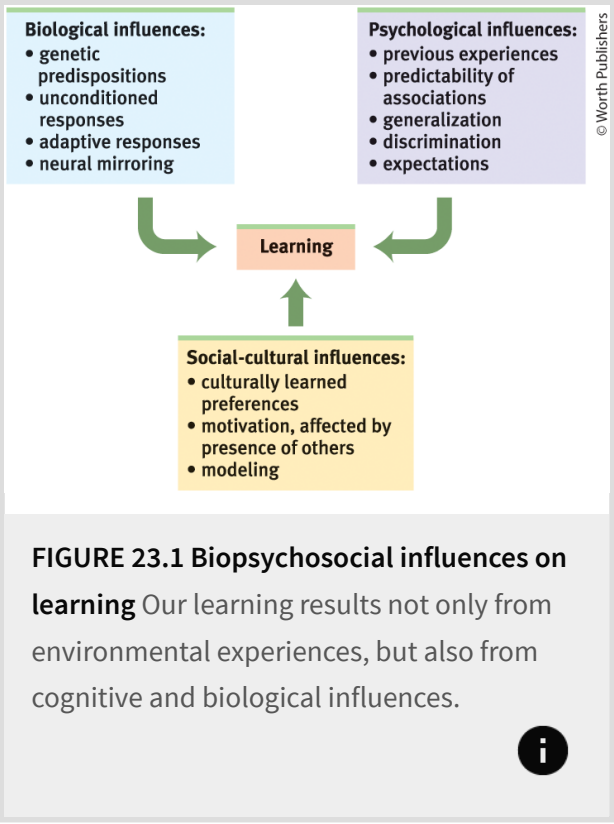


FIGURE 23.1 Biopsychosocial influences on learning Our learning results not only from environmental experiences, but also from cognitive and biological influences.

Biological Constraints on Conditioning

LOQ 23-1

How do biological constraints affect classical and operant conditioning?

Ever since Charles Darwin, scientists have assumed that all animals share a common evolutionary history and thus share commonalities in their makeup and functioning. Pavlov, Watson, and Skinner believed the basic laws of learning were essentially similar in all animals. So, it should make little difference whether one studied pigeons or people. Moreover, it seemed that any natural response could be conditioned to any neutral stimulus.

Biological Limits on Classical Conditioning

In 1956, learning researcher Gregory Kimble proclaimed, "Just about any activity of which the organism is capable can be conditioned and … these responses can be conditioned to any stimulus that the organism can perceive" (p. 195). Twenty-five years later, he humbly acknowledged that "half a thousand" scientific reports had proven him wrong (Kimble, 1981). More than the early behaviorists realized, an animal's capacity for conditioning is limited by biological constraints. For example, each species' predispositions *prepare* it to learn the associations that enhance its survival—a phenomenon called **preparedness**. Environments are not the whole story. Biology matters.

John Garcia (1917–2012) was among those who challenged the prevailing idea that all associations can be learned equally well. While researching the effects of radiation on laboratory animals, Garcia and Robert Koelling (1966) noticed that rats began to avoid drinking water from the plastic bottles in radiation chambers. Could classical conditioning be the culprit? Might the rats have linked the plastic-tasting water (a CS) to the sickness (UR) triggered by the radiation (US)?



Macmillan Learning

John Garcia As the laboring son of California farmworkers, Garcia attended school only in the off-season during his early childhood years. After entering junior college in his late twenties, and earning his Ph.D. in his late forties, he received the American Psychological Association's Distinguished Scientific Contribution Award "for his highly original, pioneering research in conditioning and learning." He was also elected to the National Academy of Sciences.

Classical Conditioning Review:
NS = Neutral Stimulus
US = Unconditioned Stimulus
UR = Unconditioned Response
CS = Conditioned Stimulus
CR = Conditioned Response

To test their hunch, Garcia and Koelling exposed the rats to a particular taste, sight, or sound (CS) and later also to radiation or drugs (US) that led to nausea (UR). Two startling findings emerged: First, even if sickened as late as several hours after tasting a particular novel flavor, the rats thereafter avoided that flavor. This appeared to violate the notion that for conditioning to occur, the US must immediately follow the CS.

Second, the sickened rats developed aversions to tastes but not to sights or sounds. This contradicted the behaviorists' idea that any perceivable stimulus could serve as a CS. But it made adaptive sense. For rats, the easiest way to identify tainted food is to taste it; if sickened after sampling a new food, they thereafter avoid it. This response, called *taste aversion,* makes it difficult to eradicate a population of "bait-shy" rats by poisoning.

"Once bitten, twice shy." — G. F. Northall, *Folk-Phrases,* 1894

Humans, too, seem biologically prepared to learn some associations rather than others. If you become violently ill four hours after eating contaminated oysters, you will probably develop an aversion to the *taste* of oysters more readily than to the sight of the associated restaurant, the people you ate with, or the music you listened to while eating. (In contrast, birds, which hunt by sight, appear biologically primed to develop aversions to the *sight* of tainted food [Nicolaus et al., 1983].)



Jose Oto/BSIP SA/Alamy Stock Photo

Taste aversion Our biology prepares us to learn taste aversions to toxic foods.

Garcia's early findings on taste aversion were met with an onslaught of criticism. As the German philosopher Arthur Schopenhauer (1788–

1860) once said, important ideas are first ridiculed, then attacked, and finally taken for granted. Leading journals refused to publish Garcia's work: The findings are impossible, said some critics. But, as sometimes happens in science, Garcia and Koelling's taste-aversion research replicated often, from the simple snail to the complex human (Aonuma et al., 2018). Conditioned taste aversion is now basic textbook material.

It is also a good example of experiments that begin with the discomfort of some laboratory animals and end by enhancing many others' welfare. In one conditioned taste-aversion study, coyotes and wolves were tempted into eating sheep carcasses laced with a sickening poison. Thereafter, they developed an aversion to sheep meat; two wolves later penned with a live sheep seemed actually to fear it (Gustavson et al., 1974, 1976). These studies not only saved the sheep from their predators, but also saved the sheep-shunning coyotes and wolves from angry ranchers and farmers who had wanted to destroy them. Similar applications have prevented baboons from raiding African gardens, raccoons from attacking chickens, and ravens and crows from feeding on crane eggs. In all these cases, research helped preserve both the prey and their predators, all of which occupy an important ecological niche (Dingfelder, 2010; Garcia & Gustavson, 1997).

Such research supports Darwin's principle that natural selection favors traits that aid survival. Our ancestors learned to avoid foods and situations that made them sick, which helped them survive and

leave descendants (Bernal-Gamboa et al., 2018). Nausea, like anxiety, pain, and other bad feelings, serves a good purpose. Like a "malware detected" message that pops up on your computer, each alerts the body to a threat (Davidson & Riley, 2015; Neese, 1991).

Our preparedness to associate a CS with a US that follows predictably and immediately is adaptive. Causes often do immediately precede effects. But as we saw in the taste-aversion findings, our predisposition to associate an effect with a preceding event can trick us. When chemotherapy triggers nausea and vomiting more than an hour following treatment, cancer patients may, over time, develop classically conditioned nausea (and sometimes anxiety) to the sights, sounds, and smells associated with the clinic (Hall, 1997) (**FIGURE 23.2**). Merely returning to the clinic's waiting room or seeing the nurses can provoke these conditioned feelings (Burish & Carey, 1986; Davey, 1992). Under normal circumstances, such revulsion to sickening stimuli would be adaptive.

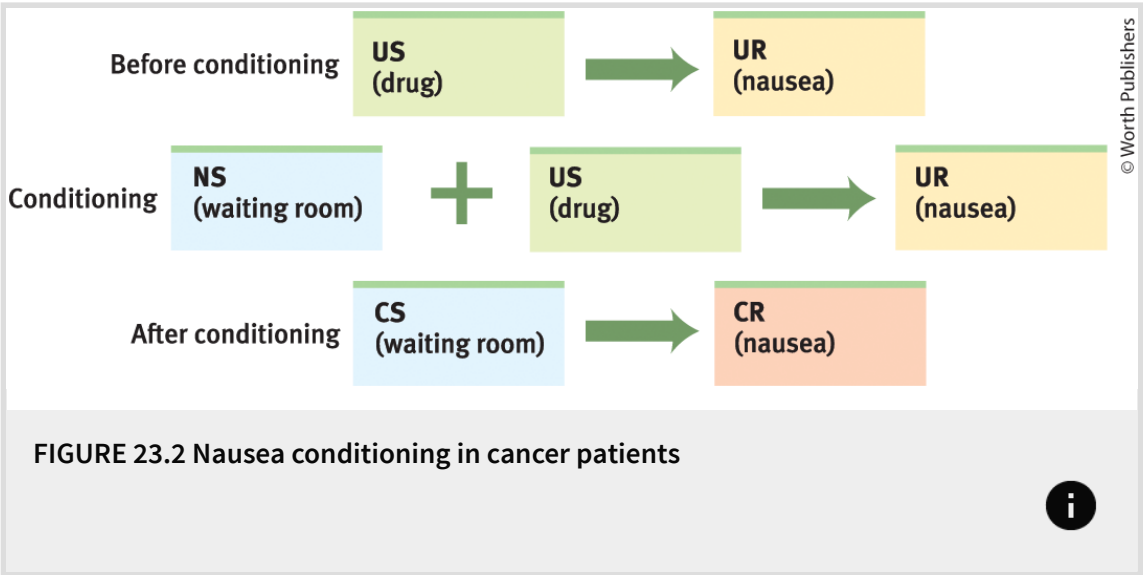


FIGURE 23.2 Nausea conditioning in cancer patients

Retrieval Practice

RP-1 How did Garcia and Koelling's taste-aversion studies help disprove Gregory Kimble's early claim that "just about any activity of which the organism is capable can be conditioned … to any stimulus that the organism can perceive"?

ANSWERS IN APPENDIX E

Biological Limits on Operant Conditioning

Nature also constrains each species' capacity for operant conditioning. Science fiction writer Robert Heinlein (1973) said it well: "Never try to teach a pig to sing; it wastes your time and annoys the pig."



Jeffery Jones/The Gallup Independent/AP Photo

Natural athletes Animals can most easily learn and retain behaviors that draw on their biological predispositions, such as this horse's inborn ability to move around obstacles with speed and agility.

We most easily learn and retain behaviors that reflect our biological and psychological predispositions (Iliescu et al., 2018). Thus, using food as a reinforcer, you could easily condition a hamster to dig or to rear up, because these are among the animal's natural food-searching behaviors. But you won't be so successful if you use food as a reinforcer to shape face washing and other hamster behaviors that aren't typically associated with food or hunger (Shettleworth, 1973). Similarly, you could easily teach pigeons to flap their wings to avoid

being shocked, and to peck to obtain food: Fleeing with their wings and eating with their beaks are natural pigeon behaviors. However, pigeons would have a hard time learning to peck to avoid a shock, or to flap their wings to obtain food (Foree & LoLordo, 1973). *The bottom line:* Biological constraints predispose organisms to learn associations that are naturally adaptive.

In the early years of their work, animal trainers Marian Breland and Keller Breland presumed that operant principles would work on almost any response an animal could make. But along the way, they too learned about biological constraints. In one act, pigs trained to pick up large wooden "dollars" and deposit them in a piggy bank began to drift back to their natural ways. They dropped the coin, pushed it with their snouts as pigs are prone to do, picked it up again, and then repeated the sequence—delaying their food reinforcer. This **instinctive drift** occurred as the animals reverted to their biologically predisposed patterns.

Cognition's Influence on Conditioning

LOQ 23-2

How do cognitive processes affect classical and operant conditioning?

Cognition and Classical Conditioning

In their dismissal of "mentalistic" concepts such as consciousness, Pavlov and Watson underestimated the importance of not only biological constraints such as preparedness and instinctive drift, but also the effects of cognitive processes (thoughts, perceptions, expectations). The early behaviorists believed that rats' and dogs' learned behaviors could be reduced to mindless mechanisms, so there was no need to consider cognition. But Robert Rescorla and Allan Wagner (1972) argued that an animal can learn an event's *predictability.* If a shock always is preceded by a tone, and then may also be preceded by a light that accompanies the tone, a rat will react with fear to the tone but not to the light. Although the light is always followed by the shock, it adds no new information; the tone is a better predictor. The more predictable the association, the stronger the conditioned response. It's as if the animal learns an *expectancy,* an awareness of how likely it is that the US will occur.

> **"All brains are, in essence, anticipation machines."** — Daniel C. Dennett, *Consciousness Explained,* 1991

Classical conditioning treatments that ignore cognition often have limited success. For example, people receiving therapy for alcohol use disorder may be given alcohol spiked with a nauseating drug. Will they then associate alcohol with sickness? If classical conditioning were merely a matter of "stamping in" stimulus associations, we might

hope so, and to some extent this does occur. However, one's awareness that the drug, not the alcohol, induces nausea often weakens the association between drinking alcohol and feeling sick, reducing the treatment's effectiveness. So, even in classical conditioning, it is—especially with humans—not simply the CS-US association, but also the thought that counts.

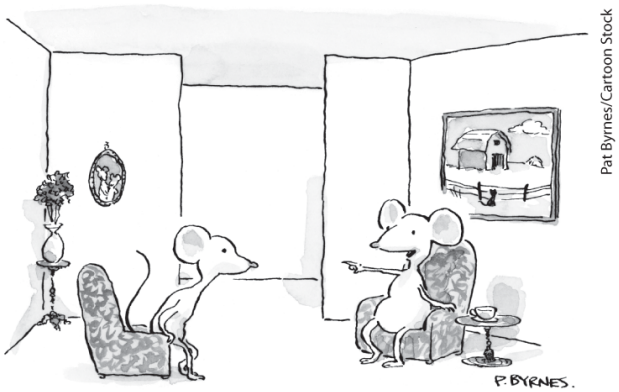
Cognition and Operant Conditioning

B. F. Skinner acknowledged the biological underpinnings of behavior and the existence of private thought processes. Nevertheless, many psychologists criticized him for discounting cognition's importance.

A mere 8 days before dying of leukemia at age 86, Skinner stood before the American Psychological Association convention. In this final address, he still resisted the growing belief that cognition has a necessary place in the science of psychology and even in our understanding of conditioning. He viewed "cognitive science" as a throwback to early twentieth-century introspectionism. For Skinner, thoughts and emotions were behaviors that follow the same laws as other behaviors.

Nevertheless, the evidence of cognitive processes cannot be ignored. For example, rats exploring a maze, given no obvious rewards, seem to develop a **cognitive map**, a mental representation of the maze. When an experimenter then places food in the maze's goal box, these rats run the maze as quickly as other rats that were previously reinforced with food for this result. Like people sightseeing in a new

town, the exploring rats seemingly experienced **latent learning** during their earlier tours (Tolman & Honzik, 1930). That learning became apparent only when there was some incentive to demonstrate it. Children, too, may learn from watching a parent but demonstrate the learning only much later, as needed.



Pat Byrnes/Cartoon Stock

"Bathroom? Sure, it's just down the hall to the left, jog right, left, another left, straight past two more lefts, then right, and it's at the end of the third corridor on your right."

The point to remember: There is more to learning than associating a response with a consequence; there is also cognition. In the Thinking and Language modules, we encounter more striking evidence of animals' cognitive abilities in solving problems and in using aspects of language. And in the Affiliation and Achievement module, we see how, due to cognition, excessive rewards can make us *less* motivated to perform a desired behavior.

TABLE 23.1 compares the biological and cognitive influences on classical and operant conditioning.

TABLE 23.1 Biological and Cognitive Influences on Conditioning

	Classical Conditioning	Operant Conditioning
Biological influences	Natural predispositions constrain what stimuli and responses can easily be associated.	Organisms most easily learn behaviors similar to their natural behaviors; unnatural behaviors instinctively drift back toward natural ones.
Cognitive influences	Organisms develop an expectation that a CS signals the arrival of a US.	Organisms develop an expectation that a response will be reinforced or punished; they also exhibit latent learning, without reinforcement.

Ask Yourself

Can you remember examples from your childhood of learning through *classical conditioning* (salivating at the sound or smell of some delicious food cooking in the kitchen?), *operant conditioning* (deciding not to repeat a behavior because you disliked its consequence?), and *cognitive learning* (repeating or avoiding what you watched someone else do)?

Retrieval Practice

RP-2 Instinctive drift and latent learning are examples of what important idea?

ANSWERS IN APPENDIX E

Learning by Observation

LOQ 23-3

What is *observational learning?*

Cognition supports **observational learning** (also called *social learning*). A child who sees their sister burn her fingers on a hot stove learns not to touch it. Likewise, nonhuman animals learn by observing others responding to threats, such as predators (Olsson et al., 2020). Observational learning does have its limits: Merely observing someone who is proficient at, say, dart-throwing, can lead people to overestimate their talent at doing the same (Kardas & O'Brien, 2018). Imitative *practice* matters, too. We learn our native languages and various other specific behaviors by observing and by imitating others, a process called **modeling**.

Picture this scene from an experiment by Albert Bandura (1925–2021), the pioneering researcher of observational learning (Bandura et al., 1961): A preschool child works on a drawing. An adult in another part of the room builds with Tinkertoys. As the child watches, the adult gets up and for nearly 10 minutes pounds, kicks, and throws around the room a large inflated toy clown called a Bobo doll, yelling, "Sock him in the nose.... Hit him down.... Kick him."



Polaris/Newscom

Albert Bandura An analysis of citations, awards, and textbook coverage identified Bandura—shown here receiving a 2016 U.S. National Medal of Science from President Barack Obama—as the world's most eminent psychologist (Diener et al., 2014).

The child is then taken to another room filled with appealing toys. Soon the experimenter returns and tells the child she has decided to save these good toys "for the other children." She takes the now-frustrated child to a third room containing a few toys, including a Bobo doll. Left alone, what does the child do?

Unlike children not exposed to the adult model (none of whom acted aggressively), those who viewed the model's actions often lashed out at

the doll (Bandura, 2017). Observing the aggressive outburst apparently lowered their inhibitions. But *something more* was also at work, for the children imitated the very acts they had observed and used the very words they had heard (**FIGURE 23.3**). Additionally, reported Bandura (2017), the children displayed other "non-modeled" aggressive behaviors, such as "assaults with dart guns and fights among toy animals."



Courtesy Albert Bandura Trust

FIGURE 23.3 The famous Bobo doll experiment Notice how the children's actions directly imitate the adult's.

That "something more," Bandura suggests, was this: By watching models, we experience *vicarious reinforcement* or *vicarious punishment,* and we learn to anticipate a behavior's consequences in situations like those we are observing. We are especially likely to learn from people we perceive as powerful, successful, or similar to ourselves. Thus, children may acquire fears vicariously, by observing their parents' fearful reactions (Marin et al., 2020). fMRI scans show that when

people observe someone winning a reward (and especially when it's someone likable and similar to themselves), their own brain reward systems activate, much as if they themselves had won the reward (Mobbs et al., 2009). When we identify with someone, we experience their outcomes vicariously. Even our learned fears may extinguish as we observe someone else safely navigating the feared situation (Golkar et al., 2013). Lord Chesterfield (1694–1773) had the idea: "We are, in truth, more than half what we are by imitation."

Bandura's work provides an example of how basic research "pursued for its own sake" can have a broader purpose. Insights derived from his research have been used not only to restrain televised violence, but also to offer social models in African, Asian, and Latin American television and radio series that have helped reduce unplanned childbearing, protect against AIDS, and promote environmental conservation.

> **"The Bobo doll follows me wherever I go. The photographs are published in every introductory psychology text and virtually every undergraduate takes introductory psychology. I recently checked into a Washington hotel. The clerk at the desk asked, 'Aren't you the psychologist who did the Bobo doll experiment?' I answered, 'I am afraid that will be my legacy.' He replied, 'That deserves an upgrade. I will put you in a suite in the quiet part of the hotel.'"** — Albert Bandura (2005)

Mirrors and Imitation in the Brain

LOQ 23-4

How may observational learning be enabled by neural mirroring?

In 1991, on a hot summer day in Parma, Italy, a lab monkey awaited its researchers' return from lunch. The researchers had implanted electrodes next to its motor cortex, in a frontal lobe brain region that enabled the monkey to plan and enact movements. The monitoring device would alert the researchers to activity in that region of the monkey's brain. When the monkey moved a peanut into its mouth, for example, the device would buzz. That day, as one of the researchers reentered the lab, ice cream cone in hand, the monkey stared at him. As the researcher raised the cone to lick it, the monkey's monitor buzzed—as if the motionless monkey had itself moved (Blakeslee, 2006; Iacoboni, 2008, 2009).

The same buzzing had been heard earlier, when the monkey watched humans or other monkeys move peanuts to their mouths. The flabbergasted researchers, led by Giacomo Rizzolatti (2002, 2006), had, they believed, stumbled onto a previously unknown type of neuron. These presumed **mirror neurons**, they argued, provide a neural basis for everyday imitation and observational learning. When one monkey sees, its neurons mirror what another monkey does. (Other researchers continue to debate the existence and importance of

mirror neurons and related networks [Bekkali et al., 2021; Fox et al., 2016].)



Mirror neurons at work?

Imitation is widespread in other species. Primates observe and imitate all sorts of behaviors, such as how to crack nuts using stone hammers (Fragaszy et al., 2017). These types of behaviors are then transmitted from generation to generation within their local culture (Hopper et al., 2008; Whiten et al., 2007). In one 27-year analysis of 73,790 humpback whale observations, a single whale in 1980 whacked the water to drive prey fish into a clump. In the years since, this "lobtail" technique spread among other whales (Allen et al., 2013).

So, too, with monkeys. Erica van de Waal and her co-researchers (2013) trained groups of vervet monkeys to prefer either blue or pink corn by soaking one color in a disgusting-tasting solution. Four to six months later, after a new generation of monkeys was born, the adults stuck with whatever color they had learned to prefer—and, on

observing them, so did all but 1 of 27 infant monkeys. Moreover, when blue- (or pink-) preferring male monkeys migrated to the other group, they switched preferences and began eating as the other group did. Monkey see, monkey do.



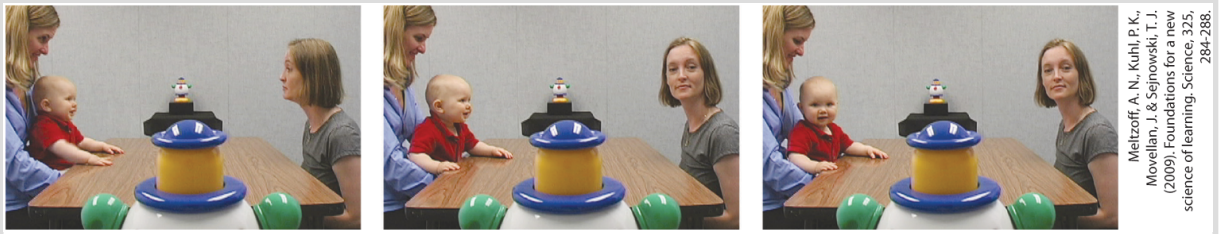
(a) (b)

a: Masa Ushioda/AGE Fotostock; b: Erica van de Waal

Animal social learning Whacking the water to boost feeding has spread among humpback whales through social learning (Allen et al., 2013). Likewise, monkeys learn to prefer whatever color corn they observe other monkeys eating.

In humans, imitation is pervasive. Our catchphrases, fashions, ceremonies, foods, traditions, morals, and fads all spread by one person copying another. Children, and even infants, are natural imitators (Marshall & Meltzoff, 2014). From 8 to 16 months, infants come to imitate various novel gestures (Jones, 2007, 2017). By 12 months (**FIGURE 23.4**), they look where an adult is looking (Meltzoff et al., 2009). And by 14 months, children imitate acts modeled on TV (Meltzoff, 1988; Meltzoff & Moore, 1989, 1997). Even as $2^1/_2$-year-olds, when many of their mental abilities are near those of adult chimpanzees, young humans surpass chimps at social tasks such as

imitating another's solution to a problem (Herrmann et al., 2007). Children see, children do.



Meltzoff, A. N., Kuhl, P. K., Movellan, J. & Sejnowski, T. J. (2009). Foundations for a new science of learning. Science, 325, 284-288.

FIGURE 23.4 Imitation This 12-month-old infant sees an adult look left, and immediately follows her gaze (Meltzoff et al., 2009).

So strong is the human predisposition to learn from watching adults that 2- to 5-year-old children *overimitate.* Whether living in urban Australia or a rural region of Africa, they copy even irrelevant adult actions. Before reaching for a toy in a plastic jar, they will first stroke the jar with a feather if that's what they have observed (Lyons et al., 2007). Or, imitating an adult, they will wave a stick over a box and then use the stick to push on a knob that opens the box—when all they needed to do to open the box was to push on the knob (Nielsen & Tomaselli, 2010).

> **"Children need models more than they need critics."** — Joseph Joubert, *Pensées,* 1842

Humans, like monkeys, have brains that support empathy and imitation. Researchers cannot insert experimental electrodes in

human brains, but they can use fMRI scans to see brain activity associated with performing and with observing actions. So, is the human capacity to simulate another's action and to share in another's experience due to specialized mirror neurons? Or is it due to distributed brain networks? That issue is under debate (Bekkali et al., 2021; Jeon & Lee, 2018). Regardless, children's brains do enable their empathy and their ability to infer another's mental state, an ability known as *theory of mind.*

Our brain's response to observing others makes emotions contagious. Our brain simulates and vicariously experiences what we observe. So real are these mental instant replays that we may misremember an action we have observed as one we have performed (Lindner et al., 2010). When research participants watched someone experience electric shocks, they became more fearful in their own choices—as if they had experienced the shocks (Lindström et al., 2019). Through these reenactments, we grasp others' states of mind. As we observe others' postures, faces, voices, and writing styles, we unconsciously mimic them. When others yawn, primates, dogs, and we humans often yawn, too (Palagi et al., 2020). Such mimicry helps us grasp others' states of mind and we feel what they feel (Bernieri et al., 1994; Ireland & Pennebaker, 2010). Imitation helps us gain friends, leading us to mimic those we like, who then like us more in return (Chartrand & Lakin, 2013; Salazar Kämpf, 2018).

Seeing a loved one's pain, our faces mirror their emotion. But as **FIGURE 23.5** shows, so do our brains. Ditto for mice brains when

observing other mice experiencing pain (Smith et al., 2021). Observing others' pain also releases our body's natural painkillers, thus calming our distress and enabling our helping (Haaker et al., 2017). Even fiction reading may trigger such activity, as we mentally simulate (and vicariously experience) the experiences described (Mar & Oatley, 2008; Speer et al., 2009). In a series of experiments, reading about kid wizard Harry Potter and his acceptance of people such as the "Mudbloods" reduced readers' prejudice against immigrants, refugees, and gay people (Vezzali et al., 2015).

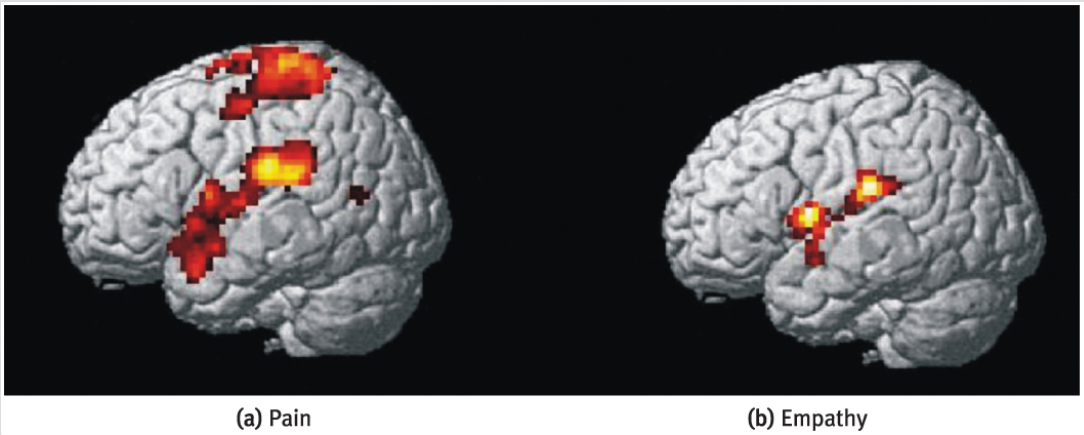


FIGURE 23.5 Experienced and imagined pain in the brain In these fMRI scans, brain activity related to actual pain (a) is mirrored in the brain of an observing loved one (b) (Singer et al., 2004). Empathy in the brain shows up in areas that process emotions, but not in the somatosensory cortex, which receives the physical pain input.

Applications of Observational Learning

LOQ 23-5

What is the impact of prosocial modeling and of antisocial modeling?

The big news from Bandura's studies and mirror-neuron research is that we look, we mentally imitate, and we learn. Models—in our family, our neighborhood, or the media we consume—have effects, good and bad.

Prosocial Effects

The good news is that people's modeling of **prosocial** (positive, helpful) **behaviors** can have prosocial effects. Many business organizations effectively use *behavior modeling* to help new employees learn communications, sales, and customer service skills (Taylor et al., 2005). Trainees gain these skills faster when they can observe the skills being modeled effectively by experienced workers (or actors simulating them).

People who exemplify nonviolent, helpful behavior can also prompt similar behavior in others (Jung et al., 2020). After observing someone helping (assisting a woman with dropped books), people became more helpful, such as by assisting someone who dropped a dollar (Burger et al., 2015). India's Mahatma Gandhi and America's Martin Luther King, Jr., both drew on the power of modeling, making nonviolent action a powerful, enduring force for social change in both countries (Matsumoto et al., 2015). The media offer models. Across many countries and dozens of studies, exposure to prosocial TV, movies, and video games boosted later helping behavior (Coyne et al., 2018; Prot et al., 2014).



Zumapress/Newscom

A model caregiver This girl is learning orphan-nursing skills, as well as compassion, by observing her mentor in this Humane Society program. As a sixteenth-century proverb states, "Example is better than precept."

Parents are also powerful models. European Christians who risked their lives to rescue Jews from the Nazis usually had a close relationship with at least one parent who modeled a strong moral or humanitarian concern; this was also true for U.S. civil rights activists in the 1960s (London, 1970; Oliner & Oliner, 1988). The observational learning of morality begins early. Socially responsive toddlers, who readily imitate their parents, tend to become preschoolers with a strong internalized conscience (Forman et al., 2004). To encourage children's honesty, let them overhear adults praising honesty (Sai et al., 2020).

Models are most effective when their actions and words are consistent. To encourage children to read, read to them and surround them with books and people who read. To increase the odds that your

children will practice your religion, worship and attend religious activities with them (Lowicki & Zajenkowski, 2020). To teach your children persistence, let them see *you* practice persistence (Butler, 2017).

Sometimes, however, models say one thing and do another. Many parents seem to operate according to the principle "Do as I *say,* not as I do." Experiments suggest that children learn to do both (Rice & Grusec, 1975; Rushton, 1975). Exposed to a hypocrite, they tend to imitate the hypocrisy—by doing what the model did and saying what the model said. Actions often speak louder than words.

Retrieval Practice

RP-3 Hannah's parents and older friends all drive over the speed limit, but they advise her not to. Breonna's parents and friends drive within the speed limit, but they say nothing to deter her from speeding. Will Hannah or Breonna be more likely to speed?

ANSWERS IN APPENDIX E

Antisocial Effects

The bad news is that observational learning can increase **antisocial behavior.** This helps us understand why abusive parents might have aggressive children, why children who are lied to become more likely to cheat and lie, and why many men who abuse their wives are themselves the children of wife-abusing fathers (Hays & Carver, 2014;

Jung et al., 2019; Stith et al., 2000). Aggressiveness could have a genetic link. But with monkeys, we know it can be environmental. In study after study, young monkeys separated from their mothers and subjected to high levels of aggression grew up to be aggressive themselves (Chamove, 1980). The lessons we learn as children are not easily replaced as adults, and they are sometimes visited on future generations.

Observational learning influences adults, too. Those repeatedly exposed to hate speech become desensitized to hateful words. And they become more prejudiced toward its targets (Soral et al., 2018). As social psychologists Chris Crandall and Mark White (2016) remind us, political leaders have the power to influence *norms,* and norms matter: "People express the prejudices that are socially acceptable and they hide the ones that are not."

> **"This instinct to humiliate, when it's modeled by someone in the public platform, by someone powerful, it filters down into everybody's life, because it … gives permission for other people to do the same thing."** — Meryl Streep, U.S. Golden Globe Award speech, 2017

TV shows, movies, and videos are sources of observational learning. While watching, children may learn that bullying is an effective way to control others, that free-and-easy sex brings pleasure without consequence, or that men should be tough and women gentle. Do films that glorify high-speed and risky driving teach viewers that such

driving is acceptable? An analysis of nearly 200,000 speeding tickets showed increased average speed among drivers who received them on the weekends following the release of the *Fast and the Furious* films (Jena et al., 2018). And most U.S. children have ample time to learn such lessons.



Paul Noth/Cartoon Stock

"Screen time . . . screen time . . . "

Viewers are learning about life from a peculiar storyteller, one that reflects the culture's mythology rather than its reality. Between 1998 and 2006, prime-time violence on TV reportedly increased 75 percent (PTC, 2007). An analysis of more than 3000 network and cable programs aired during one closely studied year revealed that nearly 6 in 10 featured violence, that 74 percent of the violence went unpunished, that 58 percent did not show the victims' pain, that nearly half the incidents involved "justified" violence, and that nearly half involved an attractive perpetrator. These conditions define the recipe for the *violence-viewing effect* described in many studies around the world and recognized by most media researchers (Anderson et al., 2017; Bushman, 2018; Martins & Weaver, 2019; Teng et al., 2019). (See Thinking Critically About: The Effects of Viewing Media Violence.)

LOQ 23-6

What is the violence-viewing effect?

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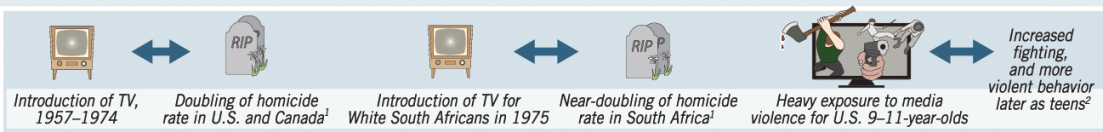
Thinking Critically About:
The Effects of Viewing Media Violence



BUT, CORRELATION ≠ CAUSATION!

***Experimental* studies have also found that media violence viewing can cause aggression:**
Viewing violence (compared to entertaining nonviolence) → participants react more cruelly when provoked. (Effect is strongest if the violent person is attractive, the violence seems justified and realistic, the act goes unpunished, and the viewer does not see pain or harm caused.)

What prompts the *violence-viewing effect*?

1 IMITATION:

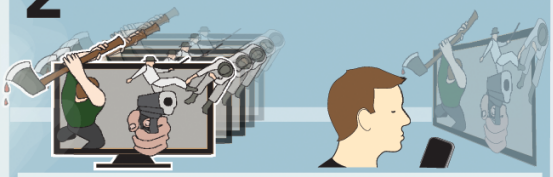


Watching violent cartoons → Sevenfold increase in violent play[3]



Limited exposure to violent programs → Reduced aggressive behavior[4]

2 DESENSITIZATION:



Prolonged exposure to violence → Viewers are later indifferent (desensitized) to violence on TV or in real life.[5]



Adult males spent 3 evenings watching sexually violent movies. → Viewers became progressively less bothered by the violence shown. Compared to a control group, they expressed less sympathy for domestic violence victims and rated victims' injuries as less severe.[6]

Violent moviegoers → less likely to help

Nonviolent moviegoers → more likely to help[7]

- **APA Task Force on Violent Media (2015)** found that the "research demonstrates a consistent relation between violent video game use and increases in aggressive behavior, aggressive cognitions, and aggressive affect, and decreases in prosocial behavior, empathy, and sensitivity to aggression."

- **American Academy of Pediatrics (2009)** has advised pediatricians that "media violence can contribute to aggressive behavior, desensitization to violence, nightmares, and fear of being harmed."

Critics suggest that these statements may ignore some weakness in media violence research, such as reliability and the size of the effect. They also note that some places, such as Japan, have similarly violent media but much less violent behavior.[8]

1. Centerwall, 1989. 2. Boxer et al., 2009; Gentile et al., 2011; Gentile & Bushman, 2012. 3. Boyatzis et al., 1995. 4. Christakis et al., 2013.
5. Fanti et al., 2009; Jin et al., 2018; Rule & Ferguson, 1986. 6. Mullin & Linz, 1995. 7. Bushman & Anderson, 2009. 8. Elson et al., 2019; Ferguson et al., 2020

***

Bandura's work—like that of Ivan Pavlov, John Watson, B. F. Skinner, and thousands of others who advanced our knowledge of learning principles—illustrates the impact that can result from single-minded devotion to a few well-defined problems and ideas. These researchers defined the issues and impressed on us the importance of learning. As their legacy demonstrates, intellectual history is often made by people who risk going to extremes in pushing ideas to their limits (Simonton, 2000).

Ask Yourself

Most of us spend plenty of time on screens. What prosocial and antisocial role models do you see on your screens? Which ones have you chosen to imitate? For whom are you a role model? How might you become a better role model for others?

Retrieval Practice

RP-4 Match the examples (i–v) to the appropriate underlying learning principle (a–e):

i. Knowing the way from your bed to the bathroom in the dark	a. Classical conditioning
ii. Your little brother getting in a fight after watching a violent action movie	b. Operant conditioning
iii. Salivating when you smell brownies in the oven	c. Latent learning
iv. Disliking the taste of chili after becoming violently sick a few hours after eating chili	d. Observational learning

v. Your dog racing to greet you on your arrival home	e. Biological predispositions

ANSWERS IN APPENDIX E

REVIEW

Module 23: Biology, Cognition, and Learning

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 23-1: How do biological constraints affect classical and operant conditioning?

LOQ 23-2: How do cognitive processes affect classical and operant conditioning?

LOQ 23-3: What is *observational learning?*

LOQ 23-4: How may observational learning be enabled by neural mirroring?

LOQ 23-5: What is the impact of prosocial modeling and of antisocial modeling?

LOQ 23-6: What is the violence-viewing effect?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

learning
preparedness
instinctive drift
cognitive map
latent learning
observational learning
modeling
mirror neurons
prosocial behavior
antisocial behavior

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in

Appendix E.

1. Garcia and Koelling's _____-_____ studies showed that conditioning can occur even when the unconditioned stimulus (US) does not immediately follow the neutral stimulus (NS).

2. Taste-aversion research has shown that some animals develop aversions to certain tastes but not to sights or sounds. Which of Darwin's principles does this support?

3. Evidence that cognitive processes play an important role in learning comes in part from studies in which rats running a maze develop a _____ _____ of the maze.

4. Rats that explored a maze without any reward were later able to run the maze as well as other rats that had received food rewards for doing so. The rats that had learned without reinforcement demonstrated _____ _____.

5. Children learn many social behaviors by imitating parents and other models. This type of learning is called _____ _____.

6. According to Bandura, we learn by watching models because we experience _____ reinforcement or _____ punishment.

7. Parents are most effective in getting their children to imitate them if

a. their words and actions are consistent.
b. they have outgoing personalities.
c. they do *not* have outgoing personalities.
d. they carefully explain why a behavior is acceptable in adults but not in children.

8. Some scientists believe that the brain has _____ neurons that enable empathy and imitation.

9. Most experts agree that repeated viewing of media violence
a. makes all viewers significantly more aggressive.
b. has little effect on viewers.
c. is a risk factor for viewers' increased aggression.
d. makes viewers angry and frustrated.

CHAPTER 8
Memory (Modules 24–26)



DarioGaona/E+/Getty Images

MODULE 24 Studying and Encoding Memories

Studying Memory

Encoding Memories

MODULE 25 Storing and Retrieving Memories

Memory Storage

Memory Retrieval

MODULE 26 Forgetting, Memory Construction, and Improving Memory

- Forgetting
- Memory Construction Errors
- **THINKING CRITICALLY ABOUT:** Can Memories of Childhood Sexual Abuse Be Repressed and Then Recovered?
- Improving Memory

Be thankful for your memory. We often take memory for granted, except when it malfunctions. But it is our memory that accounts for time and defines our life. It is our memory that enables us to recognize family members, speak our language, and find our way home. It is our memory that enables us to enjoy an experience and then mentally replay it to enjoy again. It is our memory that enables us to build histories with those we love. And it is our shared memories that bind us together as Irish or Iranian, Somalian or Samoan—and occasionally pit us against others whose offenses we cannot forget.

In large part, we are what we remember. Without memory—our archive of accumulated learning—there would be no savoring of past joys, no guilt or anger over painful recollections. We would instead live in an enduring present, each moment unfamiliar. Each person would be a stranger, every language foreign, every task—dressing, cooking, and biking—a new challenge. You would even be a stranger to yourself, lacking that continuous sense of self that extends from your distant past to your momentary present.

Researchers study memory from many perspectives. Module 24 introduces the measuring, modeling, and encoding of memories. Module 25 examines how memories are stored and retrieved. Module 26 explores what happens when our memories fail us, and looks at ways to improve memory.

MODULE 24: Studying and Encoding Memories

Psychologists study memory by measuring our retention of learned information and creating models that help us understand our brain's memory-making process. Such models begin with encoding, when new information enters our memory system.

Studying Memory

Learning Objective Question LOQ 24-1

What is *memory,* and how is it measured?

Memory is learning that persists over time; it is information that has been acquired and stored and can be retrieved. Research on memory's extremes has helped us understand how memory works. At age 92, my [DM's] father experienced a small stroke-like brain event that had but one peculiar effect. His genial personality was intact. He knew us and enjoyed poring over family photo albums and reminiscing about his past. But he had lost most of his ability to form new memories of conversations and everyday episodes. He could not tell me what day of the week it was, or what he'd had for lunch. Told repeatedly of his

brother-in-law's recent death, he was surprised and saddened each time he heard the news.

Some disorders slowly strip away memory (FIGURE 24.1). *Alzheimer's disease* begins as difficulty remembering new information, progressing to an inability to do everyday tasks. Complex speech becomes simple sentences; family members and close friends become strangers; the brain's memory centers, once strong, become weak and wither away (Rathore et al., 2017). Over several years, those with Alzheimer's may become unknowing and unknowable. Their sense of self fades, leaving them wondering, "Who am I?" (Ben Malek et al., 2019). Lost memory strikes at the core of their humanity, robbing them of their joy, meaning, and companionship.

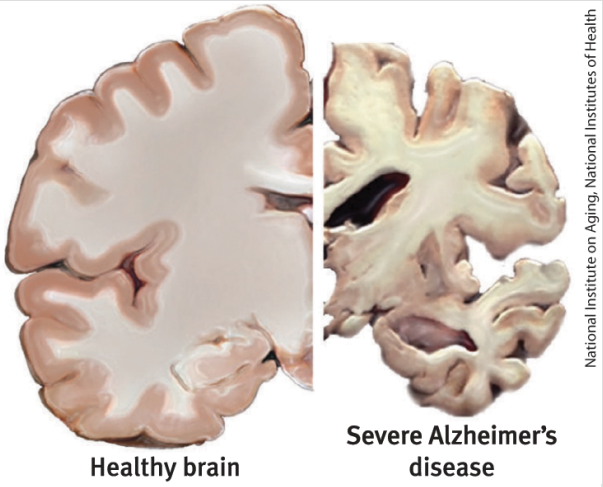


FIGURE 24.1 Extreme forgetting Alzheimer's disease severely damages the brain, and in the process strips away memory.

At the other extreme are people who win memory competitions. When two-time World Memory Champion Feng Wang was a 21-year-old college student, he didn't need help from his phone to remember his friends' numbers. The average person could parrot back a string of about 7—maybe even 9—digits. If numbers were read to him about 1 per second, Feng could reliably repeat up to 200 (Ericsson et al., 2017).

> Want to test your memory? Try to memorize the first 10 digits of pi (π): 3.141592653. In 2015, Rajveer Meena of India broke the world record by reciting 70,000 digits of pi (*Guinness World Records,* 2019).

Amazing? Yes, but consider your own impressive memory. You remember countless faces, places, and happenings; tastes, smells, and textures; and voices, sounds, and songs. One study asked students to listen to snippets—a mere four-tenths of a second—from popular songs. How often did they recognize the artist and song? More than 25 percent of the time (Krumhansl, 2010). We often recognize songs as quickly as we recognize a familiar voice.

So, too, with faces and places. Imagine viewing more than 2500 slides of faces and places for 10 seconds each. Later, you see 280 of these slides, paired with others you've never seen. Actual participants recognized 90 percent of the slides they had viewed in the first round (Haber, 1970). In a follow-up experiment, people who viewed 2800 images for only 3 seconds each later spotted the repeats with 82 percent accuracy (Konkle et al., 2010). Look for a target face in a sea of

faces and you later will recognize other faces from the scene as well (Kaunitz et al., 2016).

The average person permanently stores and recognizes about 5000 faces (Jenkins et al., 2018). But some *super-recognizers* display an extraordinary face-recognition ability. By watching street footage, super-recognizers have helped British, Asian, and German police to solve difficult cases (Keefe, 2016; NPR, 2018). Eighteen months after viewing a video of an armed robbery, one super-recognizer police officer spotted and arrested the robber walking on a busy street (Davis et al., 2013). And it's not just humans who have shown remarkable memory for faces. Sheep remember faces, too (**FIGURE 24.2**). And so has at least one fish species—as demonstrated by their spitting at familiar faces to trigger a food reward (Newport et al., 2016).

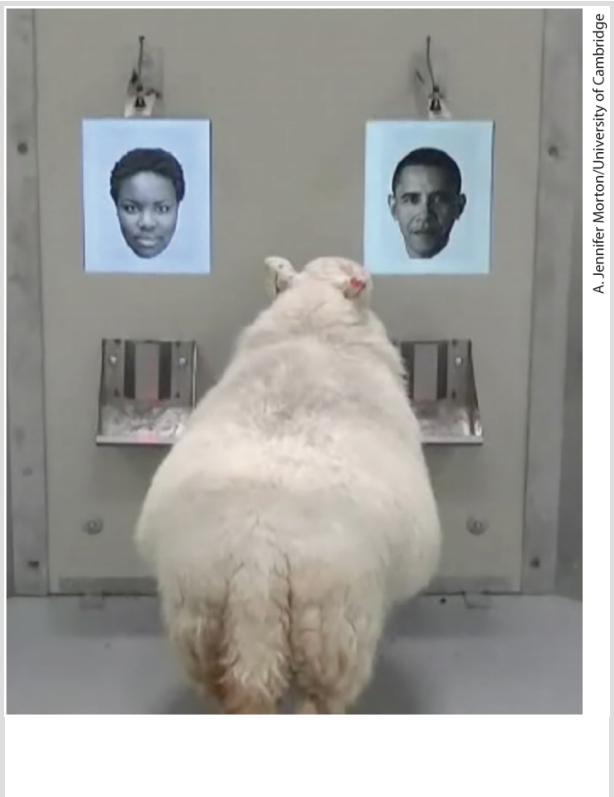


FIGURE 24.2 Other animals also display face smarts After food rewards are repeatedly associated with some sheep and human faces, but not with others, sheep remember food-associated faces for 2 years (Kendrick & Feng, 2011; Knolle et al., 2017).

How do we humans accomplish such memory feats? How does our brain pluck information out of the world around us and tuck it away for later use? How can we remember things we have not thought about for years, yet forget the name of someone we just met? How are memories stored in our brain? Why will you be likely, later in this module, to misrecall this sentence: *"The angry rioter threw the rock at the window"*?

"If any one faculty of our nature may be called *more* wonderful than the rest, I do think it is memory." — Jane Austen, *Mansfield Park,* 1814

Ask Yourself

Imagine having an injury that significantly impairs your ability to form new memories. Now imagine having a record-setting ability to remember, like Feng Wang. How would each condition affect your daily routine?

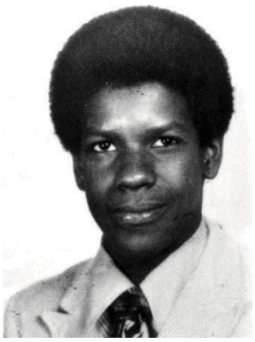
Measuring Retention

To a psychologist, evidence that learning persists includes these three *retention measures:*

- **recall**—*retrieving* information that is not currently in your conscious awareness but that was learned at an earlier time. A fill-in-the-blank question tests your recall.
- **recognition**—*identifying* items previously learned. A multiple-choice question tests your recognition.
- **relearning**—*learning something more quickly* when you learn it a second or later time. When you review the first weeks of course work to prepare for your final exam, or engage a language used in early childhood, it will be easier to relearn the information than it was to learn it initially.

Long after you cannot recall most of the people in your high school graduating class, you may still be able to recognize their yearbook pictures and spot their names in a list of names. In one experiment, people who had graduated 25 years earlier could not recall many of their old classmates. But they could *recognize* 90 percent of their pictures and names (Bahrick et al., 1975). If you are like most students, you, too, could probably recognize more names of Snow White's seven dwarfs than you could recall (Miserandino, 1991).





Left: National News/Zuma Press/Newscom; right: Globe Photos/Zuma Press

Remembering faces Even if Taylor Swift and Denzel Washington had not become famous, their high school classmates would most likely still recognize them in these photos.

Our recognition memory is impressively quick and vast. "Is your friend wearing a new or old outfit?" *Old.* "Have you read this textbook material before?" *No.* "Have you ever seen this person before?" *No.* Before the mouth can form our answer to any of millions of such questions, the mind knows, and knows that it knows.

Our response speed when recalling or recognizing information indicates memory strength, as does our speed at *relearning.* Pioneering memory researcher Hermann Ebbinghaus (1850–1909) showed this in the nineteenth century using nonsense syllables. He randomly selected a sample of syllables, practiced them, and tested himself. To get a feel for his experiments, rapidly read aloud, eight times over, the following list of syllables (from Baddeley, 1982), then look away and try to recall the items:

> JIH, BAZ, FUB, YOX, SUJ, XIR, DAX, LEQ, VUM, PID, KEL, WAV, TUV, ZOF, GEK, HIW.

The day after learning such a list, Ebbinghaus could recall few of the syllables. But they weren't entirely forgotten. As **FIGURE 24.3** portrays, the more frequently he repeated the list aloud on Day 1, the less time he required to relearn the list on Day 2. Additional rehearsal *(overlearning)* of verbal information increases retention, especially when practice is distributed over time. For students, this means that it helps to rehearse course material over time, even after you know it. Better to rehearse and overlearn than relax and remember too little.

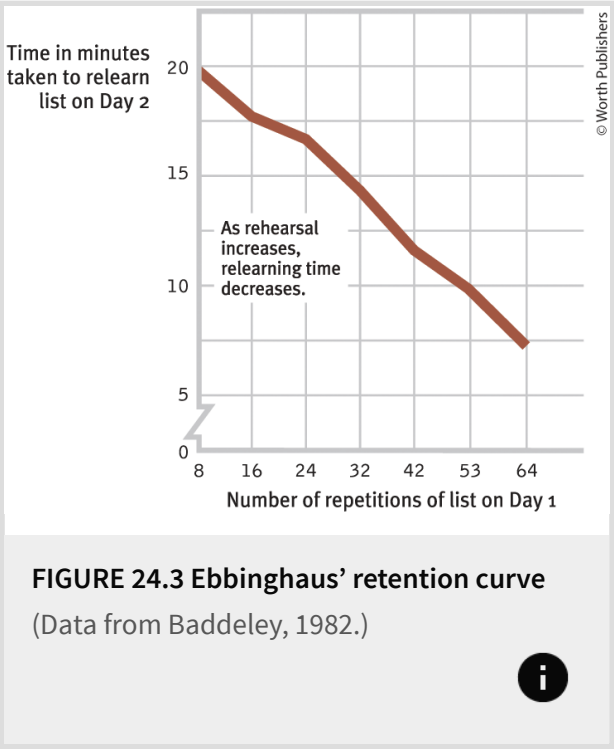


FIGURE 24.3 Ebbinghaus' retention curve
(Data from Baddeley, 1982.)

The point to remember: Tests of recognition and of time spent relearning demonstrate that we remember more than we can recall.

Retrieval Practice

RP-1 Multiple-choice questions test our _____. Fill-in-the-blank questions test our _____.

RP-2 If you want to be sure to remember what you're learning for an upcoming test, would it be better to use *recall* or *recognition* to check your memory? Why?

ANSWERS IN APPENDIX E

Memory Models

LOQ 24-2

How do memory models help us study memory, and how has later research updated the three-stage information-processing model?

Architects create virtual models to help clients imagine their future homes. Similarly, psychologists create memory models. Such models aren't perfect, but they help us think about how our brain forms and retrieves memories. History has offered varied memory models: a wax tablet (Aristotle); a "mystic writing pad" (Freud); a house, a library, a telephone switchboard, a videotape (Roediger, 1980). Today's *information-processing model* likens human memory to computer operations. Thus, to remember, we must

- **encode**—get information into our brain.
- **store**—retain that information.

- **retrieve**—later get the information back out.

Like all analogies, computer models have their limits. Our memories are less literal and more fragile than a computer's. Most computers also process information *sequentially,* even while alternating between tasks. Our agile brain processes many things *simultaneously* (some of them unconsciously) using **parallel processing.** To focus on this multitrack processing, one information-processing model, *connectionism,* views memories as products of interconnected neural networks. Specific memories arise from particular activation patterns within these networks. Every time you learn something new, your brain's neural connections change—an example of *neuroplasticity*—forming and strengthening pathways that allow you to interact with and learn from your constantly changing environment.

To explain our memory-forming process, Richard Atkinson and Richard Shiffrin (1968, 2016) proposed a three-stage information-processing model:

1. We first record to-be-remembered information as a fleeting **sensory memory.**
2. From there, we process information into **short-term memory,** where we encode it through *rehearsal.*
3. Finally, information moves into **long-term memory** for later retrieval.

This model has been updated (FIGURE 24.4) with important newer concepts, including *working memory* and *automatic processing*.

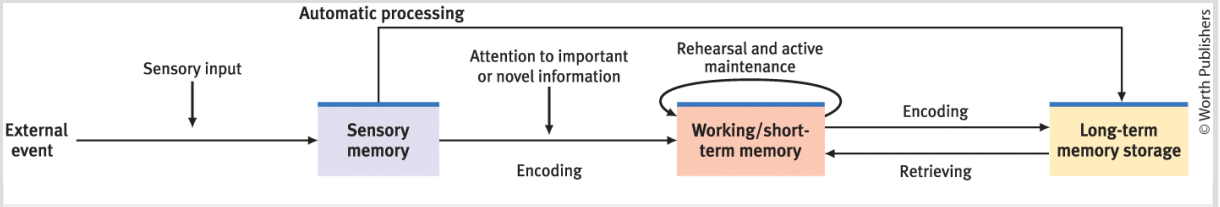


FIGURE 24.4 A modified three-stage information-processing model of memory Atkinson and Shiffrin's classic three-stage model helps us to think about how memories are processed, but researchers now recognize other ways that long-term memories form. For example, some information slips into long-term memory via a "back door," without our consciously attending to it *(automatic processing).* And so much active processing occurs in the short-term memory stage that we now call it *working memory.*

ASK YOURSELF

What has your memory system encoded, stored, and retrieved today?

WORKING MEMORY

Atkinson and Shiffrin saw short-term memory merely as a space for briefly storing recent thoughts and experiences. Alan Baddeley and others (Baddeley, 2002; Barrouillet et al., 2011; Engle, 2002) extended our understanding. They began calling this stage **working memory**, a stage where short-term memories combine with long-term memories. Baddeley likened working memory to an active "scratch pad" where our brain makes sense of new experiences and links them with our

long-term memories. This “system for holding information in mind and working on it” (Oberauer et al., 2018) also functions in the opposite direction, by retrieving and processing previously stored information.

As you integrate new information with your existing long-term memory, your attention is focused. In Baddeley’s (2002) model, a *central executive* coordinates this focused processing. Without focused attention, information typically fades. If you think you can look something up later, you attend to it less and forget it more quickly. In one experiment, people read and typed new bits of trivia they would later need, such as “an ostrich’s eye is bigger than its brain.” If they knew the information would be available online, they invested less energy and remembered it less well (Wegner & Ward, 2013). Online, out of mind.

Right now, your working memory is actively linking what you’re reading with what you already know (Cowan, 2010, 2016; deBettencourt et al., 2019). If you hear “eye-screem,” you may encode it as *ice cream* or *I scream,* depending on both your experiences and the context (snack shop or horror film).

Cultural traditions influence how we encode and retrieve information (Wang, 2021). For many of you, what you are reading enters working memory through vision. You might also repeat the information using auditory rehearsal. Some groups, such as Inuit in northern Canada, use repeated oral histories to help younger group members remember

important information. In one dramatic case, repeated information passed down through many generations was crucial to the archeological discovery of the doomed ships of the 1845 Franklin Expedition, which sank near where local Inuit lived (Neatby & Mercer, 2018). Whether we soak up information with our eyes or our ears, working memory helps us integrate our previous experiences to make smart decisions.

Retrieval Practice

RP-3 How does the *working memory* concept update the classic Atkinson-Shiffrin three-stage information-processing model?

RP-4 What are two basic functions of working memory?

ANSWERS IN APPENDIX E

Encoding Memories

How do we *encode* information, and how does this process differ for *explicit* versus *implicit* memories?

Dual-Track Memory: Effortful Versus Automatic Processing

LOQ 24-3

How do explicit and implicit memories differ?

Explicit *(declarative)* **memories** are the facts and experiences that we can consciously know and "declare." We encode many explicit memories through conscious **effortful processing.** But our mind has a second, unconscious track. Behind the scenes, other information skips the conscious encoding track and barges directly into storage. This **automatic processing,** which happens without our awareness, produces some things we can know without actively thinking about them (the shape of the cafeteria tray in our hands), and also produces our **implicit** *(nondeclarative)* **memories.**

Our two-track mind, then, helps us encode, store, and retrieve information through both effortful and automatic tracks. Let's see how automatic processing assists the formation of implicit memories.

Automatic Processing and Implicit Memories

LOQ 24-4

What information do we process automatically?

Our implicit memories include *procedural* memory for automatic skills (such as how to ride a bike) and classically conditioned *associations* among stimuli. If once attacked by a dog, years later you may, without recalling the conditioned association, automatically tense up as a dog

approaches. Such memories are implicit because we react automatically and without conscious effort.

You also automatically process information about

- ***space.*** While studying, if you are reading visually, you often encode the place on the page or screen where certain material appears; later, you may visualize its location when you want to retrieve the information.
- ***time.*** While going about your day, you unintentionally note the sequence of its events. Later, realizing you've left your phone somewhere, the event sequence your brain automatically encoded will enable you to retrace your steps.
- ***frequency.*** You effortlessly keep track of how many times things happen, as when you realize, "This is the third time I've run into her today!"

Our two-track mind engages in impressively efficient information processing. As one track automatically tucks away routine details, the other track is free to focus on conscious, effortful processing. Mental feats, such as vision, thinking, and memory, may seem to be single abilities, but they are not. Rather, we split information into different components for separate and simultaneous processing.

Effortful Processing and Explicit Memories

Automatic processing happens effortlessly. When you see familiar words on the side of a delivery truck, you can't help but read them and

register their meaning. *Learning* to read wasn't automatic. You may recall working hard to pick out letters and connect them to certain sounds. But with experience and practice, your reading became automatic. Imagine now learning to read sentences in reverse:

.citamotua emoceb nac gnissecorp luftroffE

At first, this requires effort, but after enough practice, you would also perform this task much more automatically. We develop many skills in this way: driving, texting, and speaking a new language.

Ask Yourself

Does it surprise you to learn how much of your memory processing is automatic? What might life be like if *all* memory processing were effortful?

Sensory Memory

LOQ 24-5

How does sensory memory work?

Sensory memory (recall Figure 24.4) feeds our active working memory, recording momentary images, sounds, and strong scents. But sensory memory, like a lightning flash, is fleeting. How fleeting? In one experiment, people viewed three rows of three letters each, for only one-twentieth of a second (**FIGURE 24.5**). After the nine letters disappeared, they could recall only about half of them.

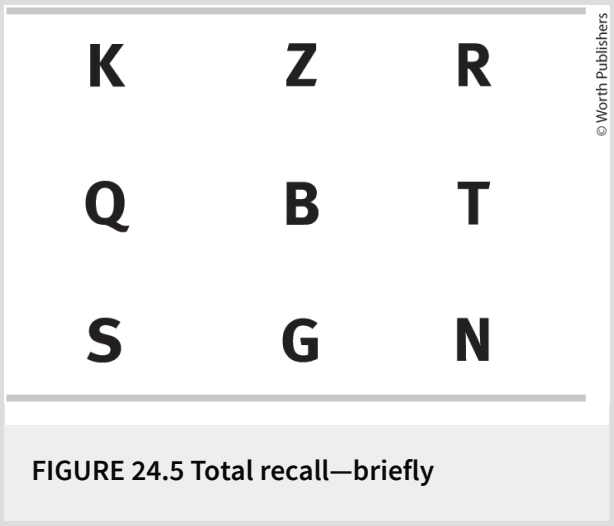


FIGURE 24.5 Total recall—briefly

Was it because they had insufficient time to glimpse them? *No.* People actually *could* see and recall all the letters but only momentarily. We know this because rather than ask them to recall all nine letters at once, researcher George Sperling sounded a high, medium, or low tone immediately *after* flashing the nine letters. The pitch of the tone directed participants to report *only* the top, middle, or bottom row letters, respectively. Now, they rarely missed a letter, showing that all nine letters were momentarily available for recall.

Sperling's experiment demonstrated **iconic memory**, a fleeting sensory memory of visual stimuli. For a few tenths of a second, our eyes register a picture-image memory of a scene, and we can recall any part of it in amazing detail. But delaying the tone signal by more than half a second caused the image to fade and memory to suffer. We also have an impeccable, though fleeting, memory for auditory stimuli, called **echoic memory** (Cowan, 1988; Lu et al., 1992). Picture yourself in class being distracted by a text message. If your mildly irked instructor tests you by asking, "What did I just say?" you can

recover the last few words from your mind's echo chamber. Auditory echoes tend to linger for 3 or 4 seconds.

Short-Term Memory Capacity

LOQ 24-6

What is our short-term memory capacity?

Recall that short-term memory—and working memory, its processing manager—refers to what we can briefly retain for just a few seconds. What are the limits of what we can hold in this middle, short-term stage?

George Miller (1956) proposed that we can store about seven pieces of information (give or take two) in short-term memory. Miller's magical number seven is psychology's contribution to the list of magical sevens—the seven wonders of the world, the seven seas, the seven deadly sins, the seven colors of the rainbow, the seven-note musical scale, and the seven days of the week—seven magical sevens.

> After Miller's 2012 death, his daughter recalled his best moment of golf: "He made the one and only hole-in-one of his life at the age of 77, on the seventh green … with a seven iron. He loved that" (quoted by Vitello, 2012).

Other research confirms that we can, if nothing distracts us, recall about seven bits of information. But the number varies by task; we tend to remember about six letters and only about five words (Baddeley et al., 1975; Cowan, 2015). And how quickly do our short-term memories disappear? To find out, Lloyd Peterson and Margaret Peterson (1959) asked people to remember three-consonant groups, such as *CHJ*. To prevent rehearsal, the researchers distracted participants (asking them, for example, to start at 100 and begin counting aloud backward by threes). After 3 seconds, people recalled the letters only about half the time; after 12 seconds, they seldom recalled them at all (**FIGURE 24.6**). Without the active processing that we now understand to be a part of our working memory, short-term memories have a limited life.

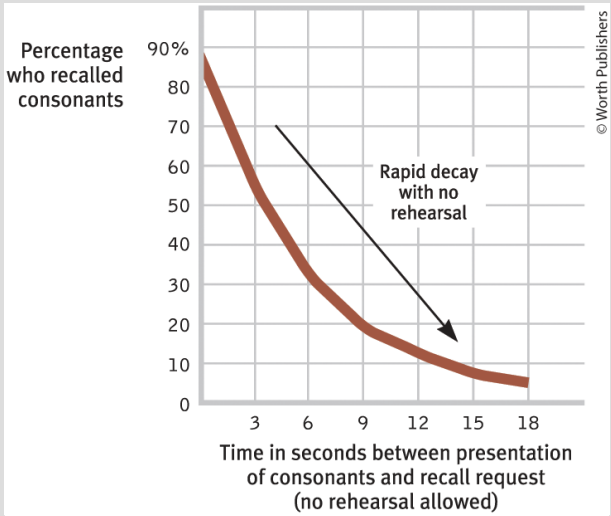


FIGURE 24.6 Short-term memory decay
(Data from Peterson & Peterson, 1959; see also Brown, 1958.)

Working memory capacity varies, depending on age and other factors. Young adults tend to have greater working memory capacity—the ability to juggle multiple items while processing information—than do children and older adults (Bopp & Verhaeghen, 2020; Jaroslawska & Rhodes, 2019). This helps young adults to better retain information and to solve problems creatively (De Dreu et al., 2012; Fenn & Hambrick, 2012; Wiley & Jarosz, 2012). But because task-switching reduces working memory, everyone does better and more efficient work when focused, without distractions, on one task at a time (Steyvers et al., 2019). *The bottom line:* It's probably a bad idea to simultaneously watch a live stream, text your friends, and study psychology, with your attention switching among them (Willingham, 2010)!

Working memory capacity appears to reflect intelligence level (Cowan, 2008; Shelton et al., 2010). Imagine seeing a letter of the alphabet, then a simple question, then another letter, followed by another question, and so on. In such experiments, those who could juggle the most mental balls—who could remember the most letters despite the interruptions—tended in everyday life to exhibit high intelligence and an ability to maintain their focus (Kane et al., 2007; Unsworth & Engle, 2007). When beeped to report in at various times, they were less likely than others to report that their mind was wandering.

Retrieval Practice

RP-5 What is the difference between *automatic* and *effortful* processing, and what are some examples of each?

RP-6 At which of Atkinson-Shiffrin's three memory stages would *iconic* and *echoic* memory occur?

ANSWERS IN APPENDIX E

Effortful Processing Strategies

LOQ 24-7

What are some effortful processing strategies that can help us remember new information?

Several effortful processing strategies boost our ability to form new memories. Later, when we try to retrieve a memory, these strategies can make the difference between success and failure.

Chunking

Glance for a few seconds at the first set of letters (row 1) in **FIGURE 24.7**, then look away and try to reproduce what you saw. Impossible, yes? But you can easily reproduce set 2, which is no less complex. Similarly, you will probably remember sets 4 and 6 more easily than the same elements in sets 3 and 5. As this demonstrates, **chunking**

information into familiar segments enables us to recall it more easily (Thalmann et al., 2019). Try remembering 43 individual numbers and letters. It would be impossible, unless chunked into, say, seven meaningful chunks, such as “Try remembering 43 individual numbers and letters.” 😊

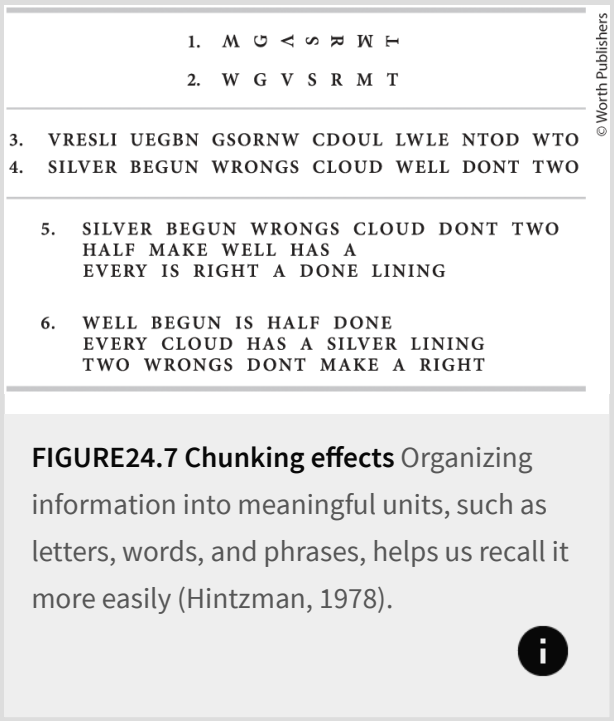


FIGURE24.7 Chunking effects Organizing information into meaningful units, such as letters, words, and phrases, helps us recall it more easily (Hintzman, 1978).

Chunking usually occurs so naturally that we take it for granted. Native English speakers can reproduce perfectly the 150 or so line segments that make up the words in the three phrases of set 6 in Figure 24.7. Similarly amazing is a Chinese reader’s ability to glance at **FIGURE 24.8** and then reproduce all the strokes, or a varsity basketball player’s recall of all the players’ positions after a 4-second peek at a picture of a basketball play (Allard & Burnett, 1985). We all remember information best when we can organize it into personally meaningful arrangements.



FIGURE 24.8 An example of chunking—for those who read Chinese After looking at these characters, can you reproduce them exactly? If so, you likely are fluent in Chinese.

Mnemonics

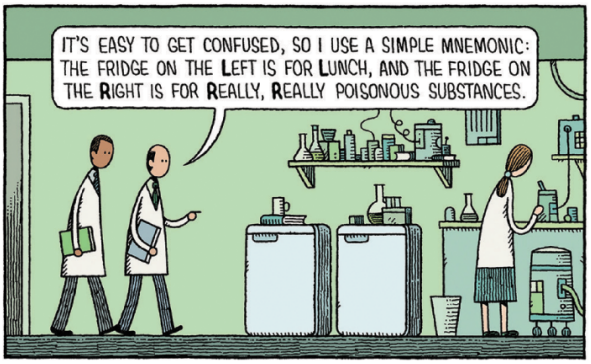
To help encode lengthy passages and speeches, ancient Greek scholars and orators developed **mnemonics.** Many of these memory aids use

vivid imagery, because we are particularly good at remembering mental pictures. We more easily remember concrete, visualizable words than we do abstract words (Akpinar & Berger, 2015). (When we quiz you later, which three of these words—*bicycle, void, cigarette, inherent, fire, process*—will you most likely recall?) If you still recall the rock-throwing rioter sentence, it is probably not only because of the meaning you encoded but also because the sentence painted a mental image.

Memory whizzes understand the power of such systems. Star performers in the World Memory Championships do not usually have exceptional intelligence but rather are superior at using mnemonic strategies (Maguire et al., 2003). Frustrated by his ordinary memory, science writer Joshua Foer wanted to see how much he could improve it. After a year of intense practice, he won the U.S. Memory Championship, memorizing a pack of 52 playing cards in under 2 minutes. How did Foer do it? He added vivid new details to memories of a familiar place—his childhood home. Each card, presented in any order, could then match up with the clear picture in his head. As the test subject of his own wild memory experiment, he learned the power of painting pretty pictures in his mind (Foer, 2011).

When combined, chunking and mnemonic techniques can be great memory aids for unfamiliar material. Want to remember the planets in order of distance from the Sun? Think of the mnemonic My Very Educated Mother Just Served Us Noodles (*M*ercury, *V*enus, *E*arth, *M*ars, *J*upiter, *S*aturn, *U*ranus, and *N*eptune). Need to recall the names

of North America's five Great Lakes? Just remember HOMES (*H*uron, *O*ntario, *M*ichigan, *E*rie, and *S*uperior). In many cases, we chunk information into a more familiar form by creating a word or phrase from the first letters of the to-be-remembered items.



Hierarchies

When people develop expertise in an area, they often process information in *hierarchies* composed of a few broad concepts divided and subdivided into narrower concepts and facts. Organizing knowledge in hierarchies helps us retrieve information efficiently, as Gordon Bower and his colleagues (1969) demonstrated by presenting words either randomly or grouped into categories. When the words were grouped, recall was two to three times better. Such results show the benefits of organizing what you study—of giving special attention to module headings, and, in this text, to numbered Learning Objective Questions. Taking lecture and text notes in outline format—a type of hierarchical organization—may also prove helpful.

Ask Yourself

How have you used hierarchies to organize material that you are trying to remember? How would you do so for one of this text's modules?

Distributed Practice

LOQ 24-8

How do distributed practice, deep processing, and making new material personally meaningful aid memory?

We retain information better when our encoding is distributed over time. Experiments have consistently revealed the benefits of this **spacing effect** (Cepeda et al., 2006; Soderstrom et al., 2016). *Massed practice* (cramming) can produce speedy short-term learning and an inflated feeling of confidence. But to paraphrase early memory researcher Hermann Ebbinghaus (1885), those who learn quickly also forget quickly. *Distributed practice* produces better long-term recall. After you've studied long enough for competence with the material, further study at that time becomes inefficient. Better to spend that extra reviewing time later—a day later if you need to remember something 10 days hence, or a month later if you need to remember something 6 months hence (Cepeda et al., 2008). The spacing effect is one of psychology's most reliable findings, and it extends to motor skills and online game performance, too (Stafford & Dewar, 2014).

Memory researcher Henry Roediger (2013) sums it up: "Hundreds of studies have shown that distributed practice leads to more durable learning."

> **"The mind is slow in unlearning what it has been long in learning."** — Roman philosopher Seneca (4 B.C.E.–65 C.E.)

One effective way to distribute practice is *repeated* self-testing, a phenomenon that researchers have called the **testing effect** (Roediger & Karpicke, 2006; Yang et al., 2021). Testing does more than assess learning and memory: It improves them (Su et al., 2021). In this book, the Retrieval Practice questions and Review sections, including the Module Test questions, offer opportunities to improve learning and memory. "Practicing retrieval facilitates learning," notes memory expert Kathleen McDermott (2021). Better to practice retrieval (as any exam will demand) than to merely reread material (which may lull you into a false sense of competence). Roediger (2013) explains, "Two techniques that students frequently report using for studying—highlighting (or underlining) text and rereading text—[have been found] ineffective." As another memory expert explained, "What we recall becomes more recallable" (Bjork, 2011). No wonder daily quizzing improves introductory psychology students' course performance (Batsell et al., 2017; Pennebaker et al., 2013). So, too, can teaching the material to someone else, self-testing with flash cards, and responding to teacher questions with a clicker (Fazio & Marsh, 2019).

The point to remember: Spaced study and self-assessment beat cramming and rereading. Practice may not make perfect, but smart practice—occasional rehearsal with self-testing—makes for lasting memories.

Levels of Processing

Memory researchers have discovered that we process verbal information at different levels and that depth of processing affects our long-term retention. **Shallow processing** encodes on an elementary level, such as a word's letters or, at a more intermediate level, a word's sound. Thus, we may type *there* when we mean *their, write* when we mean *right,* and *two* when we mean *too.* **Deep processing** encodes *semantically,* based on the meaning of the words. The deeper (more meaningful) the processing, the better our retention.

In one classic experiment, researchers Fergus Craik and Endel Tulving (1975) flashed words at viewers. Then they asked them questions that would elicit different levels of processing. To experience the task yourself, rapidly answer the questions in **TABLE 24.1**.

TABLE 24.1

Sample Questions to Elicit Different Levels of Processing	Word Flashed	Yes	No
Shallowest: Is the word in capital letters?	CHAIR	_____	_____

Shallow: Does the word rhyme with train?	brain	_____	_____
Deep: Would the word fit in this sentence? The girl put the _____ on the table.	puzzle	_____	_____

Which type of processing would best prepare you to recognize the words at a later time? In this experiment, the deeper, semantic processing triggered by the third question yielded a much better memory than did the shallower processing elicited by the second question or the very shallow processing elicited by the first question (which was especially ineffective).

Making Material Personally Meaningful

If new information is neither meaningful nor related to our experience, we have trouble processing it. Imagine being asked to remember the following recorded passage:

> The procedure is actually quite simple. First, you arrange things into different groups. Of course, one pile may be sufficient depending on how much there is to do …. After the procedure is completed, one arranges the materials into different groups again. Then they can be put into their appropriate places. Eventually, they will be used once more and the whole cycle will then have to be repeated. However, that is part of life.

When some students heard the paragraph you have just read, without a meaningful context, they remembered little of it (Bransford & Johnson, 1972). When others were told the paragraph described

washing clothes (something meaningful), they remembered much more of it—as you probably could now after rereading it.

Can you repeat the sentence about the angry rioter that we gave you at this module's beginning?

Perhaps, like those in an experiment by William Brewer (1977), you recalled the sentence by the meaning you encoded when you read it (for example, "The angry rioter threw the rock *through* the window") and not as it was written ("The angry rioter threw the rock *at* the window"). Referring to such mental mismatches, some researchers have likened our minds to theater directors who, given a raw script, imagine the finished stage production (Bower & Morrow, 1990). Asked later what we heard or read, we recall not the literal text but what we encoded. Thus, studying for an exam, you may remember your lecture notes rather than the lecture itself.

We can avoid significant mismatches by rephrasing what we see and hear into meaningful terms. From his experiments on himself, Ebbinghaus estimated that, compared with learning nonsense syllables, learning meaningful material required one-tenth the effort. As memory researcher Wayne Wickelgren (1977, p. 346) noted, "The time you spend thinking about material you are reading and relating it to previously stored material is about the most useful thing you can do in learning any new subject matter."

Psychologist-actor team Helga Noice and Tony Noice (2006) have described how actors inject meaning into the daunting task of learning "all those lines." They do it by first coming to understand the flow of meaning: "One actor divided a half-page of dialogue into three [intentions]: 'to flatter,' 'to draw him out,' and 'to allay his fears.'" With this meaningful sequence in mind, the actor more easily remembered the lines.

Most people excel at remembering personally relevant information. Asked how well certain adjectives describe a stranger, we often forget them; asked how well the adjectives describe us, we often remember them. To remember their passwords, people (you, too?) often use self-relevant information (Taylor & Garry, 2019). The tendency to remember self-relevant information, called the *self-reference effect,* is especially strong in individualist Western cultures (Jiang et al., 2019; Zhang & Tullis, 2021).

The point to remember: You can profit from taking time to find personal meaning in what you are studying.

In the discussion of mnemonics, we gave you six words and told you we would quiz you about them later. How many of these words can you now recall? Of these, how many are high-imagery words? How many are low-imagery?[1]

Retrieval Practice

RP-7 Which strategies are better for long-term retention: cramming and rereading material or spreading out learning over time and repeatedly testing yourself?

RP-8 If you try to make the material you are learning personally meaningful, are you processing at a shallow or a deep level? Which level leads to greater retention?

ANSWERS IN APPENDIX E

REVIEW

Module 24: Studying and Encoding Memories

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 24-1: What is *memory,* and how is it measured?

LOQ 24-2: How do memory models help us study memory, and how has later research updated the three-stage information-processing model?

LOQ 24-3: How do explicit and implicit memories differ?

LOQ 24-4: What information do we process automatically?

LOQ 24-5: How does sensory memory work?

LOQ 24-6: What is our short-term memory capacity?

LOQ 24-7: What are some effortful processing strategies that can help us remember new information?

LOQ 24-8: How do distributed practice, deep processing, and making new material personally meaningful aid memory?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

memory
recall
recognition
relearning
encoding
storage
retrieval
parallel processing
sensory memory

short-term memory
long-term memory
working memory
explicit memory
effortful processing
automatic processing
implicit memory
iconic memory
echoic memory
chunking
mnemonics [nih-MON-iks]
spacing effect
testing effect
shallow processing
deep processing

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. A psychologist who asks you to write down as many objects as you can remember having seen a few minutes earlier is testing your _____.

2. The psychological terms for taking in information, retaining it, and later getting it back out are _____, _____, and _____.

3. The concept of working memory
   a. clarifies the idea of short-term memory by focusing on the active processing that occurs in this stage.
   b. splits short-term memory into two substages—sensory memory and iconic memory.
   c. splits short-term memory into two types: implicit and explicit memory.
   d. clarifies the idea of short-term memory by focusing on space, time, and frequency.

4. Sensory memory may be visual (_____ memory) or auditory (_____ memory).

5. Our short-term memory for new information is limited to about _____ bits of information.

6. Memory aids that use visual imagery or other organizational devices are called _____.

MODULE 25: Storing and Retrieving Memories

Once information is encoded, how does our brain process and store it? What can affect our memory processing? And once a memory is stored, how do we get it back out? What influences memory retrieval?

Memory Storage

LOQ 25-1

What is the capacity of long-term memory? Are our long-term memories processed and stored in specific locations?

In Arthur Conan Doyle's *A Study in Scarlet,* Sherlock Holmes offers a popular theory of memory capacity:

> [A] brain originally is like a little empty attic, and you have to stock it with such furniture as you choose …. It is a mistake to think that that little room has elastic walls and can distend to any extent. Depend upon it, there comes a time when for every addition of knowledge you forget something that you knew before.

Contrary to Holmes' "memory model," our brain is *not* like an attic, which once filled can store more items only if we discard old ones. Our capacity for storing long-term memories is essentially limitless.

After studying the brain's neural connections, researchers estimated its storage capacity as "in the same ballpark as the World Wide Web" (Sejnowski, 2016).

Retaining Information in the Brain

I [DM] marveled at my aging mother-in-law, a retired pianist and organist. At age 88, her blind eyes could no longer read music. But let her sit at a keyboard and she would flawlessly play any of hundreds of hymns, including ones she had not thought of for 20 years. Where did her brain store those thousands of sequenced notes?

For a time, some surgeons and memory researchers marveled at patients' apparently vivid memories triggered by brain stimulation during surgery. Did this prove that our whole past, not just well-practiced music, is "in there," in complete detail, just waiting to be relived? On closer analysis, the seeming flashbacks appeared to have been invented, not a vivid reliving of long-forgotten experiences (Loftus & Loftus, 1980). In a further demonstration that memories do not reside in single, specific spots, psychologist Karl Lashley (1950) trained rats to find their way out of a maze, then surgically removed pieces of their brain's cortex and retested their memory. No matter which small brain section he removed, the rats retained at least a partial memory of how to navigate the maze. Memories *are* brain based, but the brain distributes the components of a memory across a network of locations. These specific locations include some of the neural circuitry involved in the original experience: Some brain cells

that fire when we experience something fire again when we recall it (G. Miller, 2012; Miller et al., 2013).

The point to remember: Despite the brain's vast storage capacity, we do not store information as libraries store their books, in single, precise locations. Instead, brain networks encode, store, and retrieve the information that forms our complex memories.

Explicit Memory System: The Frontal Lobes and Hippocampus

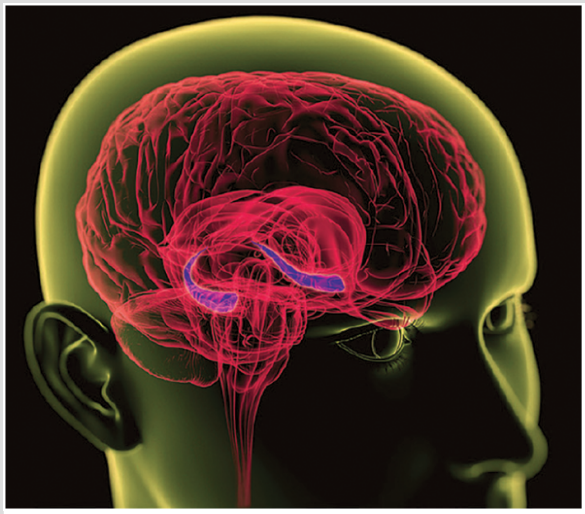
LOQ 25-2

What roles do the frontal lobes and hippocampus play in memory processing?

Explicit, conscious memories are either **semantic** (facts and general knowledge) or **episodic** (experienced events). The network that processes and stores new explicit memories for facts and episodes includes your frontal lobes and hippocampus. When you summon up a mental encore of a past experience, many brain regions send input to your *prefrontal cortex* (the front part of your frontal lobes) for working memory processing (de Chastelaine et al., 2016; Michalka et al., 2015). The left and right frontal lobes process different types of memories. Recalling a password and holding it in working memory, for example, would activate the left frontal lobe. Calling up a visual party scene would more likely activate the right frontal lobe. And women, whose episodic memory surpasses men's, are most likely to

accurately remember what happened at the party (Asperholm et al., 2019).

Cognitive neuroscientists have found that the **hippocampus**, a temporal lobe neural structure located in the limbic system, can be likened to a "save" button for explicit memories (FIGURE 25.1). As children mature, their hippocampus grows, enabling them to construct detailed memories (Keresztes et al., 2017). Brain scans reveal activity in the hippocampus and nearby brain networks as people form explicit memories of names, images, and events (Norman et al., 2019).



Roger Harris/Science Source

FIGURE 25.1 The hippocampus Explicit memories for facts and episodes are processed in the hippocampus (purple structures) and fed to other brain regions for storage.

Damage to this structure therefore disrupts the formation and recall of explicit memories. If their hippocampus is severed, chickadees and other birds will continue to cache food in hundreds of places, but later cannot find the places (Kamil & Cheng, 2001; Sherry & Vaccarino, 1989). With left-hippocampus damage, people have trouble remembering verbal information, but they have no trouble recalling visual designs and locations. With right-hippocampus damage, the problem is reversed (Schacter, 1996).



Tim Zurowski/All Canada Photos

Hippocampus hero One contender for champion memorist is a mere birdbrain—the Clark's Nutcracker—which can locate up to 6000 caches of pine seed it had previously buried (Gould et al.,

2013; Shettleworth, 1993).

So the hippocampus is complex, with subregions that serve different functions. One part is active as people and mice learn social information (Okuyama et al., 2016; Zeineh et al., 2003). Another part is active as memory champions engage in spatial mnemonics (Maguire et al., 2003). The rear area processes spatial memory, and it grows bigger as London cabbies memorize the names and layout of 26,000 streets and thousands of popular city locations (Woollett & Maguire, 2011).

Memories are not permanently stored in the hippocampus. Instead, the hippocampus acts as a loading dock where the brain registers and temporarily holds the elements of a to-be-remembered episode—its smell, feel, sound, and location. Then, like older files shifted to be archived, memories migrate to the cortex for storage. This storage process is called **memory consolidation.**

Sleep supports memory consolidation. In one experiment, students who learned material in a study/sleep/restudy condition remembered material better, both a week and 6 months later, than did students who studied in both the morning and evening without intervening sleep (Mazza et al., 2016). During deep sleep, the hippocampus processes memories for later retrieval. After a training experience, the greater one's hippocampus activity during sleep, the better the next day's memory will be (Peigneux et al., 2004; Whitehurst et al., 2016).

Researchers have watched the hippocampus and brain cortex displaying simultaneous activity rhythms during sleep, as if they were having a dialogue (Euston et al., 2007; Khodagholy et al., 2017). The brain seems to replay the day's experiences as it transfers them to the cortex for long-term storage (Squire & Zola-Morgan, 1991). When our learning is distributed over days rather than crammed into a single day, we experience more sleep-induced memory consolidation. And that helps explain the spacing effect.

Implicit Memory System: The Cerebellum and Basal Ganglia

LOQ 25-3

What roles do the cerebellum and basal ganglia play in memory processing?

Your hippocampus and frontal lobes are processing sites for your *explicit* memories. But you could lose those newer areas of the brain and still, thanks to automatic processing, lay down *implicit* memories for skills and newly conditioned associations. Joseph LeDoux (1996) recounted the story of a patient with brain damage whose amnesia left her unable to recognize her physician as, each day, he shook her hand and introduced himself. One day, she yanked her hand back, for the physician had pricked her with a tack in his palm. The next time he returned to introduce himself, she refused to shake his hand but couldn't explain why. Having been classically conditioned, she just wouldn't do it. Implicitly, she felt what she could not explain.

The *cerebellum* plays a key role in forming and storing the implicit memories created by classical conditioning. With a damaged cerebellum, people cannot develop certain conditioned reflexes, such as associating a tone with an impending puff of air—and thus, do not blink in anticipation of the puff (Daum & Schugens, 1996; Green & Woodruff-Pak, 2000). Implicit memory formation needs the cerebellum.

The *basal ganglia,* deep brain structures involved in motor movement, facilitate formation of our procedural memories for skills (Mishkin, 1982; Mishkin et al., 1997). The basal ganglia receive input from the cortex but do not return the favor by sending information back to the cortex for conscious awareness of procedural learning. If you have learned how to ride a bike, thank your basal ganglia.

Our implicit memory system, enabled by these brain areas, helps explain why the reactions and skills we learned during infancy reach far into our future. Yet as adults, our *conscious* memory of our first 4 years is largely blank due to *infantile amnesia.* As an adult, my [ND's] son, Ellis, will not consciously remember his happy visit to Disney World at age 2. Two influences contribute to infantile amnesia: First, we index much of our explicit memory with a command of language that young children do not possess. Second, the hippocampus is one of the last brain structures to mature, and as it does, more gets retained (Akers et al., 2014).

Retrieval Practice

RP-1 Which parts of the brain are important for *implicit* memory processing, and which parts play a key role in *explicit* memory processing?

RP-2 Leslie, who has experienced brain damage in an accident, can remember how to tie shoes but has a hard time remembering anything you say during a conversation. How can implicit versus explicit information processing explain what's going on here?

ANSWERS IN APPENDIX E

The Amygdala, Emotions, and Memory

LOQ 25-4

How do emotions affect our memory processing?

Our emotions trigger stress hormones that influence memory formation. When we are excited or stressed, these hormones make more glucose energy available to fuel brain activity, signaling the brain that something important is happening. Moreover, stress hormones focus memory. Stress provokes the *amygdala* (two limbic system, emotion-processing clusters) to initiate a *memory trace*—a lasting physical change as the memory forms—that boosts activity in the brain's memory-forming areas (Buchanan, 2007; Kensinger, 2007) (**FIGURE 25.2**). It's as if the amygdala says, "Brain, encode this moment for future reference!" The result? Emotional arousal can sear

certain events into the brain, while disrupting memory for irrelevant events (Brewin et al., 2007; McGaugh, 2015).

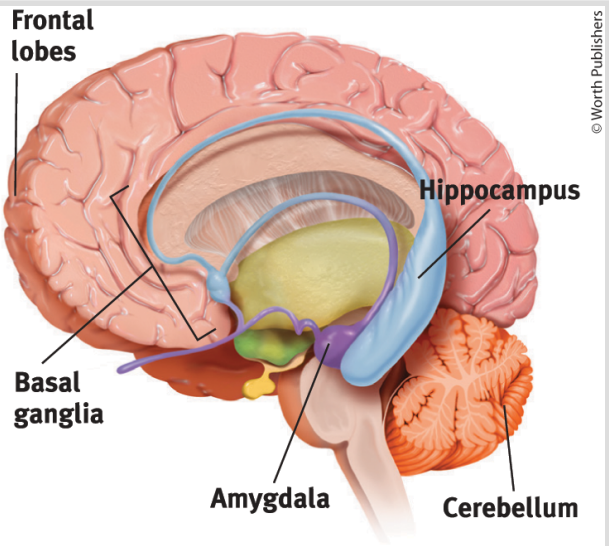


FIGURE 25.2 Review key memory structures in the brain

Frontal lobes and *hippocampus:* explicit memory formation

Cerebellum and *basal ganglia:* implicit memory formation

Amygdala: emotion-related memory formation

Significantly stressful events can form unforgettable memories. After a traumatic experience—a school shooting, a house fire, a sexual assault—vivid recollections of the horrific event may intrude again and again. “Stronger emotional experiences make for stronger, more reliable memories,” noted James McGaugh (1994, 2003). Such experiences even strengthen recall for relevant, immediately

preceding events (Dunsmoor et al., 2015; Jobson & Cheraghi, 2016). This makes adaptive sense: By waving warning flags, memory protects us from future dangers (Leding, 2019).

But emotional events produce tunnel vision memory. They focus our attention and recall on high-priority information and reduce our recall of irrelevant details (Mather & Sutherland, 2012). Whatever captures our attention gets well recalled, at the expense of the surrounding context.

Flashbulb memories form when we create mental snapshots of exciting or shocking events, such as our first kiss or our whereabouts when learning of a loved one's death (Brown & Kulik, 1977; Muzzulini et al., 2020). In a 2006 Pew survey, 95 percent of U.S. adults said they could recall exactly where they were or what they were doing when they first heard the news of the 9/11 terrorist attacks.

> Which do you feel is more important—your experiences or your memories of them?

Our flashbulb memories are noteworthy for their vividness and our confidence in them. But as we relive, rehearse, and discuss them, even our flashbulb memories may become inconsistent, especially among older people (Kopp et al., 2020). With time, some errors crept into people's 9/11 recollections (compared with their earlier reports taken right afterward). Mostly, however, people's memories of 9/11 remained consistent over the next 10 years (Hirst et al., 2015).

Dramatic experiences remain clear in our memory in part because we rehearse them (Hirst & Phelps, 2016). We think about them and describe them to others. Memories of personally important experiences also endure (Storm & Jobe, 2012; Talarico & Moore, 2012). When their team won, fans enjoyed recalling and recounting the victory, leading to longer-lasting memories.

Synaptic Changes

LOQ 25-5

How do changes at the synapse level affect our memory processing?

As you now think and learn about memory processes, your flexible brain is changing. Given increased activity in particular pathways, neural interconnections are forming and strengthening.

The quest to understand the physical basis of memory—how information becomes embedded in brain matter—has sparked study of the synaptic meeting places where neurons communicate with one another via their neurotransmitter messengers. Eric Kandel and James Schwartz (1982) recruited a seemingly unlikely candidate for this research: the California sea slug, a simple animal with a mere 20,000 or so unusually large and accessible nerve cells. It can be classically conditioned (with mild electric shock) to reflexively withdraw its gills when squirted with water, much as a soldier traumatized by combat might jump at the sound of a firecracker.

When learning occurs, the researchers discovered, the slug releases more of the neurotransmitter *serotonin* into certain neurons. These cells' synapses then become more efficient at transmitting signals. Experience and learning can increase—even double—the number of synapses, even in slugs (Kandel, 2012).



Renata Rodrigues Pereira/Shutterstock

Not-so-sluggish synapses The California sea slug, which neuroscientist Eric Kandel studied for 45 years, has increased our understanding of the neural basis of learning and memory.

In experiments with people, rapidly stimulating certain memory-circuit connections has increased their sensitivity for hours or even weeks to come. The sending neuron now needs less prompting to release its neurotransmitter, and more connections exist between neurons. This increased efficiency of potential neural firing, called

long-term potentiation (LTP), provides a neural basis for learning and remembering associations (Lynch, 2002; Whitlock et al., 2006) (**FIGURE 25.3**). Several lines of evidence confirm that LTP is a physical basis for memory. For example, drugs that block LTP interfere with learning (Lynch & Staubli, 1991). Drugs that mimic what happens during learning increase LTP (Harward et al., 2016). And rats given a drug that enhanced synaptic efficiency (LTP) learned a maze with half the usual number of mistakes (Service, 1994).

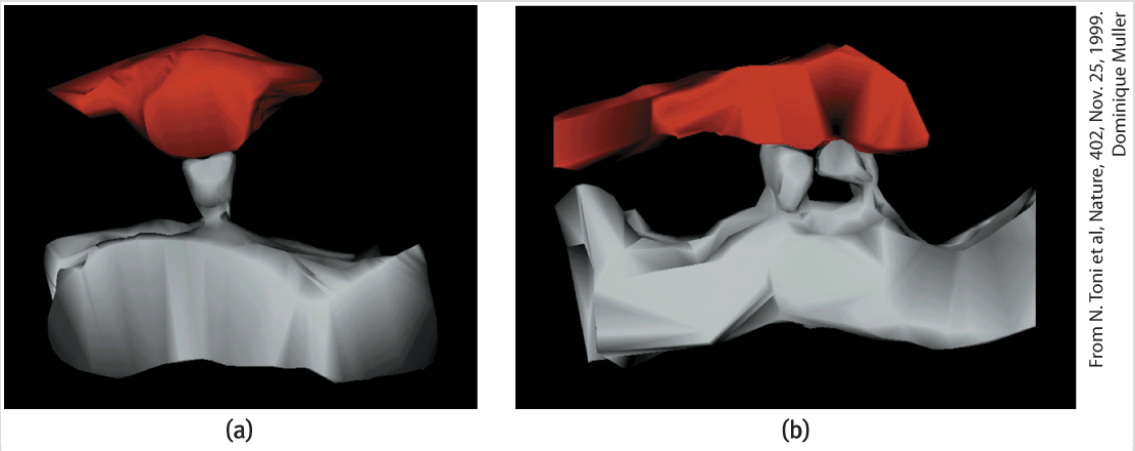


FIGURE 25.3 Doubled receptor sites An electron microscope image (a) shows just one receptor site (gray) reaching toward a sending neuron before long-term potentiation. Image (b) shows that, after LTP, the receptor sites have doubled. This means the receiving neuron has increased sensitivity for detecting the presence of the neurotransmitter molecules that may be released by the sending neuron (Toni et al., 1999).

After LTP has occurred, passing an electric current through the brain won't disrupt old memories. But the current will wipe out very recent memories. Such is the experience both of laboratory animals and of severely depressed people given *electroconvulsive therapy (ECT).* A blow

to the head can do the same. Football players and boxers momentarily knocked unconscious typically have no memory of events just before the knockout (Yarnell & Lynch, 1970). Their working memory had no time to consolidate the information into long-term memory before the lights went out.

Recently, I [DM] did a little test of memory consolidation. While on an operating table for a basketball-related tendon repair, I was given a face mask and soon could smell the anesthesia gas. "So how much longer will I be with you?" I asked the anesthesiologist (knowing that our last seconds before falling asleep go unremembered). My last moment of memory was her answer: "About 10 seconds." My brain spent that 10 seconds consolidating a memory for her 2-second answer, but could not tuck any further memory away before I was out cold.

Some memory-biology explorers have helped found companies that are competing to develop memory-altering drugs. The target market for memory-boosting drugs is massive: people with Alzheimer's disease or the *mild cognitive impairment* that often becomes Alzheimer's, people with more typical age-related memory decline, and anyone who simply wants a better memory. Meanwhile, students already have free access to one safe, proven memory enhancer: effective study techniques followed by adequate *sleep!*

One approach to improving memory focuses on drugs that boost the LTP-enhancing neurotransmitter *glutamate* (Lynch et al., 2011).

Another approach involves developing drugs that boost production of CREB, a protein that also enhances the LTP process (Fields, 2005). Boosting CREB production might trigger increased production of other proteins that help reshape synapses and transfer short-term memories into long-term memories.

Some of us may wish for memory-*blocking* drugs that could blunt intrusive memories when taken after a traumatic experience (Adler, 2012; Kearns et al., 2012). In experiments, survivors of events such as car accidents and sexual assault received, afterward, several doses of one such drug (propranolol) or a placebo. Later testing revealed more stress reduction in the drug-treated group (Brunet et al., 2018; Pitman et al., 2002).

FIGURE 25.4 summarizes the brain's two-track memory processing and storage system for implicit (automatic) and explicit (effortful) memories. *The bottom line:* Learn something and you can change your brain a little.

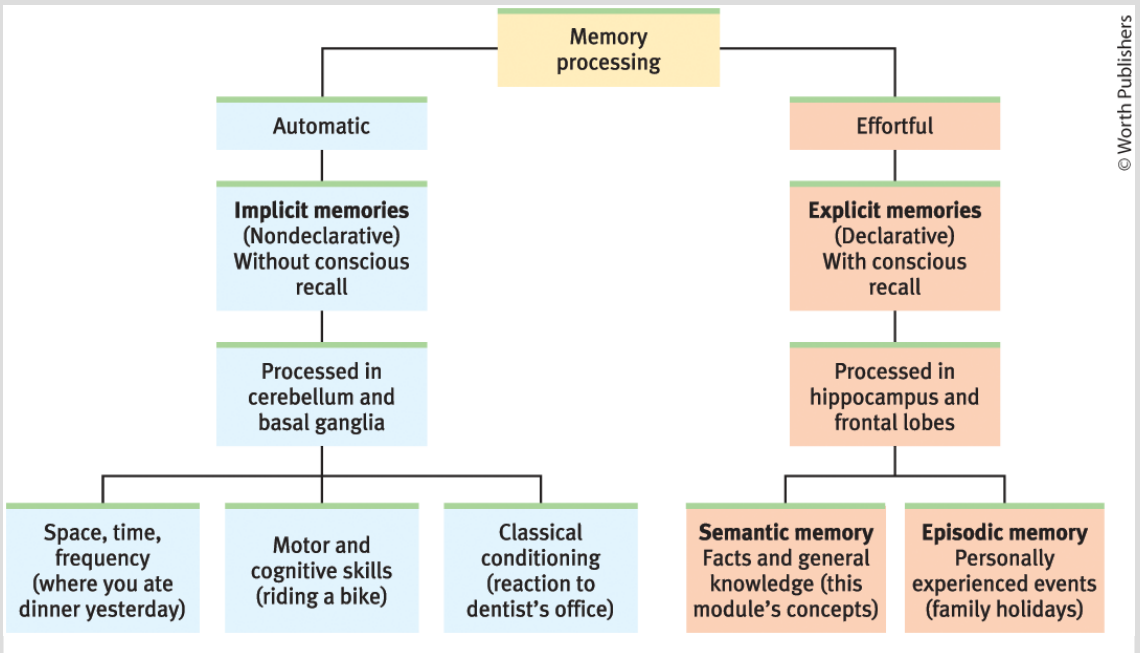


FIGURE 25.4 Our two memory systems

Retrieval Practice

RP-3 Which brain area responds to stress hormones by helping to create stronger memories?

RP-4 Increased efficiency at the synapses is evidence of the neural basis of learning and memory. This is called _____.

ANSWERS IN APPENDIX E

Memory Retrieval

After the magic of brain encoding and storage, we still have the daunting task of retrieving the information. What triggers retrieval?

Retrieval Cues

LOQ 25-6

How do external cues, internal emotions, and order of appearance influence memory retrieval?

Imagine a spider suspended in the middle of her web, held up by the many strands extending outward from her in all directions to different points. If you were to trace a pathway to the spider, you would first need to locate an anchor point and then follow the strand into the web.

The process of retrieving a memory follows a similar principle, because memories are held in storage by a web of associations, each piece of information interconnected with others. When you encode into memory a target piece of information, such as the name of the person sitting next to you in class, you associate with it other bits of information about your surroundings, mood, seating position, and so on. These bits can serve as *retrieval cues*—like passwords that open memories. The more retrieval cues you have, the better your chances of finding a route to the suspended memory. The best retrieval cues come from associations we form when we encode a memory—smells, tastes, and sights that can evoke our memory of the associated person or event (Tamminen & Mebude, 2019).

> **"Memory is not like a container that gradually fills up; it is more like a tree growing hooks onto which memories are hung."** — Peter Russell, *The Brain Book,* 1979

To call up visual cues when trying to recall something, we may mentally place ourselves in the original context. After losing his sight, British scholar John Hull (1990, p. 174) described his difficulty recalling such details:

> I knew I had been somewhere, and had done particular things with certain people, but where? I could not put the conversations … into a context. There was no background, no features against which to identify the place. Normally, the memories of people you have spoken to during the day are stored in frames which include the background.

To help people recall older memories, *reminiscence therapy* uses the power of retrieval cues (İnel Manav & Simsek, 2019; Park et al., 2019). One study had older people with Alzheimer's disease spend time in a room styled as a 1950s museum, filled with sights, sounds, and smells that triggered their youthful memories (Kirk et al., 2019). Compared with people who received standard assistive care, those who experienced the immersive reminiscence therapy performed better on memory tests. Retrieval cues helped them regain memories.

We need to retrieve memories for both our past (called *retrospective memory*) and our intended future actions *(prospective memory)*. To remember to do something (say, to get the mail), one effective strategy is to mentally associate the act with a cue (perhaps putting your

mailbox key by the door) (Rogers & Milkman, 2016). It pays to plan ahead, which helps explain why most people spend more time thinking about their future than their past (Anderson & McDaniel, 2019).



Robert Leighton/Cartoon Stock

"Oh, is that today?"

Does the unprepared astronaut illustrate a failure of retrospective or prospective memory?[2]

PRIMING

Often our associations are activated without our awareness. Philosopher-psychologist William James referred to this process, which we call **priming**, as the "wakening of associations." After seeing or hearing the word *rabbit,* we are later more likely to spell the spoken word *hair/hare* as *h-a-r-e,* even if we don't recall seeing or hearing *rabbit* (Bower, 1986) (**FIGURE 25.5**).

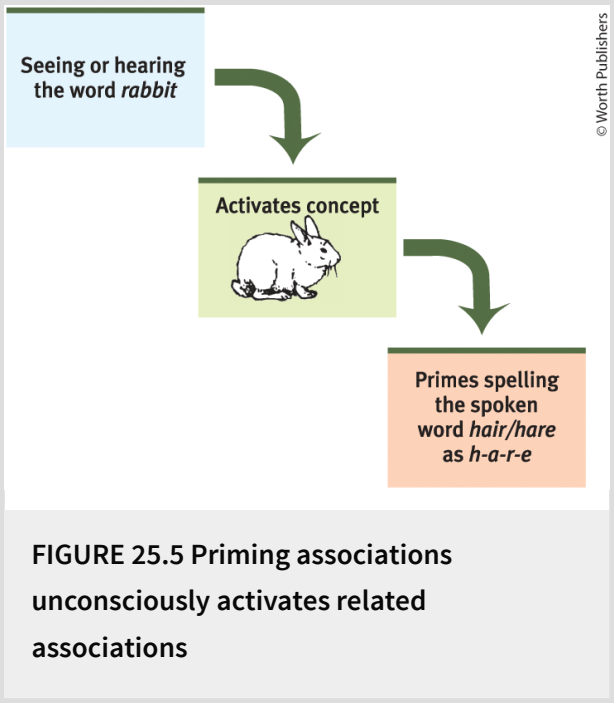


FIGURE 25.5 Priming associations unconsciously activates related associations

Priming is often "memoryless memory"—an implicit, invisible memory, without your conscious awareness. If you see a poster of a missing child, you may then unconsciously be primed to interpret an ambiguous adult-child interaction as a possible kidnapping (James, 1986). Although you no longer have the poster in mind, it predisposes your interpretation. Priming can also influence behaviors (Weingarten et al., 2016). Adults and children primed with money-related words and materials change their behavior in various ways, such as by becoming less helpful (Gasiorowska et al., 2016; Lodder et al., 2019). Money may prime our materialism and self-interest. And priming people with threatening (versus pleasant) images causes them to evaluate other people negatively (Lai & Wilson, 2021). Similarly, our learned stereotypes—of which we may not be consciously aware—can prime our perceptions and actions that feed prejudice and discrimination (see the Social Psychology modules).

Ask a friend three rapid-fire questions:

1. What color is snow?
2. What color are clouds?
3. What do cows drink?

If your friend answers “milk” to the third question, you have demonstrated priming.

Context-Dependent Memory

Have you noticed? Putting yourself back in the context where you earlier experienced something can prime your memory retrieval. Remembering, in many ways, depends on our environment (Palmer, 1989). When you visit your childhood home or neighborhood, old memories surface. When scuba divers listened to a word list in one of two different settings (either 10 feet underwater or sitting on the beach), they recalled more words when later tested in the same place where they first heard the list (Godden & Baddeley, 1975).

By contrast, experiencing something outside the usual setting can be confusing. Have you ever run into a former teacher in an unusual place, such as at a store or park? Perhaps you felt a glimmer of recognition but struggled to realize who it was and how you were acquainted. The **encoding specificity principle** helps us understand how *specific* cues will most effectively trigger that memory. In new settings, you may be missing the memory cues needed for speedy face

recognition. Our memories are *context-dependent* and are affected by the cues we have associated with that context.

In several experiments, Carolyn Rovee-Collier (1993) found that a familiar context activated memories even in 3-month-olds. After infants learned that kicking would make a crib mobile move (via a connecting ribbon from their ankle), the infants kicked more when tested again in the same crib than when in a different context.

State-Dependent Memory

Closely related to context-dependent memory is *state-dependent memory.* What we learn in one state may be more easily recalled when we are again in that state. What people learn when drunk they don't recall well in *any* state (alcohol disrupts memory storage). But they recall it slightly better when again drunk. Someone who hides money when drunk may forget the location until drunk again.



"I can't remember what we're arguing about, either. Let's keep yelling, and maybe it will come back to us."

Moods also provide an example of memory's state dependence. Emotions that accompany good or bad events become retrieval cues (Gaddy & Ingram, 2014). Thus, our memories are somewhat **mood congruent.** If you've had a bad day—you argued with a friend, made a big mistake at work, and got a poor grade on your midterm—your gloomy mood may facilitate recalling other bad times. Depression sours memories by priming negative associations, which we then use to explain our current mood (Mihailova & Jobson, 2020). In many experiments, people put in a buoyant mood—whether under hypnosis or just by the day's events (a World Cup soccer victory for German participants in one study)—recall the world through rose-colored glasses (DeSteno et al., 2000; Forgas et al., 1984; Schwarz et al., 1987). They recall their behaviors as competent and effective, other people as benevolent, happy events as more frequent.

Have you ever noticed that how you feel influences how you perceive others? In one study, adolescents' ratings of parental warmth in 1 week gave little clue to how they would rate their parents 6 weeks later (Bornstein et al., 1991). When teens were down, their parents seemed cruel; as their mood brightened, their parents morphed from devils into angels. And at age 26, people's recall of their parents' caregiving during their childhood were linked less with the actual caregiving (which had been assessed years earlier) than with their *current* moods and parental relationship (Nivison et al., 2021). We may nod our heads knowingly. Yet, in a good or bad mood, we persist in attributing to reality our own changing judgments, memories, and interpretations. In a bad mood, we may read someone's look as a glare and feel even worse. In a good mood, we may encode the same look as interest and feel even better.

Mood effects on retrieval help explain why our moods persist. When happy, we recall pleasant events and, therefore, see the world as a wonderful place, which helps prolong our good mood. When depressed, we recall sad events, which darkens our interpretations of current events. For those of us predisposed to depression, this process can help maintain a vicious, dark cycle. Moods magnify.

> **"When a feeling was there, they felt as if it would never go; when it was gone, they felt as if it had never been; when it returned, they felt as if it had never gone."** — George MacDonald, *What's Mine's Mine,* 1886

Ask Yourself

What sort of mood have you been in lately? How has your mood colored your memories, perceptions, and expectations?

Serial Position Effect

Another memory-retrieval quirk, the **serial position effect**, explains why we may have large holes in our memory of a list of recent events. Imagine it's your first day in a new job, and your manager is introducing you to your co-workers. As you meet each person, you silently repeat everyone's name, starting from the beginning. As the last person smiles and turns away, you feel confident you'll be able to greet your new co-workers by name the next day.

Don't count on it. Because you have spent more time rehearsing the earlier names than the later ones, those are the names you'll probably recall more easily the next day. In experiments, when people viewed a list of items (words, names, dates) or experienced a series of odors or tastes, and then immediately tried to recall them in any order, they fell prey to the serial position effect (Daniel & Katz, 2018; Dimsdale-Zucker et al., 2019). They briefly recalled the last items especially quickly and well (a *recency effect*), perhaps because those last items were still in working memory. But after a delay, when their attention was elsewhere, their recall was best for the first items (a *primacy effect*; see **FIGURE 25.6**).

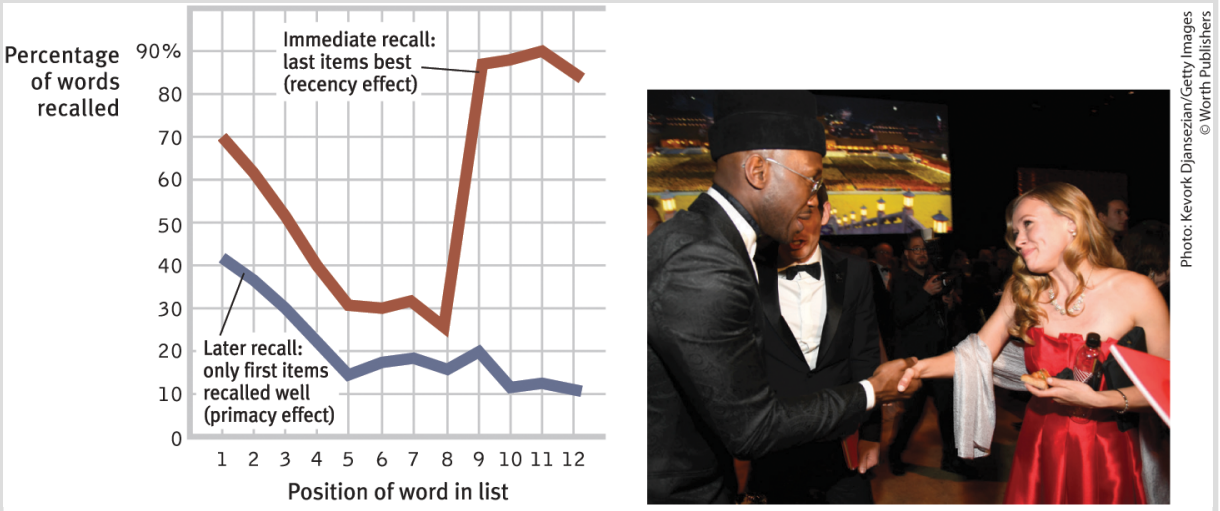


FIGURE 25.6 The serial position effect Immediately after Mahershala Ali made his way down the red carpet at the 2019 Academy Awards, he would probably have best recalled the names of the last few people he greeted *(recency effect).* But later, he may only have been able to recall the first few people best *(primacy effect)*. Memory "sags in the middle," leading us to remember best the first and last people we meet.

Retrieval Practice

RP-5 What is *priming?*

RP-6 When tested immediately after viewing a list of words, we tend to recall the first and last items best, which is known as the _____ _____ effect.

ANSWERS IN APPENDIX E

REVIEW

Module 25: Storing and Retrieving Memories

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 25-1: What is the capacity of long-term memory? Are our long-term memories processed and stored in specific locations?

LOQ 25-2: What roles do the frontal lobes and hippocampus play in memory processing?

LOQ 25-3: What roles do the cerebellum and basal ganglia play in memory processing?

LOQ 25-4: How do emotions affect our memory processing?

LOQ 25-5: How do changes at the synapse level affect our memory processing?

LOQ 25-6: How do external cues, internal emotions, and order of appearance influence memory retrieval?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

semantic memory
episodic memory
hippocampus
memory consolidation
flashbulb memory
long-term potentiation (LTP)
priming
encoding specificity principle
mood-congruent memory
serial position effect

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. The hippocampus seems to function as a
    a. temporary processing site for explicit memories.
    b. temporary processing site for implicit memories.

c. permanent storage area for emotion-based memories.
d. permanent storage area for unconscious memories.

2. Hippocampus damage typically leaves people unable to learn new facts or recall recent events. However, they may be able to learn new skills, such as riding a bicycle, which is an _____ (explicit/implicit) memory.

3. Long-term potentiation (LTP) refers to
   a. emotion-triggered hormonal changes.
   b. the role of the hippocampus in processing explicit memories.
   c. an increase in a cell's firing potential.
   d. the potential for learning in late adulthood.

4. Specific odors, visual images, emotions, or other associations that help us access a memory are examples of _____ _____.

5. When you feel sad, why might it help to look at pictures that reawaken some of your best memories?

6. When tested immediately after viewing a list of words, people tend to recall the first and last items more readily than those in the middle. When retested after a delay, they are most likely to recall
   a. the first items on the list.
   b. the first and last items on the list.
   c. a few items at random.

d. the last items on the list.

MODULE 26: Forgetting, Memory Construction, and Improving Memory

Our memories are amazing, but they are not perfect. We may forget, fail to encode, or find ourselves unable to retrieve information. We might misremember what we've seen or heard, or "remember" things that are false. What influences these errors in memory? And how can we use research findings to improve our memories?

Forgetting

LOQ 26-1

Why do we forget?

Amid all the applause for memory—all the efforts to understand it, all the books on how to improve it—have any voices been heard in praise of forgetting? William James (1890, p. 680) was such a voice: "If we remembered everything, we should on most occasions be as ill off as if we remembered nothing." Psychologists Robert Bjork and Elizabeth Bjork (2019) agree, calling forgetting "the friend of learning." Indeed, the ability to forget out-of-date information—where we parked yesterday, an old phone number, meals prepared and eaten—is a

blessing (Nørby, 2015). Forgetting unimportant information helps us remember what matters most (Murphy & Castel, 2021). So the next time you fret about forgetting, remember that letting go of bad memories is good for our mental well-being (Stramaccia et al., 2021).

> **"Amnesia seeps into the crevices of our brains, and amnesia heals."** — Joyce Carol Oates, "Words Fail, Memory Blurs, Life Wins," 2001

Yet some people seem unable to forget. In the 1920s, Russian journalist and memory whiz Solomon Shereshevsky had merely to listen while other reporters scribbled notes. Performing in front of a crowd, he could memorize streams of nonsensical or random information, such as long sections from Dante's *Inferno* in Italian—despite not knowing Italian (Johnson, 2017). But his junk heap of memories dominated his conscious mind (Luria, 1968). He had difficulty thinking abstractly—generalizing, organizing, evaluating. After reading a story, he could recite it but would struggle to summarize its gist.

Jill Price's incredibly accurate memory of her life's events since age 14 has been closely studied by a University of California at Irvine research team. She reports that her super-memory, called *highly superior autobiographical memory,* interferes with her life, with one memory cuing another (McGaugh & LePort, 2014; Parker et al., 2006): "It's like a running movie that never stops …. It is nonstop, uncontrollable, and totally exhausting." Although their memories are

not perfect, people like Price are prone to having their mind fill up with information that most people ignore—shoes worn on a first date, the day of the week that you first ate at a favorite childhood restaurant—and that, once in memory storage, never leaves (Frithsen et al., 2019; Patihis, 2016). In such rare individuals—60 of whom have been identified worldwide—researchers have found enlarged brain areas and increased brain activity in memory centers (Dutton, 2018; Santangelo et al., 2020). A good memory is helpful but so is the ability to forget. If a memory-enhancing pill ever becomes available, it had better not be *too* effective.

More often, however, our unpredictable memory dismays and frustrates us. Memories are quirky. My [DM's] own memory can easily call up such episodes as that wonderful first kiss with the woman I love, or trivial facts like the mileage from Los Angeles to New York. Then it abandons me when I fail to encode, store, or retrieve a student's name or where I left my keys. See how you do with remembering this sentence when we ask you about it later: *The fish attacked the swimmer.*

As we process information, we filter, alter, or lose most of it (**FIGURE 26.1**).

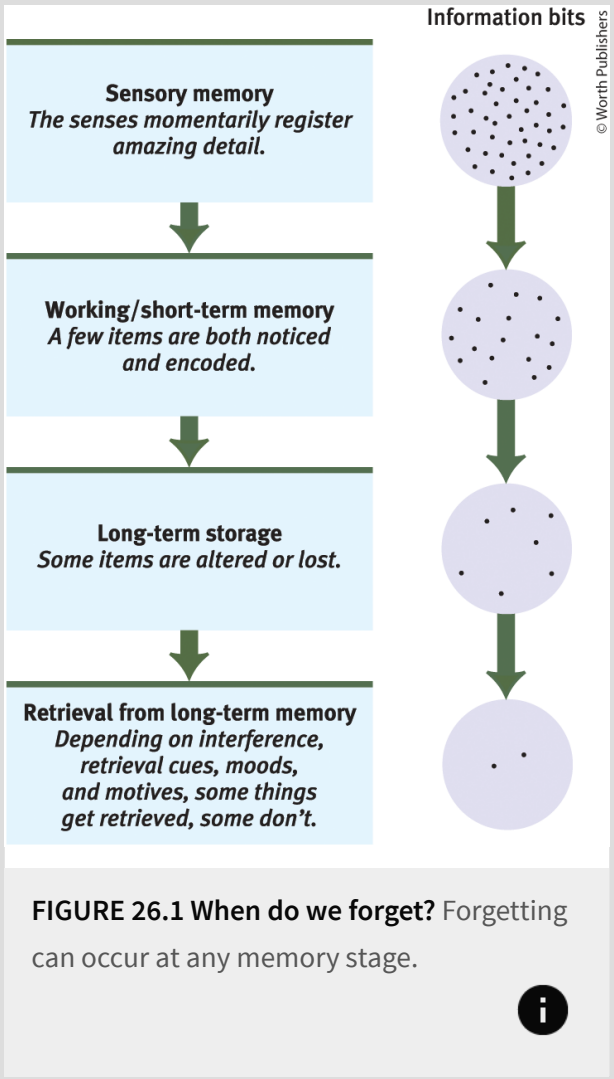


FIGURE 26.1 When do we forget? Forgetting can occur at any memory stage.

Forgetting and the Two-Track Mind

For some, memory loss is severe and permanent. Consider Henry Molaison (or H. M., as he was known until his 2008 death). Surgeons removed much of his hippocampus to stop persistent seizures. This resulted "in severe disconnection of the remaining hippocampus" from the rest of the brain (Annese et al., 2014). For his remaining 55 years, he was unable to form new conscious memories. Molaison suffered from **anterograde amnesia**—he could remember his past,

but he could not form new memories. (Those who *cannot* remember their past—the old information stored in long-term memory—suffer from **retrograde amnesia**.) Molaison was, as before his surgery, intelligent and did daily crossword puzzles. Yet, reported neuroscientist Suzanne Corkin (2005, 2013), "I've known H. M. since 1962, and he still doesn't know who I am." For about half a minute he could keep something in mind, enough to carry on a conversation. When distracted, he would lose what was just said or what had just occurred. Without the neural tissue for turning new information into long-term memories, he never could name the current U.S. president (Ogden, 2012).

Neurologist Oliver Sacks (1985, pp. 26–27) described another patient, Jimmie, who had anterograde amnesia resulting from brain damage. Jimmie had no memories—thus, no sense of elapsed time—beyond his injury in 1945.

When Jimmie gave his age as 19, Sacks set a mirror before him: "Look in the mirror and tell me what you see. Is that a 19-year-old looking out from the mirror?"

Jimmie turned ashen, gripped the chair, cursed, then became frantic: "What's going on? What's happened to me? Is this a nightmare? Am I crazy? Is this a joke?" When his attention was diverted to some children playing baseball, his panic ended, the dreadful mirror forgotten.

Sacks showed Jimmie a photo from *National Geographic*. "What is this?" he asked.

"It's the Moon," Jimmie replied.

"No, it's not," Sacks answered. "It's a picture of the Earth taken from the Moon."

"Doc, you're kidding! Someone would've had to get a camera up there!"

"Naturally."

"Hell! You're joking—how the hell would you do that?" Jimmie's wonder was that of a bright young man from the 1940s, amazed by his travel back to the future.

Careful testing of these unique people reveals something even stranger: Although incapable of recalling new facts or anything they have done recently, Molaison, Jimmie, and others with similar conditions can learn nonverbal tasks. Shown hard-to-find figures in pictures (in the *Where's Waldo?* series, for example), they can quickly spot them again later. They can find their way to the bathroom, though without being able to tell you where it is. They can learn to read mirror-image writing or do a jigsaw puzzle, and they have even learned complicated *procedural* job skills (Schacter, 1992, 1996; Xu & Corkin, 2001). They can be classically conditioned. However, *they do*

all these things with no awareness of having learned them. "Well, this is strange," Molaison said, after demonstrating his nondeclarative memory of skillful mirror tracing. "I thought that would be difficult. But it seems as though I've done it quite well" (Shapin, 2013).

Molaison and Jimmie lost their ability to form new explicit memories, but their automatic processing ability remained intact. Like Alzheimer's patients, whose *explicit* memories for new people and events are lost, they could form new *implicit* memories (Lustig & Buckner, 2004). These patients can learn *how* to do something, but they will not consciously recall learning their new skill. Such sad case studies confirm that we have two distinct memory systems, controlled by different parts of the brain.

For most of us, forgetting is a less drastic process. Let's consider some of the reasons we forget.

Encoding Failure

Much of what we sense we never notice, and what we fail to encode, we will never remember (**FIGURE 26.2**). English novelist and critic C. S. Lewis (1967, p. 107) described the enormity of what we never encode:

> [We are] bombarded every second by sensations, emotions, thoughts … nine-tenths of which [we] must simply ignore. The past [is] a roaring cataract of billions upon billions of such moments: Any one of them too complex to grasp in its entirety, and the aggregate beyond all imagination …. At every tick of the

clock, in every inhabited part of the world, an unimaginable richness and variety of "history" falls off the world into total oblivion.

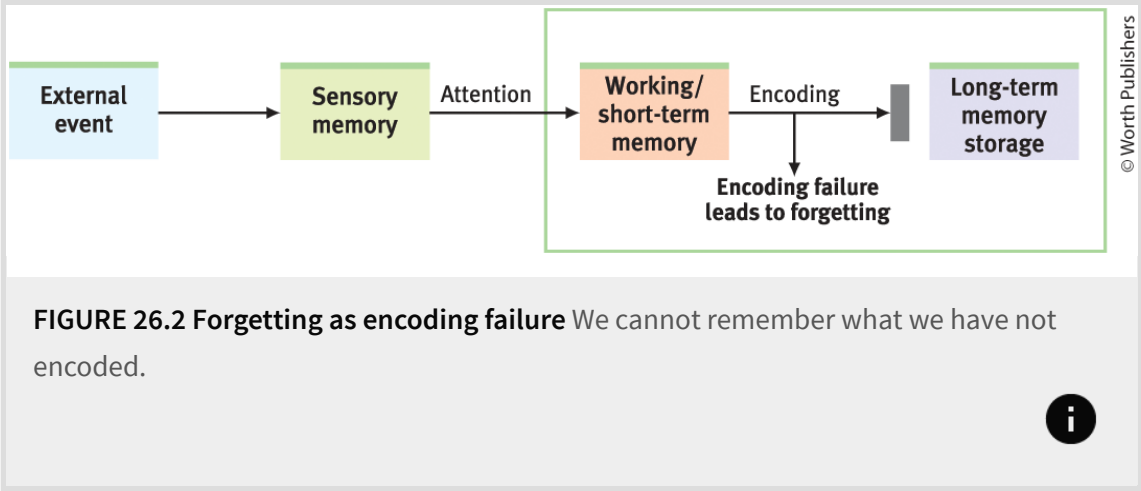


FIGURE 26.2 Forgetting as encoding failure We cannot remember what we have not encoded.

Age can affect encoding efficiency. The brain areas that jump into action when young adults encode new information are less responsive in older adults. This slower encoding helps explain age-related memory decline (Ward et al., 2020). (For more on aging's effect on memory, see the Developing Through the Life Span modules.)



But no matter how young we are, we selectively attend to few of the myriad sights and sounds continually bombarding us. Consider: You have surely seen the Apple logo thousands of times. Can you draw it? In one study, only 1 of 85 UCLA students (including 52 Apple users) could do so accurately (Blake et al., 2015). Without encoding effort, many potential memories never form.

Storage Decay

"You are already beginning to forget the material you just read." So said famed memory researcher Gordon Bower (1973). Indeed, even after encoding something well, we sometimes later forget it. To study the durability of stored memories, Hermann Ebbinghaus (1885) learned lists of nonsense syllables, such as *YOX* and *JIH,* and measured how much he retained when relearning each list, from 20 minutes to 30 days later. The result was his famous forgetting curve: *The course of forgetting is initially rapid, then levels off with time* (Wixted & Ebbesen, 1991). Another study found a similar forgetting curve for Spanish vocabulary learned in school (Bahrick, 1984). Compared with those just completing a high school or college Spanish course, people 3 years out of school had forgotten much of what they had learned (**FIGURE 26.3**). However, what people remembered then, they still mostly remembered 25+ years later. Their forgetting had leveled off.

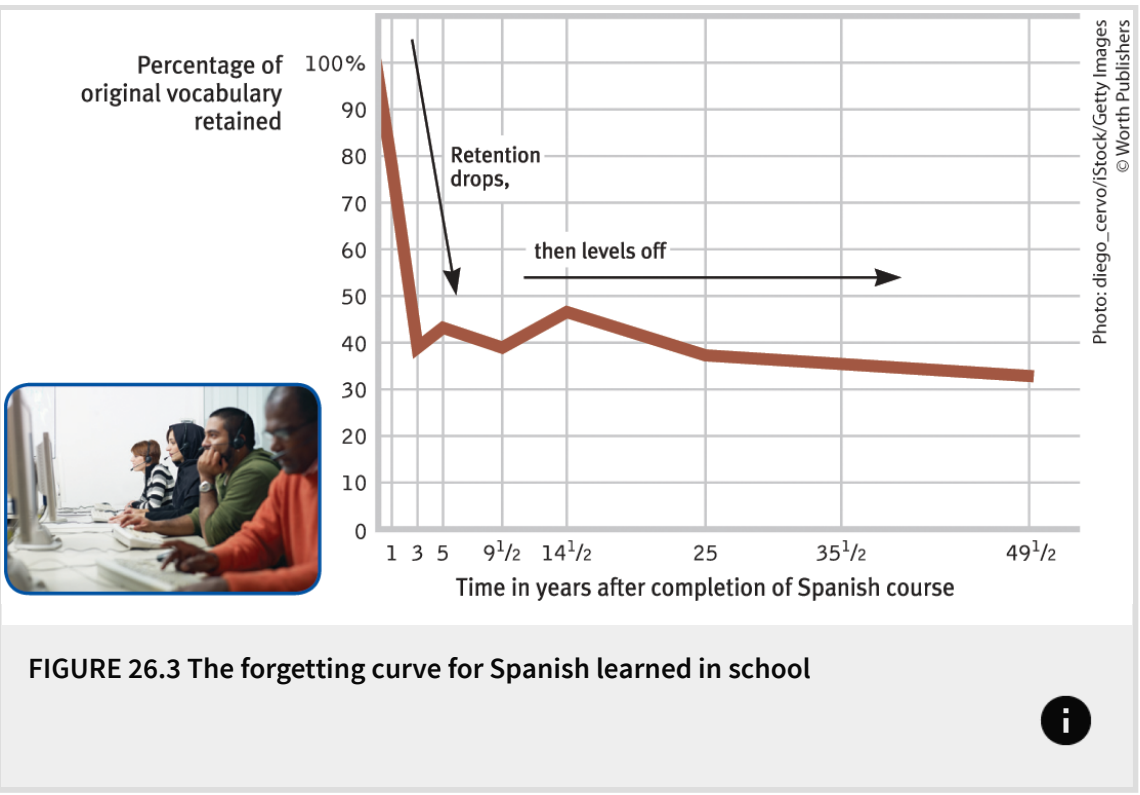


FIGURE 26.3 The forgetting curve for Spanish learned in school

One explanation for these forgetting curves is a gradual fading of the physical *memory trace.* Cognitive neuroscientists are getting closer to solving the mystery of memory's physical storage and are increasing our understanding of how memory storage could decay. Like books you can't find in your campus library, memories may be inaccessible for many reasons. Some were never acquired (not encoded). Others were discarded (stored memories decay). And others are out of reach because we can't retrieve them.

Retrieval Failure

Often, forgetting is not memories faded but memories unretrieved. We store in long-term memory what's important to us or what we've rehearsed. But sometimes important events defy our attempts to

access them (FIGURE 26.4). How frustrating when a name lies poised on the tip of our tongue, just beyond reach. Given retrieval cues *(It begins with an M),* we may easily retrieve the elusive memory. Retrieval problems contribute to the occasional memory failures of older adults, who more frequently are frustrated by tip-of-the-tongue forgetting (Abrams, 2008; Salthouse & Mandell, 2013).

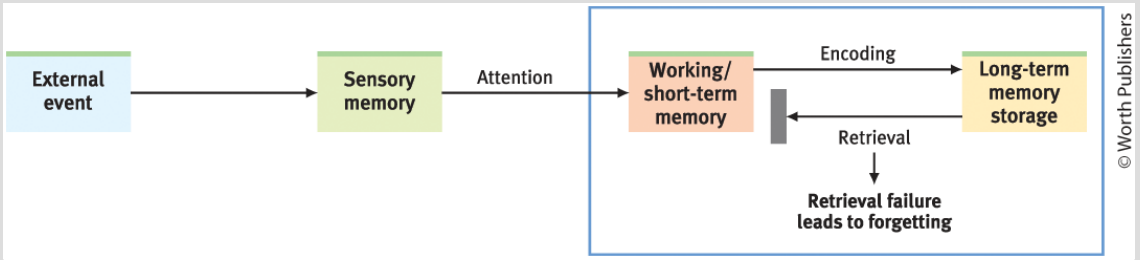


FIGURE 26.4 Retrieval failure Sometimes even stored information cannot be accessed, which leads to forgetting.

People who are deaf and fluent in sign language experience a parallel "tip of the fingers" phenomenon (Thompson et al., 2005).

Do you recall the gist of the sentence about the attacked swimmer that we asked you to remember? If not, does the word *shark* serve as a retrieval cue? Experiments show that *shark* (likely what you visualized) more readily retrieves the image you stored than does the sentence's actual word, *fish* (Anderson et al., 1976). (The sentence was, *The fish attacked the swimmer.*)

Retrieval problems occasionally stem from interference and even from motivated forgetting.

Interference

As you collect more and more information, your mental attic never fills, but it does get cluttered. Your brain tries to keep things tidy: Using a new password weakens your memory of competing old passwords (Wimber et al., 2015). But sometimes the clutter wins, and new and old learning collide. **Proactive** *(forward-acting)* **interference** occurs when prior learning disrupts your recall of new information. If you buy a new combination lock, your well-rehearsed old combination may interfere with your retrieval of the new one.

Retroactive *(backward-acting)* **interference** occurs when new learning disrupts your recall of old information. If someone sings new lyrics to an old song's tune, you may have trouble remembering the original words. Imagine a second stone tossed in a pond, disrupting the waves rippling out from the first.

Information presented in the hour before sleep suffers less retroactive interference because the opportunity for interfering events is minimized (Mercer, 2015). In a classic experiment, two people each learned some nonsense syllables (Jenkins & Dallenbach, 1924). Then they tried to recall them after a night's sleep or after remaining awake. As **FIGURE 26.5** shows forgetting occurred more rapidly after being awake and involved with other activities. The investigators surmised that "forgetting is not so much a matter of the decay of old

impressions and associations as it is a matter of interference, inhibition, or obliteration of the old by the new" (1924, p. 612).

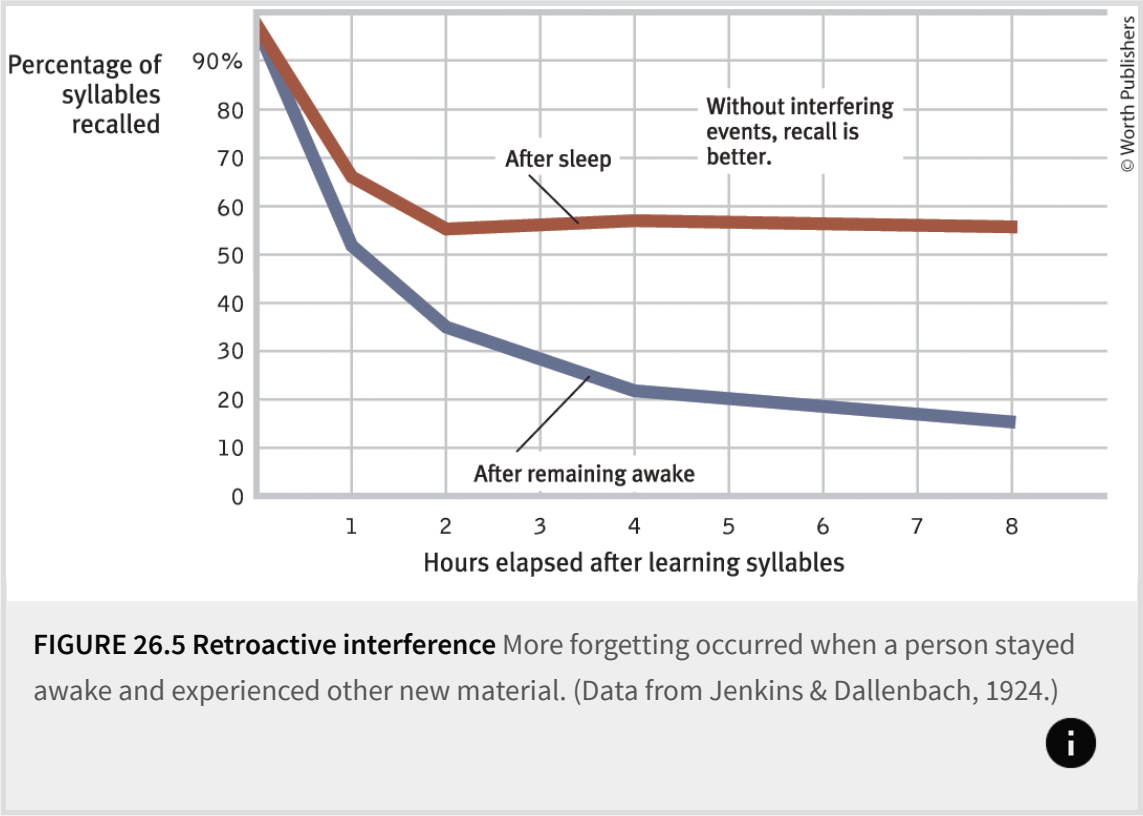


FIGURE 26.5 Retroactive interference More forgetting occurred when a person stayed awake and experienced other new material. (Data from Jenkins & Dallenbach, 1924.)

The hour before sleep is a good time to commit information to memory (Scullin & McDaniel, 2010), though information presented in the *seconds* just before sleep is seldom remembered (Wyatt & Bootzin, 1994). If you're considering learning *while* sleeping, forget it. We have little memory for information played aloud in the room during sleep, although the ears do register it (Wood et al., 1992).

Old and new learning do not always compete. Previously learned information (Latin) often facilitates our learning of new information (French). This phenomenon is called *positive transfer.*

Motivated Forgetting

To remember our past is often to revise it. Years ago, the huge cookie jar in my [DM's] kitchen was jammed with freshly baked chocolate chip cookies. Still, more were cooling across racks on the counter. Twenty-four hours later, not a crumb was left. Who had taken them? During that time, my wife, three children, and I were the only people in the house. So while memories were still fresh, I conducted a little memory test. Andy admitted wolfing down as many as 20. Peter thought he had eaten 15. Laura guessed she had stuffed her then-6-year-old body with 15 cookies. My wife, Carol, recalled eating 6, and I remembered consuming 15 and taking 18 more to the office. We sheepishly accepted responsibility for 89 cookies. Still, we had not come close; there had been 160.



Peter Johansky/Photolibrary/Getty Images

Why do our memories fail us? This happens in part because memory is an "unreliable, self-serving historian" (Tavris & Aronson, 2007, p. 6). Consider one study, in which researchers told some participants about the benefits of frequent toothbrushing. Those individuals then

recalled (more than others did) having frequently brushed their teeth in the preceding 2 weeks (Ross et al., 1981).

So why were my family and I so far off in our cookie-consumption estimates? Was it an *encoding* problem? (Did we just not notice what we had eaten?) Was it a storage problem? (Might our memories of cookies, like Ebbinghaus' memory of nonsense syllables, have melted away almost as fast as the cookies themselves?) Or was the information still intact but not *retrievable.*[3]

Sigmund Freud might have argued that our memory systems self-censored this information. He proposed that we **repress** painful or unacceptable memories to protect our self-concept and to minimize anxiety. But the repressed memory lingers, he believed, and can be retrieved by some later cue or during therapy. Repression was central to Freud's psychoanalytic theory and remains a popular idea. Indeed, many people, including many clinicians, continue to believe that people repress their traumatic memories (Otgaar et al., 2021; Wake et al., 2020). However, memory experts think repression rarely, if ever, occurs (Patihis et al., 2021). Consider the words people later remember. People who have experienced sexual assault, for example, succeed in forgetting neutral words *(salt, plant),* but they struggle to forget trauma-related words *(intercourse, assault)* (Blix & Brennen, 2011). Trauma releases stress hormones, which cause trauma survivors to attend to and remember the threat (Quaedflieg & Schwabe, 2017). Thus, people often have intrusive, persistent

memories of the very same traumatic experiences they would most like to forget (Marks et al., 2018).



European Pressphoto Agency/Lages/PORTUGAL/Newscom

Do people vividly remember—or repress—traumatic experiences? Imagine yourself several hours into Flight AT236 from Toronto to Lisbon. A fractured fuel line begins leaking. Soon the engines go silent and primary electrical power is lost. In the eerie silence, the pilots instruct you and other terrified passengers to don life jackets and prepare for ocean impact. Before long, the pilot declares, above the passengers' screams and prayers, "About to go into the water." Death awaits.

But no! "We have a runway! Brace! Brace! Brace!" The plane makes a hard landing at an Azores airbase, averting death for all 305 on board.

Among the passengers thinking "I'm going to die" was psychologist Margaret McKinnon. Seizing the opportunity, four years later she tracked down 15 of her fellow passengers to test their trauma memories. Did they repress the experience? *No.* All exhibited vivid, detailed memories. With trauma comes not repression, but, far more often, "robust" memory (McKinnon et al., 2015).

Retrieval Practice

RP-1 What are three ways we forget, and how does each of these happen?

RP-2 Freud believed (though many researchers doubt) that we _____ unacceptable memories to minimize anxiety.

ANSWERS IN APPENDIX E

Memory Construction Errors

LOQ 26-2

How do misinformation, imagination, and source amnesia influence our memory construction? How do we decide whether a memory is real or false?

Nearly two-thirds of Americans agree: "Human memory works like a video camera, accurately recording the events we see and hear so that we can review and inspect them later" (Simons & Chabris, 2011). Actually, memory is not so precise. Like scientists who infer a dinosaur's appearance from its remains, we infer our past from stored information, plus what we later imagined, expected, saw, and heard. Memories are constructed: We don't just retrieve memories, we reweave them.

> **"Our memories are flexible and superimposable, a panoramic blackboard with an endless supply of chalk and erasers."** — Elizabeth Loftus and Katherine

> Ketcham, *The Myth of Repressed Memory,* 1994

Our memories are like Wikipedia pages, capable of constant revision. When we "replay" a memory, we often replace the original with a slightly modified version, rather like what happens in the telephone game, as a whispered message gets progressively altered when passed from person to person (Hardt et al., 2010). Memory researchers call this **reconsolidation** (Elsey et al., 2018). So, in a sense, said Joseph LeDoux (2009), "your memory is only as good as your last memory. The fewer times you use it, the more pristine it is." This means that, to some degree, "all memory is false" (Bernstein & Loftus, 2009).

Despite knowing all this, I [DM] rewrote my own past at an international conference, where memory researcher Elizabeth Loftus (2012) spoke. Loftus showed attendees a handful of individual faces that we were later to identify, as if in a police lineup. She then showed us some pairs of faces—one face we had seen earlier and one we had not—and asked us to identify the one we had seen. But one pair she had slipped in included *two* new faces, one of which was rather *like* a face we had seen earlier. Most of us understandably but wrongly identified this face as one we had previously seen. To climax the demonstration, she showed us the originally seen face and the previously chosen wrong face and asked us to choose the original face we had seen. Again, most of us picked the wrong face! As a result of our memory reconsolidation, we—an audience of psychologists who should have known better—had replaced the original memory with a false memory.

Neuroscientists are identifying relevant brain regions and neurochemicals that help or hinder memory consolidation (Bang et al., 2018). And clinical researchers have been experimenting. They ask people to recall a traumatic or negative experience and then disrupt the reconsolidation of that memory with a drug (such as propranolol), a brief, painless electroconvulsive shock, or novel distracting images (Phelps & Hofmann, 2019; Scully et al., 2017; Treanor et al., 2017). Someday it might become possible to use memory reconsolidation to erase specific traumatic memories. Would you wish to do this if you could? If brutally assaulted, would you welcome having your memory of the attack and its associated fears deleted?

Misinformation and Imagination Effects

In more than 200 experiments involving more than 20,000 people, Loftus has shown how eyewitnesses reconstruct their memories after a crime or accident. In one classic study, two groups of people watched a traffic accident film clip and then answered questions about what they had seen (Loftus & Palmer, 1974). Those asked, "About how fast were the cars going when they *smashed* into each other?" gave higher speed estimates than those asked, "About how fast were the cars going when they *hit* each other?" A week later, when asked whether they recalled seeing any broken glass, people who had heard *smashed* were more than twice as likely to report seeing glass fragments (**FIGURE 26.6**). In fact, the film showed no broken glass.

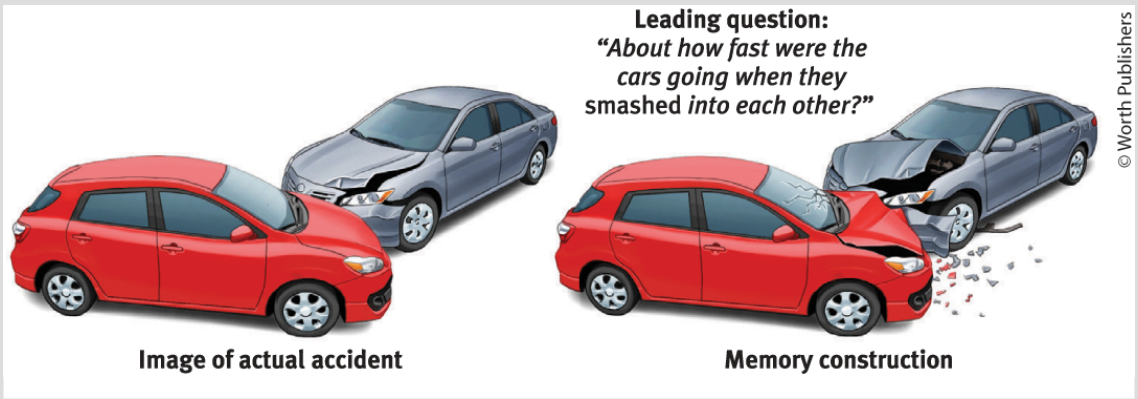


FIGURE 26.6 Memory construction

In many follow-up experiments worldwide, others have witnessed an event, received or not received misleading information about it, and then taken a memory test. The repeated result is a **misinformation effect**: After exposure to subtly misleading information, we may confidently misremember what we've seen or heard (Anglada-Tort et al., 2019; Loftus et al., 1992). Across studies, about half of people show some vulnerability to the misinformation effect (Brewin & Andrews, 2017; Scoboria et al., 2017). A yield sign becomes a stop sign, hammers become screwdrivers, Coke cans become peanut cans, breakfast cereal becomes eggs, and a clean-shaven man morphs into a man with a mustache. These false memories wither away once the trickster researchers *debrief* research participants, revealing that the study's purpose was to demonstrate the human mind's built-in photo-editing software (Murphy et al., 2020).

> **"Memory is insubstantial. Things keep replacing it. Your batch of snapshots will both fix and ruin your memory .... You can't remember anything from your trip except the wretched collection of snapshots."** — Annie Dillard, "To Fashion a Text," 1988

So powerful is the misinformation effect that it can influence later attitudes and behaviors (Bernstein & Loftus, 2009). One experiment falsely suggested to some Dutch university students that, as children, they became ill after eating spoiled egg salad (Geraerts et al., 2008). After absorbing that suggestion, they were less likely to eat egg salad sandwiches, both immediately and 4 months later.

Even repeatedly *imagining* nonexistent actions and events can create false memories. In real life, some people, after suggestive interviews, have even vividly recalled murders or other crimes they didn't commit (Aviv, 2017; Shaw, 2018; Wade et al., 2018).

Misinformation and imagination effects occur partly because visualizing something and actually perceiving it activate similar brain areas (Gonsalves et al., 2004). Imagined events also later seem more familiar, and familiar things seem more real. The more vividly we can imagine things, the more likely they are to become memories (Loftus, 2001; Porter et al., 2000). Telling lies can likewise alter people's memories of the truth (Otgaar & Baker, 2018). Fibbing feeds falsehoods.





Left: Evan Agostini/Invision/AP Photo; right: YamabikaY/Shutterstock

Was Alexander Hamilton a U.S. president? Sometimes our mind tricks us into misremembering dates, places, and names. This often happens because we misuse familiar information. In one study, many Americans mistakenly recalled Alexander Hamilton—whose face appears on the U.S. $10 bill, and who is the subject of Lin-Manuel Miranda's popular Broadway musical—as a U.S. president (Roediger & DeSoto, 2016).

In experiments, researchers have altered photos from a family album to show some family members taking a hot-air balloon ride. After viewing these photos (rather than photos showing just the balloon), children reported more false memories of the balloon ride and indicated high confidence in those memories. *Imagination inflation* was evident several days later, when they reported even richer details of their false memories (Strange et al., 2008; Wade et al., 2002). In British and Canadian university surveys, nearly one-fourth of students have reported personal memories that they later realized were not accurate (Foley, 2015; Mazzoni et al., 2010). *The bottom line:* Don't believe everything you remember.

Source Amnesia

What is the frailest part of a memory? Its source. An example: On a recent anniversary of the 9/11 terrorist attack, I [DM] mentioned to my wife my vivid memory of our Manhattan daughter's call as she witnessed—while we talked—the horror of the second tower's collapse. But no, replied my wife, whose memory is usually far more reliable than mine: "She made that call to *me*."

Clearly, one of us had reported the call to the other, who was now misattributing the source. ("I was definitely speaking to Dad," our daughter later informed us, triggering a smug smile from her error-prone father.) We may cite a statistic when arguing a point but be unable to recall where we read or heard it. We may dream an event and later be unsure whether it really happened. We may tell a friend some gossip, only to learn we got the news from that friend. Famed child psychologist Jean Piaget was startled as an adult to learn that a vivid, detailed memory from his childhood—a nursemaid's thwarting his kidnapping—was utterly false. He apparently constructed the memory from repeatedly hearing the story (which his nursemaid, after undergoing a religious conversion, later confessed had never happened). In attributing his "memory" to his own experiences, rather than to his nursemaid's stories, Piaget exhibited **source amnesia** (also called *source misattribution*). Misattribution is at the heart of many false memories. Authors, songwriters, and comedians sometimes suffer from it. They think an idea came from their own

creative imagination, when in fact they are unintentionally plagiarizing something they earlier read or heard.

Source amnesia also helps explain **déjà vu** (French for "already seen"). Two-thirds of us have experienced this fleeting, eerie sense that "I've been in this exact situation before." The key to déjà vu seems to be familiarity with a stimulus coupled with uncertainty about where we encountered it before (Cleary & Claxton, 2018; Urquhart et al., 2018). Normally, we experience a feeling of *familiarity* (thanks to temporal lobe processing) before we consciously remember details (thanks to hippocampus and frontal lobe processing). When these functions (and brain regions) are out of sync, we may experience a feeling of familiarity without conscious recall. Our amazing brains try to make sense of such an improbable situation, and we get an eerie feeling that we're reliving some earlier part of our life. Our source amnesia forces us to do our best to make sense of an odd moment.

> **"Do you ever get that strange feeling of vujà dé? Not déjà vu; vujà dé. It's the distinct sense that, somehow, something just happened that has never happened before. Nothing seems familiar. And then suddenly the feeling is gone. Vujà dé."** — Comedian George Carlin, *Funny Times,* December 2001

Discerning True and False Memories

Since memory is reconstruction as well as reproduction, we can't be sure whether a memory is real by how real it feels. Much as perceptual illusions may seem like real perceptions, unreal memories

feel like real memories. Because the misinformation effect and source amnesia happen outside our awareness, it is hard to separate false memories from real ones (Schooler et al., 1986). You can likely recall describing a childhood experience to a friend and filling in memory gaps with reasonable guesses and assumptions. We all do it. After more retellings, those guessed details—now absorbed into your memory—may feel as real as if you had actually experienced them (Roediger et al., 1993). False memories, like fake diamonds, seem so real.

False memories can be persistent, especially when they align with our beliefs. Such was the case when, in one large experiment, Irish people retained inaccurate memories of false news related to Ireland's 2018 abortion referendum—especially when the false news supported their own views (Murphy et al., 2019).

False memories often retain a false association. Imagine that we were to read aloud a list of words, such as *candy, sugar, honey,* and *taste.* Later, we ask you to recognize the presented words from a larger list. If you are at all like the people tested by Henry Roediger and Kathleen McDermott (1995), you would err three out of four times—by falsely remembering a nonpresented similar word, such as *sweet.* We more easily remember the gist than the words themselves.

False memories are socially contagious. When we hear others falsely remember events, we tend to make the same memory mistakes (Roediger et al., 2001). We get confused about where we originally

learned about the false event—*Did I already know that or am I learning it from others?*—and adopt others' false memories (Hirst & Echterhoff, 2012). It's easy to see how false memories can spread as online misinformation.

Memory construction errors also help explain why some people have been sent to prison for crimes they never committed. Of 375 people (60 percent of whom were African American) who were later proven not guilty by DNA testing, 69 percent had been convicted because of faulty eyewitness identification (Innocence Project, 2021; Wells, 2020). It explains why "hypnotically refreshed" memories of crimes so easily incorporate errors, some of which may originate with the hypnotist's leading questions *(Did you hear loud noises?).* Memory construction errors also seem to be at work in many "recovered" memories of childhood abuse. (See Thinking Critically About: Can Memories of Childhood Sexual Abuse Be Repressed and Then Recovered?)

LOQ 26-3

Why have reports of repressed and recovered memories been so hotly debated?

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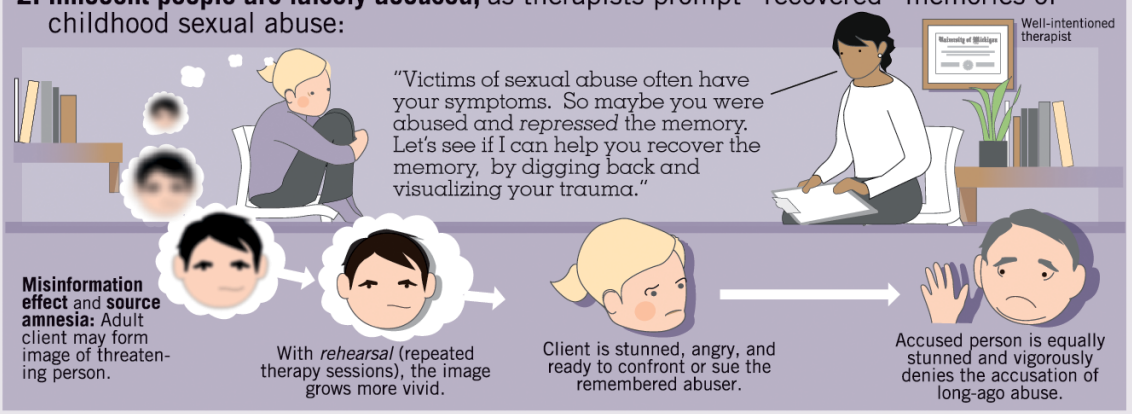
Thinking Critically About:

Can Memories of Childhood Sexual Abuse Be Repressed and Then Recovered?

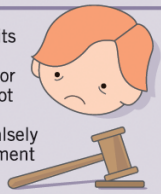
Two Possible Tragedies:

1. People doubt childhood sexual abuse survivors who tell their secret.

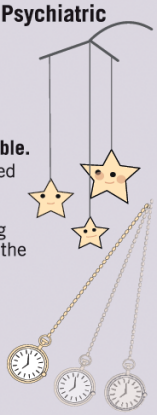
2. Innocent people are falsely accused, as therapists prompt "recovered" memories of childhood sexual abuse:



Professional organizations (including the American Medical, American Psychological, and American Psychiatric Associations) are working to find sensible common ground to resolve psychology's "memory war":[1]



- **Childhood sexual abuse happens** and can leave its victims at risk for problems ranging from sexual dysfunction to depression.[2] But there is no "survivor syndrome"—no group of symptoms that lets us spot victims of sexual abuse.[3]
- **Injustice happens.** Innocent people have been falsely convicted. And guilty people have avoided punishment by casting doubt on their truth-telling accusers.
- **Forgetting happens.** Children abused when very young may not have understood the meaning of their experience or remember it. Forgetting long-ago good and bad events is an ordinary part of everyday life.
- **Recovered memories are common.** Cued by a remark or an experience, we may recover pleasant or unpleasant memories of long-forgotten events. But does the unconscious mind forcibly repress painful experiences, and can these experiences be recovered by therapist-aided techniques?[4] Memories that surface naturally are more likely to be true.[5]
- **Memories of events before age 4 are unreliable.** Infantile amnesia results from not yet developed brain pathways. Most psychologists therefore doubt "recovered" memories of abuse during infancy.[6] The older a child was when suffering sexual abuse, and the more severe the abuse, the more likely it is to be remembered.[7]
- **Memories "recovered" under hypnosis are especially unreliable.**
- **Memories, whether real or false, can be emotionally upsetting.** What was born of mere suggestion can become, like an actual event, a stinging memory that drives bodily stress.[8]



Psychologists question whether *repression* ever occurs.
(See the Psychological Disorders modules for more on this concept, which is central to Freud's theory.)

Traumatic experiences (witnessing a loved one's murder, being terrorized by a hijacker or rapist, losing everything in a natural disaster) → **TYPICALLY LEAD TO** → **vivid, persistent, haunting memories**[9]

The Royal College of Psychiatrists Working Group on Reported Recovered Memories of Child Sexual Abuse advised that "when memories are 'recovered' after long periods of amnesia, particularly when extraordinary means were used to secure the recovery of memory, there is a high probability that the memories are false." [10]

1. Patihis et al., 2014. 2. Freyd et al., 2007. 3. Kendall-Tackett et al., 1993. 4. McNally & Geraerts, 2009. 5. Geraerts et al., 2007. 6. Gore-Felton et al., 2000; Knapp & VandeCreek, 2000. 7. Goodman et al., 2003. 8. McNally, 2003, 2007. 9. Porter & Peace, 2007; Goldfarb et al., 2019. 10. Brandon et al., 1998.

Eyewitness accuracy is also influenced by our tendency to recall faces of our own race more accurately than faces of other races (see the Social Psychology modules' discussion of the *other-race effect*). Among criminal suspects exonerated with DNA evidence after eyewitness misidentification, more than 40 percent were falsely accused after a cross-racial misidentification (Innocence Project, 2021).

Memory construction errors explain why dating partners now in love *over*estimate their first impressions of one another *(It was love at first sight),* while those who have broken up *under*estimate their earlier liking *(We never really clicked)* (McFarland & Ross, 1987). When we love someone, our memory extinguishes the negative and shines a light on the positive (Cortes et al., 2018). And it explains why people asked how they felt 10 years ago about marijuana or gender issues recalled attitudes closer to their current views than to the views they had actually reported a decade earlier (Markus, 1986). In one experiment, students who chose to write an essay supporting a higher tuition policy constructed a false memory of previously supporting the policy, despite initially opposing it (Rodriguez & Strange, 2015). People tend to recall having always felt as they feel today (Mazzoni & Vannucci, 2007). As George Vaillant (1977, p. 197) noted after following adult lives through time, "It is all too common for caterpillars to become butterflies and then to maintain that in their youth they had been little butterflies. Maturation makes liars of us all."

Ask Yourself

Think of a memory you frequently recall. How might you have changed it without conscious awareness?

Children's Eyewitness Recall

LOQ 26-4

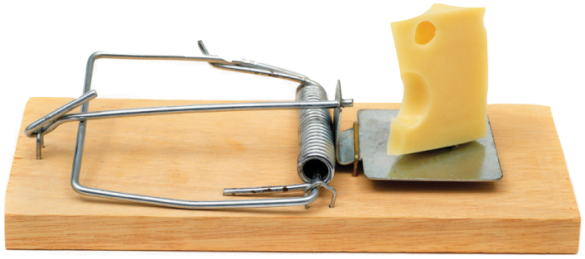
How reliable are young children's eyewitness descriptions?

If memories can be sincere, yet sincerely wrong, how can jurors decide cases in which children's memories of sexual abuse are the only evidence? "It would be truly awful to ever lose sight of the enormity of child abuse," observed Stephen Ceci (1993). Yet Ceci and Maggie Bruck's (1993, 1995) studies of children's memories made them aware of how easily children's memories can err. For example, they asked 3-year-olds to show on anatomically correct dolls where a pediatrician had touched them. Of the children who had not received genital examinations, 55 percent pointed to either genital or anal areas.

The researchers also studied the effect of suggestive interviewing techniques (Bruck & Ceci, 1999, 2004). In one experiment, children chose a card from a deck containing events that, according to their parents, had and had not happened. An adult then asked them a

question about the event on the card—for example, “Think real hard, and tell me if this ever happened to you. Can you remember going to the hospital with a mousetrap on your finger?” In subsequent interviews, the same adult repeatedly asked the children to think about the same events, both real and fictitious. After 10 weeks of this, a new adult asked the original question: “Can you remember going to the hospital with a mousetrap on your finger?” The stunning result: 58 percent of preschoolers produced false (often vivid) stories regarding one or more events they had never experienced (Ceci et al., 1994). Here’s one:

> My brother Colin was trying to get Blowtorch [an action figure] from me, and I wouldn’t let him take it from me, so he pushed me into the wood pile where the mousetrap was. And then my finger got caught in it. And then we went to the hospital, and my mommy, daddy, and Colin drove me there, to the hospital in our van, because it was far away. And the doctor put a bandage on this finger.



Darren Matthews/Alamy Stock Photo

Given such detailed stories, professional psychologists who specialize in interviewing children could not reliably separate the real memories from the false ones. Nor could the children themselves. The above child, reminded that his parents had told him several times that the mousetrap incident never happened—that he had imagined it—

protested, “But it really did happen. I remember it!” This misinformation effect is common. In one analysis of eyewitness data from over 20,000 participants, children regularly identified innocent suspects as guilty (Fitzgerald & Price, 2015). “[The] research,” said Ceci (1993), “leads me to worry about the possibility of false allegations. It is not a tribute to one’s scientific integrity to walk down the middle of the road if the data are more to one side.”

With carefully trained interviewers, however, both adults and children can be accurate eyewitnesses (Wixted et al., 2018). When questioned about their experiences in neutral words they understand, children often accurately recall what happened and who did it (Brewin & Andrews, 2017; Goodman, 2006). When interviewers have used less suggestive, more effective techniques, even 4- to 5-year-old children have produced more accurate recall (Holliday & Albon, 2004; Pipe et al., 2004). Children are especially accurate when they haven’t talked with involved adults prior to the interview, and when their disclosure was made in a first interview with a neutral person who asked nonleading questions.

“Older adults—especially those whose frontal lobe functioning has declined—are more susceptible than young adults to false memories. This makes older adults more vulnerable to scams, as when a caller falsely claims, “Remember that lottery you entered? You won $4.5 million! To process and deliver your winnings, this lottery requires you to send a $4,500 deposit” (Jacoby & Rhodes, 2006; Roediger & McDaniel, 2007).

Retrieval Practice

RP-3 What might life be like if we remembered all our waking experiences and all our dreams?

RP-4 Imagine being a jury member in a trial for a parent accused of sexual abuse based on a recovered memory. What insights from memory research should you share with the rest of the jury?

ANSWERS IN APPENDIX E

Improving Memory

LOQ 26-5

How can you use memory research findings to do better in this and other courses?

Biology's findings benefit medicine. Botany's findings benefit agriculture. So, too, can memory researchers' findings benefit education. And they can boost your performance in class and on tests. Here, for easy reference, is a summary of some research-based suggestions that can help you remember information when you need it. The SQ3R—*S*urvey, *Q*uestion, *R*ead, *R*etrieve, *R*eview—study technique used in this book incorporates several of these strategies.

Rehearse repeatedly. To thoroughly comprehend material, remember the *spacing effect*—use *distributed (spaced) practice.* To learn a concept,

give yourself many separate study sessions. Take advantage of life's little intervals—riding a bus, walking across campus, waiting for class to start. New memories are weak; if you exercise them, they will strengthen. Experts recommend retrieving a to-be-remembered item three times before you stop studying it (Miyatsu et al., 2018). Reading complex material with minimal rehearsal yields little retention. Rehearsal and critical reflection help more. As the *testing effect* has shown, it pays to study actively. Mentally saying, writing, or typing information beats silently reading it (MacLeod & Bodner, 2017). This *production effect* explains why we so often learn something best when teaching it, explaining it to ourselves, or rehearsing it out loud (Bisra et al., 2018; Forrin & Macleod, 2018; Koh et al., 2018).



DMEPhotography/iStock/Getty Images

Thinking and memory Think actively as you read, by rehearsing and relating ideas, and by making the material personally meaningful. This will yield the best retention.

The learning power of actively explaining or rehearsing information often goes unnoticed. One experiment randomly assigned students to

experience either passive lectures or active learning. The students learned more in the active classroom—but *believed* they learned less (Deslauriers et al., 2019). So you might form a study group where you can verbalize your class material and reap the rewards of social support.

> Laptop distraction? In one study of introductory psychology students in a large university course, the average student spent one-third of the class hour browsing online. More time spent online predicted poorer exam performance, even after controlling for aptitude and expressed interest (Ravizza et al., 2017).

Make the material meaningful. Space it. Rehearse it. And also personalize it. You can build a network of retrieval cues by forming as many associations as possible. Apply the concepts to your own life. Understand and organize information. Relate the material to what you already know or have experienced. As William James (1890) suggested, "Knit each new thing on to some acquisition already there." You can even try *drawing* the concept (Fernandes et al., 2018). Mindlessly repeating someone else's words without taking the time to really understand what they mean won't supply many retrieval cues. On an exam, you may find yourself stuck when a question uses phrasing different from the words you memorized.

Activate retrieval cues. Remember the importance of *context-dependent* and *state-dependent memory*. Mentally re-create the situation

and the mood in which your original learning occurred. Jog your memory by allowing one thought to cue the next.

Use mnemonic devices. Make up a story that incorporates *vivid images* of the concepts. *Chunk* information. Create a memorable mnemonic. (Did you learn Never Eat Soggy Waffles for the four directions clockwise—*n*orth, *e*ast, *s*outh, and *w*est?)

Minimize proactive and retroactive interference. Study before sleep. Do not schedule back-to-back study times for topics that are likely to interfere with each other, such as Spanish and French.

Sleep more. During sleep, the brain reorganizes and *consolidates* information for long-term memory. Sleeping more will help you remember what you've learned, and also what you're planning to do tomorrow (Cousins et al., 2021; Leong et al., 2020). Sleep deprivation disrupts this process (Frenda et al., 2014; Lo et al., 2016).

Test your own knowledge, both to rehearse it and to find out what you don't yet know. The testing effect is real, and it is powerful. Don't be lulled into overconfidence by your ability to *recognize* information. Test your *recall* using the periodic Retrieval Practice items, and the numbered Learning Objective and Module Test questions in the Review sections. Outline modules using a blank page. Define the terms and concepts listed at each module's end by yourself before turning back to their definitions. Take practice tests; the online

resources that accompany many texts, including this text, are a good source.

Ask Yourself

Which three of these study and memory strategies will be most important for you to start using to improve your own learning and retention?

Retrieval Practice

RP-5 Which memory strategies can help you study smarter and retain more information?

ANSWERS IN APPENDIX E

REVIEW

Module 26: Forgetting, Memory Construction, and Improving Memory

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the

answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 26-1: Why do we forget?

LOQ 26-2: How do misinformation, imagination, and source amnesia influence our memory construction? How do we decide whether a memory is real or false?

LOQ 26-3: Why have reports of repressed and recovered memories been so hotly debated?

LOQ 26-4: How reliable are young children's eyewitness descriptions?

LOQ 26-5: How can you use memory research findings to do better in this and other courses?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

anterograde amnesia
retrograde amnesia
proactive interference
retroactive interference
repression
reconsolidation

misinformation effect
source amnesia
déjà vu

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. When forgetting is due to encoding failure, information has not been transferred from
   a. the environment into sensory memory.
   b. sensory memory into long-term memory.
   c. long-term memory into short-term memory.
   d. short-term memory into long-term memory.

2. Ebbinghaus' forgetting curve shows that after an initial decline, memory for novel information tends to
   a. increase slightly.
   b. decrease noticeably.
   c. decrease greatly.
   d. level off.

3. You will experience less _____ (proactive/retroactive) interference if you learn new material in the hour before

sleep than you will if you learn it before turning to another subject.

4. Freud proposed that painful or unacceptable memories are blocked from consciousness through a mechanism called _____.

5. One reason false memories form is our tendency to fill in memory gaps with our reasonable guesses and assumptions, sometimes based on misleading information. This tendency is an example of
   a. proactive interference.
   b. the misinformation effect.
   c. retroactive interference.
   d. the forgetting curve.

6. Eliza's family loves to tell the story of how she "stole the show" as a 2-year-old, dancing at her aunt's wedding reception. Even though she was so young, Eliza says she can recall the event clearly. How might Eliza have formed this memory?

7. We may recognize a face at a social gathering but be unable to remember how we know that person. This is an example of _____ _____.

8. When a situation triggers the feeling that "I've been here before," you are experiencing _____ _____.

9. Children can be accurate eyewitnesses if
    a. interviewers give the children hints about what really happened.
    b. a neutral person asks nonleading questions soon after the event.
    c. the children have a chance to talk with involved adults before the interview.
    d. interviewers use precise technical and medical terms.

10. Memory researchers involved in the study of memories of abuse tend to *disagree* with some therapists about which of the following statements?
    a. Memories of events that happened before age 4 are not reliable.
    b. We tend to repress extremely upsetting memories.
    c. Memories can be emotionally upsetting.
    d. Sexual abuse happens.

CHAPTER 9
Thinking and Language (Modules 27–28)



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MODULE 27 Thinking

Concepts

Problem Solving: Strategies and Obstacles

Forming Good (and Bad) Decisions and Judgments

THINKING CRITICALLY ABOUT: The Fear Factor
Thinking Creatively
Do Other Species Share Our Cognitive Skills?
MODULE 28 Language and Thought
Language Structure
Language Acquisition and Development
The Brain and Language
Thinking and Language
Do Other Species Have Language?

Throughout history, we humans have both celebrated our wisdom and bemoaned our foolishness. Shakespeare's Hamlet extolled the human species as "noble in reason! … infinite in faculties! … in apprehension how like a god!" But the poet T. S. Eliot was struck by "the hollow men … Headpiece filled with straw." Throughout this text, we likewise marvel at both our abilities and our errors.

We study the human brain—three pounds of tissue the size of a head of lettuce, yet containing staggeringly complex circuitry. We appreciate the amazing abilities of newborns. We marvel at our visual system, which converts physical stimuli into nerve impulses, distributes them for parallel processing, and reassembles them into colorful perceptions. We ponder our memory's enormous capacity, and the ease with which our two-track mind processes information, with and without our awareness. Little wonder that our species has had the collective genius to invent the camera, the car, and the computer; to unlock the atom and modify our genetic code; to travel out to space and into our brain's depths.

Yet we also see that in some other ways, we are less than noble in reason. Our species is kin to the other animals, influenced by the same principles that produce learning in rats and pigeons. We note that we not-always-wise humans are easily deceived by perceptual illusions, misinformation, and false memories.

In Modules 27 and 28, we encounter further instances of these two aspects of the human condition—the rational and the irrational. We will first consider *thinking:* how we use—and sometimes ignore or misuse—information about the world around us (Module 27). And we will look at our gift for *language* and consider how and why it develops (Module 28). Finally, we will reflect on how deserving we are of our species name, *Homo sapiens*—"wise human."

MODULE 27: Thinking

How do we use—and sometimes ignore or misuse—information about the world around us as we solve problems, make judgments, and find creative solutions? Do other species share our cognitive skills?

Concepts

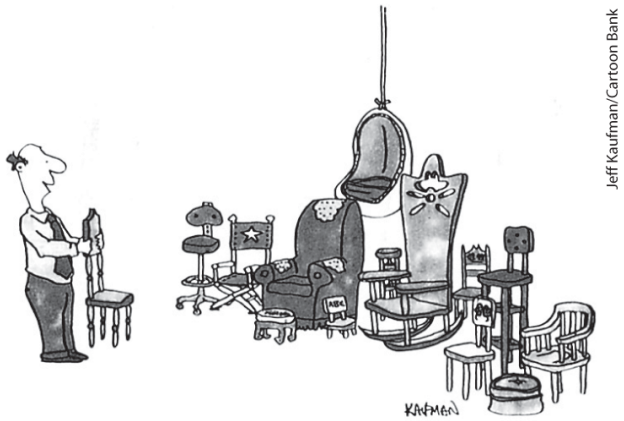
Learning Objective Question LOQ 27-1

What are *cognition* and *metacognition,* and what are the functions of concepts?

Psychologists who study **cognition** focus on the mental activities associated with thinking, knowing, remembering, and communicating information. One of these activities is **metacognition**. Metacognition is cognition about cognition, or thinking about our thinking. Students who use metacognition—who monitor and evaluate their learning—perform better academically (de Boer et al., 2018). (To improve your grades, it helps to figure out what you *don't* know. The LearningCurve adaptive quizzing available with this text can help.)

At a basic level, we form **concepts**—mental groupings of similar objects, events, ideas, or people. The concept *chair* includes many items—a baby's high chair, a reclining chair, and a dentist's chair—all

for sitting. Concepts simplify our thinking. Imagine life without them. We could not ask a child to "throw the ball" because there would be no concept of *throw* or *ball.* We could not say "I want to earn money" because people aren't born with a concept of *earn* or *money.* Concepts, such as *ball* and *money,* give us much information with little cognitive effort.



Jeff Kaufman/Cartoon Bank

"Attention, everyone! I'd like to introduce the newest member of our family."

We often form our concepts by developing a **prototype**—a mental image or best example of a category (Rosch, 1978). People more quickly agree that "a crow is a bird" than that "a penguin is a bird." For most of us, the crow is the birdier bird; it more closely resembles our *bird* prototype. When something closely matches our prototype of a concept, we more readily recognize it as an example of the concept.

When we categorize people, we mentally shift them toward our category prototypes. Such was the experience of Belgian students who viewed ethnically blended faces. When viewing a blended face in which 70 percent of the features were prototypically White and 30

percent were Asian, the students categorized the face as White (FIGURE 27.1). Later, as their memory shifted toward the White prototype, they were more likely to remember an 80 percent White face than the 70 percent White face they had actually seen (Corneille et al., 2004). Likewise, if shown a 70 percent Asian face, they later remembered a more prototypically Asian face. So, too, with gender: People who viewed 70 percent male faces later misremembered them as even more prototypically male (Huart et al., 2005).



FIGURE 27.1 Categorizing faces influences recollection Shown a face that was 70 percent White, people tended to classify the person as White and to recollect the face as more White than it was. (Re-creation of experiment courtesy of Olivier Corneille.)

Move away from our prototypes, and category boundaries may blur. Is a tomato a fruit? Is a 17-year-old a girl or a woman? Is a whale a fish or a mammal? Because a whale fails to match our *mammal* prototype, we are slower to recognize it as a mammal. Similarly, when symptoms don't fit one of our disease prototypes, we are slow to perceive an illness (Bishop, 1991). People whose heart attack symptoms (shortness of breath, exhaustion, a dull weight in the chest) don't match their *heart attack* prototype (sharp chest pain) may not seek help. And when behaviors don't fit our *discrimination* prototypes, of White against

Black, men against women, young against old, we often fail to notice prejudice. People more easily detect men's prejudice against women than women's prejudice against men or women's prejudice against other women (Cunningham et al., 2009; Inman & Baron, 1996). Although concepts speed and guide our thinking, they don't always make us wise.

Problem Solving: Strategies and Obstacles

LOQ 27-2

What cognitive strategies assist our problem solving, and what obstacles hinder it?

One tribute to our rationality is our problem-solving skill. What's the best route around this traffic jam? How should we handle a friend's criticism? How, without our keys, can we get into the house?

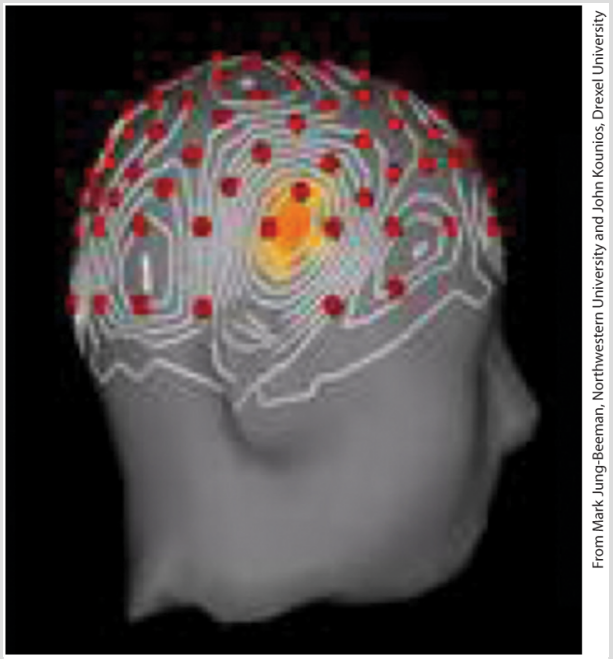
Some problems we solve through *trial and error.* Thomas Edison tried thousands of light bulb filaments before stumbling upon one that worked. For other problems, we use **algorithms**, step-by-step procedures that guarantee a solution. But step-by-step algorithms can be laborious and exasperating. To find a word using the 10 letters in *SPLOYOCHYG,* for example, you could try each letter in each of the 10 positions—907,200 permutations in all. Rather than give you a computing brain the size of a beach ball, nature resorts to **heuristics**,

simpler thinking strategies. Thus, you might reduce the number of options in the *SPLOYOCHYG* example by grouping letters that often appear together (*CH* and *GY*) and excluding rare letter combinations (such as *YY*). By using heuristics and then applying trial and error, you may hit on the answer. Have you guessed it?[1]

Sometimes, we puzzle over a problem and the pieces suddenly fall together in a flash of **insight**—an abrupt, true-seeming, and often satisfying solution (Topolinski & Reber, 2010; Webb et al., 2019). Ten-year-old Johnny Appleton had one of these Aha! moments and solved a problem that had stumped construction workers: how to rescue a young robin from a narrow 30-inch-deep hole in a cement-block wall. The child's solution: Slowly pour in sand, giving the bird enough time to keep its feet on top of the constantly rising pile (Ruchlis, 1990). Insights aren't always perfect, but they often lead to correct solutions (Danek & Salvi, 2020).

What happens in the brain when people experience an Aha! moment? Brain scans show bursts of activity associated with sudden flashes of insight (Kounios & Beeman, 2014). In one study, researchers asked people to think of a word that forms a compound word or phrase with each of three other words in a set (such as *pine, crab,* and *sauce*) and to press a button to sound a bell when they knew the answer. (Need a hint? The word is a fruit.[2]) A sudden Aha! insight led to about half the solutions. Before the Aha! moment, the problem solvers' frontal lobes (involved in focusing attention) were active. At the instant of

discovery, there was a burst of activity in the right temporal lobe, just above the ear (**FIGURE 27.2**).



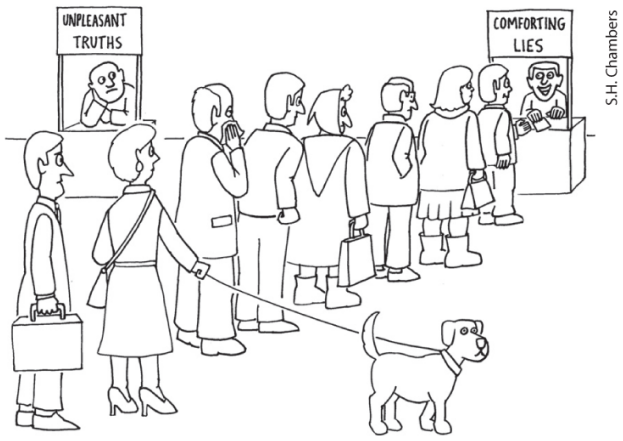
From Mark Jung-Beeman, Northwestern University and John Kounios, Drexel University

FIGURE 27.2 The Aha! moment A burst of right temporal lobe activity accompanied insight solutions to word problems (Jung-Beeman et al., 2004). The red dots designate EEG electrodes. The light gray lines show the distribution of high-frequency activity accompanying insight. The insight-related activity is centered in the right temporal lobe (yellow area).

Insight often strikes suddenly, creating a happy sense of satisfaction (Knoblich & Oellinger, 2006; Metcalfe, 1986). When the answer pops into mind *(apple!),* we feel a happy sense of satisfaction. The joy of a joke may similarly lie in our sudden comprehension of an unexpected ending or a double meaning (as "aha" becomes "ha ha"): "When a

clock is hungry, it goes back 4 seconds" or "The only thing flat-earthers fear is sphere itself." The grim reaper also strikes with a surprise ending: "You don't need a parachute to skydive. You only need a parachute to skydive twice."

Insightful as we are, other cognitive tendencies may lead us astray. We seek news that not only informs us but also affirms us. **Confirmation bias**, for example, leads us to seek evidence *for* our ideas more eagerly than we seek evidence *against* them (Klayman & Ha, 1987; Skov & Sherman, 1986). In a classic study, Peter Wason (1960) gave British university students a set of three numbers *(2-4-6)* and told them the series was based on a rule. Their task was to guess the rule. (It was simple: any three ascending numbers.) Before submitting answers, students generated their own three-number sets, and Wason told them whether their sets conformed to his rule. Once *certain* they had the rule, they could announce it. The result? Most students formed a wrong idea *("Maybe it's counting by twos")* and then searched *only* for confirming evidence (by testing *6-8-10, 100-102-104,* and so forth). Seldom right but never in doubt.



> **"The human understanding, when any proposition has been once laid down … forces everything else to add fresh support and confirmation."** — Francis Bacon, *Novum Organum,* 1620

In real life, having formed a belief—that people can (or cannot) change their sexual orientation, that gun control fails (or does not fail) to save lives—we prefer information that supports our belief. And once we get hung up on an incorrect view of a problem, it's hard to approach it from a different angle. This obstacle to problem solving is called **fixation**, an inability to come to a fresh perspective. See if fixation prevents you from solving the matchstick problem in **FIGURE 27.3**. (For the solution, see **FIGURE 27.4**.)

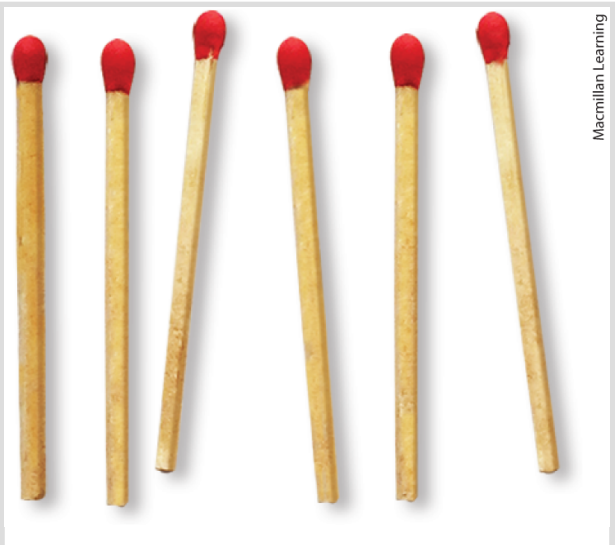


FIGURE 27.3 The matchstick problem How would you arrange six matches to form four equilateral triangles?

A prime example of fixation is **mental set**, our tendency to approach a problem with the mindset of what has worked for us previously. Indeed, solutions that worked in the past often do work on new problems. Consider:

Given the sequence *O-T-T-F-?-?-?,* what are the final three letters?

Most people have difficulty recognizing that the three final letters are *F*(ive), *S*(ix), and *S*(even). But solving this problem may make the next one easier:

Given the sequence *J-F-M-A-?-?-?,* what are the final three letters? (If you don't get this one, ask yourself what month it is.)

As a *perceptual set* predisposes what we perceive, a mental set predisposes how we think. Sometimes this can be an obstacle to problem solving, as when our mental set from our past experiences with matchsticks predisposes us to arrange them in two dimensions.

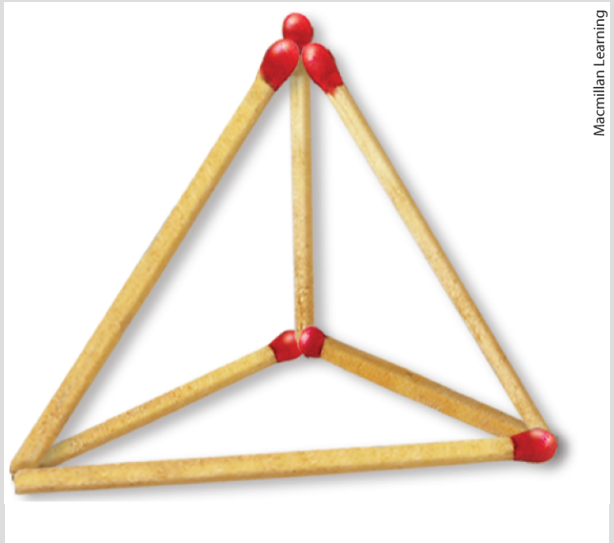


FIGURE 27.4 Solution to the matchstick problem To solve this problem, you must view it from a new perspective, breaking the fixation of limiting solutions to two dimensions.

Forming Good (and Bad) Decisions and Judgments

LOQ 27-3

What is *intuition,* and how can the representativeness and availability heuristics influence our decisions and judgments?

When making each day's hundreds of judgments and decisions *(Should I take a jacket? Can I trust this person? Is that a friendly dog?)*, we seldom take the time and effort to reason systematically. We follow our **intuition**, our fast, automatic, unreasoned feelings and thoughts. After interviewing policy makers in government, business, and education, social psychologist Irving Janis (1986) concluded that they "often do not use a reflective problem-solving approach. How do they usually arrive at their decisions? If you ask, they are likely to tell you … they do it mostly by the *seat of their pants.*"

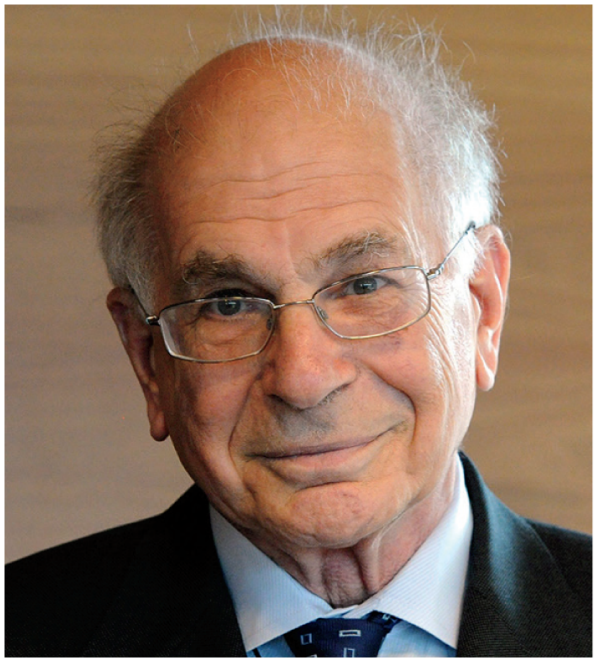
Two Quick But Risky Shortcuts

When we need to make snap judgments, *heuristics* enable quick thinking that often serves us well (Gigerenzer, 2015). But as cognitive psychologists Amos Tversky and Daniel Kahneman (1974) showed, some intuitive mental shortcuts—the *representativeness* and *availability heuristics*—can lead even the smartest people into dumb decisions.



Macmillan Learning

> "In creating these problems, we didn't set out to fool people. All our problems fooled us, too." — Amos Tversky (1985)



Carsten Rehder/KIEL/European Pressphoto Agency/Newscom

"Intuitive thinking [is] fine most of the time …. But sometimes that habit of mind gets us in trouble." — Daniel Kahneman (2005)

Few would have predicted Tversky and Kahneman's becoming friends and collaborators (Lewis, 2016; Sunstein & Thaler, 2016). When they met, Tversky was a war hero with a confident swagger who studied decision making; Kahneman was a chronic worrier who studied vision. Setting aside their differences, Tversky and Kahneman would sequester themselves in a small seminar room, where they argued, laughed, and ultimately changed the way that people view thinking and decision making (Dean & Ortoleva, 2019). Their joint efforts earned the ultimate award: a 2002 Nobel Prize. (Sadly, only Kahneman was alive to receive the honor.) As Kahneman wrote in a vignette for my [DM's] *Social Psychology* text, "Amos and I shared the wonder of

together owning a goose that could lay golden eggs—a joint mind that was better than our separate minds."

The Representativeness Heuristic

To judge the likelihood of something by intuitively comparing it to particular prototypes is to use the **representativeness heuristic**. Imagine someone who is short, slim, and likes to read poetry. Is this person more likely to be an Ivy League university English professor or a truck driver (Nisbett & Ross, 1980)?

Many people guess English professor—because the person better fits their prototype of professor than of truck driver. In doing so, they fail to consider the *base rate* number of Ivy League English professors (fewer than 400) and truck drivers (3.5 million in the United States alone). Instead, they recall situations that confirm their professor prototype (Bordalo et al., 2021). Thus, even if the description is 50 times more typical of English professors than of truck drivers, the fact that there are about 7000 times more truck drivers means that the poetry reader is many times more likely to be a truck driver.

Some prototypes have social consequences. One mother of two Black and three White teens asked other parents: "Do store personnel follow your children when they are picking out their Gatorade flavors? They didn't follow my White kids …. When your kids trick-or-treat dressed as a ninja and a clown, do they get asked who they are with and where they live, door after door? My White kids didn't get asked" (Roper, 2016). If people have a prototype—a *stereotype*—of delinquent Black

teens—they may unconsciously use the representativeness heuristic when judging individuals. The result is racial bias.

> **"Kahneman and his colleagues and students have changed the way we think about the way people think."** — American Psychological Association President Sharon Brehm, 2007

The Availability Heuristic

The **availability heuristic** operates when we evaluate the commonality of an event *based on its mental availability*. Anything that makes information pop into mind—its vividness, recency, or distinctiveness—can make it seem commonplace. Exceptional happenings may, therefore, seem typical. Watching a horrific terrorist beheading online implants a fear of global terrorism that lingers for 2 or more years (Redmond et al., 2019). Sometimes photos—say, of terrified children separated from their parents at the U.S. border, or of the mother of seven children being appointed to the U.S. Supreme Court—can change thinking for years. As climate change has become more vividly associated with extreme weather—fires, floods, and hurricanes—public concern has risen. For worse or for better, the incidents that we see often overwhelm the larger realities we don't see.

The availability heuristic distorts our judgments of risks. Nonstop news coverage of the dangerous Covid-19 pandemic distorted young people's judgments of how Covid-19 might affect them. Asked whether

they were worried about their health during the Covid-19 pandemic, younger (ages 18 to 29) respondents reported equal levels of worry as older respondents (ages 65 and older) (Rothwell, 2020). Yet Americans aged 18 to 29 were 180 times *less* likely to die from Covid-19 than were Americans aged 65 and older (CDC, 2021). (Younger adults were nonetheless well advised to protect themselves from contracting and spreading the virus to others.)

The bottom line: We often fear the wrong things (see Thinking Critically About: The Fear Factor).

LOQ 27-4

What factors exaggerate our fear of unlikely events?

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Thinking Critically About:

The Fear Factor



Many people fear flying more than driving.

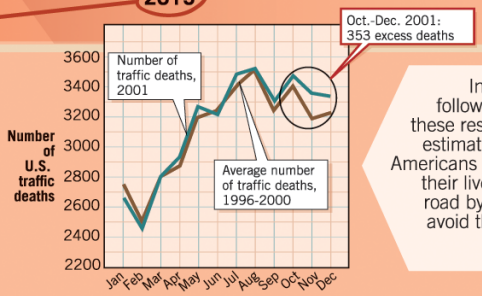
2002

2019

HOWEVER:
Per mile traveled, people in the U.S. are 1623 times more likely to die in a vehicle accident than on a scheduled flight.[1]

From 2002 to 2019, for example,
484,100
people died in U.S. car, light truck, heavy truck, and bus accidents, and
154
died on scheduled U.S. airline flights.

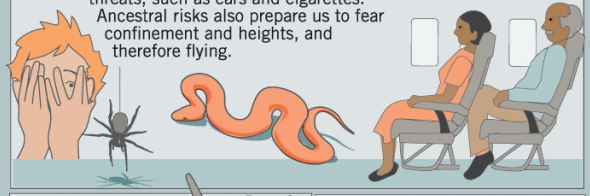
In the three months after 9/11, **FEAR OF FLYING** led more Americans to travel by car, and some to die:[2]



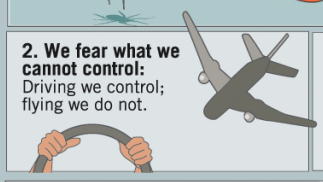
In the year following 9/11, these researchers estimated, 1500 Americans had "lost their lives on the road by trying to avoid the risk of flying."

WHY DO WE FEAR THE WRONG THINGS?

1. We fear what our ancestral history has prepared us to fear: Snakes, lizards, and spiders combined now kill a tiny fraction of the number killed by modern-day threats, such as cars and cigarettes. Ancestral risks also prepare us to fear confinement and heights, and therefore flying.



2. We fear what we cannot control: Driving we control; flying we do not.



3. We fear what is immediate: Dangers of flying are mostly in the moments of takeoff and landing. Dangers of driving are spread across many moments, each trivially dangerous.

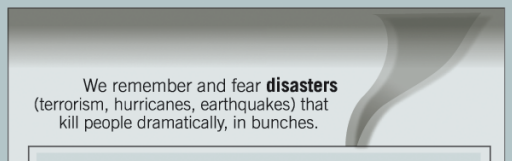
4. Thanks to the availability heuristic, we fear what is most readily available in memory: Vivid images of horrific airline crashes feed our judgments of risk. People may fear sharks more than cigarettes or the effects of an unhealthy diet.[3]



"Vivid image!"



"Harder to visualize"



We remember and fear **disasters** (terrorism, hurricanes, earthquakes) that kill people dramatically, in bunches.

We fear too little the **less dramatic and ongoing threats** that claim lives one by one:

- Each year, guns kill nearly 40,000 Americans — in homicides, suicides, and accidents.[4] Yet renewed calls for U.S. gun control tend to follow the well-publicized, mass shootings.



- Worldwide, 500,000 children die each year from diarrhea, with tragically little notice.



"If it's in the news, don't worry about it. The very definition of news is 'something that hardly ever happens.'"[5]

1. National Safety Council, 2023; National Highway Traffic Safety Administration, 2021. 2. Gaissmaier & Gigerenzer, 2012; Gigerenzer, 2004, 2006. 3. Daley, 2011. 4. USA Facts, 2021. 5. Schneider, 2007.

"Don't believe everything you think." — Bumper sticker

The lack of available images of a *future* climate change disaster—a climate crisis described by scientists as "Armageddon in slow motion"—has left some people unconcerned. Moreover, climate beliefs can shift with the day's hot or cold weather, which, though more cognitively available, tells us zilch about long-term planetary trends (Egan & Mullin, 2012; Kaufmann et al., 2017; Zaval et al., 2014). As Stephen Colbert (2014) tweeted, "Global warming isn't real because it was cold today! Also great news: World hunger is over because I just ate."



Emily Flake/Cartoon Stock

"Don't let this beautiful weather fool you into thinking everything's fine."

To offer a vivid depiction of climate crisis, Cal Tech scientists created and continue to update an interactive map of global temperatures since 1884 (see tinyurl.com/TempChange).

Over 40 nations have sought to harness the positive power of vivid, memorable images by putting eye-catching warnings and graphic photos on cigarette packages (Riordan, 2013). This campaign has worked because we reason emotionally (Huang et al., 2013). In 2015, a viral photo of a Syrian child lying dead on a beach had massive impact. Red Cross donations to Syrian refugees were 55 times greater in response to that photo than in response to "psychically numbing" statistics describing the hundreds of thousands of other refugee deaths (Slovic et al., 2017). Dramatic incidents make us gasp ("four deaths!"); probabilities we barely grasp ("per million"). It's so easy to scare people with a horrific happening and then harder to unscare them with representative data.

Ask Yourself

How has your family managed risk related to Covid-19? Have some of your fears been excessive, or have you not feared enough? How have heuristics influenced your thinking?

Retrieval Practice

RP-1 Why can news be described as "something that hardly ever happens"? How does knowing this help us assess our fears?

ANSWERS IN APPENDIX E

Overconfidence

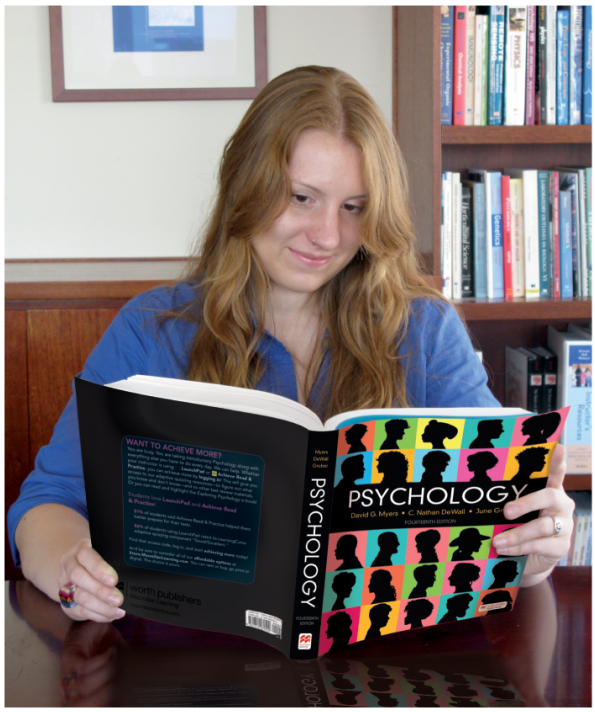
LOQ 27-5

How are our decisions and judgments affected by overconfidence, belief perseverance, and framing?

Sometimes we are more confident than correct. When answering factual questions, such as "Is absinthe a liqueur or a precious stone?" only 60 percent of people in one study answered correctly. (It's a licorice-flavored liqueur.) Yet those answering felt, on average, 75 percent confident (Fischhoff et al., 1977). This tendency to overestimate the accuracy of our knowledge and judgments is **overconfidence**.

It is overconfidence that drives stockbrokers and investment managers to market their ability to outperform stock market averages—which, as a group, they cannot do (Malkiel, 2016). And it is overconfidence that so often leads us to succumb to a *planning fallacy* (Zauberman & Lynch, 2005). Students and others often expect to finish

assignments ahead of schedule (Buehler et al., 1994, 2002). In fact, such projects generally take about twice the predicted time. Anticipating how much more time we will have next month, we happily accept invitations. And believing we'll surely have more money next year, we take out loans or buy on credit.



Bianca Moscatelli/Macmillan Learning

Predict your own behavior When will you finish reading this module?

"Hofstadter's Law: It always takes longer than you expect, even when you take into account Hofstadter's Law." — Douglas Hofstadter, *Gödel, Escher, Bach: The Eternal Golden Braid,* 1979

Overconfidence—the bias that Kahneman (2015), if given a magic wand, would most like to eliminate—affects life-or-death decisions. History is full of leaders who, when faced with potential war, were more confident than correct. On December 4, 1941, U.S. Secretary of the Navy Frank Knox said, "Whatever happens, the U.S. Navy is not going to be caught napping" (Warren, 2019). Three days later, the Japanese attacked Pearl Harbor, killing more than 2300 U.S. service members. In politics, overconfidence feeds extreme political views. In medicine, overconfidence can lead to incorrect diagnoses (Saposnik et al., 2016). One research team tested 743 U.S. federal intelligence analysts' ability to predict future events—predictions that typically are overconfident. Those whose predictions most often failed tended to be inflexible and closed-minded (Mellers et al., 2015).



Jason Adam Katzenstein/Cartoon Stock

"Let me interrupt your expertise with my confidence."

Nevertheless, overconfidence sometimes has adaptive value. Believing that their decisions are right and they have time to spare, self-confident people tend to live more happily. They make tough decisions more easily, and they seem competent (Anderson et al.,

2012). Given prompt and clear feedback, we can also learn to be more realistic about the accuracy of our judgments (Fischhoff, 1982). The wisdom to know when we know a thing and when we do not is born of experience.

> **"When you know a thing, to hold that you know it; and when you do not know a thing, to allow that you do not know it; this is knowledge."** — Confucius (551–479 B.C.E.), *Analects*

Belief Perseverance

Our overconfidence is startling. Equally so is our **belief perseverance**—our tendency to stick to our beliefs, even when faced with evidence that disproves them. A classic study of belief perseverance engaged people with opposing views of capital punishment (Lord et al., 1979). After studying two supposedly new research findings, one supporting and the other refuting the claim that the death penalty deters crime, each side was more impressed by the study supporting its own beliefs. And each readily disputed the other study. Thus, showing the pro- and anti-capital-punishment groups the *same* mixed evidence actually *increased* their disagreement. Rather than using evidence to draw conclusions, they used their conclusions to assess evidence—a phenomenon also known as *motivated reasoning*.

In other studies and in everyday life, people have similarly welcomed belief-supportive logic and evidence—about climate change, same-sex

marriage, or politics—while discounting challenging evidence (Friesen et al., 2015; Gampe et al., 2019; Sunstein et al., 2016). Often, prejudice persists. Beliefs persevere. It's hard to teach old dogma new tricks.

To rein in belief perseverance, a simple remedy exists: *Consider the opposite.* When the same researchers repeated the capital-punishment study, they asked some participants to be "as *objective* and *unbiased* as possible" (Lord et al., 1984). The plea did nothing to reduce biased evaluations of evidence. They also asked another group to consider "whether you would have made the same high or low evaluations had exactly the same study produced results on the *other* side of the issue." Having imagined and pondered *opposite* findings, these people became much less biased. Newer studies confirm the point: Considering opposing arguments reduces bias (Catapano et al., 2019; Van Boven et al., 2019).

Once beliefs take root, it takes more compelling evidence to change them than it did to create them. We often label evidence that contradicts our beliefs as "weak" (Anglin, 2019). Climate change skeptics, for example, tend to view evidence of the climate crisis as inaccurate or untrustworthy (Druckman & McGrath, 2019). As an old Chinese proverb says, "Two-thirds of what we see is behind our eyes."



Ellis Rosen/Cartoon Stock

"And in this corner, still undefeated,
Frank's long-held beliefs!"

The Effects of Framing

Framing—the way we present an issue—can be a powerful tool of persuasion for good or ill, as psychologists and economists have together learned. Long before the Covid-19 pandemic, Tversky and Kahneman (1981) asked people to consider a scenario: How should the United States prepare for the outbreak of an unusual disease that could kill 600 people? Participants strongly preferred solutions framed as *gains* ("200 people will be saved") rather than *losses* ("400 people will die.").

As a young scholar, behavioral economist Richard Thaler worked closely with cognitive psychologists Tversky and Kahneman. Thaler and others have shown how the framing of options can **nudge** people

toward beneficial decisions (Benartzi et al., 2017; Daniels & Zlatev, 2019; Thaler & Sunstein, 2008).

- ***Healthier eating.*** Knowing that many people prefer tasty to healthy foods, researchers have nudged healthy choices with tasty-sounding food labels. The university dining hall turnips got chosen more when labeled "Herb n' Honey Balsamic Glazed Turnips" (Turnwald et al., 2019).
- ***Making moral decisions.*** Imagine an experimenter gives you $5.00 and asks how much (if any) you want to donate to charity, then asks, "What do you personally think is the morally right thing to do in this situation?" Researchers did just that and found that nudging people to take a moral mindset made them more generous, increasing donations by 44 percent (Capraro et al., 2019).
- ***Becoming an organ donor.*** In many countries, people renewing their driver's license can decide whether to be organ donors. Sometimes, the default option is *Yes,* but people can opt out. Nearly 100 percent of the people in opt-out countries have agreed to be donors. In countries where the default option is *No,* most do *not* agree to be donors (Hajhosseini et al., 2013; Johnson & Goldstein, 2003). One way or the other, the default option nudges people's organ donation choices.

The point to remember: Framing can nudge our attitudes and decisions.

The Perils and Powers of Intuition

LOQ 27-6

How do smart thinkers use intuition?

It's clear that very smart people can make not-so-smart judgments. So, are our heads indeed "filled with straw," as T. S. Eliot suggested? Good news: Cognitive scientists are also revealing intuition's powers.

- ***Intuition is recognition born of experience.*** It is implicit (unconscious) knowledge—what we've recorded in our brains but can't fully explain (Chassy & Gobet, 2011; Gore & Sadler-Smith, 2011). We see it in the smart and quick judgments of experienced nurses, firefighters, art critics, car mechanics, and athletes who react *without thinking*. Indeed, conscious thinking may disrupt well-practiced movements, leading skilled athletes to choke under pressure, as when shooting free throws (Beilock, 2010). And we would see this instant intuition in you, too, for anything in which you have developed knowledge based on experience.
- ***Intuition is usually adaptive.*** Our fast and frugal heuristics let us intuitively rely on learned associations that surface as gut feelings, right or wrong: Seeing a stranger who resembles someone who has harmed or threatened us previously, we may automatically react with distrust. Our intuition aids our survival, and it can also steer us toward more satisfying relationships: Newlyweds' implicit, gut-level attitudes toward their new spouse

predict their future marital happiness (McNulty et al., 2017). Smart thinking often means having smart intuitions (Raoelison et al., 2020).

- ***Intuition is huge.*** Unconscious, automatic influences constantly affect our judgments (Custers & Aarts, 2010; Kihlstrom, 2019). Consider: Most people guess that the more complex the choice, the smarter it is to make decisions rationally rather than intuitively (Inbar et al., 2010). Actually, in making complex decisions, we sometimes benefit by letting our brain work on a problem without consciously thinking about it (Strick et al., 2010, 2011). In one series of experiments, three groups of people read complex information (for example, about apartments or European football matches). Those in the first group stated their preference immediately after reading information about four possible options. The second group, given several minutes to analyze the information, made slightly smarter decisions. But wisest of all, in several studies, were those in the third group, whose attention was distracted for a time, enabling their minds to engage in automatic, unconscious processing of the complex information. The practical lesson: Letting a problem incubate while we attend to other things can pay dividends (Dijksterhuis & Strick, 2016). Facing a difficult decision involving a lot of facts, we're wise to gather all the information we can and then say, "Give me some time to *not* think about this." Even sleeping on it can help. Thanks to our ever-active brain, nonconscious thinking (reasoning, problem solving, decision making, planning) can be

surprisingly astute (Creswell et al., 2013; Hassin, 2013; Lin & Murray, 2015).

> **"The heart has its reasons which reason does not know."** — Blaise Pascal, *Pensées,* 1670

Critics note that some studies have not found the supposed power of unconscious thought, and they remind us that deliberate, conscious thought also furthers smart thinking (Newell, 2015; Nieuwenstein et al., 2015; Phillips et al., 2016). In challenging situations—making the best chess move, distinguishing between false and real news headlines—deliberate thinking beats instant intuition (Bago et al., 2020; Moxley et al., 2012).

Consider:

1. A bat and a ball together cost 110 cents. The bat costs 100 cents more than the ball. How much does the ball cost?
2. Emily's father has three daughters. The first two are named April and May. What is the third daughter's name?

Most people's intuitive responses—10 cents and June—are wrong, and a few moments of deliberate thinking reveals why.[3]

The bottom line: Our two-track mind makes sweet harmony as smart, critical thinking listens to the creative whispers of our vast unseen

mind and then evaluates evidence, tests conclusions, and plans for the future.

Ask Yourself

Can you recall a time when contradictory information challenged one of your views? Was it hard for you to consider the opposite view? What caused you to change your thinking or keep your opinion?

Thinking Creatively

LOQ 27-7

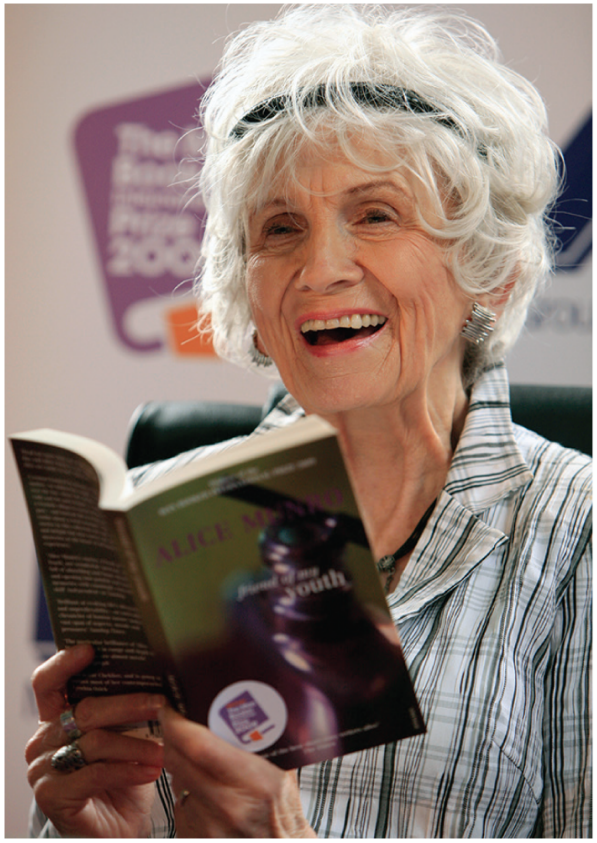
What is *creativity,* and what fosters it?

Creativity is the ability to produce novel and valuable ideas (Hennessey & Amabile, 2010). Consider Princeton mathematician Andrew Wiles' incredible, creative moment. *Fermat's last theorem* (dreamed up by seventeenth-century mischievous genius Pierre de Fermat) had baffled the greatest mathematical minds for centuries—even after a $2 million prize (in today's dollars) for the first proof was offered in 1908.

Wiles had pondered Fermat's theorem for more than 30 years. One morning, out of the blue, the final "incredible revelation" struck him. "It was so indescribably beautiful; it was so simple and so elegant. I

couldn't understand how I'd missed it …. It was the most important moment of my working life" (Singh, 1997, p. 25). Likewise, creative writers and physicists experience many significant ideas, unbidden, during mind wandering (Gable et al., 2019). (Perhaps, you can recall such an experience?)

Creativity is supported by a certain level of *aptitude* (ability to learn). Those who score exceptionally high in quantitative aptitude as 13-year-olds, for example, are later more likely to create published or patented work (Bernstein et al., 2019; Lubinski et al., 2014). Yet there is more to creativity than aptitude, or what intelligence tests reveal. Indeed, brain activity associated with intelligence differs from that associated with creativity (Jung & Haier, 2013; Shen et al., 2017).



PETER MUHLY/Getty Images

Creative women Researcher Sally Reis (2001) found that notably creative women were typically "intelligent, hardworking, imaginative, and strong willed" as girls. In her 2013 Nobel Prize for Literature acceptance speech, author Alice Munro, shown here, described the creative process as hard work: "The part that's hardest is when you go over the story and realize how bad it is. You know, the first part, excitement, the second, pretty good, but then you pick it up one morning and you think, 'what nonsense,' and that is when you really have to get to work."

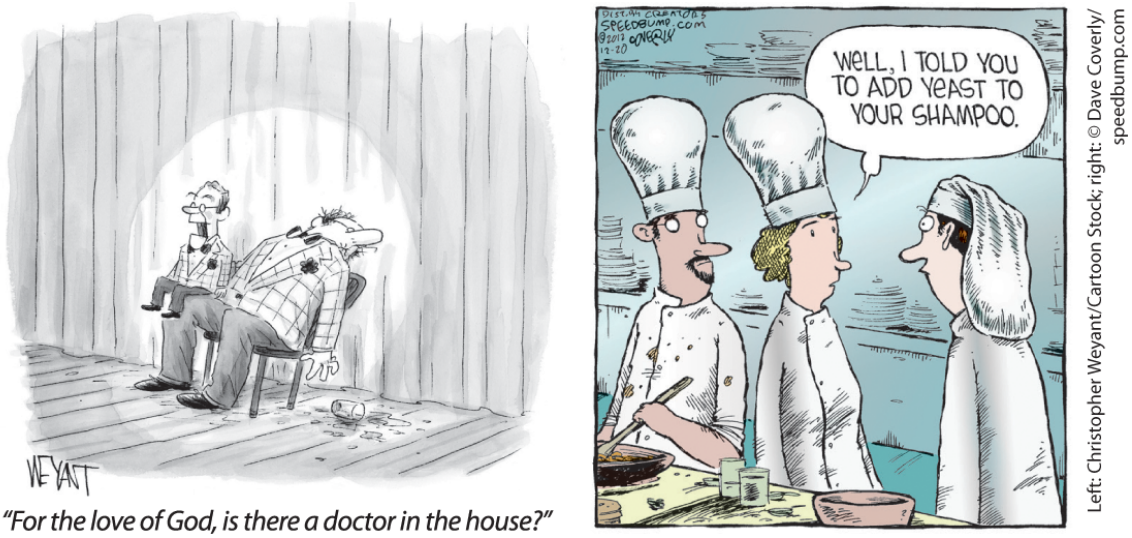
Aptitude tests (such as the SAT) typically require **convergent thinking** —an ability to provide a single correct answer. Creativity tests *(How*

many uses can you think of for a brick?) require **divergent thinking**—the ability to consider many different options and to think in novel ways. Injury to certain areas of the frontal lobes can leave reading, writing, and arithmetic skills intact but destroy imagination (Kolb & Whishaw, 2006).

Robert Sternberg and his colleagues believe creativity has five components (Sternberg, 1988, 2003; Sternberg & Lubart, 1991, 1992):

1. ***Expertise—***well-developed knowledge—furnishes the ideas, images, and phrases, we use as mental building blocks. "Chance favors only the prepared mind" observed Louis Pasteur. The longer we work on a problem, the more creative are our solutions (Lucas & Nordgren, 2020).
2. ***Imaginative thinking skills*** provide the ability to see things in novel ways, to recognize patterns, and to make connections. Having fully understood a problem's basic elements, we can redefine or explore it in a new way.
3. ***A venturesome personality*** seeks new experiences, tolerates ambiguity and risk, and perseveres in overcoming obstacles.
4. ***Intrinsic motivation*** is the quality of being driven more by interest, satisfaction, and challenge than by external pressures (Amabile & Hennessey, 1992). Creative people focus less on extrinsic motivators—meeting deadlines, impressing people, or making money—than on the pleasure and stimulation of the work itself.

5. ***A creative environment*** sparks, supports, and refines creative ideas. Wiles stood on the shoulders of others and collaborated with a former student. A study of the careers of 2026 prominent scientists and inventors revealed that the most eminent were mentored, challenged, and supported by their colleagues (Simonton, 1992). Creativity-fostering environments support innovation, team building, and communication (Hülsheger et al., 2009). They also minimize anxiety and foster contemplation (Byron & Khazanchi, 2011).



Imaginative thinking Cartoonists often display creativity as they see things in new ways or make unusual connections.

For those seeking to boost the creative process, research offers some ideas:

- ***Develop your expertise.*** Ask yourself what you care about and most enjoy. Follow your passion by broadening your knowledge base and becoming an expert at something.
- ***Allow time for incubation.*** Think hard on a problem, but then set it aside and come back to it later. Periods of inattention to a problem ("sleeping on it") allow for automatic processing to form associations (Zhong et al., 2008).
- ***Set aside time for the mind to roam freely.*** Creativity springs from "defocused attention" (Simonton, 2012a,b). So, detach from attention-grabbing TV shows, social media, and video gaming. Jog, go for a long walk, or meditate. Serenity seeds spontaneity. "Time alone is … the font of creativity," says playwright and musician Lin-Manuel Miranda (Hainey, 2016).
- ***Experience other cultures and ways of thinking.*** Viewing life from a different perspective sometimes sets the creative juices flowing. Students who spend time in other cultures learn how to blend new norms with those from their home culture, which increases creativity (Godart et al., 2015; Lu et al., 2018). Even getting out of your neighborhood or embracing intercultural friendships fosters flexible thinking (Kim et al., 2013; Ritter et al., 2012).

For a summary of some key ideas from this section, see **TABLE 27.1**.

TABLE 27.1 Comparing Cognitive Processes and Strategies

Process or Strategy	Description	Powers	Perils

Algorithm	Methodical rule or procedure	Guarantees solution	Requires time and effort
Heuristic	Simple thinking shortcut, such as the availability heuristic (which estimates likelihood based on how easily events come to mind)	Lets us act quickly and efficiently	Puts us at risk for errors
Insight	Sudden Aha! reaction	Provides instant realization of solution	May not happen
Confirmation bias	Tendency to search for support for our own views and ignore contradictory evidence	Lets us quickly recognize supporting evidence	Hinders recognition of contradictory evidence
Fixation	Inability to view problems from a new angle	Focuses thinking	Hinders creative problem solving
Intuition	Fast, automatic feelings and thoughts	Is based on our experience; huge and adaptive	Can lead us to overfeel and underthink
Overconfidence	Overestimating the accuracy of our beliefs and judgments	Allows us to live more happily and to make decisions easily	Puts us at risk for errors
Belief perseverance	Ignoring evidence that contradicts our beliefs	Supports our enduring beliefs	Closes our mind to new ideas
Framing	Wording a question or statement so that it evokes a desired response	Can influence others' decisions	Can produce a misleading result

Creativity	Ability to innovate valuable ideas	Produces new insights and products	May distract from structured, routine work

Retrieval Practice

RP-2 Match the process or strategy listed below (i–xi) with its description (a–k).

i. Algorithm	a. Inability to view problems from a new angle; focuses thinking but hinders creative problem solving
ii. Intuition	b. Methodological rule or procedure that guarantees a solution but requires time and effort
iii. Insight	c. Your fast, automatic, effortless feelings, and thoughts based on your experience; huge and adaptive but can lead you to overfeel and underthink
iv. Heuristic	d. Simple thinking shortcut that lets you act quickly and efficiently but puts you at risk for errors
v. Fixation	e. Sudden Aha! reaction that instantly reveals the solution
vi. Confirmation bias	f. Tendency to search for support for your own views and to ignore contradictory evidence
vii. Overconfidence	g. Holding on to your beliefs even after they are proven wrong; closing your mind to new ideas
viii. Creativity	h. Overestimating the accuracy of your beliefs and judgments; allows you to be happier and to make decisions more easily but puts you at risk for errors
ix. Framing	i. Wording a question or statement so that it evokes a desired response; can mislead people and influence

	their decisions
x. Belief perseverance	j. The ability to produce novel and valuable ideas
xi. Nudge	k. Framing choices to encourage certain decisions

ANSWERS IN APPENDIX E

Do Other Species Share Our Cognitive Skills?

LOQ 27-8

What do we know about thinking in other species?

Other animals are surprisingly smart (de Waal, 2016). In her 1908 book, *The Animal Mind,* pioneering psychologist Margaret Floy Washburn argued that animal consciousness and intelligence can be inferred from their behavior. In 2012, neuroscientists convening at the University of Cambridge added that animal consciousness can also be inferred from their brains: "Nonhuman animals, including all mammals and birds," possess the neural networks "that generate consciousness" (Herculano-Houzel, 2020). Consider, then, what animal brains can do.

Using Concepts and Numbers

By touching screens in quest of a food reward, black bears have learned to sort pictures into animal and nonanimal categories, or concepts (Vonk et al., 2012). The great apes—a group that includes chimpanzees and gorillas—also form concepts, such as *cat* and *dog*. After monkeys have learned these concepts, certain frontal lobe neurons in their brain fire in response to new "cat-like" images, others to new "dog-like" images (Freedman et al., 2001). Even pigeons—mere birdbrains—can sort objects (pictures of cars, cats, chairs, flowers) into categories. Shown a picture of a never-before-seen chair, pigeons will reliably peck a key that represents *chairs* (Wasserman, 1995).



Mike Lovett

Animal cognition in action Alex, an African Grey parrot, could categorize and name objects (Pepperberg, 2009, 2012, 2013). Among his jaw-dropping numerical skills was the ability to comprehend numbers up to 8. He could speak the number of objects. He could add two small clusters of objects and announce the sum. He could indicate which of two numbers was greater. And he gave correct

answers when shown various groups of objects. Asked, for example, “What color four?” (meaning “What’s the color of the objects of which there are four?”), he could speak the answer.

Displaying Insight

Psychologist Wolfgang Köhler (1925) showed that humans are not the only creatures to display insight. He placed a piece of fruit and a long stick outside the cage of a chimpanzee named Sultan, beyond his reach. Inside the cage, Köhler placed a short stick, which Sultan grabbed, using it to try to reach the fruit. After several failed attempts, the chimpanzee dropped the stick and seemed to survey the situation. Then suddenly (as if thinking *Aha!*), Sultan jumped up and seized the short stick again. This time, he used it to pull in the longer stick—which he then used to reach the fruit. Apes have even exhibited foresight by storing a tool they could use to retrieve food the next day (Mulcahy & Call, 2006). (For one example of a chimpanzee’s use of foresight, see **FIGURE 27.5a**.)



FIGURE 27.5 Animal talents (a) One male chimpanzee in Sweden's Furuvik Zoo was observed every morning collecting stones, which later in the day he used as ammunition to pelt visitors (Osvath & Karvonen, 2012). (b) Crows quickly learned to raise the water level in a tube and nab a floating worm by dropping in stones (Bird & Emery, 2009).

Birds, too, have displayed insight. One experiment, by (yes) Christopher Bird and Nathan Emery (2009), brought to life an Aesop fable in which a thirsty crow is unable to reach the water in a partly filled pitcher. See the crow's solution (exactly as in the fable) in Figure 27.5b. Other crows have fashioned wire or sticks for extracting food, such as insects in rotting logs (Jelbert et al., 2018; Rutz et al., 2016). In one study, an African gray parrot equaled or bettered the performance of Harvard students at a complex shell game testing visual memory (Pailian et al., 2020).

Transmitting Culture

Like humans, other species invent behaviors and transmit cultural patterns to their observing peers and offspring (Boesch-Achermann &

Boesch, 1993). Orca whales may look similar, but each subpopulation has its own language, social behaviors, and food preferences—all of which are transmitted across generations (Mapes, 2021). The Pacific Northwest southern resident orcas find Chinook salmon tasty, while their transient orca cousins dine on seals and other sea mammals. And similar to human accents, naked mole-rats' vocal "chirps" mirror those of other nearby mole-rats (Barker et al., 2021).

Forest-dwelling chimpanzees select different tools for different purposes—a heavy stick for making holes, a light, flexible stick for fishing for termites, or a pointed stick for roasting marshmallows. (Just kidding: They don't roast marshmallows, but they have surprised us with their sophisticated tool use [Sanz et al., 2004]). Researchers have found at least 39 local customs related to chimpanzee tool use, grooming, and courtship (Claidière & Whiten, 2012; Whiten, 2021a,b). One group may slurp termites directly from a stick, while another group may pluck them off individually. One group may break nuts with a stone, while their neighbors use a piece of wood. One chimpanzee discovered that tree moss could absorb water for drinking from a waterhole, and within 6 days, seven other observant chimpanzees began using moss in the same way (Hobaiter et al., 2014). Along with differing communication and hunting styles, these transmitted behaviors are the chimpanzee version of cultural diversity, a diversity that is threatened by habitat loss.

Other Cognitive Skills

Great apes, dolphins, magpies, and elephants recognize themselves in a mirror, demonstrating self-awareness (Boyle, 2021). Elephants also display abilities to learn, remember, discriminate smells, empathize, cooperate, teach, and spontaneously use tools (Byrne et al., 2009). Chimpanzees show altruism, cooperation, and group aggression. Like humans, they may purposefully kill their neighbor, and they grieve over dead relatives (D. Biro et al., 2010; Mitani et al., 2010).

***

Thinking about other species' abilities brings us back to our initial question: How deserving are we of the label *Homo sapiens*—wise human? On decision making and risk assessment, our smart but error-prone species might rate a B−. On problem solving, where humans are inventive yet vulnerable to confirmation bias and fixation, we would probably receive a better mark, perhaps a B+. And on cognitive efficiency and creativity, our quick (though sometimes faulty) heuristics and divergent thinking would surely earn us an A.

What time is it now? When we asked you (in the section on overconfidence) to estimate how quickly you would finish this module, did you underestimate or overestimate?

REVIEW

Module 27: Thinking

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 27-1: What are *cognition* and *metacognition,* and what are the functions of concepts?

LOQ 27-2: What cognitive strategies assist our problem solving, and what obstacles hinder it?

LOQ 27-3: What is *intuition,* and how can the representativeness and availability heuristics influence our decisions and judgments?

LOQ 27-4: What factors exaggerate our fear of unlikely events?

LOQ 27-5: How are our decisions and judgments affected by overconfidence, belief perseverance, and framing?

LOQ 27-6: How do smart thinkers use intuition?

LOQ 27-7: What is *creativity,* and what fosters it?

LOQ 27-8: What do we know about thinking in other species?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

cognition
metacognition
concept
prototype
algorithm
heuristic
insight
confirmation bias
fixation
mental set
intuition
representativeness heuristic
availability heuristic
overconfidence
belief perseverance
framing
nudge
creativity
convergent thinking
divergent thinking

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. A mental grouping of similar things is called a _____.

2. The most systematic procedure for solving a problem is a(n) _____.

3. Omar describes his political beliefs as "strongly liberal," but he is interested in exploring opposing viewpoints. How might he be affected by confirmation bias and belief perseverance?

4. A major obstacle to problem solving is fixation, which is a(n)
   a. tendency to base our judgments on vivid memories.
   b. tendency to wait for insight to occur.
   c. inability to view a problem from a new perspective.
   d. rule of thumb for judging the likelihood of an event in terms of our mental image of it.

5. Foreign terrorist attacks made Americans more fearful of being victimized by foreign terrorism than of other, greater

threats. Such exaggerated fear after dramatic events illustrates the _____ heuristic.

6. When consumers respond more positively to ground beef described as “75 percent lean” than to the same product labeled “25 percent fat,” they have been influenced by _____.

7. Which of the following is NOT a characteristic of a creative person?
   a. Expertise
   b. Extrinsic motivation
   c. A venturesome personality
   d. Imaginative thinking skills

8. In the early twentieth century, some psychologists noted that animal consciousness can be inferred from their behavior. In the early twenty-first century, other scientists argued that animal consciousness can be inferred from their brain’s _____ _____.

MODULE 28: Language and Thought

Imagine an alien species that could pass thoughts from one head to another merely by pulsating air molecules in the space between them. Perhaps, these weird creatures could inhabit a future science fiction movie? Actually, we are those creatures! When we speak, our brain and voice apparatus transmit air pressure waves that we send banging against another's eardrum—enabling us to transfer thoughts from our brain into theirs. As cognitive psychologist Steven Pinker (1998) noted, we sometimes sit for hours "listening to other people make noise as they exhale, because those hisses and squeaks contain *information*." Depending on how you vibrate the air, you may get a scowl or a kiss.



M. Spencer Green/AP Photo

Language transmits knowledge Whether spoken, written, or signed, language—the original wireless communication—enables mind-to-mind information transfer and with it

the transmission of civilization's accumulated knowledge across generations.

Language is more than vibrating air—it is our spoken, written, or signed words, and the ways we combine them to communicate meaning. When I [DM] created this paragraph, my fingers on the keyboard generated electronic binary numbers that morphed into the squiggles before you. These squiggles trigger formless nerve impulses that travel to several areas of your brain, which integrate the information, compare it to stored information, and decode meaning. Thanks to language, information is moving from our minds to yours. Many animals know little more than what they sense. Thanks to language, we comprehend much that we've never seen and that our distant ancestors never knew. And thanks to technology, we can use language to communicate across vast distances—through spoken, written, and even pictorial words (including the 2015 *Oxford English Dictionary* "Word" of the Year, the emoji: 😂).

Let's begin our study of language by examining some of its components.

Language Structure

LOQ 28-1

What are the structural components of a language?

Consider how we might go about inventing a language. For a spoken language, we would need three building blocks:

- **Phonemes** are the smallest distinctive sound units in a language. The word *that* has three phonemes—*th, a,* and *t.* Each *e* in *Mercedes* is a different phoneme because each is pronounced differently. Linguists surveying nearly 500 languages have identified 869 different phonemes in human speech, but no language uses all of them (Holt, 2002; Maddieson, 1984). Those 800+ sounds "can form all the words in every language of the world," notes child language researcher Patricia Kuhl (2015). English uses about 40 phonemes; other languages use anywhere from half to more than twice as many. Consonant phonemes generally carry more information than do vowel phonemes. *The treth ef thes stetement shed be evedent frem thes bref demenstretien.*
- **Morphemes** are the smallest language units that carry meaning. In English, a few morphemes are also phonemes—the article *a,* for instance. But most morphemes combine two or more phonemes. The word *readers,* for example, contains three morphemes: *read, er* (that is, "one who reads"), and *s* (not one but multiple readers). Every word in a language contains one or more morphemes.
- **Grammar** is a language's set of rules that enable people to communicate. Grammatical rules guide us in deriving meaning from sounds *(semantics)* and in ordering words into sentences *(syntax).*

Like life constructed from the genetic code's simple alphabet, language is complexity built of simplicity. In English, for example, 40 or so phonemes can be combined to form more than 100,000 morphemes, which alone or in combination produce the 600,000 variations of past and present words in the *Oxford English Dictionary*. Using those words, we can then create an infinite number of sentences, most of which (like this one) are original. We know that you can know why we worry that you think this sentence is starting to get too complex; but that complexity—and our capacity to communicate and comprehend it—is what distinguishes our human language capacity (Hauser et al., 2002; Premack, 2007).

Retrieval Practice

RP-1 How many morphemes are in the word *cats?* How many phonemes?

ANSWERS IN APPENDIX E

Language Acquisition and Development

We humans have an astonishing knack for language. With little effort, we draw from tens of thousands of words in our memory, assemble them on the fly with near-perfect **syntax**, and spew them out, three words a second (Vigliocco & Hartsuiker, 2002). Given how many ways we can mess up, our language capacity is truly amazing.

"Language is a uniquely human gift, central to our experience of being human."
— Cognitive scientist Lera Boroditsky (2009)

Language Acquisition: How Do We Learn Language?

LOQ 28-2

How do we acquire language, and what did Chomsky mean by *universal grammar?*

Linguist Noam Chomsky has argued that language is an unlearned human trait, separate from other parts of human cognition. He theorized that a built-in predisposition to learn grammar rules, which he called *universal grammar,* helps explain why preschoolers pick up language so readily and use grammar so well. It happens so naturally —as naturally as birds learn to fly—that training hardly helps. Whether in Indiana or Indonesia, we intuitively follow similar syntax rules (Aryawibawa & Ambridge, 2018). All human languages—and there are more than 6000 of them—have nouns, verbs, and adjectives as grammatical building blocks, and they use words in some common ways (Blasi et al., 2016; Futrell et al., 2015).

Other researchers note that children learn grammar as they discern patterns in the language they hear (Ibbotson & Tomasello, 2016). And Chomsky agrees that we are not born with a built-in *specific* language

or *specific* set of grammatical rules. The world's languages are structurally very diverse—more so than the universal grammar idea implies (Bergen, 2014). Whatever language we experience as children, whether spoken or signed, we will readily learn its specific grammar and vocabulary (Bavelier et al., 2003). And we always start speaking mostly in nouns *(kitty, da-da)* rather than in verbs and adjectives (Bornstein et al., 2004). Biology and experience work together.



© Susan Meiselas/Magnum Photos

Creating a language Brought together as if on a desert island (actually a school), Nicaragua's young deaf children over time drew upon sign gestures from home to create their own Nicaraguan Sign Language, complete with words and intricate grammar. Activated by a social context, nature and nurture work creatively together (Osborne, 1999; Sandler et al., 2005; Senghas & Coppola, 2001).

Retrieval Practice

RP-2 What was Noam Chomsky's view of language learning?

ANSWERS IN APPENDIX E

Language Development: When Do We Learn Language?

LOQ 28-3

What are the milestones in language development, and when is the critical period for acquiring language?

Make a quick guess: How many words of your native language did you learn between your first birthday and your high school graduation? Although you use only 150 words for about half of what you say, you probably learned about 60,000 words (Bloom, 2000; McMurray, 2007). That averages (after age 2) to nearly 3500 words each year, or about 10 each day! How you did it—how those 3500 words could so far outnumber the roughly 200 words your schoolteachers consciously taught you each year—is one of the great human wonders.

Could you even now state the rules of syntax (the correct way to string words together to form sentences) for the language(s) you speak fluently? Most of us cannot. Yet before you could add 2 + 2, you were

creating your own original sentences and applying these rules. As a preschooler, you comprehended and spoke with a facility that far outpaced even the brightest adult's ability to learn a new language.

Receptive Language

Children's language development moves from simplicity to complexity. Babies are born prepared to learn any language, with a slight bent toward the language they heard in the womb. By 4 months of age, babies can recognize differences in speech sounds (Stager & Werker, 1997). They can also read lips. We know this because in experiments by Patricia Kuhl and Andrew Meltzoff (1982), babies have preferred looking at a face that matches a sound—an *"ah"* coming from wide open lips and an *"ee"* from a mouth with corners pulled back. Recognizing such differences marks the beginning of the development of babies' *receptive language,* their ability to understand what is said to and about them. At 7 months and beyond, they grow in their power to do what adults find difficult when listening to an unfamiliar language: to segment spoken sounds into individual words.

When adults listen to an unfamiliar language, the syllables all run together. A young Sudanese couple new to North America and unfamiliar with English might, for example, hear *United Nations* as "Uneye Tednay Shuns." Their 7-month-old daughter would not have this problem. Human infants display a remarkable ability to learn statistical aspects of human speech (Batterink, 2017; Werker et al., 2012). Their brains not only discern word breaks, they statistically

analyze which syllables—as in *hap-py-ba-by*—most often go together. After just 2 minutes of exposure to a computer voice speaking an unbroken, monotone string of nonsense syllables *(bidakupadotigolabubidaku …)*, 8-month-olds were able to recognize (as indicated by their attention) three-syllable sequences that appeared repeatedly (Saffran, 2009; Saffran et al., 1996).



Purestock/AGE Fotostock

A natural talent Human infants come with a remarkable capacity to soak up language. But the particular language they learn will reflect their unique interactions with others.

Productive Language

Long after the beginnings of receptive language, babies' *productive language*—their ability to produce words—matures. Before nurture molds babies' speech, nature enables a wide range of possible sounds in the **babbling stage**, beginning around 4 months. In this stage, babies seem to sample all the sounds they can make, such as *ah-goo.* Babbling does not imitate the adult speech babies hear—it includes sounds from various languages. From this early babbling, a listener could not identify an infant as being, say, French, Korean, or Ethiopian.

By about 10 months, infants' babbling has changed so that a trained ear can identify the household language (de Boysson-Bardies et al., 1989). Deaf infants who observe their deaf parents using sign language begin to babble more with their hands (Petitto & Marentette, 1991). Without exposure to other languages, babies lose their ability to do what we cannot—to discriminate and produce sounds and tones found outside their native language (Kuhl et al., 2014; Meltzoff et al., 2009). Thus, by adulthood, those who speak only English cannot discriminate certain sounds in Japanese speech. Nor can Japanese adults with no training in English hear the difference between the English *r* and *l.* For a Japanese-speaking adult, *"la-la-ra-ra"* may sound like the same syllable repeated.

Around their first birthday, most children enter the **one-word stage**. They know that sounds carry meanings, and they begin to use sounds

—usually only one barely recognizable syllable, such as *ma* or *da*—to communicate meaning. But gradually the infant's language conforms more to the family's language. Across the world, baby's first words are often nouns that label objects or people (Tardif et al., 2008). At this one-word stage, *"Doggy!"* may mean *"Look at the dog out there!"*

> Care to guess babies' most common first words? In English, Croatian, French, Italian, and Kiswahili, they are *mommy* and *daddy* (Frank et al., 2019).

At about 18 months, children's word learning explodes from about a word per week to a word per day. By their second birthday, most have entered the **two-word stage** (TABLE 28.1). They start uttering two-word sentences in **telegraphic speech**. Like yesterday's telegrams that charged by the word ("TERMS ACCEPTED. SEND MONEY"), a 2-year-old's speech contains mostly nouns and verbs *("Want juice").* Also like telegrams, their speech follows rules of syntax, arranging words in a sensible order. English-speaking children typically place adjectives before nouns—*white house* rather than *house white.* Spanish reverses this order, as in *casa blanca.*

TABLE 28.1 Summary of Language Development

Month (approximate)	Stage
4	Babbles many speech sounds ("ah-goo")
10	Babbling resembles household language ("ma-ma")

12	One-word speech (“Kitty!”)
24	Two-word speech (“Get ball.”)
24+	Rapid development into complete sentences



“Got idea. Talk better. Combine words. Make sentences.”

Moving out of the two-word stage, children quickly begin uttering longer phrases (Fromkin & Rodman, 1983). By early elementary school, they understand complex sentences and begin to enjoy the humor conveyed by double meanings: “You never starve in the desert because of all the sand-which-is there.”

Retrieval Practice

RP-3 What is the difference between *receptive* language and *productive* language, and when do children typically hit these milestones in language development?

ANSWERS IN APPENDIX E

Critical Periods

Some children—such as those who receive a cochlear implant to enable hearing, or those who are adopted by a family that uses another language—get a late start on learning a language. For these late bloomers, language development follows the same sequence, although usually at a faster pace (Ertmer et al., 2007; Snedeker et al., 2007). But there is a limit on how long language learning can be delayed. Childhood seems to represent a *critical* (or *sensitive*) *period* for learning certain aspects of language before the language-learning window gradually closes (Hernandez & Li, 2007; Lenneberg, 1967). If not exposed to either a spoken or a signed language by age 7, children lose their ability to fully comprehend and use *any* language.

Cultural and other environmental variations affect children's language exposure. Children exposed to less complex language—such as U.S. 4-year-olds in classrooms with 3-year-olds, or some children from impoverished homes—often display less language skill (Ansari et al., 2015; Hirsh-Pasek et al., 2015). Reading to children increases language exposure. Jessica Logan and her colleagues (2019) found that frequent exposure to children's books boosts children's school readiness. "Kids who hear more vocabulary words are going to be better prepared to see those words in print when they enter school."

Language-learning ability is universal, but it is easiest when we're children. If we learn a new language as adults, we will usually speak it with the accent of our native language and with imperfect grammar (Hartshorne et al., 2018). In one experiment, U.S. immigrants from South Korea and China considered 276 English sentences *("Yesterday the hunter shoots a deer")* and decided whether each was grammatically correct or incorrect (Johnson & Newport, 1991). All had been in the United States for approximately 10 years; some had arrived in early childhood, others as adults. As **FIGURE 28.1** reveals, those who learned their second language early learned it best.

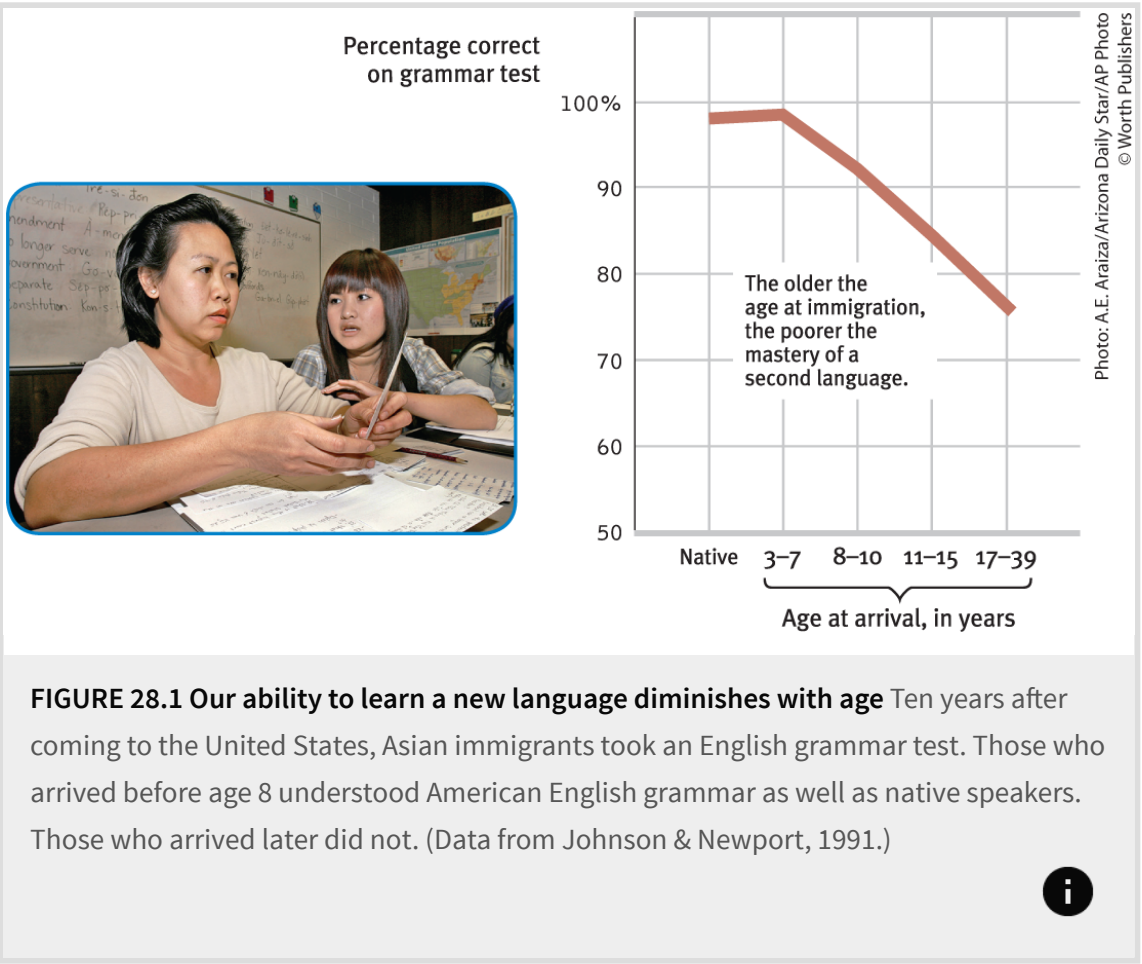


FIGURE 28.1 Our ability to learn a new language diminishes with age Ten years after coming to the United States, Asian immigrants took an English grammar test. Those who arrived before age 8 understood American English grammar as well as native speakers. Those who arrived later did not. (Data from Johnson & Newport, 1991.)

Retrieval Practice

RP-4 Why is it so difficult to learn a new language in adulthood?

ANSWERS IN APPENDIX E

Deafness and Language Development

The impact of early experiences is evident in language learning in deaf children of hearing-nonsigning parents. These children typically do not experience language during their early years. For example, natively deaf children who learn sign language after age 9 never learn it as well as those who learned it early in life. Those who learn to sign as teens or adults never become as fluent as native signers in producing and comprehending subtle grammatical differences (Newport, 1990). As a flower's growth requires nourishment, so, too, children's language acquisition requires early-life language exposure.

More than 90 percent of all deaf children are born to hearing parents. Most of these parents want their children to experience their world of sound and talk. Cochlear implants enable this by converting sounds into electrical signals and stimulating the auditory nerve by means of electrodes threaded into the child's cochlea. But if an implant is to help children become proficient in oral communication, parents cannot delay the surgery until their child reaches the age of consent. Giving cochlear implants to children is hotly debated. Deaf culture advocates object to giving implants to children who were deaf

prelingually. The National Association of the Deaf, for example, argues that deafness is *not* a disability because native signers are not linguistically disabled. More than five decades ago, Gallaudet University linguist William Stokoe (1960) showed that sign is a complete language with its own grammar, syntax, and meanings. Deaf culture advocates sometimes further contend that deafness could as well be considered "vision enhancement" as "hearing impairment." Close your eyes and immediately you, too, will notice your attention being drawn to your other senses. In one experiment, people who had spent 90 minutes sitting quietly blindfolded became more accurate in their location of sounds (Lewald, 2007). When kissing, lovers minimize distraction and increase sensitivity by closing their eyes.



Andy Richter/Cavan Images

Hearing improved A boy in Malawi experiences new hearing aids.

People who lose one channel of sensation compensate with a slight enhancement of their other sensory abilities (Backman & Dixon, 1992; Levy & Langer, 1992). Those who have been deaf from birth exhibit

enhanced visual processing (Almeida et al., 2015). Their auditory cortex, starved for sensory input, remains largely intact but becomes responsive to touch and to visual input (Karns et al., 2012). Once repurposed, the auditory cortex becomes less available for hearing—which helps explain why cochlear implants are most effective when given before age 2 (Geers & Nicholas, 2013; Niparko et al., 2010).



Jim Cummins/Getty Images

Talking hands Human language appears to have evolved from gestured communications (Corballis, 2002, 2003; Pollick & de Waal, 2007). Even today, gestures are naturally associated with spontaneous speech, and similarly so for blind and sighted speakers of a given language (Özçaliskan et al., 2016). Both gesture and speech communicate, and when they convey the same rather than different information (as they do in baseball's sign language), we humans understand faster and more accurately (Dargue et al., 2019; Hostetter, 2011; Kelly et al., 2010). Outfielder William Hoy, the first deaf player to join the major leagues (1892), reportedly helped invent hand signals for "Strike!" "Safe!" (shown here) and "Yerr out!" (Pollard, 1992).

Referees in all sports now use invented signs, and fans are fluent in sports sign language.

Living in a Silent World

Worldwide, 466 million people live with hearing loss (WHO, 2019). Some are profoundly deaf; most (more men than women) have hearing loss (Agrawal et al., 2008). Some were deaf from birth; others have known the hearing world. Some sign and identify with the language-based Deaf culture. Others, especially those who lost their hearing after speaking a language, are "oral" and converse with the hearing world by reading lips or written notes. Still others move between the two cultures.

The challenges of life without hearing may be greatest for children. Unable to communicate in customary ways, signing playmates may struggle to coordinate their play with speaking playmates. School achievement may also suffer; academic subjects are rooted in *spoken* languages. Adolescents may feel socially excluded, with a resulting low self-confidence. Deaf children who grow up around other deaf people more often identify with Deaf culture and feel positive self-esteem. If raised in a signing household, whether by deaf or hearing parents, they also express higher self-esteem and feel more accepted (Bat-Chava, 1993, 1994).

Adults who lose hearing late in life also face challenges. Expending effort to hear words drains their capacity to perceive, comprehend, and remember them (Wingfield et al., 2005). In several studies, people

with hearing loss, especially those not wearing hearing aids, have reported more sadness, less social engagement, and worrying that they irritate others (Kashubeck-West & Meyer, 2008; National Council on Aging, 2000). They also may experience a sort of shyness: "It's almost universal among the deaf to want to cause hearing people as little fuss as possible," observed Henry Kisor (1990, p. 244), a Chicago newspaper editor and columnist who lost his hearing at age 3. "We can be self-effacing and diffident to the point of invisibility. Sometimes this tendency can be crippling. I must fight it all the time." Helen Keller, both blind and deaf, noted that "blindness cuts people off from things. Deafness cuts people off from people."

I [DM] understand. My mother, with whom we communicated by writing notes on an erasable "magic pad," spent her last dozen years in an utterly silent world, largely withdrawn from the stress and strain of trying to interact with people outside a small circle of family and old friends. My own hearing is declining on a trajectory toward hers (with my hearing aid and cochlear implant receiver out at night, I cannot understand my wife speaking from her adjacent pillow). Even with hearing aids, I sit front and center at plays and meetings and seek quiet corners in restaurants. I do benefit from cool technology (see HearingLoop.org) that, at the press of a button, can transform my hearing aid into an in-the-ear loudspeaker for the broadcast of phone, TV, and public address system sound. Yet I still experience frustration when I can't hear the joke everyone else is guffawing over; when, after repeated tries, I just can't catch that exasperated person's question and can't fake my way around it; when family members give up and say,

"Oh, never mind" after trying three times to tell me something unimportant.

As she aged, my mother came to feel that seeking social interaction was simply not worth the effort. I share newspaper columnist Kisor's belief that communication is worth the effort (p. 246): "So, … I will grit my teeth and plunge ahead." To reach out, to connect, to communicate with others, even across a chasm of silence, is to affirm our humanity as social creatures.

The Brain and Language

LOQ 28-4

What brain areas are involved in language processing and speech?

We think of speaking and reading, or writing and reading, or singing and speaking as merely different examples of the same general ability —language. But consider this curious finding: Damage to any of several cortical areas can produce **aphasia**, impairment of language. Even more curious, some people with aphasia can speak fluently but cannot read (despite good vision). Others can comprehend what they read but cannot speak. Still others can write but not read, read but not write, read numbers but not letters, or sing but not speak. These cases suggest that language is complex and that different brain areas must serve different language functions.

Indeed, in 1865, French physician Paul Broca confirmed a fellow physician's observation that after damage to an area of the left frontal lobe (later called **Broca's area**) a person would struggle to *speak* words, yet could sing familiar songs and comprehend speech. A decade later, German investigator Carl Wernicke discovered that after damage to a specific area of the left temporal lobe (**Wernicke's area**), people could not *understand* others' sentences and could speak only meaningless sentences.

Brain scans have confirmed activity in Broca's and Wernicke's areas during language processing (**FIGURE 28.2**). (For those with a larger-than-average Broca's area, grammar learning is a breeze [Novén et al., 2019].) For people with aphasia, electrical stimulation of Broca's area can help restore their speaking abilities (Marangolo et al., 2016). One man, whose stroke eliminated his ability to speak, allowed researchers to implant an electrode array over his speech motor cortex (Moses et al., 2021). By decoding the man's brain activity, researchers could understand what he was trying to say about half of the time—even though he could not utter a single word. "Not to be able to communicate with anyone, to have a normal conversation and express yourself in any way," the man noted, using a head-controlled mouse to type key-by-key, "it's devastating, very hard to live with" (Belluck, 2021).

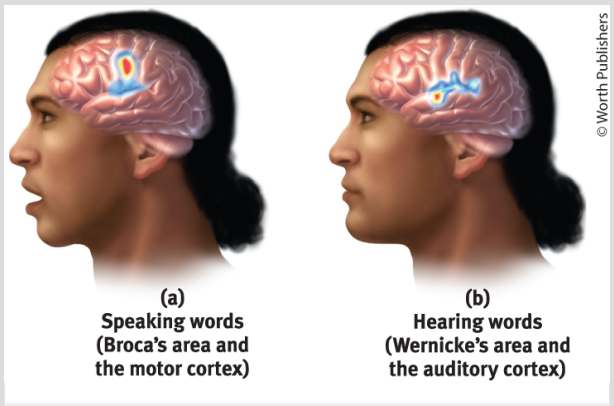


FIGURE 28.2 Brain activity when speaking and hearing words

The brain's processing of language is complex. Broca's area coordinates with the brain's processing of language in other areas as well (Flinker et al., 2015; Tremblay & Dick, 2016). Although you experience language as a single, unified stream, fMRI scans would show that your brain is busily multitasking and networking. Different neural networks are activated by nouns and verbs (or objects and actions); by different vowels; by stories of visual versus motor experiences; by who spoke and what was said; and by many other stimuli (Perrachione et al., 2011; Shapiro et al., 2006; Speer et al., 2009). And these same networks become activated whether you're reading or listening to the words (Deniz et al., 2019).

Moreover, if you're lucky enough to be natively fluent in two languages, your brain processes them in similar areas (Kim et al., 2017). But your brain doesn't use the same areas if you learned a

second language *after* the first or if you sign rather than speak your second language (Berken et al., 2015; Kovelman et al., 2014).

The point to remember: In processing language, as in other forms of information processing, the brain operates by dividing its mental functions—speaking, perceiving, thinking, and remembering—into subfunctions. Your conscious experience of learning about the brain and language *seems* indivisible, but thanks to your parallel processing, many different neural networks are pooling their work to give meaning to the words, sentences, and paragraphs (Fedorenko et al., 2016; Snell & Grainger, 2019). *E pluribus unum:* Out of many, one.

Retrieval Practice

RP-5 _____ _____ is one part of the brain that, if damaged, might impair your ability to speak words. Damage to _____ _____ might impair your ability to understand language.

ANSWERS IN APPENDIX E

Thinking and Language

LOQ 28-5

What is the relationship between thinking and language, and what is the value of thinking in images?

Thinking and language—which comes first? This is one of psychology's great chicken-and-egg questions. Do our ideas come first and then the words to name them? Or are our thoughts conceived in words and unthinkable without them?

The theory of **linguistic determinism** was developed by linguist Benjamin Lee Whorf (1956), who believed that those using languages with no past tense, such as the Hopi, could not readily *think* about the past. But Whorf's theory was too extreme. We all think about things for which we have no words. (Can you think of a shade of blue you cannot name? Can you imagine wondering if someone might fall?)

A less extreme idea, **linguistic relativism**, recognizes that our words *influence* our thinking (Gentner, 2016). To those who speak two dissimilar languages, such as English and Japanese, this point seems obvious (Brown, 1986). Unlike English, which has a rich vocabulary for self-focused emotions such as anger, Japanese has more words for interpersonal emotions such as sympathy (Markus & Kitayama, 1991). Many bilingual individuals report that they have different senses of self—that they feel like different people—depending on which language they are using (Matsumoto, 1994; Pavlenko, 2014).

Bilingual individuals may even reveal different personality profiles when taking the same test in two languages, with their differing cultural associations (Chen & Bond, 2010; Dinges & Hull, 1992). When China-born, bilingual University of Waterloo students described themselves in English, their responses fit typical Canadian profiles,

expressing mostly positive self-statements and moods. When responding in Chinese, the same students gave typically Chinese self-descriptions, reporting more agreement with Chinese values and roughly equal positive and negative self-statements and moods (Ross et al., 2002). Similar attitude and personality changes have been shown when switching between Spanish and English or Arabic and English (Ogunnaike et al., 2010; Ramírez-Esparza et al., 2006). "Learn a new language and get a new soul," says a Czech proverb.

So, our words do influence our thinking (Boroditsky, 2011). Words define our mental categories. Whether we live in New Mexico, New South Wales, or New Guinea, we *see* the same colors, but we use our native language to *classify* and *remember* them (Davidoff, 2004; Roberson et al., 2004, 2005). Imagine viewing three colors and calling two of them "yellow" and one of them "blue." Later you would likely see and recall the yellows as being more similar. But if you speak the language of Papua New Guinea's Berinmo people, which has words for two different shades of yellow, you would more speedily perceive and better recall the variations between the two yellows. And if your native language is Russian or Greek, which have distinct names for various shades of blue, you would perceive and recall the yellows as more similar and remember the blues better (Maier & Abdel Rahman, 2018). Words matter.



Prisma by Dukas Presseagentur GmbH/Alamy Stock Photo

Culture and color In Papua New Guinea, Berinmo children have words for different shades of yellow, which might enable them to spot and recall yellow variations more quickly. Here and everywhere, "the languages we speak profoundly shape the way we think, the way we see the world, the way we live our lives," noted psychologist Lera Boroditsky (2009).

On the color spectrum, blue blends into green—until we draw a dividing line between the portions we call "blue" and "green." Although equally different on the color spectrum, two different items that share the same color name (as the two "blues" do in **FIGURE 28.3**, contrast B) are harder to distinguish than two items with different names ("blue" and "green," as in Figure 28.3, contrast A) (Özgen, 2004). Likewise, $4.99 perceptually differs more from $5.01 than from $4.97. And to doctors, a patient who is 80 seems, relative to a 79-year-old,

older than does a 79-year-old compared to one who is 78 (Olenski et al., 2020).

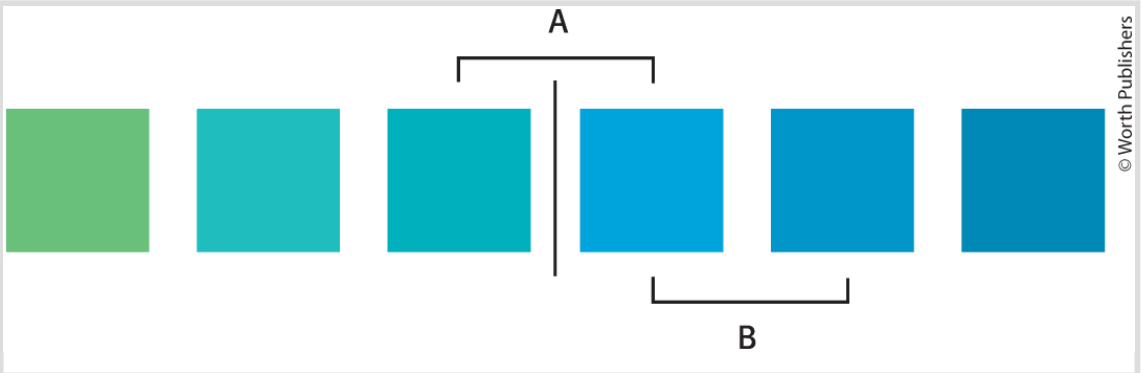


FIGURE 28.3 Language and perception When people view blocks of equally different colors, they perceive those with different names as more different. Thus, the "green" and "blue" in contrast A may appear to differ more than the two equally different blues in contrast B (Özgen, 2004).

Given their subtle influence on thinking, we do well to choose our words carefully. When hearing the generic *he* (as in "the artist and his work"), people are more likely to picture a man (Henley, 1989; Ng, 1990). If *he* and *his* were truly gender free, we shouldn't skip a beat when hearing that "man, like other mammals, nurses his young." Pronoun usage can also influence how we feel about ourselves. Transgender and gender nonconforming youth report feeling respected and included when their preferred pronouns are used—*he/she, him/her, they/their* (Olson & Gülgöz, 2018; Rae et al., 2019). And consider: Gender prejudice also occurs more in gendered languages, such as French, in which, for example, *la table* is feminine and *le téléphone* is masculine (DeFranza et al., 2020; Lewis & Lupyan, 2020).

To expand language is to expand the ability to think. Young children's thinking develops hand in hand with their language (Gopnik & Meltzoff, 1986). Indeed, it is very difficult to think about or conceptualize certain abstract ideas (*commitment, freedom,* or *rhyming*) without language. And what is true for preschoolers is true for everyone: *It pays to increase your word power.* That's why most textbooks, including this one, introduce new words—to teach new ideas and new ways of thinking.

> **"All words are pegs to hang ideas on."** — Henry Ward Beecher, *Proverbs from Plymouth Pulpit,* 1887

Increased word power helps explain some benefits of bilingualism. McGill University researcher Wallace Lambert (1992; Lambert et al., 1993) reported that bilingual people are skilled at inhibiting one language while using another—for example, inhibiting "crayón amarillo" while saying "yellow crayon" to English speakers, then doing the reverse for Spanish speakers (Tsui et al., 2019). Bilingual children also exhibit enhanced social skill by being better able to understand another's perspective (Fan et al., 2015; Gampe et al., 2019). Bilingual preschool children have also displayed less racial bias (Singh et al., 2020).

Working with bilingual education advocates Olga Melikoff, Valerie Neale, and Murielle Parkes, Lambert helped implement a Canadian program that has given millions of English-speaking children a

natural French fluency via French-immersion schooling (Statistics Canada, 2019). Compared with similarly capable children in control groups, these children exhibit no loss of English fluency. They also display increased creativity and appreciation for French-Canadian culture (Genesee & Gándara, 1999; Lazaruk, 2007).

One lingering dispute concerns whether there exists, as some have claimed, a "bilingual advantage" in cognitive tasks such as planning, focusing attention, and then, when needed, switching attention (Antoniou, 2019; Bialystok, 2017). After reviewing all the available research, critics argue that any bilingual advantage on overall cognitive performance is unreliable and small (Gunnerud et al., 2020; Nichols et al., 2020). Stay tuned: This research story is still being written.

Ask Yourself

Have you tried to learn a new language after learning your first language? If so, how did learning this other language differ from learning your first language? Does speaking it feel different?

Retrieval Practice

RP-6 Benjamin Lee Whorf's controversial hypothesis, called _____, suggested that we cannot think about things unless we have words for those concepts or ideas.

ANSWERS IN APPENDIX E

Thinking in Images

To turn on the cold water in your bathroom, in which direction do you turn the handle? To answer, you probably thought not in words but with *implicit* (nondeclarative, procedural) memory—a mental picture of how you do it.

Indeed, we often think in images; mental practice relies on it. Pianist Liu Chi Kung harnessed this power. One year after placing second in the 1958 Tchaikovsky piano competition, Liu was imprisoned during China's cultural revolution. Soon after his release, after 7 years without touching a piano, he was back on tour. Critics judged Liu's musicianship as better than ever. How did he continue to develop without practice? "I did practice," said Liu, "every day. I rehearsed every piece I had ever played, note by note, in my mind" (Garfield, 1986).

For someone who has learned a skill, such as ballet dancing, even *watching* the activity will activate the brain's internal simulation of it (Calvo-Merino et al., 2004). So, too, will *imagining* a physical experience, which activates some of the same neural networks that are active during the actual experience (Grèzes & Decety, 2001). Small wonder, then, that mental practice has become a standard part of training for Olympic athletes (Blumenstein & Orbach, 2012; Ungerleider, 2005).

One experiment on mental practice and basketball free-throw shooting tracked the University of Tennessee women's team over 35 games (Savoy & Beitel, 1996). During that time, the team's free-throw accuracy increased from approximately 52 percent in games following standard physical practice, to some 65 percent after mental practice. Players had repeatedly imagined making free throws under various conditions, including being "trash-talked" by their opposition. In a dramatic conclusion, Tennessee won the national championship game in overtime, thanks in part to their free-throw shooting.



Researchers demonstrated academic benefits of mental rehearsal with two groups of introductory psychology students facing a midterm exam 1 week later (Taylor et al., 1998). (Students not engaged in any mental rehearsal formed a third control group.) The first group spent 5 minutes daily visualizing themselves scanning the posted grade list, seeing their A, beaming with joy, and feeling proud. This daily *outcome simulation* added only 2 points to their exam-score average. The second group spent 5 minutes daily visualizing themselves reading their text, going over notes, eliminating distractions, declining an invitation out. This daily *process simulation* paid off: The group began

studying sooner, spent more time at it, and beat the others' average score by 8 points. *The point to remember:* It's better to imagine *how* to reach your goal than merely to fantasize your desired destination.

***

Psychological research on thinking and language mirrors the mixed impressions of our species by those in fields such as literature and religion. Our misjudgments are commonplace and our intellectual failures striking. Yet our problem-solving ingenuity and our extraordinary power of language mark humankind as (in Shakespeare's words) almost "infinite in faculties."

Ask Yourself

How could you use mental practice to improve your performance in some area of your life—for example, in your schoolwork, personal relationships, or hobbies?

Retrieval Practice

RP-7 What is mental practice, and how can it help you to prepare for an upcoming event?

ANSWERS IN APPENDIX E

Do Other Species Have Language?

LOQ 28-6

What do we know about other species' capacity for language?

Humans, more than other animals, can take others' perspectives and regulate themselves with a moral sense (Li & Tomasello, 2021). Humans also have long proclaimed that language sets us above other animals. "When we study human language," asserted linguist Noam Chomsky (1972), "we are approaching what some might call the 'human essence,' the qualities of mind that are, so far as we know, unique [to humans]." Is it true that humans, alone, have language?

Some animals display basic language processing. Pigeons can learn the difference between words and nonwords, but they could never read this book (Scarf et al., 2016). Various monkey species sound different alarm cries for different predators. Hearing the leopard alarm, vervets climb the nearest tree. Hearing the eagle alarm, they rush into the bushes. Hearing the snake alarm, they stand up and scan the ground (Byrne, 1991; Clarke et al., 2015; Coye et al., 2015). To indicate multiple threats (some combination of eagle, leopard, falling tree, and neighboring group), monkeys will combine 6 different calls into a 25-call sequence (Balter, 2010). But are such communications language?

In the late 1960s, psychologists Allen Gardner and Beatrix Gardner (1969) aroused enormous scientific and public interest with their work with Washoe, a young chimpanzee. Building on chimpanzees' natural tendencies for gestured communication, they taught Washoe sign language. After 4 years, Washoe could use 132 signs; by her life's end in 2007, she was using 250 signs (Metzler, 2011; Sanz et al., 1998).

During the 1970s, some chimpanzees reportedly began stringing signs together to form sentences. Washoe, for example, signed "You me go out, please." Some word combinations seemed creative—saying *water bird* for "swan" or *apple-which-is-orange* for "orange" (Patterson, 1978; Rumbaugh, 1977).

But by the late 1970s, other psychologists were growing skeptical. Were the chimps language champs or were the researchers chumps? Consider, said the skeptics:

- Ape vocabularies and sentences are simple—rather like those of a 2-year-old child. And unlike children, apes gain their limited vocabularies only with great difficulty (Wynne, 2004, 2008). Apes' signing might also be nothing more than aping their trainers' signs and learning that certain arm movements produce rewards (Terrace, 1979).
- When information is unclear, we are prone to *perceptual set*—a tendency to see what we want or expect to see. Interpreting chimpanzee signs as language may have been little more than the trainers' wishful thinking (Terrace, 1979). When Washoe

seemingly signed *water bird,* she may actually have been separately naming *water* and *bird.*

- "Give orange me give eat orange me eat orange … " is a far cry from the exquisite syntax of a 3-year-old (Anderson, 2004; Pinker, 1995). Rules of syntax in human language govern the order of words in sentences. So to a child, "You tickle" and "Tickle you" communicate different ideas. Not so to a chimpanzee.

Controversy can stimulate progress, and in this case, it triggered more evidence of other species' abilities to think and communicate. One surprising finding was that Washoe trained her adopted son Loulis to use the signs she had learned. Without human assistance, Loulis eventually picked up 68 signs, simply by observing Washoe and three other language-trained chimps signing together. Even more stunning was a later report: Kanzi, a bonobo with a reported 384-word vocabulary, could understand syntax in spoken English (Savage-Rumbaugh et al., 1993, 2009). Kanzi, who appears to have the receptive language ability of a human 2-year-old, has responded appropriately when asked, "Can you show me the light?" and "Can you bring me the [flash]light?" and "Can you turn the light on?" Given stuffed animals and asked—for the first time—to "make the dog bite the snake," he put the snake to the dog's mouth.



Susanne Baus/AFP/Newscom

Comprehending canine Border collie Rico had a vocabulary of 200 human words. If asked to retrieve a toy with a name he had never heard, Rico would pick out a new toy from a group of familiar items (Kaminski et al., 2004). Hearing that name for the second time 4 weeks later, Rico more often than not would retrieve the same toy. Another border collie, Chaser, set an animal record by learning 1000 object names (Pilley, 2013). Like a 3-year-old child, she could also categorize them by function and shape and could "fetch a ball" or "fetch a doll."

So, are humans the only language-using species? If by *language* we mean an ability to communicate through a meaningful sequence of symbols, then apes are indeed capable of language. But if we mean a verbal or signed expression of complex grammar that enables us to

exchange thoughts, most psychologists would now agree that humans alone possess language (Suddendorf, 2018).

One thing is certain: Studies of animal language and thinking have moved psychologists toward a greater appreciation of other species' remarkable abilities (de Waal, 2019; Wilson et al., 2015). In the past, many psychologists doubted that other species could plan, form concepts, count, use tools, or show compassion (Thorpe, 1974). Today, thanks to animal researchers, we know better. When communicating, chimps seem to consider what others know—*Does my friend know a snake is nearby?* (Crockford et al., 2017). Nonhuman animals exhibit insight, show family loyalty, care for one another, and transmit cultural patterns across generations. Working out what this means for the moral rights of other animals is an unfinished task.

Ask Yourself

Can you think of a time when you believed an animal was communicating with you? How might you put that to a test?

Retrieval Practice

RP-8 If your dog barks at a stranger at the door, does this qualify as language? What if the dog yips in a telltale way to let you know she needs to go out?

ANSWERS IN APPENDIX E

REVIEW

Module 28: Language and Thought

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 28-1: What are the structural components of a language?

LOQ 28-2: How do we acquire language, and what did Chomsky mean by *universal grammar?*

LOQ 28-3: What are the milestones in language development, and when is the critical period for acquiring language?

LOQ 28-4: What brain areas are involved in language processing and speech?

LOQ 28-5: What is the relationship between thinking and language, and what is the value of thinking in images?

LOQ 28-6: What do we know about other species' capacity for language?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

language
phoneme
morpheme
grammar
syntax
babbling stage
one-word stage
two-word stage
telegraphic speech
aphasia
Broca's area
Wernicke's area
linguistic determinism
linguistic relativism

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. Children reach the one-word stage of speech development at about
   a. 4 months.
   b. 6 months.
   c. 1 year.
   d. 2 years.

2. The three basic building blocks of language are _____, _____, and _____.

3. When young children speak in short phrases using mostly verbs and nouns, this is referred to as _____ _____.

4. According to Chomsky, humans have a built-in predisposition to learn grammar rules. He called this trait _____ _____.

5. Most researchers agree that apes can
   a. communicate through symbols.
   b. gain vocabulary with little difficulty.
   c. comprehend language in adulthood.
   d. surpass a human 3-year-old in language skills.

CHAPTER 10
Intelligence (Modules 29–31)



RealPeopleGroup/E+/Getty Images

MODULE 29 What Is Intelligence?

Is Intelligence One General Ability?

The Cattell-Horn-Carroll Intelligence Theory

Theories of Multiple Intelligences

Emotional Intelligence

MODULE 30 Intelligence Assessment and Dynamics

Early and Modern Tests of Mental Abilities
Principles of Test Construction
Extremes of Intelligence
Intelligence Across the Life Span
THINKING CRITICALLY ABOUT: Cross-Sectional and Longitudinal Studies

MODULE 31 Genetic and Environmental Influences on Intelligence

Heredity and Intelligence
Environment and Intelligence
Gene–Environment Interactions
Group Differences in Intelligence Test Scores

Little Natey's parents never thought he'd excel in the classroom. They were just being realistic: Their son often seemed bored at school. He was never the "smart" kid. Natey overwhelmingly preferred sports to studying. Eventually, he became a skilled musician, learning how to sing and to play multiple instruments. College wasn't in Natey's plans. He definitely wanted a music career. Then Natey's father suggested, "Maybe try a year of college. It can't hurt." So, Natey agreed.

To fill his course schedule, Natey registered for Introduction to Psychology. The assigned text—an earlier edition of the very book you're reading now—left him abuzz with excitement: "I had no idea you could use science to understand people!" Although he did not earn an A, Natey learned something that forever changed his life: Hard work and persistence could grow his knowledge.

With his new mindset, Natey immersed himself in psychology. He read dozens of psychology books and began to excel in his classes. He gained research experience and attended academic conferences. Natey went on to earn two master's degrees and a Ph.D. in psychology and became a professor—and one of your authors. Yes, that's correct: Natey (a family nickname) is me [ND].

Few topics have sparked more debate than intelligence: Does each of us have an inborn general mental capacity (intelligence)? Can we quantify this capacity as a meaningful number? How much does intelligence vary within and between groups, and why? Do beliefs about intelligence—whether it is unchangeable or can grow through experience—influence academic achievement?

Modules 29–31 offer answers, by identifying a variety of mental gifts and concluding that the recipe for high achievement blends talent, grit, and life circumstances.

MODULE 29: What Is Intelligence?

Learning Objective Question LOQ 29-1

How do psychologists define *intelligence?*

In many studies, *intelligence* has been defined as whatever *intelligence tests* measure, which has tended to be school smarts. But intelligence is not a quality like height or weight, which has the same meaning to everyone worldwide. Intelligence describes the qualities that enable people to achieve success in their own time and place (Sternberg & Kaufman, 1998). In Cameroon's equatorial forest, *intelligence* may reflect understanding the medicinal qualities of local plants. In a North American high school, it may reflect mastering difficult concepts in calculus or chemistry. In both places, **intelligence** is the ability to learn from experience, solve problems, and use knowledge to adapt to new situations.



imageBROKER/Alamy Stock Photo

Hands-on healing The socially constructed concept of intelligence varies from culture to culture. This natural healer in Cameroon displays intelligence in his knowledge about medicinal plants and his understanding of the needs of the people he is helping.

You probably know some people with talents in science, others who excel in the humanities, and still others gifted in athletics, art, music, or dance. You may also know a talented artist who is stumped by the simplest math problem, or a brilliant math student who struggles when discussing literature. Are all these people intelligent? Could you rate their intelligence on a single scale? Or would you need several different scales?

Is Intelligence One General Ability?

LOQ 29-2

What are the arguments for *g?*

Charles Spearman (1863–1945) believed we have one **general intelligence** (often shortened to *g*) that is at the heart of all our intelligent behavior, from sailing the sea to sailing through school. He granted that people often have special, outstanding abilities. But he noted that those who score high in one area, such as verbal intelligence, typically score higher than average in other areas, such as spatial or reasoning ability.

> **"*g* is one of the most reliable and valid measures in the behavioral domain … and it predicts important social outcomes such as educational and occupational levels far better than any other trait."** — Behavior geneticist Robert Plomin (1999)

Spearman's (1904) belief stemmed in part from his work with *factor analysis,* a statistical procedure that identifies clusters of related variables. His idea of a general mental capacity expressed by a single intelligence score was controversial in Spearman's day, and so it remains. One of Spearman's early critics was L. L. Thurstone (1887–1955). Thurstone gave 56 different tests to people and mathematically identified seven clusters of *primary mental abilities* (word fluency,

verbal comprehension, spatial ability, perceptual speed, numerical ability, inductive reasoning, and memory). Thurstone did not rank people on a single scale of general aptitude. But when other investigators studied these profiles, they detected a persistent tendency: Those who excelled in one of the seven clusters generally scored well on the others. So, the investigators concluded, there was still some evidence of a *g* factor.

We might, then, liken mental abilities to physical abilities: Athleticism is not one thing, but many. The ability to run fast is distinct from the eye-hand coordination required to throw a ball on target. Yet there remains some tendency for good things to come packaged together—for running speed and throwing accuracy to correlate. So, too, with intelligence. Several distinct abilities tend to cluster together and to correlate enough to define a general intelligence factor. Distinct brain networks enable distinct abilities, with *g* explained by their coordinated activity (Cole et al., 2015; Kocevar et al., 2019).

The Cattell-Horn-Carroll Intelligence Theory

LOQ 29-3

How have the concepts of *fluid intelligence* and *crystallized intelligence,* and the *CHC theory,* affected our understanding of intelligence?

Raymond Cattell (1905–1998) and his student, John Horn (1928–2006) simplified Thurstone's primary mental abilities into two factors: **fluid intelligence *(Gf)***—our ability to reason speedily and abstractly, as when solving logic problems—and **crystallized intelligence *(Gc)***—our accumulated knowledge as reflected in vocabulary and applied skills (Cattell, 1963). A mathematician may use her *Gf* to develop new theories of mathematics. Her *Gc* may be evident in the way she expertly discusses her research when teaching college math classes. Our *Gf* and *Gc* often work together, as when we solve problems by drawing on our accumulated knowledge.

The idea of a single intelligence factor *(g)* received support from hundreds of intelligence studies. But studies also confirm the distinction between fluid and crystallized intelligence, and more specific abilities (Carroll, 1993). The **Cattell-Horn-Carroll (CHC) theory** brings all of these abilities together in one cumulative framework, affirming a general intellectual ability factor and the existence of *Gf* and *Gc*. And it identifies more specific abilities, such as reading and writing ability, memory capacity, and processing speed (Schneider & McGrew, 2012). The CHC theory remains influential because it recognizes that intelligence comprises many abilities but that these specific abilities exist under a broader umbrella of general intelligence. This expanded view of intelligence has inspired other psychologists, particularly since the mid-1980s, to extend the definition of *intelligence* beyond the idea of academic smarts (Caemmerer et al., 2020).

Theories of Multiple Intelligences

LOQ 29-4

How do Gardner's and Sternberg's theories of multiple intelligences differ, and what criticisms have they faced?

Gardner's Multiple Intelligences

Howard Gardner has identified eight *relatively independent intelligences,* including the verbal and mathematical aptitudes assessed by standardized tests (**FIGURE 29.1**). Thus, the app developer, the poet, the street-smart adolescent, and the basketball team's play-making point guard exhibit different kinds of intelligence (Gardner, 1998). Gardner (1999) has also proposed a ninth possible intelligence—*existential intelligence*—the ability "to ponder large questions about life, death, and existence." Gardner's notion of multiple intelligences continues to influence many educators' belief that children have different "learning styles," such as visual and auditory (Newton & Miah, 2017). In one study, 93 percent of British teachers agreed that "individuals learn better when they receive information in their preferred Learning Style" (Dekker et al., 2012). Increasingly, however, research casts doubt on the idea of boosting comprehension in this way (Nancekivell et al., 2019; Papadatou-Pastou et al., 2018).



FIGURE 29.1 Gardner's eight intelligences Gardner has also proposed *existential intelligence* (the ability to ponder deep questions about life) as a ninth possible intelligence.

Gardner (1983, 2006, 2011; Davis et al., 2011) views intelligence domains as multiple abilities that come in different packages. Brain damage, for example, may destroy one ability but leave others intact. One man, Dr. P., had damage to a visual brain area. He spoke fluently and could walk a straight line. But his facial recognition ability suffered, causing him to mistake his wife for, of all things, a hat (Sacks, 1985). And consider people with **savant syndrome**, who have an island of brilliance but often score low on intelligence tests and may have limited or no language ability (Treffert, 2010). Some can compute complicated calculations almost instantly, or identify the day

of the week of any given historical date, or render incredible works of art or music (Miller, 1999).



Then Chih Wey/Xinhua News Agency/Newscom

Islands of genius: savant syndrome After a brief helicopter ride over Singapore followed by 5 days of drawing, British savant artist Stephen Wiltshire accurately reproduced an aerial view of the city from memory.

The late memory whiz Kim Peek inspired the 1988 movie *Rain Man.* In 8 to 10 seconds, he could read and remember a page. During his lifetime, he memorized 9000 books, including Shakespeare's works and the Bible. He could provide GPS-like travel directions within any major U.S. city. Yet he could not button his clothes, and he had little capacity for abstract concepts. Asked by his father at a restaurant to lower his voice, he slid down in his chair to lower his voice box. Asked for Lincoln's Gettysburg Address, he responded, "227 North West Front Street. But he only stayed there one night—he gave the speech the next day" (Treffert & Christensen, 2005).

Sternberg's Three Intelligences

Robert Sternberg (1985, 2015, 2017) agrees with Gardner that there is more to success than academic intelligence and that we have multiple intelligences. But Sternberg's *triarchic theory* proposes three, not eight or nine, reliably measured intelligences:

- ***Analytical (academic problem-solving) intelligence*** is assessed by intelligence tests, which present well-defined problems having a single right answer. Such tests predict school grades reasonably well and vocational success more modestly.
- ***Creative intelligence*** is demonstrated in innovative smarts: the ability to adapt to new situations and generate novel ideas.
- ***Practical intelligence*** is required for everyday tasks that may be poorly defined and may have multiple solutions.

Gardner and Sternberg agree on two important points: Multiple abilities can contribute to life success, and differing varieties of giftedness bring both spice to life and challenges for education. Trained to appreciate such variety, many teachers have applied multiple intelligence theories in their classrooms.



imageBROKER/Alamy Stock Photo

Street smarts This child selling candy on the streets of Bogota, Colombia, is developing practical intelligence at a very young age.

Ask Yourself

The concept of multiple intelligences assumes that the analytical school smarts measured by traditional intelligence tests are important, but that other abilities are also important. Different people have different gifts. What are yours?

General Intelligence, Grit, and Deliberate Practice

Wouldn't it be nice if the world were so fair that a weakness in one area would be compensated by genius in another? Alas, say scientists, the world is not fair (Brown et al., 2021; Ferguson, 2009). There *is* a general intelligence factor: *g* matters (Johnson et al., 2008). It predicts performance on various complex tasks and in various jobs (Gottfredson, 2002a,b, 2003a,b). Studies of nearly 70,000 people from

19 countries find that *g* predicts higher incomes (Ganzach & Patel, 2018; see also **FIGURE 29.2**). And extremely high cognitive ability scores predict exceptional achievements, such as doctoral degrees and publications (Kuncel & Hezlett, 2010).

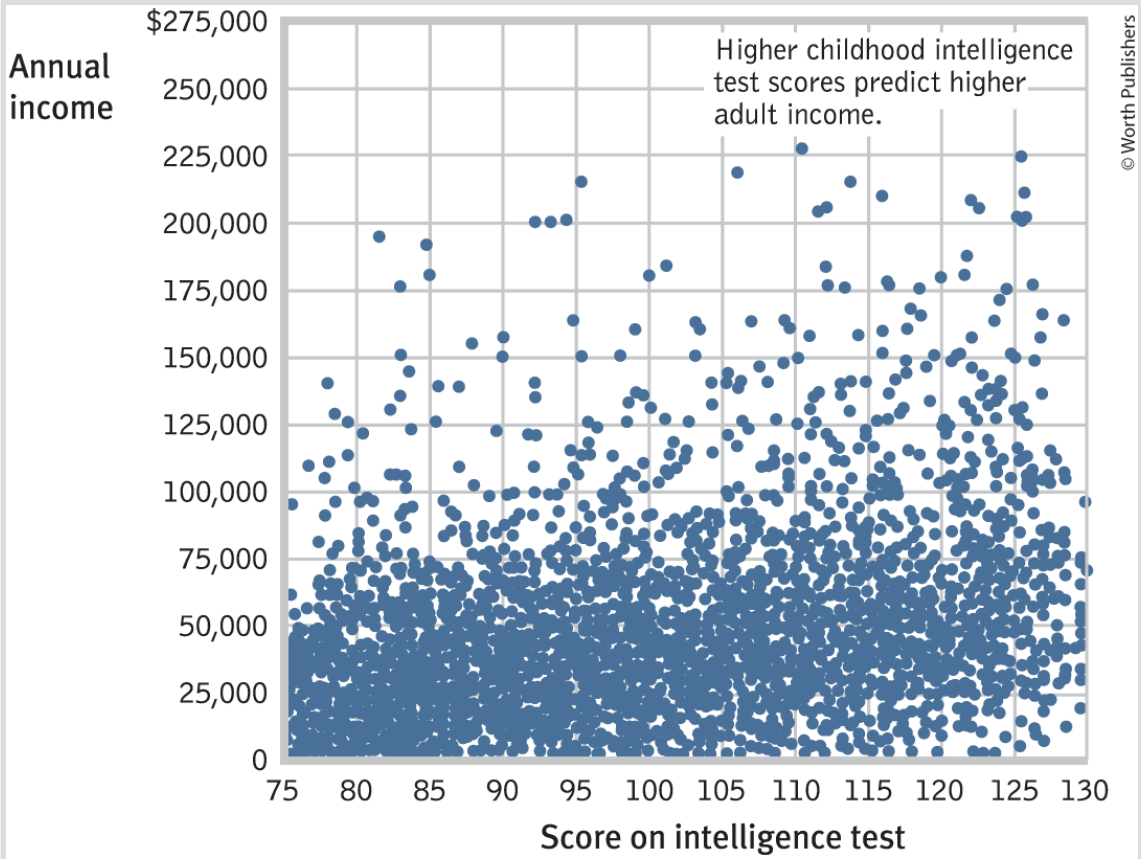


FIGURE 29.2 Smart and rich? Jay Zagorsky (2007) tracked 7403 participants in the U.S. National Longitudinal Survey of Youth across 25 years. As shown in this illustrative scatterplot, their intelligence scores correlated $+.30$ (a moderate positive correlation) with their later income.

Even so, "success" is not a one-ingredient recipe. Although high academic intelligence will help you get into a profession (via schools

and training programs), it alone won't make you successful once there. Success is a combination of talent and *grit:* Highly successful people tend also to be conscientious and doggedly energetic.

> **"I happen to have a talent for allocating capital. But my ability to use that talent is completely dependent on the society I was born into. If I'd been born into a tribe of hunters … I'd probably end up as some wild animal's dinner."** — Warren Buffett, multibillionaire stock investor (2006)

> For more on how self-disciplined grit feeds achievement, see the What Drives Us modules.

Skills that breed success seldom sprout spontaneously. It takes time to cultivate a seedling of talent. K. Anders Ericsson and others proposed a *10-year rule:* A common ingredient of expert performance in chess, dance, sports, computer programming, music, and medicine is "about 10 years of intense, daily practice" (Ericsson & Pool, 2016). Becoming a professional musician, chess player, or elite athlete requires, first, native ability (Macnamara et al., 2014, 2016; Vaci et al., 2019). But it also requires years of *deliberate practice*—about 11,000 hours on average (Campitelli & Gobet, 2011). The recipe for success is a gift of nature plus a whole lot of nurture.



Christopher Lee/The New York Times/Redux Pictures

Talent + opportunity + practice After winning the New York State chess championship for kindergarten through third grade, Tanitoluwa ("Tani") Adewumi lugged his trophy to his home at the time—a homeless shelter. In the prior year, after his family fled terrorists in northern Nigeria, Tani learned chess at his elementary school, then began hours of daily practice. "He does 10 times more chess puzzles than the average kid," said his chess teacher, after Tani bested privately tutored children from elite schools (Kristof, 2019).

Retrieval Practice

RP-1 How does the existence of savant syndrome support Gardner's theory of multiple intelligences?

ANSWERS IN APPENDIX E

Emotional Intelligence

LOQ 29-5

What are the four components of emotional intelligence?

Social intelligence is the know-how involved in understanding social situations and managing yourself successfully (Cantor & Kihlstrom, 1987). Psychologist Edward Thorndike first proposed the concept in 1920, noting that "the best mechanic in a factory may fail as a [supervisor] for lack of social intelligence" (Goleman, 2006, p. 83).

A critical part of social intelligence, **emotional intelligence**, consists of four abilities (Mayer et al., 2002, 2012, 2016):

- ***Perceiving emotions*** (recognizing them in faces, music, and stories, and identifying our own emotions),
- ***Understanding emotions*** (predicting them and how they may change and blend),
- ***Managing emotions*** (knowing how to express them in varied situations, and how to handle others' emotions), and
- ***Using emotions*** to facilitate adaptive or creative thinking.



Donald Reilly/Cartoon Stock

"You're wise, but you lack tree smarts."

Emotionally intelligent people are both socially aware and self-aware. They avoid being hijacked by overwhelming depression, anxiety, or anger. They can read others' emotional cues and know what to say to soothe a grieving friend, encourage a workmate, and manage a conflict. They can delay gratification in pursuit of long-range rewards. Thus, emotionally intelligent people tend to succeed in relationship, career, and parenting situations where academically smarter but less emotionally intelligent people may fail (Cherniss, 2010a,b; Czarna et al., 2016; Miao et al., 2016). They also tend to be happy and healthy (Sánchez-Álvarez et al., 2016; Sarrionandia & Mikolajczak, 2020). And they do somewhat better academically (MacCann et al., 2020). Aware of these benefits, school-based programs have sought to increase teachers' and students' emotional intelligence (Mahoney et al., 2021).

***

For a summary of these theories of intelligence, see **TABLE 29.1**.

TABLE 29.1 Comparing Theories of Intelligence

Theory	Summary	Strengths	Other Considerations
Spearman's general intelligence (g)	A basic intelligence predicts our abilities in varied academic areas.	Different abilities, such as verbal and spatial, do have some tendency to correlate.	Human abilities are too diverse to be encapsulated by a single general intelligence factor.
Thurstone's primary mental abilities	Our intelligence may be broken down into seven distinct factors.	A single *g* score is not as informative as scores for seven primary mental abilities.	Even Thurstone's seven mental abilities show a tendency to cluster, suggesting an underlying *g* factor.
Cattell-Horn-Carroll (CHC) theory	Our intelligence is based on a general ability factor as well as other specific abilities, bridged by crystallized and fluid intelligence.	Intelligence is composed of broad and narrow abilities, such as reading ability, memory capacity, and processing speed.	The specific abilities outlined by the CHC theory may be too narrowly cognitive.
Gardner's multiple intelligences	Our abilities are best classified into eight or nine independent intelligences, which include a broad range of skills beyond traditional school smarts.	Intelligence is more than just verbal and mathematical skills. Other abilities are equally important to our human adaptability.	Should all our abilities be considered *intelligences?* Shouldn't some be called less vital *talents?*
Sternberg's triarchic theory	Our intelligence is best classified into three areas that predict real-world success: analytical, creative, and practical.	These three domains can be reliably measured.	These three domains may be less independent than the theory suggests, and

			may actually share an underlying *g* factor.
Emotional intelligence	Social intelligence is an important indicator of life success. Emotional intelligence is a key aspect of it, consisting of perceiving, understanding, managing, and using emotions.	These four components predict social success and emotional well-being.	Does this stretch the concept of intelligence too far?

Retrieval Practice

RP-2 How does the Cattell-Horn-Carroll theory of intelligence integrate the idea of having general intelligence as well as specific abilities?

ANSWERS IN APPENDIX E

REVIEW

Module 29: What Is Intelligence?

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the

answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 29-1: How do psychologists define *intelligence?*

LOQ 29-2: What are the arguments for *g?*

LOQ 29-3: How have the concepts of *fluid intelligence* and *crystallized intelligence,* and the *CHC theory,* affected our understanding of intelligence?

LOQ 29-4: How do Gardner's and Sternberg's theories of multiple intelligences differ, and what criticisms have they faced?

LOQ 29-5: What are the four components of emotional intelligence?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

intelligence
general intelligence *(g)*
fluid intelligence *(Gf)*
crystallized intelligence *(Gc)*
Cattell-Horn-Carroll (CHC) theory
savant syndrome
emotional intelligence

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. Charles Spearman suggested we have one _____ _____ underlying success across a variety of intellectual abilities.

2. The existence of savant syndrome seems to support
   a. Sternberg's distinction among three types of intelligence.
   b. criticism of multiple intelligence theories.
   c. theories of multiple intelligences.
   d. Thorndike's view of social intelligence.

3. Sternberg's three types of intelligence are _____, _____, and _____.

4. Emotionally intelligent people tend to
   a. seek immediate gratification.
   b. understand their own emotions but not those of others.
   c. understand others' emotions but not their own.
   d. succeed in their careers.

MODULE 30: Intelligence Assessment and Dynamics

LOQ 30-1

What is an *intelligence test,* and how do *achievement tests* and *aptitude tests* differ?

An **intelligence test** assesses people's mental aptitudes and compares them with those of others, using numerical scores. How do psychologists design such tests, and what makes them credible?

In your lifetime, you've taken dozens of mental ability tests: school tests of basic reading and math skills, course exams, intelligence tests, driver's license exams. These tests fall under two general categories:

- **Achievement tests**, which are intended to *reflect* what you have learned. Your final exam will measure what you learned in this class.
- **Aptitude tests**, which are intended to *predict* what you will be able to learn. If you took an entrance exam, it was designed to predict your ability to do college or university work.

An aptitude test is a "thinly disguised intelligence test," says Howard Gardner (1999). Indeed, report Meredith Frey and Douglas Detterman

(2004), total scores on the U.S. SAT have correlated $+0.82$ with general intelligence test scores in a national sample of 14- to 21-year-olds (FIGURE 30.1). Aptitude also supports achievement: People who learn quickly are also better at retaining information (Zerr et al., 2018).

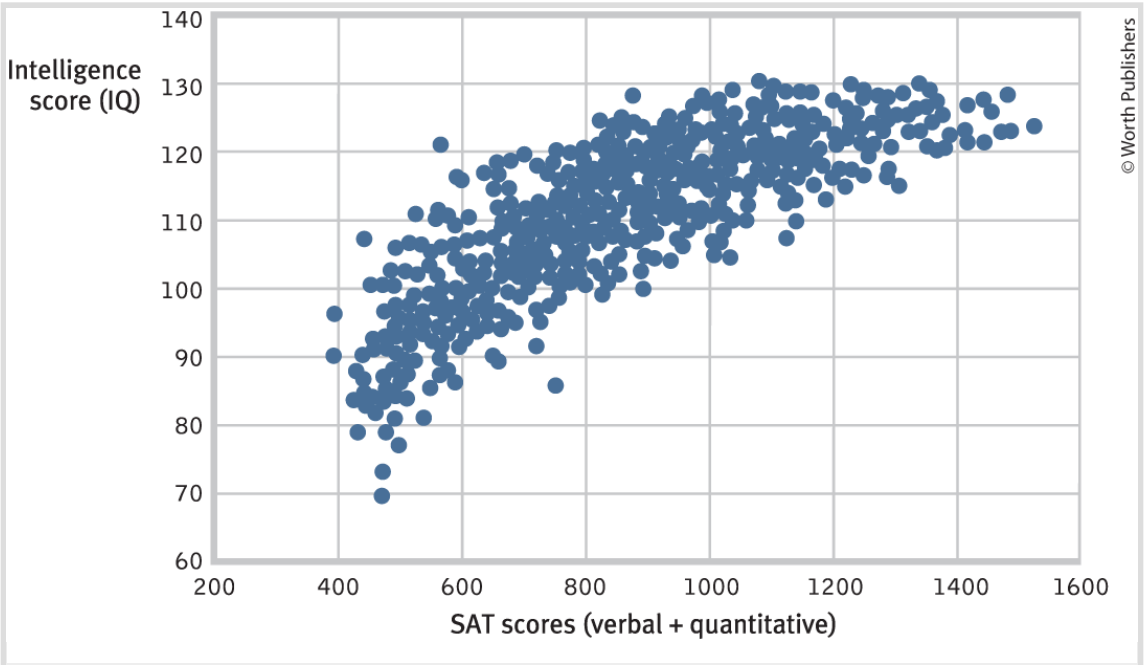


FIGURE 30.1 Close cousins: Aptitude and intelligence test scores A scatterplot shows the close correlation that has existed between intelligence test scores and verbal and quantitative SAT scores. (Data from Frey & Detterman, 2004.)

Ask Yourself

What achievement or aptitude tests have you taken? In your opinion, how well did these tests assess what you'd learned or predict what you were capable of learning?

Early and Modern Tests of Mental Abilities

LOQ 30-2

When and why were intelligence tests created, and how do today's tests differ from early intelligence tests?

Francis Galton: Presuming Hereditary Genius

Western attempts to assess such differences began in earnest with English scientist Francis Galton (1822–1911), who was fascinated with measuring human traits. When his cousin Charles Darwin proposed that nature selects successful traits through the survival of the fittest, Galton wondered if it might be possible to measure "natural ability" and to encourage those of high ability to mate with one another. At the 1884 London Health Exhibition, more than 10,000 visitors received his assessment of their "intellectual strengths" based on such things as reaction time, sensory acuity, muscular power, and body proportions. But alas, on these measures, well-regarded adults and students did not outscore others. Nor did the measures correlate with each other.

Although Galton's quest for a simple intelligence measure failed, he gave us some statistical techniques that we still use (as well as the phrase *nature and nurture*). And his persistent belief in the inheritance

of genius—reflected in his book, *Hereditary Genius* (1869)—illustrates an important lesson from both the history of intelligence research and the history of science: Although science itself strives for objectivity, individual scientists are affected by their own assumptions and attitudes.

Alfred Binet: Predicting School Achievement

Modern intelligence testing traces its birth to early twentieth-century France, where a new law required all children to attend school. French officials knew that some children, including many newcomers to Paris, would need special classes. But how could the schools make fair judgments about children's learning potential? Teachers might assess children who had little prior education as slow learners. Or they might sort children into classes by their social backgrounds. To minimize such bias, France's minister of public education gave psychologist Alfred Binet the task of designing fair tests.



Macmillan Learning

Alfred Binet (1857–1911) "Some recent philosophers have given their moral approval to the deplorable verdict that an individual's intelligence is a fixed quantity, one which cannot be augmented. We must protest and act against this brutal pessimism" (Binet, 1909, p. 141).

Binet and his student, Théodore Simon, began by assuming that all children follow the same course of intellectual development but that some develop more rapidly (Nicolas & Levine, 2012). A child with an intellectual developmental disorder should score much like a typical younger child, and an intellectually gifted child like a typical older child. Thus, their goal became measuring each child's **mental age**, the level of performance typically associated with a certain chronological age. The average 8-year-old, then, has a mental age of 8. An 8-year-old with a below-average mental age (perhaps performing at the level of typical 6-year-old) would struggle with age-appropriate schoolwork.

To measure mental age, Binet and Simon theorized that mental aptitude, like athletic aptitude, is a general capacity that shows up in various ways. They tested a variety of reasoning and problem-solving questions on Binet's two daughters, and then on what they called "backward" and "bright" Parisian schoolchildren. Items answered correctly could then predict how well other French children would handle their schoolwork.

Binet and Simon made no assumptions concerning *why* a particular child was slow, average, or precocious. Binet personally leaned toward an environmental explanation. To raise the capacities of low-scoring children, he recommended "mental orthopedics" that would help develop their attention span and self-discipline. He believed his intelligence test did not measure inborn intelligence as a scale measures weight. Rather, it had a single practical purpose: to identify French schoolchildren needing special attention. Binet hoped his test would be used to improve children's education, but he also feared it would be used to label children and limit their opportunities (Gould, 1981).

Retrieval Practice

RP-1 What did Binet hope to achieve by establishing a child's mental age?

ANSWERS IN APPENDIX E

Lewis Terman: Measuring Innate Intelligence

After Binet's death in 1911, others adapted his tests for use as a numerical measure of intelligence. Lewis Terman (1877–1956) was an ambitious Stanford University professor who sought to bring intelligence testing to the United States. At a young age, Terman presumed he wasn't destined for an intellectual life (Terman, 1930). He grew up the twelfth of fourteen children, the son of farmers who had little education. Terman overcame being burned in a fire, breaking a hip, and tuberculosis (Boring, 1959). His persistence and unquenchable reading appetite led him out of his one-room schoolhouse to a local college and later to Stanford University to study children who, like him, were born with high general intelligence *(g)*.

To achieve his goal, Terman tried the Paris-developed questions and age norms with California kids. Adapting some of Binet's original items, adding others, and establishing new age norms, Terman extended the upper end of the test's range from age 12 to "superior adults." He also gave his revision the name today's version retains—the **Stanford-Binet**.

So, how were these intelligence tests scored? The **intelligence quotient (IQ)** was a formula developed by German psychologist William Stern. The IQ was simply a person's mental age divided by chronological age, multiplied by 100. Thus, the average 8-year-old child, whose mental age and chronological age match, has an IQ of

100. But an 8-year-old who answers questions as would a typical 10-year-old has an IQ of 125:

$$\text{IQ} = \frac{\text{mental age of 10}}{\text{chronological age of 8}} \times 100 = 125$$

This original IQ formula worked fairly well for children but not for adults. (Should a 40-year-old who does as well on the test as an average 20-year-old be assigned an IQ of only 50?) Most current intelligence tests, including the Stanford-Binet, no longer compute an IQ in this manner (though the term *IQ* still lingers as a shorthand expression for "intelligence test score"). Instead, they assign a score that represents a test-taker's performance *relative to the average performance* (arbitrarily set at 100) of others the same age. Most people—about 68 percent of those taking an intelligence test—fall between 85 and 115.



Mrs. Randolph takes mother's pride too far.

Terman assumed that intelligence tests revealed a mental capacity present from birth. He also assumed that some ethnic groups were naturally more intelligent than others. And he supported *eugenics,* the discriminatory nineteenth- and twentieth-century movement that proposed measuring human traits and encouraging only those deemed "fit" to reproduce—as well as preventing those deemed "inferior" from doing so.

With Terman's help, the U.S. government developed new tests to evaluate both newly arriving immigrants and World War I army recruits—the world's first mass administration of an intelligence test. To some psychologists, the results indicated the inferiority of people not sharing their Anglo-Saxon heritage. Abuses of the early

intelligence tests serve to remind us that science can be value laden. Behind a screen of scientific objectivity, ideology may lurk.

Retrieval Practice

RP-2 What is the IQ score of a 4-year-old with a mental age of 5?

ANSWERS IN APPENDIX E

David Wechsler: Testing Separate Strengths

Psychologist David Wechsler created what is now the most widely used individual intelligence test, the **Wechsler Adult Intelligence Scale (WAIS)**, together with a version for school-age children (the *Wechsler Intelligence Scale for Children [WISC]*), and another for preschool children (Evers et al., 2012). The 2008 edition of the WAIS (at the time we were writing this, a new version was anticipated in 2023) consists of 15 subtests, including these:

- ***Similarities***—reasoning the commonality of two objects or concepts ("In what way are wool and cotton alike?")
- ***Vocabulary***—naming pictured objects, or defining words ("What is a guitar?")
- ***Block design***—visual abstract processing ("Using the four blocks, make one just like this.")

- ***Letter-number sequencing*—**on hearing a series of numbers and letters ("R-2-C-1-M-3"), repeating the numbers in ascending order, and then the letters in alphabetical order.



Richard T. Nowitz/The Image Bank/Getty Images

Matching patterns Block-design puzzles test visual abstract processing ability. Wechsler's individually administered intelligence test comes in forms suited for adults and children.

The WAIS yields not only an overall intelligence score, as does the Stanford-Binet, but also separate scores for verbal comprehension, perceptual reasoning, *working memory,* and processing speed. In such ways, this test helps realize Binet's aim: to identify those who could benefit from special educational opportunities for improvement.

Retrieval Practice

RP-3 An employer with a pool of applicants for a single available position is interested in testing each applicant's potential. To determine that, she should use an _____ (achievement/aptitude) test. That same employer, wishing to test the effectiveness of a new, on-the-job training program, would be wise to use an _____ (achievement/aptitude) test.

ANSWERS IN APPENDIX E

Principles of Test Construction

LOQ 30-3

What is a *normal curve,* and what does it mean to say that a test has been *standardized* and is *reliable* and *valid?*

To be widely accepted, a psychological test must meet three criteria: It must be *standardized, reliable,* and *valid.* The Stanford-Binet and Wechsler tests meet these requirements.

Standardization

To know how well you performed on an intelligence test, you would need some basis for comparison. That's why test-makers give new tests to a representative sample of people. The scores from this pretested group become the basis for future comparisons. If you then take the test following the same procedures, your score, when compared with others, will be meaningful. This process is called **standardization**.

For many human attributes—height, weight, and mental aptitude—people's scores typically form a bell-shaped pattern called the *bell curve,* or **normal curve**. The curve's highest point is the average score. On an intelligence test, we give this average score a value of 100 (**FIGURE 30.2**). Moving out from the average toward either extreme, we find fewer and fewer people. For both the Stanford-Binet and Wechsler tests, a person's score indicates whether that person's performance fell above or below the average. A score of 130 would indicate that only 2.5 percent of test-takers performed better. About 95 percent of all people score within 30 points of 100.

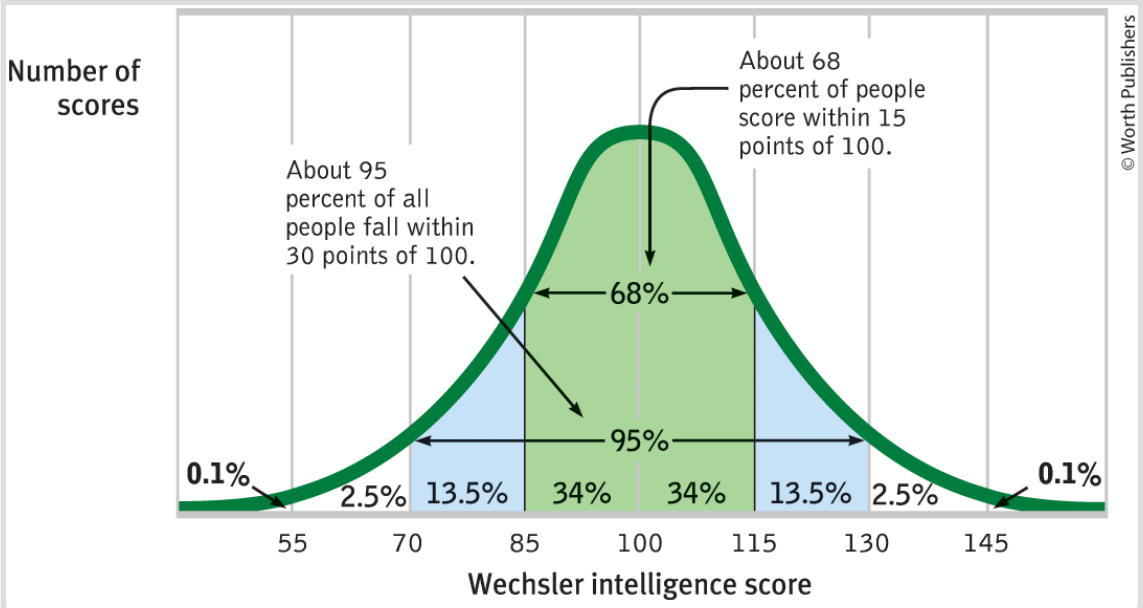


FIGURE 30.2 The normal curve Scores on aptitude tests tend to form a normal, or bell-shaped, curve around an average score. For the Wechsler scale, for example, the average score is 100. Note: Numbers do not add up to 100 percent due to rounding.

To keep the average score near 100, the Stanford-Binet and Wechsler scales are periodically restandardized. If you recently took the WAIS, Fourth Edition, your performance was compared with a standardization sample who took the test during 2007, not to David Wechsler's initial 1930s sample. If you compared the performance of the most recent standardization sample with that of the 1930s sample, do you suppose you would find rising or declining test performance? Amazingly—given that college entrance aptitude scores have sometimes dropped, such as during the 1960s and 1970s—intelligence test performance has improved. This worldwide phenomenon is called the *Flynn effect,* in honor of New Zealand researcher James Flynn (1987, 2012, 2018), who first calculated its magnitude. Flynn

observed that the average person's intelligence test score rose three points per decade. Thus, an average person in 1920 would—by today's standard—score only a 76! Such rising performance has been observed in 49 countries, from Sweden to Sudan (Dutton et al., 2018; Wongupparaj et al., 2015). Countries that have shown the greatest growth in IQ score over time have also experienced more economic growth (Rindermann & Becker, 2018). Although there have been some regional reversals, the historic increase is now widely accepted as an important phenomenon (Lynn, 2009; Teasdale & Owen, 2008).

The Flynn effect's cause has been a psychological mystery. Did it result from greater test sophistication? *No.* Gains appeared before testing was widespread. Perhaps better nutrition? Thanks to improved nutrition, people have gotten taller as well as smarter. But in postwar Britain, noted Flynn (2009), children in families with lower income gained the most from improved nutrition, yet the intelligence performance gains were greater among children in families with higher income. Might the explanation be greater educational opportunities, smaller families, and rising living standards (Pietschnig & Voracek, 2015; Rindermann et al., 2016)? For example, children around the world now have access to educational programs such as *Sesame Street* that increase their intellectual performance and reduce their prejudice toward children from different ethnic backgrounds (Kwauk et al., 2016). Flynn (2012) attributes the IQ score increases to our need to develop new mental skills to cope with modern environments. Regardless of what combination of factors explains the rise in intelligence test scores, the phenomenon counters

one concern of some hereditarians—that the higher twentieth-century birthrates among those with lower scores would shove human intelligence scores downward (Lynn & Harvey, 2008).

Reliability

Knowing where you stand in comparison to a standardization group still won't say much about your intelligence unless the test has **reliability**. A reliable test, when retaken, gives consistent scores. To check a test's reliability, researchers test people many times. They may split the test in half (*split-half:* agreement of odd-question scores and even-question scores), test with alternative forms of the test, or retest with the same test *(test-retest).* The higher the *correlation* between the two scores, the higher the test's reliability. The tests we have considered—the Stanford-Binet, the WAIS, and the WISC—are very reliable after early childhood (with *correlation coefficients* of about $+.9$). In retests, sometimes decades later, people's scores are generally similar to their first score (Deary et al., 2009; Lyons et al., 2017).

Validity

High reliability does not ensure a test's **validity**—the extent to which the test actually measures or predicts what it promises. Imagine using a tape measure with faulty markings. If you use it to measure people's heights, your results will be very reliable. No matter how many times

you measure a person's height, you will get a consistent result. But those results will not be valid.

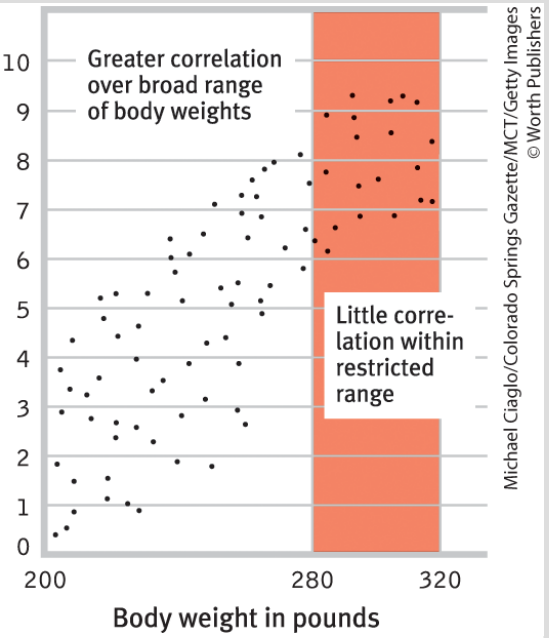
We expect intelligence tests to have **predictive validity**: They should predict the criterion of future performance, and to some extent they do. In one analysis of 223,000 students from 171 colleges and universities, SAT aptitude scores correlated $+.5$ with first-year college grade-point average (Westrick et al., 2019). Higher SAT aptitude scores also predict a greater likelihood of returning for a second year of college. Thus, the SAT has predictive validity of first-year college success and retention. And SAT aptitude scores correlate about $+.8$ with those for the Graduate Record Examination (the GRE; an aptitude test similar to the SAT but for those applying to graduate school) (Wai et al., 2018).

Are general aptitude tests as predictive as they are reliable? *No.* Aptitude test scores do predict school grades (Roth et al., 2015). But as critics are fond of noting, the predictive power of aptitude tests peaks in the early school years and weakens later. Academic aptitude test scores are reasonably good predictors of school achievement for children ages 6 to 12, where the correlation between intelligence score and school performance is about $+.6$ (Jensen, 1980). Intelligence scores correlate even more closely with scores on later achievement tests: $+.81$ in one comparison of 70,000 English children's intelligence scores at age 11 with their academic achievement in national exams at age 16 (Deary et al., 2007, 2009). The SAT, used in the United States as a college entrance exam, has been less successful

in predicting first-year college grades. (The correlation, less than $+.5$, has been, however, a bit higher when adjusting for high scorers electing tougher courses [Berry & Sackett, 2009; Willingham et al., 1990].) By the time we get to the GRE, the correlation with graduate school performance is an even more modest but still significant $+.4$ (Kuncel & Hezlett, 2007).

Why does the predictive power of aptitude scores diminish as students move up the educational ladder? Consider a parallel situation: Among all U.S. and Canadian football linemen, body weight correlates with success. A 300-pound player tends to overwhelm a 200-pound opponent. But within the narrow 280- to 320-pound range typically found at the professional level, the correlation between weight and success becomes negligible (**FIGURE 30.3**). The narrower the *range* of weights, the lower the predictive power of body weight becomes. If an elite university takes only those students who have very high aptitude scores, and then gives them a restricted range of high grades, those scores cannot possibly predict much. This will be true even if the test has excellent predictive validity with a more diverse sample of students. Likewise, modern grade inflation has produced less diverse high school grades. With their diminished range, high school grades now predict college grades no better than have SAT scores (Sackett et al., 2012). So, when we validate a measure using a wide range of scores but then use it with a restricted range of scores, it loses much of its predictive validity.





Michael Ciaglo/Colorado Springs Gazette/MCT/Getty Images
© Worth Publishers

FIGURE 30.3 Diminishing predictive power Let's imagine a correlation between football linemen's body weight and their success on the field. Note how insignificant the relationship becomes when we narrow the range of weight to 280 to 320 pounds. As the range of data under consideration narrows, its predictive power diminishes.

Retrieval Practice

RP-4 What are the three criteria that a psychological test must meet in order to be widely accepted? Explain.

RP-5 Correlation coefficients were used in this section. Here's a quick review: Correlations do not indicate cause-effect, but they do tell us whether two things are associated in some way. A correlation of −1.00 represents perfect _____ (agreement/disagreement) between two sets of scores: As one score goes up, the other score goes _____ (up/down). A correlation of _____ represents no association. The highest correlation, $+1.00$, represents perfect _____ (agreement/disagreement): As the first score goes up, the other score goes _____ (up/down).

ANSWERS IN APPENDIX E

Extremes of Intelligence

LOQ 30-4

What are the traits of those at the low and high intelligence extremes?

One way to glimpse the validity and significance of any test is to compare people who score at the two extremes of the normal curve. The two groups should differ noticeably, and on intelligence tests, they do.

The Low Extreme

Intellectual developmental disorder is a neurodevelopmental disorder that is apparent before age 18, sometimes with a known physical cause. To be diagnosed with an intellectual developmental disorder, a person must—among other criteria (see the Psychological Disorders modules)—have a test score of 70 or below. For some, intelligence test scores can mean life or death. In the United States (one of the only industrialized countries with the death penalty), the Flynn effect means fewer people are now eligible for execution. Why? Because in 2002, the U.S. Supreme Court ruled that the execution of people with an intellectual developmental disorder is "cruel and unusual punishment." For Teresa Lewis, that test score cutoff was 70. Lewis, a

"dependent personality" with limited intellect (a reported intelligence test score of 72), allegedly agreed to a plot in which two men killed her husband and stepson in exchange for a split of a life insurance payout (Eckholm, 2010). The State of Virginia executed Lewis in 2010. If only she had scored 69.

In 2014, the U.S. Supreme Court recognized the imprecision and arbitrariness of a fixed cutoff score of 70, and required states with death row inmates who have scored just above 70 to consider other evidence. Thus, Ted Herring, who had scored 72 and 74 on intelligence tests—but didn't know that summer follows spring or how to transfer between buses—was taken off Florida's death row (Alvarez & Schwartz, 2014).



Richard Bailey/Corbis/Getty Images

Integrated intelligence Many U.S. classrooms combine children with differing intellectual

abilities, providing additional support services as needed.

The High Extreme

Children whose intelligence test scores indicate extraordinary academic gifts mostly thrive. In one famous project begun in 1921, Lewis Terman studied more than 1500 California schoolchildren with IQ scores over 135. These high-scoring children (later called the "Termites") were—like those in later studies—healthy, well-adjusted, and unusually successful academically (Friedman & Martin, 2012; Lubinski, 2016). Their success continued over the next seven decades. Most had attained high levels of education, and many were doctors, lawyers, professors, scientists, and writers (Austin et al., 2002; Holahan & Sears, 1995).



Barbara Smaller/Cartoon Stock

"Zach is in the gifted-and-talented-and-you're-not class."

Other studies have followed the lives of precocious youths who had aced the math SAT at age 13—by scoring in the top 1 percent of their age group. By their fifties, these math whizzes had secured 681 patents and many had achieved eminence, often in STEM (science, technology, engineering, and math) fields (Bernstein et al., 2019; Lubinski et al., 2014). About 1 percent of Americans earn doctorates. But for the 12- and 13-year-olds who scored in the top 1 in 10,000 among those of their age taking the SAT, about 40 percent had done so (Kell et al., 2013; Makel et al., 2016). Among U.S. high-scoring whiz kids were Google co-founder Sergey Brin and musician Stefani Germanotta (Lady Gaga) (Clynes, 2016).

Schooling and Intelligence

"Gifted child" programs tend to segregate high-scoring children in special classes, often giving them academic enrichment not available to their peers. "Remedial" programs generally mainstream children, but give them access to resources that help them overcome challenges. Critics note that grouping ("tracking") students by aptitude sometimes creates a self-fulfilling prophecy: Implicitly labeling some children as "ungifted" and denying them enrichment opportunities can widen the achievement gap between ability groups (Batruch et al., 2019). Because minority and low-income youth are more often placed in lower academic groups, tracking can also promote segregation and prejudice—hardly, note critics, a healthy preparation for working and living in a modern world.

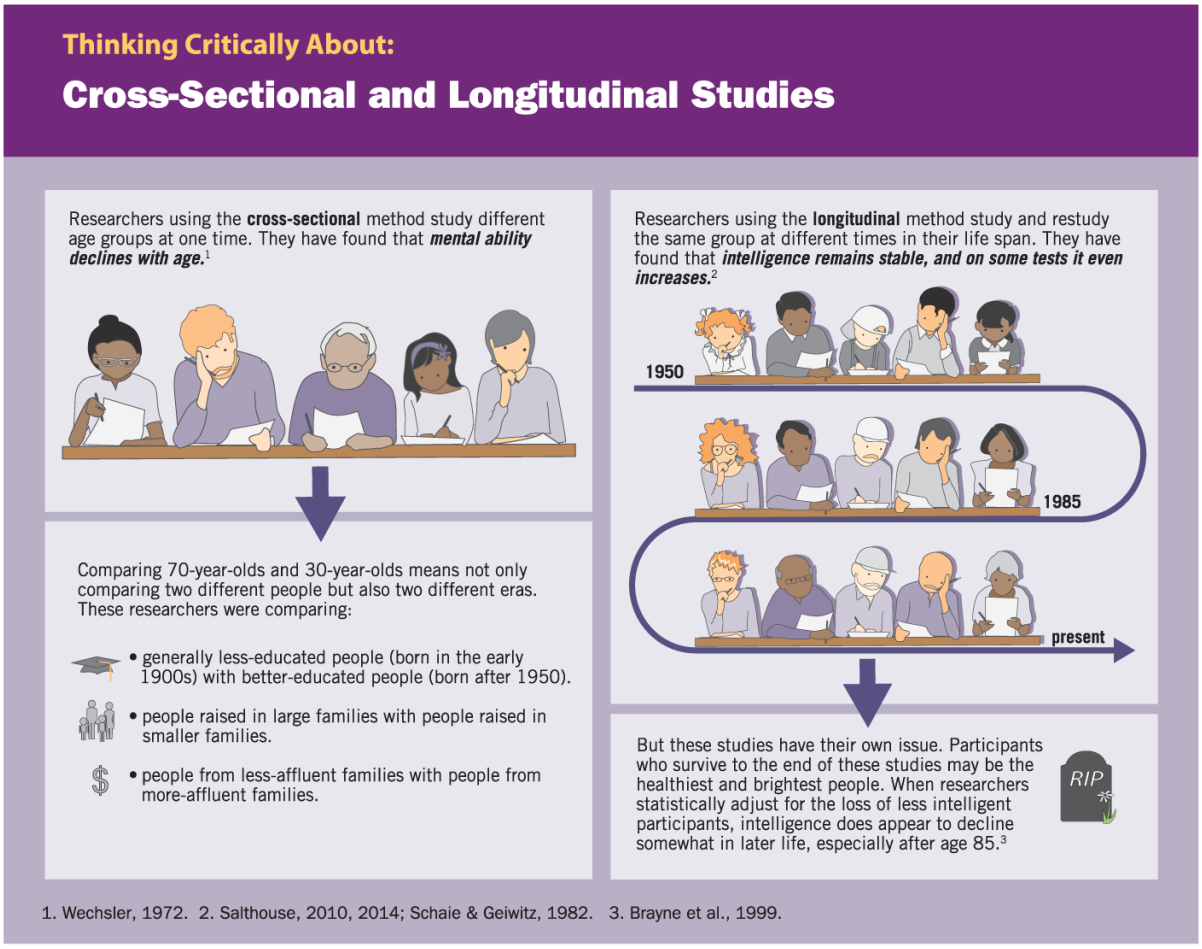
Critics and proponents of gifted education do, however, agree on this: Children have differing gifts, whether at math, verbal reasoning, art, or social leadership. Educating children as if all were alike is as naive as assuming that giftedness is something, like curly hair, that you either have or do not have. One need not stick labels on children to affirm their special talents or their challenges, and to reach them all at the frontiers of their own ability and understanding. By providing *appropriate placement* suited to each child's talents (as when allowing a math whiz to study math at a higher level, or providing extra resources to children struggling to read), we can promote both equity and excellence for all (Subotnik et al., 2011).

Intelligence Across the Life Span

What happens to our intellectual muscles as we age? Do they gradually decline, as does our body strength? Or do they remain constant? To see how psychologists have studied intelligence across the life span—and for an illustration of psychology's self-correcting process—see Thinking Critically About: Cross-Sectional and Longitudinal Studies.

LOQ 30-5

What are *cross-sectional studies* and *longitudinal studies,* and why is it important to know which method was used?



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Stability or Change?

LOQ 30-6

How stable are intelligence test scores over the life span?

What can we predict from a child's early-life intelligence scores? Will a precocious 2-year-old mature into a talented college student and a brilliant senior citizen? Maybe—or maybe not. For most children,

intelligence assessments before age 3 only modestly predict future aptitudes (Humphreys & Davey, 1988; Tasbihsazan et al., 2003; Yu et al., 2018). Some precocious preschoolers become brilliant adults, but even Albert Einstein was once thought "slow"—as he was in learning to talk (Quasha, 1980).



The stability of intelligence At age 4, James Holzhauer was featured in a *Chicago Tribune* article about his math ability. By age 7, he was in the fifth grade (Jacobs, 2019). At age 34, he won 32 consecutive appearances on the quiz show *Jeopardy!*

By age 4, however, children's performance on intelligence tests begins to predict their adolescent and adult scores. The consistency of scores over time increases with the age of the child (Tucker-Drob & Briley, 2014). By age 11, the stability becomes impressive, as Ian Deary and his colleagues (2004, 2009, 2013) discovered when they retested the same **cohort**—the same group of people—over many years. Their

amazing longitudinal studies have been enabled by their country, Scotland, doing something no nation has done before or since. On June 1, 1932, essentially every child in the country born in 1921—87,498 children around age 11—took an intelligence test. The aim was to identify working-class children who would benefit from further education. Sixty-five years later to the day, Deary's colleague Lawrence Whalley and Whalley's wife Patricia scoured the dusty storeroom shelves at the Scottish Council for Research in Education, not far from Deary's Edinburgh University office. At the last possible moment, Patricia uncovered the test results tucked away in a brown paper sack (Carpenter, 2001). "This will change our lives," Deary replied when Whalley told him the news.

And so it has, with dozens of studies of the stability and the predictive capacity of these early test results. One of Deary's studies, for example, retested 542 survivors from the 1932 test group now at age 80. The correlation between the two sets of scores—after nearly 70 years of varied life experiences—was striking (**FIGURE 30.4**). Ditto when 106 survivors were retested at age 90 (Deary et al., 2013). Another study that followed Scots born in 1936 from ages 11 to 70 confirmed the remarkable stability of intelligence, independent of life circumstance (Johnson et al., 2010).

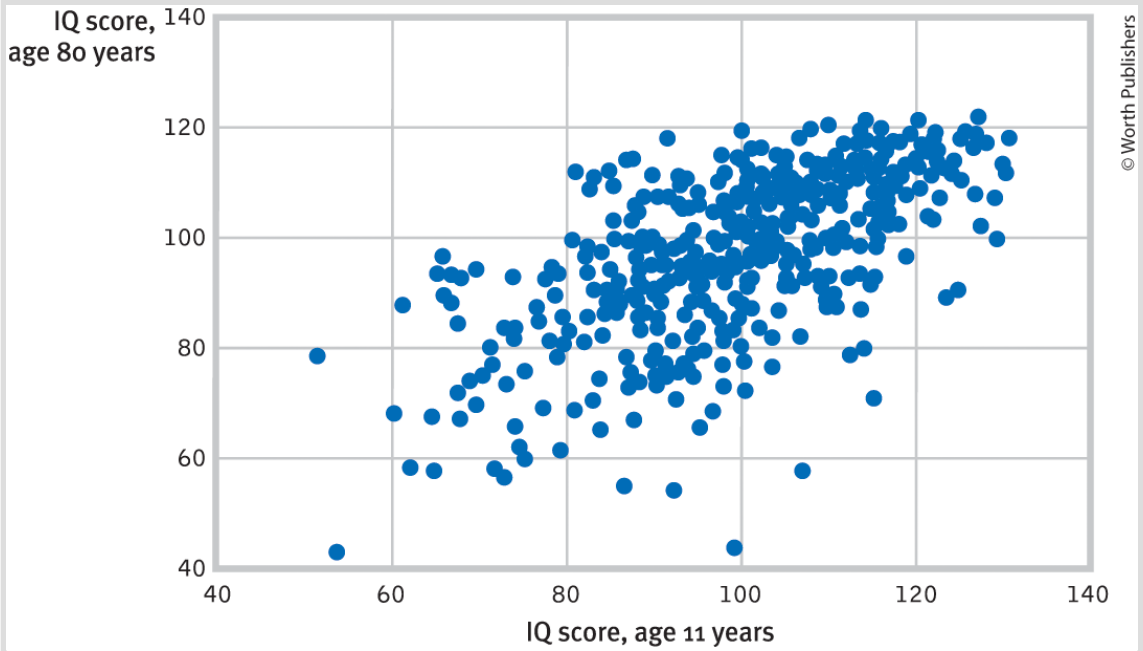

FIGURE 30.4 Intelligence endures When Ian Deary and his colleagues retested 80-year-old Scots, using an intelligence test they had taken as 11-year-olds, their scores across seven decades correlated $+.66$, as shown here. (Data from Deary et al., 2004.) When 106 survivors were again retested at age 90, the correlation with their age 11 scores was $+.54$ (Deary et al., 2013).

Children and adults who are more intelligent tend to live healthier and longer lives (Cadar et al., 2020; Geary, 2019). High-scoring adolescents, 50 years later, even *feel* younger than their age (Stephan et al., 2018). Why might this intelligence-health link exist? Deary (2008) has proposed four possible explanations:

1. Intelligence facilitates more education, better jobs, and a healthier environment.
2. Intelligence encourages healthy living: less smoking, better diet, and more exercise.

3. Prenatal events or early childhood illnesses can influence both intelligence and health.
4. A "well-wired body," as evidenced by fast reaction speeds, perhaps fosters both intelligence and longevity.

> **"Whether you live to collect your old-age pension depends in part on your IQ at age 11."** — Ian Deary, "Intelligence, Health, and Death," 2005

Aging and Intelligence

LOQ 30-7

How does aging affect crystallized intelligence *(Gc)* and fluid intelligence *(Gf)*?

It matters what questions psychological scientists ask, but as we've seen, sometimes it matters even more *how* they ask them—the research methods they use. Cross-sectional studies had shown that older adults gave fewer correct answers on intelligence tests than did younger adults. These findings caused WAIS-creator David Wechsler (1972) to conclude that "the decline of mental ability with age is part of the general [aging] process of the organism as a whole." For a long time, this rather dismal view went unchallenged. Many corporations established mandatory retirement policies, assuming the companies would benefit by replacing aging workers with younger, more capable employees. This thinking persists today, with some countries requiring professors to retire by age 60 (Hong Kong) or 65 (the

Netherlands). As “everyone knows,” you can’t teach an old dog new tricks. But after colleges in the 1920s began giving intelligence tests to entering students, psychologists using longitudinal studies (retesting the same cohorts over a period of years) discovered that intelligence remained stable. On some tests, scores even increased, due partly to experience with the tests (Salthouse, 2014) (FIGURE 30.5). Methods matter.

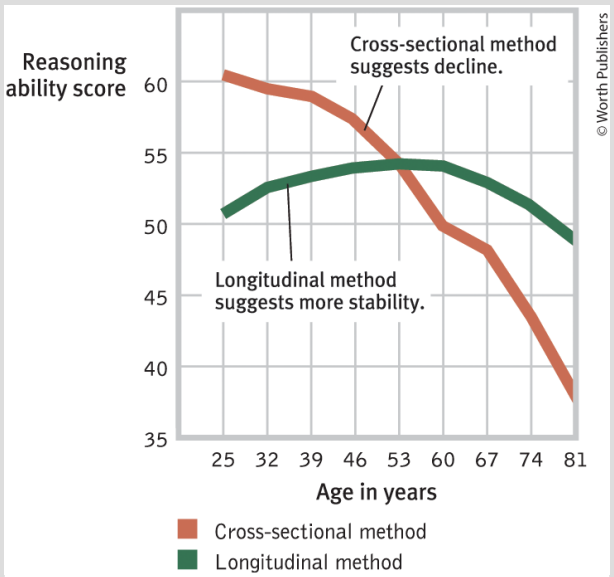

FIGURE 30.5 Cross-sectional versus longitudinal testing of intelligence at various ages In this test of one type of verbal intelligence (inductive reasoning), the cross-sectional method showed declining scores with age. The longitudinal method (in which the same people were retested over a period of years) showed a slight rise in scores well into adulthood. (Data from Schaie, 1994.)

The more optimistic results from longitudinal studies challenged the presumption that intelligence sharply declines with age. Famed painter Anna Mary Robertson Moses ("Grandma Moses") took up painting in her seventies, and at age 88 a popular magazine named her "Young Woman of the Year." At age 89, architect Frank Lloyd Wright designed New York City's Guggenheim Museum. At age 101, neuropsychologist Brenda Milner was still conducting research and supervising students. As everyone knows, given good health, you're never too old to learn.

For most people, aging leads to losses and gains. We simultaneously lose recall memory and processing speed but gain vocabulary and knowledge (Ackerman, 2014; Tucker-Drob et al., 2019; **FIGURE 30.6**). *Crystallized intelligence (Gc)*—our accumulated knowledge as reflected in vocabulary and analogies tests—increases up to old age. *Fluid intelligence (Gf)*—our ability to reason speedily and abstractly, as when solving novel logic problems—may decline, but older adults' social reasoning skills increase, as shown by an ability to take multiple perspectives, to appreciate knowledge limits, and to offer helpful wisdom in times of social conflict (Grossmann et al., 2010). Decisions also become less distorted by negative emotions, such as anxiety, depression, and anger (Blanchard-Fields, 2007; Carstensen & Mikels, 2005).

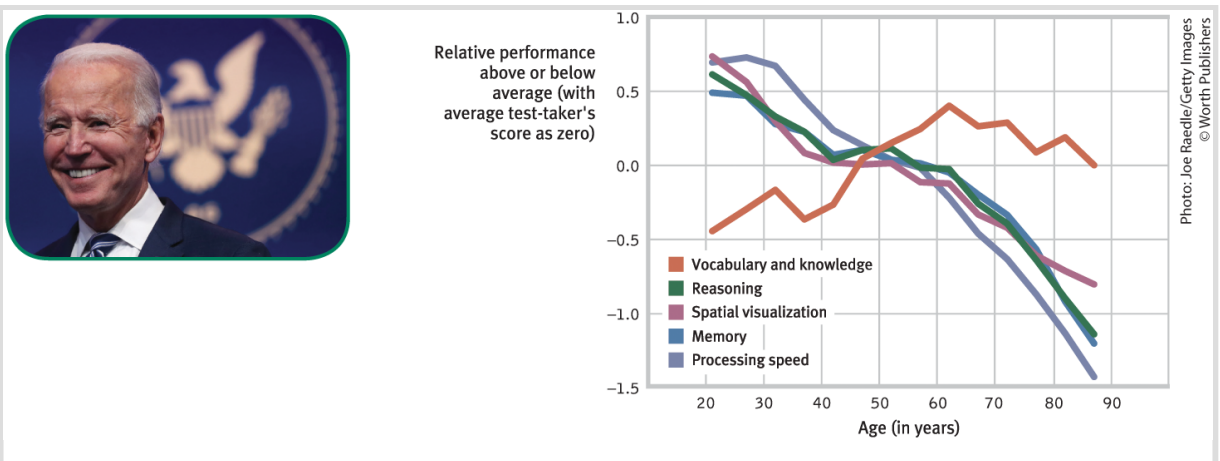

FIGURE 30.6 With age, we lose and we win When Joe Biden assumed the U.S. presidency at age 78, many wondered: Would he have the mental agility to be entrusted with the cognitive demands of national and world leadership? With age comes diminishing physical capabilities and a lessening ability to think speedily (fluid intelligence). But later life also offers an accumulation of applicable knowledge (crystallized intelligence) along with an enhanced wisdom that enables older adults to navigate conflicts, to respond with emotional composure, and to appreciate the limits of their knowledge. "In youth we learn, in age we understand," observed the nineteenth-century novelist Marie Von Ebner-Eschenbach.

These life-span differences in mental abilities help explain why older adults are less likely to embrace new technologies and have more difficulty detecting lies (Brashier & Schacter, 2020; Charness & Boot, 2009; Pew, 2017). These cognitive differences also help explain why mathematicians and scientists produce much of their most creative work, and chess players' performance peaks, during their late twenties or early thirties, when *Gf* is at its highest point (Jones et al., 2014; Strittmatter et al., 2020). In contrast, authors, historians, and philosophers tend to produce their best work in their forties, fifties, and beyond—after building their *Gc,* or accumulated knowledge (Simonton, 1988, 1990).



"We're looking for someone with the wisdom of a 50-year-old, the experience of a 40-year-old, the drive of a 30-year-old, and the payscale of a 20-year-old."

"Knowledge is knowing a tomato is a fruit; wisdom is not putting it in a fruit salad." — Anonymous

Retrieval Practice

RP-6 Researcher A wants to study how intelligence changes over the life span. Researcher B wants to study the intelligence of people who are now at various life stages. Which researcher should use the cross-sectional method, and which the longitudinal method?

ANSWERS IN APPENDIX E

REVIEW

Module 30: Intelligence Assessment and Dynamics

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 30-1: What is an *intelligence test,* and how do *achievement tests* and *aptitude tests* differ?

LOQ 30-2: When and why were intelligence tests created, and how do today's tests differ from early intelligence tests?

LOQ 30-3: What is a *normal curve,* and what does it mean to say that a test has been *standardized* and is *reliable* and *valid?*

LOQ 30-4: What are the traits of those at the low and high intelligence extremes?

LOQ 30-5: What are *cross-sectional studies* and *longitudinal studies,* and why is it important to know which method was used?

LOQ 30-6: How stable are intelligence test scores over the life span?

LOQ 30-7: How does aging affect crystallized intelligence *(Gc)* and fluid intelligence *(Gf)*?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

intelligence test
achievement test
aptitude test
mental age
Stanford-Binet
intelligence quotient (IQ)
Wechsler Adult Intelligence Scale (WAIS)
standardization
normal curve
reliability
validity
predictive validity
cross-sectional study
longitudinal study
cohort

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers i nAppendix E.

1. The IQ score of 6-year-old Shanice, who has a measured mental age of 9, would be
   a. 67.
   b. 133.
   c. 86.
   d. 150.

2. The Wechsler Adult Intelligence Scale (WAIS) is best able to tell us
   a. about innate intelligence among groups.
   b. whether the test-taker will succeed in a job.
   c. how the test-taker compares with other adults in vocabulary and arithmetic reasoning.
   d. whether the test-taker has specific skills for music and the performing arts.

3. The Stanford-Binet, the Wechsler Adult Intelligence Scale, and the Wechsler Intelligence Scale for Children yield consistent results, for example on retesting. In other words, these tests have high _____.

4. Which of the following is NOT a possible explanation for the fact that people with higher intelligence scores tend to live longer, healthier lives?
    a. Intelligence facilitates more education, better jobs, and a healthier environment.
    b. Intelligence encourages a more health-promoting lifestyle.
    c. Intelligent people have slower reaction times, so are less likely to put themselves at risk.
    d. Prenatal events or early childhood illnesses could influence both intelligence and health.

5. Use the concepts of *Gc* and *Gf* to explain why writers tend to produce their most creative work later in life, while scientists often hit their peak much earlier.

MODULE 31: Genetic and Environmental Influences on Intelligence

Intelligence runs in families. But why? Are our intellectual abilities mostly inherited? Or are they molded by our environment?

Heredity and Intelligence

LOQ 31-1

What is *heritability,* and what do twin and adoption studies tell us about the nature and nurture of intelligence?

Heritability is the portion of variation among individuals in a group that we can attribute to genes. Estimates of the heritability of intelligence—the extent to which intelligence test score variation within a group can be attributed to genetic variation—range from 50 percent to 80 percent (Madison et al., 2016; Plomin et al., 2016; Plomin & von Stumm, 2018). Does this mean that we can assume that 50 percent to 80 percent of *your* intelligence is due to your genes, and the rest to your environment? *No.* Heritability never applies to an individual, only to *why people in a group differ from one another.*

Identical twins share the same genes; do they also share mental abilities? As you can see from **FIGURE 31.1**, which summarizes many studies, the answer is clearly *Yes.* Even when adopted by two different families, their intelligence test scores are very similar. When raised together, their scores are nearly as similar as those of the same person taking the same test twice (Haworth et al., 2009; Lykken, 2006; Plomin et al., 2016). Identical twins also exhibit substantial similarity (and heritability) in specific talents, such as music, math, and sports.

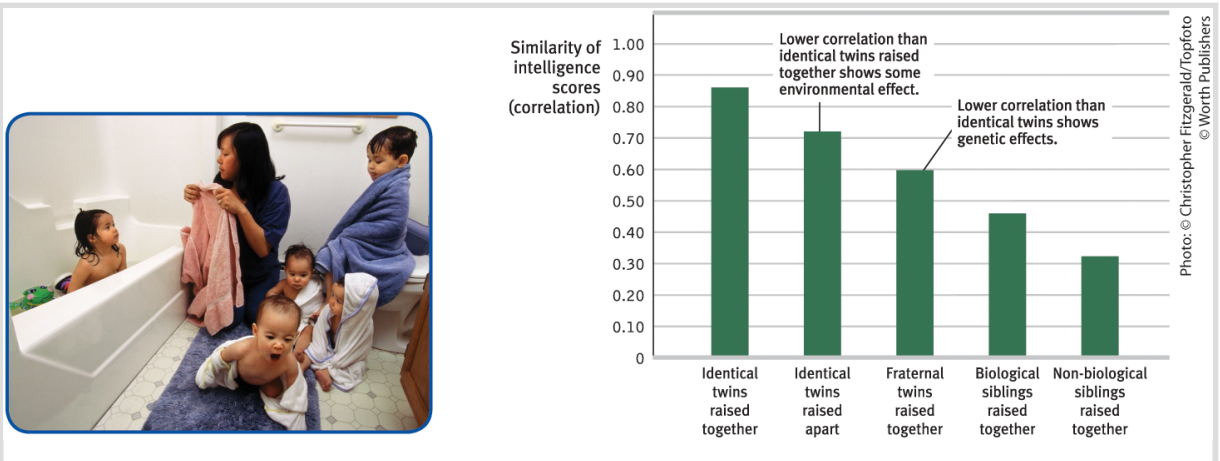

FIGURE 31.1 Intelligence: nature and nurture The most genetically similar people have the most similar intelligence scores. Remember: 1.00 indicates a perfect positive correlation; zero indicates no correlation at all. (Data from McGue et al., 1993.)

Are there known genes for genius? When 100 researchers pooled their data on 269,867 people, all of the gene variations analyzed accounted for only about 5 percent of the differences in educational achievement (Savage et al., 2018). Another analysis of genes from 1.1 million people accounted for about 12 percent of their educational attainment differences (J. J. Lee et al., 2018). Like height, which is predicted by

nearly 10,000 known DNA sequences, intelligence is *polygenic,* involving many genes (Kaiser, 2020). What matters for intelligence (as for height, personality, sexual orientation, or just about any human trait), as well as for disorders such as schizophrenia, is the combination of many genes.

Environment and Intelligence

Fraternal twins are genetically no more alike than other biological siblings, but they usually share an environment and are often treated similarly. Their intelligence test scores are also more alike than are the scores of nontwin siblings (see Figure 31.1). So, environment does have some effect. Adoption studies help us assess the influence of environment. Seeking to untangle genes and environment, researchers have also compared the intelligence test scores of adopted children with those of (a) their *biological parents,* who provided their genes, (b) *adoptive parents,* who provided their home environment, and (c) *adoptive siblings,* who shared that home environment.

Several studies suggest that a shared environment exerts a modest influence on intelligence test scores:

- Adoption from poverty into financially secure homes enhances children's intelligence test scores (Nisbett et al., 2012). One large Swedish study looked at this effect among children adopted into wealthier families with more educated parents. The adopted children's IQ scores were higher, by an average of 4.4 points, than

those of their non-adopted biological siblings (Kendler et al., 2015).
- Adoption of mistreated or neglected children enhances their intelligence scores (Almas et al., 2017).
- The intelligence scores of "virtual twins"—same-age, unrelated children adopted as infants and raised together as siblings—correlate positively: $+.28$ (Segal et al., 2012).

During childhood, adoptive siblings' test scores correlate modestly. Over time, adopted children accumulate experience in their differing adoptive families. So, would you expect the shared-environment effect to grow with age and the genetic-legacy effect to shrink?

If you would, behavior geneticists have a stunning surprise for you. Adopted children's intelligence scores resemble those of their biological parents much more than those of their adoptive parents (Loehlin, 2016). And over time, adopted children's verbal ability scores become *more* like those of their biological parents (**FIGURE 31.2**). Mental ability similarities between adopted children and their adoptive families wane with age (McGue et al., 1993). Who would have guessed?

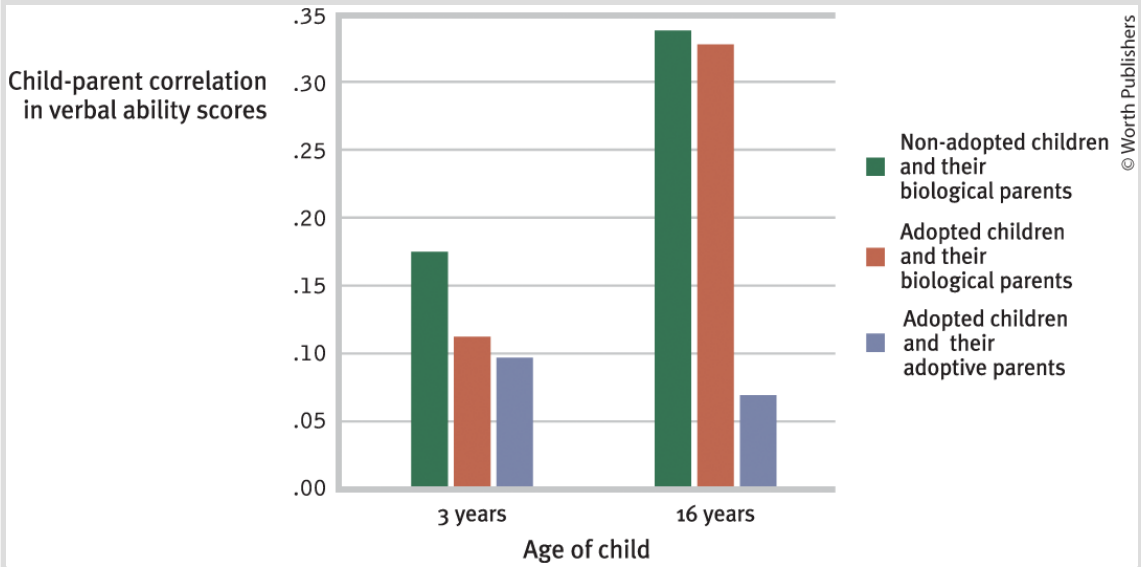

FIGURE 31.2 In verbal ability, whom do adopted children resemble? As the years went by in their adoptive families, children's verbal ability scores became more like their *biological* parents' scores. (Data from Plomin & DeFries, 1998; Plomin et al., 2016.)



"Selective breeding has given me an aptitude for the law, but I still love fetching a dead duck out of freezing water."

Genetic influences become more apparent as we accumulate life experience. Identical twins' similarities, for example, continue or

increase into their eighties. In one massive study of 11,000 twin pairs in four countries, the heritability of general intelligence *(g)* increased from 41 percent in middle childhood to 55 percent in adolescence to 66 percent in young adulthood (Haworth et al., 2010). Thus, report Ian Deary and his colleagues (2009, 2012), the heritability of general intelligence increases from "about 30 percent" in early childhood to "well over 50 percent in adulthood."

Retrieval Practice

RP-1 A check on your understanding of heritability: If environments become more equal, the heritability of intelligence will

a. increase.
b. decrease.
c. be unchanged.

ANSWERS IN APPENDIX E

Gene–Environment Interactions

LOQ 31-2

How can environmental influences affect cognitive development?

Genes and experience together weave the fabric of intelligence. *Epigenetics* studies part of the dynamic biology of this nature–nurture meeting place. With all our abilities—whether mental or physical—*our*

genes shape the experiences that shape us. If you have a natural aptitude for dance, you will probably perform more often than others (getting more practice, instruction, and experience). Or, if you have a natural aptitude for academics, you will more likely stay in school, read books, and ask questions—all of which will increase your brain power. The same would be true for your identical twin—who might, not just for genetic reasons, also become a star performer. In these gene–environment interactions, small genetic advantages can trigger social experiences that multiply our original skills (Cheesman et al., 2020; Sauce & Matzel, 2018).

Sometimes, however, environmental conditions work in reverse, depressing physical or cognitive development. Severe deprivation leaves footprints on the human brain. Nowhere is the intertwining of biology and experience more apparent than in the most hopeless human environments, such as J. McVicker Hunt (1982) observed in a destitute Iranian orphanage. The typical child Hunt observed there could not sit up unassisted at age 2 or walk at age 4. The minimal care infants received was not in response to their crying, cooing, or other behaviors, so the children developed little sense of personal control over their environment. Extreme deprivation had crushed their native intelligence—a finding confirmed by other studies of children raised in poorly run orphanages in Romania and elsewhere (Nelson et al., 2009, 2013; van IJzendoorn et al., 2008).



Mike Abrahams/Alamy Stock Photo

Devastating neglect Some Romanian orphans, such as these children in the Leaganul Pentru Copii orphanage in 1990, had minimal interaction with caregivers and suffered delayed development.

Aware of both the dramatic effects of early experiences and the impact of early intervention, Hunt began a training program for the Iranian caregivers, teaching them to play language-fostering games with 11 infants. They imitated the babies' babbling, engaged them in vocal follow-the-leader, and, finally, they taught the infants sounds from the Persian language. The results were dramatic. By 22 months of age, the infants could name more than 50 objects and body parts, and so charmed visitors that most were adopted—an unprecedented success for the orphanage.

Hunt's findings are an extreme case of a more general finding: The poor environmental conditions that accompany poverty can depress cognitive development (Heberle & Carter, 2015; Tuerk, 2005). The environment's influence was strikingly apparent after psychologist Harold Skeels in 1934 did an IQ assessment of two toddler girls at an

Iowa orphanage, where they were "scarcely touched, never held, rarely spoken to" (Brookwood, 2021). With IQ scores below 50, both toddlers were deemed ineligible for adoption, and placed in an institution for the "feebleminded" to be cared for by adult women with mental ages of only 5 to 9 years. The women lavished their new foster children with affection. When Skeels returned 9 months later, he was amazed to find the girls "alert, attractive, [and] playful. After nearly 2 years with their new caregivers, their IQs had risen to 95 and 93. By their late 20s, both were married and with children in loving households." Nurture matters. People's worries and distractions can also consume cognitive bandwidth and diminish thinking capacity. On tests of cognitive functioning, sugar cane farmers in India scored better after being paid for their harvest—when their money worries dropped (Mani et al., 2013).

If extreme conditions—sensory deprivation, social isolation, poverty—can slow brain development, could the reverse also be true? Could an "enriched" environment amplify development and give very young children a superior intellect? Most experts doubt it (DeLoache et al., 2010; Reichert et al., 2010; Vance, 2018). There is no environmental recipe for fast-forwarding a normal infant into a genius. All babies should have normal exposure to sights, sounds, and speech. Beyond that, Sandra Scarr's (1984) verdict still is widely shared: "Parents who are very concerned about providing special educational lessons for their babies are wasting their time."

More encouraging results have come from intensive, post-babyhood enrichment programs (Dodge et al., 2017; Sasser et al., 2017; Tucker-Drob, 2012). This is particularly true of preschool programs for children living in poverty (Gormley et al., 2013; Heckman & Karapakula, 2019; Magnuson et al., 2007). Intelligence scores also rise with nutritional supplements for pregnant people and newborns (3.5 points), with quality preschool experiences (4 points), and with interactive reading programs (6 points) (Protzko et al., 2013).

Growth Mindset

Schooling and intelligence interact, and both enhance later income (Ceci & Williams, 1997, 2009). But what we accomplish with our intelligence depends also on our own beliefs and motivation. One analysis of 72,431 undergraduates found that study motivation and study skills rivaled aptitude and previous grades as predictors of academic achievement (Credé & Kuncel, 2008). Even intelligence test performance can be affected by motivation. Four dozen studies show that, when promised money for doing well, adolescents score higher on such tests (Duckworth et al., 2011).

These observations would not surprise psychologist Carol Dweck (2018; Dweck & Yeager, 2019). She reports that believing intelligence is changeable fosters a **growth mindset**, a focus on learning and growing. Conversely, believing that intelligence is innately fixed fosters less optimism about people's capacity for change and growth

(Tao et al., 2021). Teachers who adopt a growth mindset tend to view their schools as more likely to improve (Rechsteiner et al., 2021).

Researcher Gregory Walton (2020) teaches a growth mindset to his young children when they tire while biking home: “It’s when you’re tired and you keep going that your muscles get stronger.” Dweck likewise teaches young teens that the brain is like a muscle, growing stronger with use as neuron connections grow: “Learning how to do a new kind of problem grows your math brain!” Receiving praise for *effort* and for tackling challenges, rather than for being smart or accomplished, helps teens understand the link between hard work and success (Gunderson et al., 2013).

A growth mindset doesn’t alter inborn intelligence, so its benefits should not be overstated or lead children to blame themselves for their struggles. But it can make children and youth more resilient when confronted with difficult learning material or frustrating people (Peng & Tullis, 2020; Walton & Wilson, 2018). One national experiment with 6320 lower-achieving U.S. high school students showed that viewing two 25-minute videos fostering a growth mindset modestly improved grades (Yeager et al., 2019). Mindset is only part of the story, but it does matter.



Courtesy Dr. Carol Dweck

It pays to view intelligence as expandable
Psychologist Carol Dweck has shown several benefits of adopting a growth mindset—believing that intelligence grows through motivated effort. Companies with mission statements that endorse a growth mindset, for example, have more trusting and committed employees (Canning et al., 2020).

More than 300 studies confirm that ability + opportunity + motivation = success in fields from sports to science to music (Ericsson et al., 2007). Extremely high intelligence-test-scoring 12-year-olds are much more likely than the average person to earn doctorates and hold patents—if their ability is "coupled with commitment" (Makel et al., 2016). High school students' math proficiency and college students' grades reflect their aptitude but also their self-discipline, their belief

in the power of effort, and a curious, "hungry mind" (Murayama et al., 2013; Richardson et al., 2012; von Stumm et al., 2011). Consider Zaila Avant-garde, who in 2021 became the first African American winner of the U.S. national spelling bee contest. For 2 years, she studied tens of thousands of words with her father and participated in 18 spelling competitions. Not only is she America's best speller; Avant-garde also holds three world records for basketball dribbling (Cramer & Yuhas, 2021). Zaila Avant-garde shows us how to realize our potential: *Believe* in your ability to learn, and *apply* yourself with sustained effort.



Scott McIntyre/The New York Times/Redux Pictures

U.S. national spelling bee champion Zaila Avant-garde

"When you [fail], embrace it; learn from it. Don't think … that's going to hinder you from becoming whoever you want to become …. I wake up every day telling the world: Come on baby, let's ride. What you got for me?" — Recording artist Pitbull, 2019

These repeated findings—that a growth mindset and disciplined effort enhance achievement—have generated attention. Applying growth mindset findings in large-scale interventions with at-risk students can have a downside: the social cost of blaming struggling individuals for their circumstances (Ikizer & Blanton, 2016). And researchers and educators sometimes overstate the modest growth-mindset benefit (Burgoyne et al., 2020). Overemphasizing growth-mindset power can, as with the motivational concept of grit, leave some students feeling that their disappointments reflect a moral flaw. Sometimes people need more than the power of positive thinking to overcome their harsh conditions.

Ask Yourself

Are you working to the potential reflected in your standardized aptitude test scores? What, other than your aptitude, is affecting your school performance?

Group Differences in Intelligence Test

Scores

If there were no group differences in intelligence test scores, psychologists would have less debate over hereditary and environmental influences. But there are group differences. What are they? And what shall we make of them?

Gender Similarities and Differences

LOQ 31-3

How and why do the genders differ in mental ability scores?

In science, as in everyday life, it is differences—not similarities—that excite interest. Men's self-estimated intelligence is often higher than women's self-estimated intelligence, which may fuel a false perception that men are smarter than women (Furnham, 2016). In truth, men's and women's intelligence differences are minor. For example, in that 1932 testing of all Scottish 11-year-olds, boys' intelligence scores averaged 100.5 and girls' 100.6 (Deary et al., 2003). As far as *g* is concerned, the genders are the same.

Yet most people find differences more newsworthy. In cultures where both girls and boys are educated, girls tend to outpace boys in spelling, verbal fluency, and reading—skills that may affect their career choices, some researchers suspect (Breda & Napp, 2019; Reilly

et al., 2019). They are better emotion detectors and are more sensitive to touch, taste, and color (Halpern et al., 2007).

> Testosterone therapy for those transitioning from female to male results in brain language-processing areas that become more male-like, as well as some gray matter loss (Hahn et al., 2016).

In math computation and overall math performance, girls and boys hardly differ (Else-Quest et al., 2010; Hyde & Mertz, 2009; Lindberg et al., 2010). On complex math problems, men outperform women. But the most reliable male edge appears in spatial ability tests like the one shown in **FIGURE 31.3** (Lauer et al., 2019). The solution requires speedy mental rotation of three-dimensional objects. Male mental ability scores (and brains) also vary more (Wierenga et al., 2022). Worldwide, boys and men outnumber girls and women at both the low and high extremes (Ball et al., 2017; Baye & Monseur, 2016). Boys, for example, are more likely than girls to need remedial math classes. But they are also more likely to earn the highest math scores.

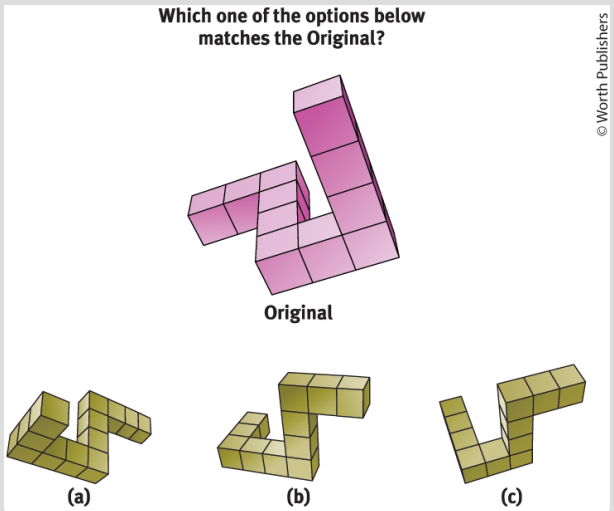

FIGURE 31.3 A mental rotation test These kinds of items are often found on spatial abilities tests. See answer in footnote.[1]

Psychologist Steven Pinker (2005) has argued for the evolutionary perspective—that biology affects gender differences in life priorities (women's somewhat greater interest in people versus men's in money and things), in risk-taking (with men more reckless), and in math reasoning and spatial abilities. Such differences are, he noted, observed across cultures, stable over time, influenced by prenatal hormones, and observed in boys raised as girls.

But social expectations and opportunities also construct gender by shaping interests and abilities (Jiang et al., 2020). Stephen Ceci and Wendy Williams (2010, 2011) reported that culturally influenced preferences help explain why U.S. women, more than men, avoid math-intensive vocations. In Asia and Russia, teen girls have

outperformed boys in an international science exam; in North America and Britain, boys have scored higher (Fairfield, 2012).



"That's an excellent suggestion, Miss Triggs. Perhaps one of the men would like to suggest it."

More gender-equal cultures, such as Sweden and Iceland, exhibit little of the gender math gap found in gender-unequal cultures, such as Turkey and Korea (Guiso et al., 2008; Kane & Mertz, 2012). Since the 1970s, as gender equity has increased in the United States, the boy-to-girl ratio among 12- to 14-year-olds with very high SAT math scores (above 700) has declined from 13 to 1 to 3 to 1 (Makel et al., 2016; Nisbett et al., 2012). And in psychology, there's been a dramatic change in the ratio of women to men earning doctorates—from 17 percent women in 1958 to 71 percent in 2018 (Burelli, 2008; NSF, 2019). As we have seen in so many areas of life, cultural expectations and opportunities matter.



(a)



(b)



(c)

a: Stanford News Service/Zuma Press/ Newscom; b-c: Henrik Montgomery/AP Photo

Shrinking the STEM gap In 2014, Iranian math professor Maryam Mirzakhani (1977–2017) became the first woman to win math's most admired award, the Fields Medal (a). In 2018, physicist Donna Strickland (b) and chemist Frances C. Arnold (c) were each awarded a Nobel Prize in scientific fields where women have rarely won. In her acceptance speech, Strickland said, "Not everyone thinks physics is fun, but I do."

Racial and Ethnic Similarities and Differences

LOQ 31-4

How and why do racial and ethnic groups differ in mental ability scores?

Fueling the group-differences debate are two other disturbing but scientifically agreed-upon facts:

- Racial and ethnic groups differ in their average intelligence test scores.
- High-scoring people (and groups) are more likely to attain high levels of education and income.

There are many group differences in average intelligence test scores. New Zealanders of European descent outscore native Maori New Zealanders. Israeli Jews outscore Israeli Arabs. Most Japanese outscore most Burakumin, a stigmatized Japanese minority. And White Americans have outscored Black Americans, although this difference has diminished, especially among children (Dickens & Flynn, 2006; Nisbett et al., 2012). Such *group* differences provide little basis for judging individuals. Worldwide, women outlive men by 5 years, but knowing only an individual's gender won't tell us how long that person will live.

We have seen that heredity contributes to *individual* differences in intelligence. But group differences in a heritable trait may be entirely environmental. Consider one of nature's experiments: Allow some children to grow up hearing their culture's dominant language, while others, born deaf, do not. Then give both groups an intelligence test rooted in the dominant language. The result? No surprise: Those with expertise in the dominant language will score higher than those who were born deaf (Braden, 1994; Steele, 1990; Zeidner, 1990).

Might the racial and ethnic gap be similarly environmental? Consider:

Genetics research reveals that under the skin, we humans are remarkably alike. Despite some racial variation, such as in health risks, the average genetic difference between two Icelandic villagers or between two Kenyans greatly exceeds the average group difference between Icelanders and Kenyans (Cavalli-Sforza et al., 1994;

Rosenberg et al., 2002). Moreover, looks can deceive. Light-skinned Europeans and dark-skinned Africans are genetically closer than are dark-skinned Africans and dark-skinned Aboriginal Australians.



Larry Williams/The Image Bank/ Getty Images

Race is not a neatly defined biological category. Race is primarily a social construction without well-defined physical boundaries; each race blends seamlessly into the race of its geographical neighbors (Helms et al., 2005; Smedley & Smedley, 2005). In one genetic analysis of more than 160,000 people living in the United States, most with less than 28 percent African ancestry said they were White; those with more than 28 percent mostly said they were African American (Byrc et al., 2015). Moreover, with increasingly mixed ancestries, more and more people defy neat racial categorization and self-identify as multiracial (Pauker et al., 2009).

Within the same populations, there are generation-to-generation differences in test scores. Test scores of today's better-fed, better-educated, and more test-prepared populations exceed those of 1930s populations—by a greater margin than the score difference between today's average-scoring Black Americans and average-scoring White Americans (Flynn, 2012; Pietschnig & Voracek, 2015; Trahan et al.,

2014). The average intelligence test performance of today's sub-Saharan Africans is the same as that of British adults in 1948 (Wicherts et al., 2010). No one credits genetics for such generation-to-generation differences.

Schools and culture matter. Countries whose economies create a large wealth gap between rich and poor tend also to have a large rich-versus-poor intelligence test score gap (Nisbett, 2009). In the United States, rising income inequality has meant less equal access to a college education (Jackson & Holzman, 2020). And fewer educational opportunities can result in lower intelligence test scores. One analysis of 600,000 students showed that each additional year of school predicted 1 to 5 additional IQ points (Ritchie & Tucker-Drob, 2018). Starting and staying in school secures superior smarts.

Math achievement, aptitude test differences, and especially grades may reflect conscientiousness more than competence (Poropat, 2014). Women in college and university outperform equally able men, thanks partly to their greater conscientiousness (Keiser et al., 2016). Students in Asia, who have largely outperformed North American students on such tests, have also spent more time in school and much more time studying in and out of school (CMEC, 2018; Larson & Verma, 1999; NCEE, 2018). These differences persist within the United States, where Asian American students devote the most time to studying and earn the highest grades (Hsin & Xie, 2014).

In different eras, different ethnic groups have experienced golden ages—periods of remarkable achievement. Twenty-five hundred years ago, it was the Greeks and the Egyptians, then the Romans. In the eighth and ninth centuries, genius seemed to reside in the Arab world, leading one Muslim scholar of the era to say of the English and the Dutch, "They lack keenness of understanding and clarity of intelligence and are overcome by ignorance and apathy, lack of discernment, and stupidity" (Henrich, 2020). Five hundred years ago, the Aztec Indians and the peoples of Northern Europe were the superachievers. While the gene pool remained relatively stable, cultures rose and fell.



HOSHANG HASHIMI/AFP/Getty Images

Intelligence allowed to flourish The famed all-women Afghan robotics team stood as a symbol of progress for women in Afghanistan. With the Taliban's return to power in 2021 and the team's welfare and educational opportunities endangered, humanitarian groups helped the team escape the country.

"Do not obtain your slaves from Britain, because they are so stupid and so utterly incapable of being taught." — Cicero, 106–43 B.C.E.

Retrieval Practice

RP-2 The heritability of intelligence scores will be greater in a society of equal opportunity than in a society of extreme inequality between the working poor and billionaires. Why?

ANSWERS IN APPENDIX E

The Question of Bias

LOQ 31-5

Are intelligence tests biased or unfair? What is *stereotype threat,* and how does it affect test-takers' performance?

Knowing there are group differences in intelligence test scores leads to the question of whether those differences are built into the tests. Are intelligence tests biased? The answer depends on how we define bias.

The *scientific* meaning of *bias* hinges solely on whether a test predicts future behavior for all groups of test-takers, not just for some. For example, if the SAT accurately predicted the college achievement of

women but not that of men, then the test would be biased. In this scientific meaning of the term, the near-consensus among psychologists (as summarized by the U.S. National Research Council's Committee on Ability Testing and the American Psychological Association's Task Force on Intelligence) has been that the major U.S. aptitude tests are *not* biased (Berry & Zhao, 2015; Neisser et al., 1996; Wigdor & Garner, 1982). The tests' predictive validity is roughly the same, regardless of gender, race, ethnicity, or socioeconomic level. If an intelligence test score of 95 predicts slightly below-average grades, that rough prediction usually applies equally to all.

But in everyday language, we sometimes use the word "bias" to describe things that are *unfair.* For example, if scores will be influenced by the test-takers' cultural or life experiences, then intelligence tests may be considered unfair, even if scientifically unbiased. Why? Because they measure the test-takers' developed abilities, which reflect, in part, their education and experiences. Being able to answer "Who wrote *Hamlet?*" relies more on educational exposure than on innate intellectual ability (Zoref & Williams, 1980). Some researchers, therefore, recommend culture-neutral questions—such as those that assess people's ability to learn novel words, sayings, and analogies—to enable *culture-fair* aptitude tests (Fagan & Holland, 2007, 2009). Today's standardized tests are rigorously reviewed to attempt to eliminate cultural bias.

Testing proponents caution us against blaming tests for exposing unequal experiences and opportunities. If, because of malnutrition,

people were to suffer stunted growth, should we blame the measuring stick that reveals it? If unequal past experiences predict unequal future achievements, a valid aptitude test will detect such inequalities.

Retrieval Practice

RP-3 What is the difference between a test that is culturally biased and a test that is scientifically biased?

ANSWERS IN APPENDIX E

Test-Takers' Expectations

Throughout this text, you have seen that expectations and attitudes can influence our perceptions and behaviors. For test-makers, expectations can introduce bias. For test-takers, they can become self-fulfilling prophecies. In one study, equally capable men and women took a difficult math test. The women did not do as well as the men—except when they were led to expect that women usually do as well as men on the test (Spencer et al., 1999). Otherwise, something affected their performance, leading the women to confirm societal expectations that they would not perform as well as the men. There was a "threat in the air" (Spencer et al., 2016). This self-fulfilling **stereotype threat** appeared again when Black students who were reminded of their race just before taking verbal aptitude tests performed worse than those who hadn't been reminded (Steele et al., 2002).

Such studies suggest that negative stereotypes may undermine people's academic and professional potential (Grand, 2016; Nguyen & Ryan, 2008; Walton & Spencer, 2009). If you worry that your group or "type" often doesn't do well on a certain kind of test or task, your self-doubts and self-monitoring may hijack your working memory and impair attention, performance, and learning (Hutchison et al., 2013; Inzlicht & Kang, 2010; Rydell et al., 2010). Critics argue that stereotype threat effects are weaker than originally thought (Flore & Wicherts, 2015; Flore et al., 2019).

> **"Math class is tough!"** — "Teen Talk" talking Barbie doll (introduced July 1992, recalled 3 months later)

Stereotype threat, like growth mindset and grit, is a modest phenomenon that often gets overstated (Flore et al., 2019). Yet it helps explain why Black Americans have scored higher when test administrators were Black than when test administrators were White (Danso & Esses, 2001). It gives us insight into why women have scored higher on math tests when there are no test-takers who are men present (Doyle & Voyer, 2016). Avoiding the presence of others who are expected to perform better can give you the confidence to do your best.

From such studies, some researchers have concluded that making students believe they probably won't succeed—an unintended effect of

some remedial programs—can function as a stereotype and weaken performance (Steele, 1995, 2010).

Other research teams have demonstrated the benefits of self-affirmation exercises that engage students in writing about their most important values (Borman et al., 2019; Ferrer & Cohen, 2018; Logel et al., 2019). When challenged to believe in their potential, think positively about their diverse life experiences, or increase their sense of belonging, disadvantaged university students have earned higher grades and have had lower dropout rates (Binning et al., 2020; Broda et al., 2018; Townsend et al., 2019).

> **"[Einstein] showed that genius equals brains plus tenacity squared."** — Walter Isaacson, "Einstein's Final Quest," 2009

***

Perhaps, then, our goals for tests of mental abilities should be threefold. First, we should realize the benefits that intelligence-testing pioneer Alfred Binet foresaw—to enable schools to recognize who might profit most from early intervention. Second, we must remain alert to Binet's wish that intelligence test scores not be misinterpreted as literal measures of a person's worth and potential. Third, we must remember that the competence that general intelligence tests sample is important; it helps enable success in some life paths. But these tests reflect only one important aspect of personal competence (Stanovich

et al., 2016). Our rationality, practical intelligence, and emotional intelligence matter, too, as do other forms of creativity, talent, and character.

> **"Almost all the joyful things of life are outside the measure of IQ tests."** — Madeleine L'Engle, *A Circle of Quiet,* 1972

The point to remember: There are many ways of being successful; our differences are variations of human adaptability. Life's great achievements result not only from "can do" abilities and fair opportunity but also from "will do" motivation. Competence + Opportunity + Diligence = Accomplishment.

Retrieval Practice

RP-4 What psychological principle may help explain why women tend to score higher on math tests when none of their fellow test-takers are men?

ANSWERS IN APPENDIX E

REVIEW

Module 31: Genetic and Environmental Influences on Intelligence

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 31-1: What is *heritability,* and what do twin and adoption studies tell us about the nature and nurture of intelligence?

LOQ 31-2: How can environmental influences affect cognitive development?

LOQ 31-3: How and why do the genders differ in mental ability scores?

LOQ 31-4: How and why do racial and ethnic groups differ in mental ability scores?

LOQ 31-5: Are intelligence tests biased or unfair? What is *stereotype threat,* and how does it affect test-takers' performance?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

heritability
growth mindset
stereotype threat

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. To say that the heritability of intelligence is about 50 percent means that 50 percent of
   a. an individual's intelligence is due to genetic factors.
   b. the similarities between two groups of people are attributable to genes.
   c. the variation in intelligence within a group of people is attributable to genetic factors.
   d. an individual's intelligence is due to each parent's genes.

2. The strongest support for heredity's influence on intelligence is the finding that
   a. identical twins, but not other siblings, have nearly identical intelligence test scores.
   b. the correlation between intelligence test scores of fraternal twins is not higher than that for other siblings.
   c. similarity of mental abilities between adopted siblings increases with age.
   d. children in impoverished families have similar intelligence scores.

3. The environmental influence that has the clearest, most profound effect on intellectual development is
   a. exposing infants to enrichment programs before age 1.
   b. growing up in an economically disadvantaged home.
   c. being raised in conditions of extreme deprivation.
   d. being an identical twin.

4. _____ _____ can lead to poor performance on tests by undermining test-takers' belief that they can do well on the test.

CHAPTER 11
What Drives Us: Hunger, Sex, Belongingness, and Achievement (Modules 32–35)



E+/Getty Images

Module 32 Basic Motivational Concepts

Instincts and Evolutionary Theory

Drives and Incentives

Arousal Theory
A Hierarchy of Needs
Module 33 Hunger
The Physiology of Hunger
The Psychology of Hunger
THINKING CRITICALLY ABOUT: The Challenges of Obesity and Weight Control
Module 34 Sexual Motivation
The Physiology of Sex
The Psychology of Sex
Sexual Orientation
Sex and Human Relationships
Module 35 Affiliation and Achievement
The Need to Belong
Achievement Motivation

How well I [DM] remember asking my first discussion question in a new introductory psychology class. Several hands rose, along with one left foot. The foot belonged to Chris Klein, who was the unlikeliest person to have made it to that class. At birth, Chris suffered oxygen deprivation that required 40 minutes of CPR. “One doctor wanted to let him go,” recalled his mother.



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A motivated man: Chris Klein To see and hear Chris presenting his story, visit https://www.youtube.com/watch?v=3H3e2MXV6iY.

The result was severe cerebral palsy. With damage to the brain area that controls muscle movement, Chris can't contain his constantly moving hands. He cannot feed, dress, or care for himself. And he cannot speak. But Chris can control his keen mind and his left foot. With that blessed foot, he operates the joystick on his motorized wheelchair. Using his left big toe, he can type sentences, which his communication system can store, send, or speak. And Chris is motivated—very motivated.

When Chris was a high school student in suburban Chicago, three teachers doubted he could leave home for college. Yet he persisted, and, with much support, attended my college called Hope. Five years later, as his left foot drove him across the stage to receive his diploma, Chris's admiring classmates honored his achievement with a spontaneous standing ovation.

Today, Chris is an inspirational speaker for schools, churches, universities, and community events, giving “a voice to those that have none, and a helping hand to those with disabilities.” He maintains a website, LessonsFromTheBigToe.com. And he has found love and married.

Few of us face Chris Klein’s challenges. But we all seek to direct our energy in ways that will produce satisfaction and success. We are pushed by biological motives, such as hunger and sex (Modules 33–34), and social ones, such as the needs to belong and to achieve (Module 35). Chris Klein’s fierce will to live, learn, and love highlights the essence of our own *motivations*, which energize and direct our lives.

Let’s begin by looking at how psychologists have approached the study of motivation (Module 32).

MODULE 32: Basic Motivational Concepts

Learning Objective Question LOQ 32-1

How do psychologists define *motivation?* What are four key motivation theories?

Our **motivations** arise from the interplay between nature (the bodily "push") and nurture (the "pulls" from our personal experiences, thoughts, and culture). Our motives drive our behavior. That is usually, but not always, for the better. If our motivations get hijacked, our lives go awry. Those with *substance use disorder*, for example, may find their cravings for an addictive substance override their longings for sustenance, safety, and social support.

In their attempts to understand motivated behavior, psychologists have viewed it from four perspectives:

- ***Instinct theory*** (now replaced by the *evolutionary perspective*) focuses on genetically predisposed behaviors.
- ***Drive-reduction theory*** focuses on how we respond to inner pushes and external pulls.
- ***Arousal theory*** focuses on finding the right level of stimulation.

- **Abraham Maslow's *hierarchy of needs*** focuses on the priority of some needs over others.

Instincts and Evolutionary Theory

To qualify as an **instinct**, a complex behavior must have a fixed pattern throughout a species and be unlearned (Tinbergen, 1951). Such unlearned behaviors include *imprinting* in birds and the return of salmon to their birthplace. A few human behaviors, such as infants' innate reflexes to root for a nipple and suck, also exhibit unlearned fixed patterns. *Instinct theory*, popular in the early twentieth century, viewed our instincts as the source of our motivations. But many more behaviors are directed by both physiological needs and psychological wants.





Left: Annika Erickson/Getty Images; right: James Warwick/ Science Source

Same motive, different wiring The more complex the nervous system, the more adaptable the organism. Both humans and weaverbirds satisfy their need for shelter in ways that reflect their inherited capacities. Human behavior is flexible; we can learn

whatever skills we need to build a house. The bird's behavior pattern is fixed; it can build only this kind of nest.

Although instincts cannot explain most human motives, the underlying assumption endures in *evolutionary psychology*: Genes do predispose some species-typical behavior. Psychologists might apply this perspective, for example, to explain our human similarities, animals' biological predispositions, and the influence of evolution on our fears, helping behaviors, and romantic attractions.

Drives and Incentives

In addition to our predispositions, we have *drives.* **Physiological needs** (such as for food or water) create an aroused, motivated state—a drive (such as hunger or thirst)—that pushes us to reduce the need. **Drive-reduction theory** explains that, with few exceptions, when a physiological need increases, so does our psychological drive to reduce it.

Drive reduction is one way our bodies strive for **homeostasis** (literally "staying the same")—the maintenance of a steady internal state. For example, our body regulates its temperature in a way similar to a room's thermostat. Both systems operate through feedback loops: Sensors feed room temperature to a control device. If the room's temperature cools, the control device switches on the furnace. Likewise, if our body's temperature cools, our blood vessels constrict

to conserve warmth, and we feel driven to put on more clothes or seek a warmer environment (FIGURE 32.1).

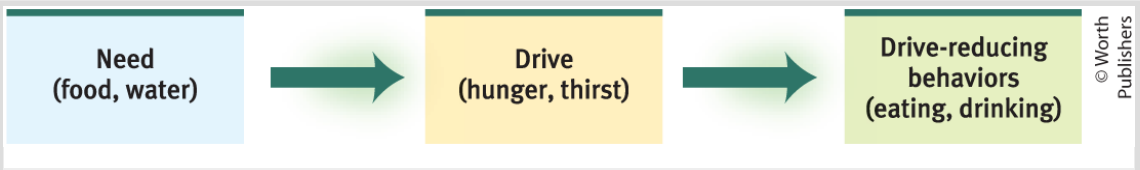


FIGURE 32.1 Drive-reduction theory Drive-reduction motivation arises from *homeostasis*—our body's natural tendency to maintain a steady internal state. Thus, if we are water-deprived, our thirst drives us to drink to restore the body's normal state.

Not only are we *pushed* by our need to reduce drives, we are also motivated (or *pulled*) by **incentives**—positive or negative environmental stimuli that lure or repel us. Such stimuli (when positive) increase our dopamine levels, causing our underlying drives (such as for food or sex) to become active impulses (Hamid et al., 2016). And the more these impulses are satisfied and reinforced, the stronger the drive—the next time it arises—may become: As Roy Baumeister (2015) noted, "Getting begets wanting." If you are hungry, the aroma of good food will motivate you. Whether that aroma comes from roasted peanuts or toasted tarantula will depend on your culture and experience. Incentives can also be negative: If teasing others on social media causes others to unfollow or unfriend us, we may feel motivated to treat others better.

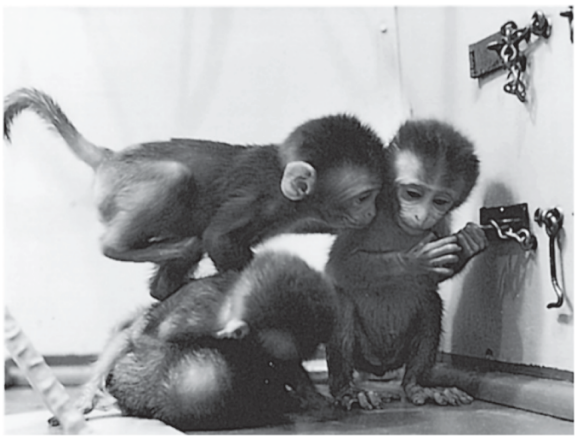
> **"Nature often equips life's essentials—sex, eating, nursing—with built-in gratification."** — Frans de Waal, "Morals Without God?," 2010

When there is both a need and an incentive, we feel strongly driven. The food-deprived person who smells pizza baking may feel an intense hunger drive, and the baking pizza may become a compelling incentive. For each motive, we can ask, "How is it pushed by our inborn physiological needs and pulled by learned incentives in the environment?"

Arousal Theory

We are much more than calm homeostatic systems, however. Some motivated behaviors actually *increase* rather than decrease arousal. Well-fed animals will leave their shelter to explore and gain information, seemingly in the absence of any need-based drive. Curiosity drives monkeys to monkey around trying to figure out how to unlock a latch that opens nothing or how to open a window that allows them to see outside their room (Butler, 1954). It drives newly mobile human infants to investigate every accessible corner of the house. It drives the scientists whose work this text discusses. And it drives explorers and adventurers such as mountaineer George Mallory. Asked why he wanted to climb Mount Everest, Mallory famously answered, "Because it's there." Sometimes uncertainty brings excitement, which amplifies motivation (Shen et al., 2015). Those who, like Mallory, enjoy high arousal are most likely to seek out intense music, novel foods, and risky behaviors and careers (Roberti et al., 2004; Zuckerman, 1979, 2009). Although they have been called *sensation-seekers,* risk takers may also be motivated to gain control over their emotions and actions (Barlow et al., 2013).

So, human motivation aims not to eliminate arousal but to seek optimum levels of arousal. Having all our biological needs satisfied, we feel driven to experience stimulation. Lacking stimulation, we feel bored and look for a way to increase arousal. Most people, worldwide, prefer to *do* something—even (when given no other option while waiting in a lab) to self-administer mild electric shocks (Buttrick et al., 2019; Wilson et al., 2014). Why might people seek to increase their arousal? Moderate arousal and even anxiety can be motivating—leading to higher levels of math achievement, for example (Z. Wang et al., 2015). Yet *too much* stimulation or stress motivates us to decrease arousal. In experiments, people have felt less stress when they limited email-checking and phone notifications to three times a day rather than being continually accessible (Fitz et al., 2019; Kushlev & Dunn, 2015).





Left: Science Source; right: Glenn Swier

Driven by curiosity Young monkeys and children are fascinated by the unfamiliar. Their drive to explore maintains an optimum level of arousal. It is one of several motives that do not fill any immediate physiological need.

Two early-twentieth-century psychologists studied the relationship of arousal to performance and identified the **Yerkes-Dodson law**: *moderate arousal leads to optimal performance* (Yerkes & Dodson, 1908). When taking an exam, it pays to be moderately aroused—alert but not trembling with nervousness. (If you're already nervous, it's better to avoid becoming further aroused with caffeine.) Between bored low arousal and anxious hyperarousal lies a flourishing life. Even people visiting a haunted house attraction enjoy it most when aroused, with an elevated heart rate, but not terrified (Andersen et al., 2020). As with Goldilocks' porridge, what's best is not too cold and not too hot. Optimal arousal levels depend on the task, with more difficult tasks requiring lower arousal for best performance (Hembree, 1988).

Ask Yourself

Does boredom ever motivate you to do things just to figure out something new? When was the last time that happened, and what did you find?

Retrieval Practice

RP-1 Performance peaks at lower levels of arousal for difficult tasks, and at higher levels for easy or well-learned tasks. (a) How might this affect marathon runners? (b) How might this affect anxious test-takers facing a difficult exam?

ANSWERS IN APPENDIX E

A Hierarchy of Needs

Some needs take priority. At this moment, with your needs for air and water hopefully satisfied, other motives—such as your desire to learn and achieve—are energizing and directing your behavior. Let your need for water go unsatisfied, however, and your thirst will preoccupy you. Deprived of air, your thirst will disappear.

Abraham Maslow (1970) described these priorities as a **hierarchy of needs**, which others later portrayed as a pyramid (Bridgman et al., 2019; **FIGURE 32.2**). Our physiological needs, such as for food and water, form the pyramid's base. As these needs become met, our focus shifts to our need for safety, and then to satisfying our needs to give and receive love and to enjoy self-esteem. Beyond this, said Maslow (1971), lies the need to actualize one's full potential.

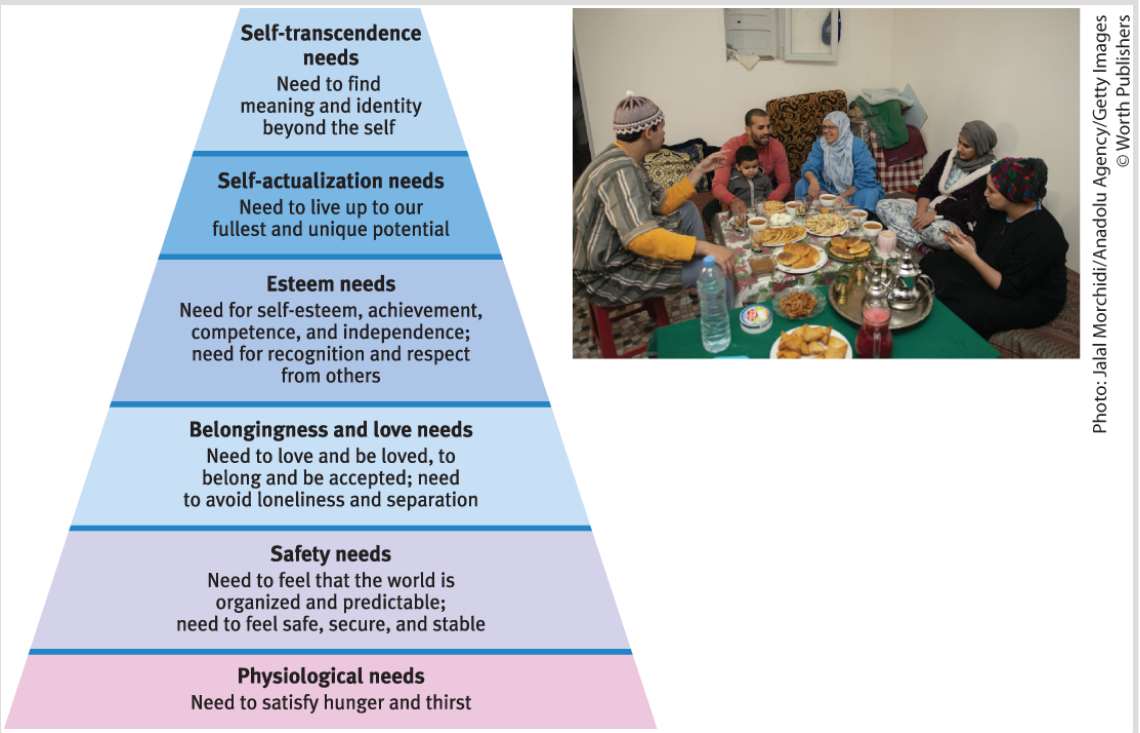


Photo: Jalal Morchidi/Anadolu Agency/Getty Images
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FIGURE 32.2 Maslow's hierarchy of needs During the month of Ramadan, many Muslims refrain from eating and drinking from dawn to sunset. They end their daily fast by satisfying their lower-level needs for food and drink and engaging their middle-level needs for belongingness and love, often having a large communal meal (called *iftar*, meaning "break fast").

Near the end of his life, Maslow proposed that some people also reach a level of *self-transcendence.* At the self-actualization level, people seek to realize their own potential. At the self-transcendence level, people strive for meaning, purpose, and communion in a way that is transpersonal—beyond the self (Kaufman, 2020). Maslow's contemporary, psychiatrist Viktor Frankl (1962), a Nazi concentration camp survivor, concurred that the search for meaning is an important

human motive: “Life is never made unbearable by circumstances, but only by lack of meaning and purpose.”

“Do you feel your life has an important purpose or meaning?” When Gallup asked this of people in 132 countries, 91 percent answered *Yes* (Oishi & Diener, 2014). People sense meaning when they experience their life as having *purpose* (goals), *significance* (value), and *coherence* (sense)—sentiments that may be nourished by strong social connections, a religious faith, an orderly world, and social status (King et al., 2016; Martela & Steger, 2016). People’s sense of life’s meaning predicts their psychological and physical well-being, and their capacity to delay gratification (Heine et al., 2006; Van Tongeren et al., 2018). Meaning matters.

The order of Maslow’s hierarchy is not universally fixed: U.S. suffragist Alice Paul starved herself to make a political statement (enduring force-feeding by her jailers). Culture also influences our priorities: Self-esteem matters most in modern individualist nations, where people prioritize personal achievements more than family and community identity (Oishi et al., 1999). And, while agreeing with Maslow’s basic levels of need, today’s psychologists note that gaining and retaining mates, parenting offspring, and desiring social status are also basic human motives (Anderson et al., 2015; Kenrick et al., 2010).

Nevertheless, the simple idea that some motives are more compelling than others provides a framework for thinking about motivation.

Worldwide life-satisfaction surveys support this basic idea (Oishi et al., 1999; Tay & Diener, 2011). In lower-income nations that lack easy access to money and the food and shelter it buys, financial satisfaction more strongly predicts feelings of well-being. In wealthy countries, where most can meet their basic needs, social connections better predict well-being.

> **"Hunger is the most urgent form of poverty."** — Alliance to End Hunger, 2002

With these classic motivation theories in mind (TABLE 32.1), the remaining What Drives Us modules consider four representative motives, beginning at the physiological level with hunger and working up through sexual motivation to the higher-level needs to belong and to achieve. At each level, we can see how experience interacts with biology.

TABLE 32.1 Classic Motivation Theories

Theory	Its Big Idea
Instincts and evolutionary theory	There is a genetic basis for unlearned, species-typical behavior (such as birds building nests or infants rooting for a nipple).
Drive-reduction theory	Physiological needs (such as hunger and thirst) create an aroused state that drives us to reduce the need (for example, by eating or drinking).
Arousal theory	Our need to maintain an optimal level of arousal motivates behaviors that meet no physiological need (such as our yearning for stimulation and our hunger for information).

Maslow's hierarchy of needs	We prioritize survival-based needs and then social needs more than the needs for esteem and meaning.

Ask Yourself

Consider your own experiences in terms of Maslow's hierarchy of needs. Do you remember experiencing hunger or thirst that displaced your concern for other, higher-level needs? Do you usually feel safe? Loved? Confident? How often can you address what Maslow called "self-actualization" needs? What about "self-transcendence" needs?

Retrieval Practice

RP-2 After hours of driving alone in an unfamiliar city, you finally see a diner. Although it looks deserted and a little creepy, you stop because you are *really* hungry and thirsty. How would Maslow's hierarchy of needs explain your behavior?

ANSWERS IN APPENDIX E

REVIEW

Module 32: Basic Motivational Concepts

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 32-1: How do psychologists define *motivation?* What are four key motivation theories?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

motivation
instinct
physiological need
drive-reduction theory
homeostasis
incentive
Yerkes-Dodson law
hierarchy of needs

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. Today's evolutionary psychology shares an idea that was an underlying assumption of instinct theory. This idea is that
   a. physiological needs arouse psychological states.
   b. genes predispose species-typical behavior.
   c. physiological needs increase arousal.
   d. external needs energize and direct behavior.

2. An example of a physiological need is _____. An example of a psychological drive is _____.
   a. hunger; a "push" to find food
   b. a "push" to find food; hunger
   c. curiosity; a "push" to reduce arousal
   d. a "push" to reduce arousal; curiosity

3. Danielle walks into a friend's kitchen, smells cookies baking, and begins to feel very hungry. The smell of baking cookies is a(n) _____ (incentive/drive).

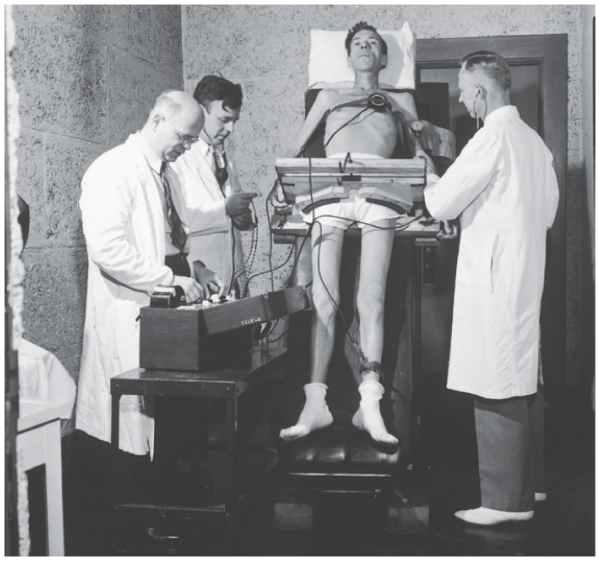
4. _____ theory attempts to explain behaviors that do NOT reduce physiological needs.

5. With a challenging task, such as taking a difficult exam, performance is likely to peak when arousal is
   a. very high.
   b. moderate.
   c. very low.
   d. absent.

6. According to Maslow's hierarchy of needs, our most basic needs are physiological, including the need for food and water; just above these are _____ needs.
   a. safety
   b. self-esteem
   c. belongingness
   d. self-transcendence

MODULE 33: Hunger

Physiological needs are powerful. In a vivid demonstration, Ancel Keys and his research team (1950) studied semistarvation among wartime volunteers, who participated as an alternative to military service. After feeding 200 men normally for 3 months, researchers halved the food intake for 36 of them. These semistarved men became listless and apathetic as their bodies conserved energy. Eventually, their body weights stabilized about 25 percent below their starting weights.



Wallace Kirkland/The LIFE Picture Collection/Shutterstock

Studying starvation in conscientious objectors Researchers carefully recorded and analyzed the physiological and psychological effects of 6 months of starvation, and various methods for rehabilitation. They hoped to

support the recovery of World War II famine survivors.

More dramatic were the psychological effects. Consistent with Abraham Maslow's idea of a needs hierarchy, the men became food-obsessed. They talked food. They daydreamed food. They collected recipes, read cookbooks, and feasted their eyes on delectable forbidden foods. Preoccupied with their unfulfilled basic need, they lost interest in sex and social activities. As one participant reported, "If we see a show, the most interesting part of it is contained in scenes where people are eating. I couldn't laugh at the funniest picture in the world, and love scenes are completely dull." The men's preoccupations illustrate how powerful motives can hijack our consciousness.

> **"Hunger, real hunger, provokes desperation and leads to choices that might otherwise be unfathomable."** — Mikki Kendall, "Hood Feminism," 2020

> **"The full person does not understand the needs of the hungry."** — Irish proverb

The Physiology of Hunger

LOQ 33-1

What physiological factors produce hunger?

Keys' semistarved volunteers felt their hunger because of a homeostatic system that maintains one's normal body weight and an adequate nutrient supply. But what precisely triggers hunger? Is it the pangs of an empty stomach? So it seemed to A. L. Washburn. Working with Walter Cannon, Washburn agreed to swallow a balloon attached to a recording device (Cannon & Washburn, 1912) (**FIGURE 33.1**). When inflated to fill his stomach, the balloon transmitted his stomach contractions. Washburn supplied information about his *feelings* of hunger by pressing a key each time he felt a hunger pang. The discovery: Whenever Washburn felt hungry, he was indeed having stomach contractions.

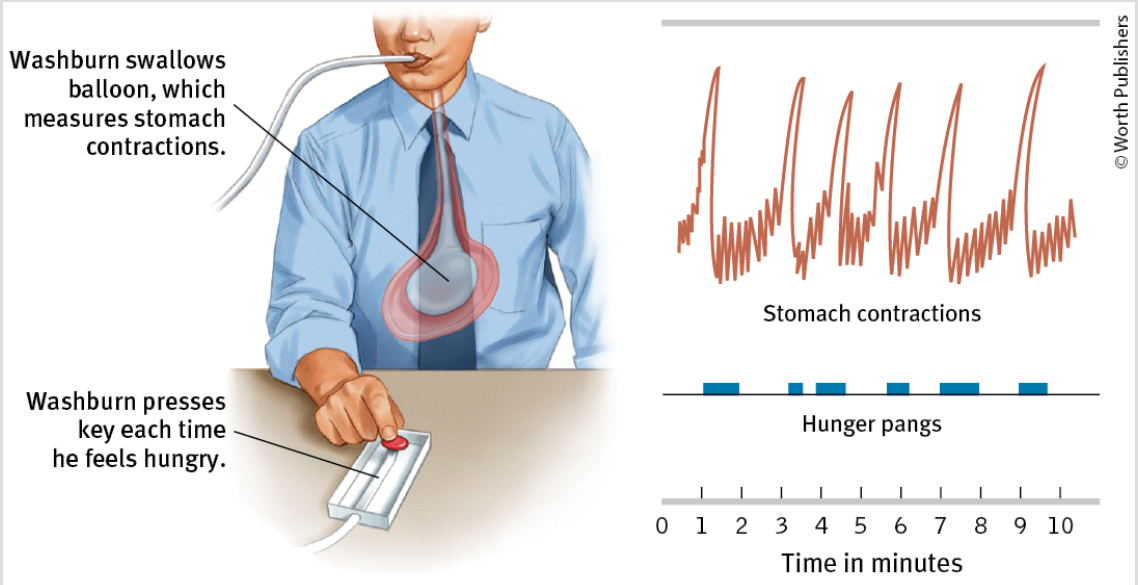


FIGURE 33.1 Monitoring stomach contractions (Information from Cannon, 1929.)

Can hunger exist without stomach pangs? To answer that question, researchers removed some rats' stomachs, creating a direct path to

their small intestines (Tsang, 1938). Did the rats continue to eat? Indeed they did. Some hunger similarly persists in humans whose stomachs have been removed due to ulcers or cancer.

If the pangs of an empty stomach are not the only source of hunger, what else matters?

Body Chemistry and the Brain

People and other animals automatically regulate their caloric intake to prevent energy deficits and maintain a stable body weight. This suggests that your body is keeping tabs on its available resources. The blood sugar **glucose** is one such resource. Increases in the hormone *insulin* (secreted by the pancreas) diminish blood glucose, partly by converting it to stored fat. If your blood glucose level drops, you won't consciously feel the lower blood sugar. But your brain, which is automatically monitoring your blood chemistry and your body's internal state, will trigger hunger. Signals from your stomach, intestines, and liver (indicating whether glucose is being deposited or withdrawn) all signal your brain to motivate eating or not.



"Never hunt when you're hungry."

How does the brain integrate these messages and sound the alarm? Several neural areas—some housed deep in the hippocampus and within the hypothalamus, a neural traffic intersection—do the work (Stevenson & Francis, 2017; **FIGURE 33.2**). For example, one neural network in the hypothalamus (called the *arcuate nucleus*) has a center that secretes appetite-stimulating hormones. When stimulated electrically, well-fed animals begin to eat. If the area is destroyed, even starving animals have no interest in food. Another neural center secretes appetite-suppressing hormones. When electrically stimulated, animals will stop eating. Destroy this area and animals can't stop eating and will become obese (see Figure 33.2b) (Duggan & Booth, 1986; Hoebel & Teitelbaum, 1966).

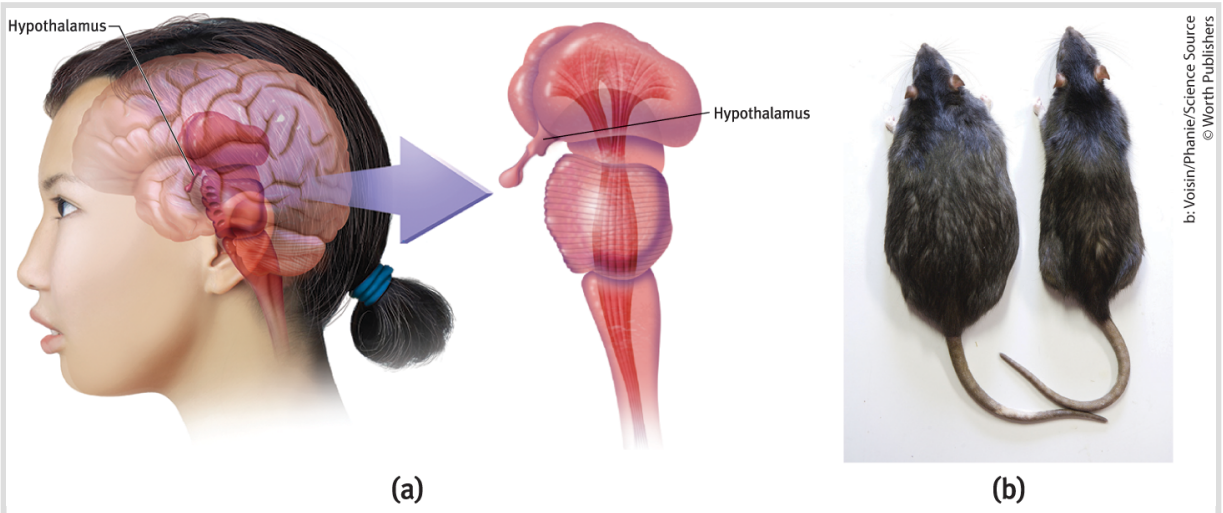


FIGURE 33.2 The hypothalamus (a) The hypothalamus performs various body maintenance functions, including control of hunger. Blood vessels supply the hypothalamus, enabling it to respond to our current blood chemistry as well as to incoming neural information about the body's state. (b) The overweight mouse on the left has nonfunctioning receptors in the appetite-suppressing part of the hypothalamus.

Blood vessels connect the hypothalamus to the rest of the body, so it can respond to our current blood chemistry and other incoming information. One of its tasks is monitoring levels of appetite hormones, such as *ghrelin*, a hunger-arousing hormone secreted by an empty stomach. During bypass surgery for severe *obesity*, surgeons seal off or remove part of the stomach. The remaining stomach then produces much less ghrelin, reducing the person's appetite and making food less enticing (Ammori, 2013; Lemonick, 2002; Scholtz et al., 2013). The result, for most, is "profound improvements in psychosocial functioning" (Sarwer & Henberg, 2020). Other appetite hormones include *orexin, leptin,* and *PYY;* **FIGURE 33.3** describes how these hormones influence our feelings of hunger.

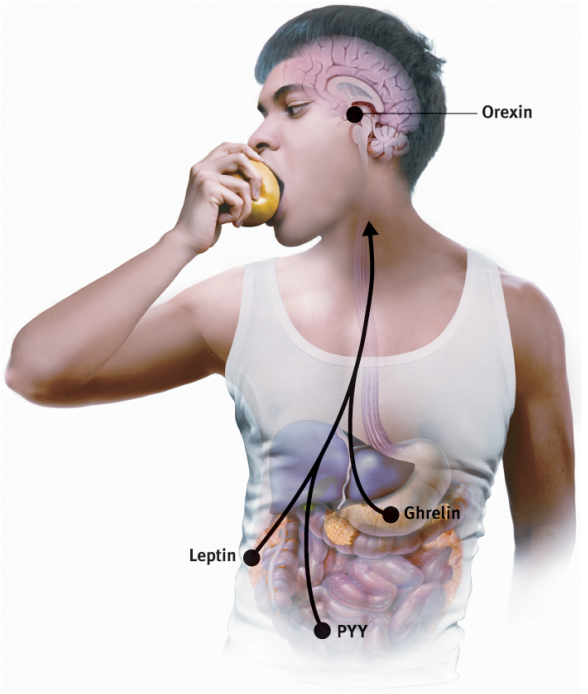


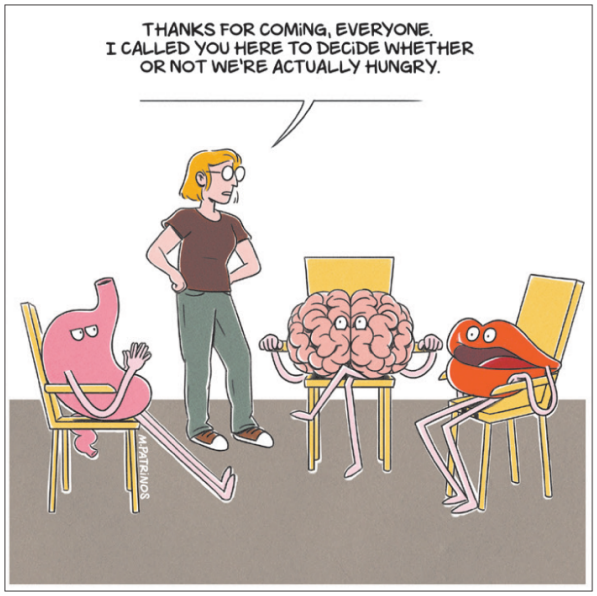
FIGURE 33.3 The appetite hormones

Increases appetite

- *Ghrelin:* Hormone secreted by empty stomach; sends “I’m hungry” signals to the brain.
- *Orexin:* Hunger-triggering hormone secreted by hypothalamus.

Decreases appetite

- *Leptin:* Protein hormone secreted by fat cells; when abundant, causes brain to increase metabolism and decrease hunger.
- *PYY:* Digestive tract hormone; sends “I’m *not* hungry” signals to the brain.



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If you lose some extra weight and later find it creeping back, you can also blame your brain for your weight regain (Cornier, 2011). The complex interaction of appetite hormones and brain activity helps explain the body’s predisposition to maintain a particular weight.

When semistarved rats fall below their normal weight, their "weight thermostat" signals the body to restore the lost weight. It's as though fat cells cry out "Feed me!" and grab glucose from the bloodstream (Ludwig & Friedman, 2014). Hunger increases and energy expenditure decreases. This stable weight toward which semistarved rats return is their **set point** (Keesey & Corbett, 1984; Yeo & O'Rahilly, 2021). In rats and humans, heredity influences body type and approximate set point.

Our bodies regulate weight through the control of food intake, energy output, and **basal metabolic rate**—the resting rate of energy expenditure for maintaining basic body functions. By the end of their 6 months of semistarvation, the men who participated in Keys' experiment had stabilized at three-quarters of their normal weight, even though they took in only *half* their previous calories. How did they achieve this dieter's nightmare? They reduced their energy expenditure, partly through inactivity but partly because of a 29 percent drop in their basal metabolic rate.

Some researchers, however, doubt that our bodies have a preset tendency to maintain a given weight (Assanand et al., 1998). They point out that slow, sustained changes in body weight can alter one's set point, and that psychological factors also sometimes drive our feelings of hunger. Given unlimited access to a wide variety of tasty foods, people and other animals tend to overeat and gain weight (Raynor & Epstein, 2001). Thus, many researchers prefer the term *settling point* to indicate the level at which a person's weight settles in

response to caloric intake and expenditure (which are influenced by environment as well as biology).

Retrieval Practice

RP-1 Hunger occurs in response to _____ (low/high) blood glucose and _____ (low/high) levels of ghrelin.

ANSWERS IN APPENDIX E

The Psychology of Hunger

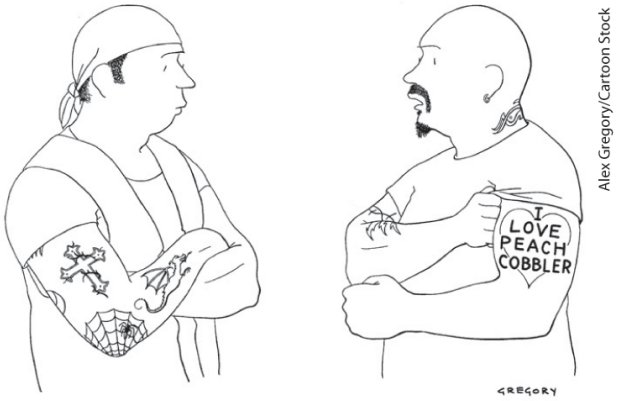
LOQ 33-2

What cultural and situational factors influence hunger?

Our internal hunger is pushed by our physiology—our body chemistry and hypothalamic activity. Yet there is more to hunger than meets the stomach. This was strikingly apparent when Paul Rozin and his colleagues (1998) tested two patients with amnesia who had no memory for events occurring more than a minute ago. If, 20 minutes after eating a normal lunch, the patients were offered another, both readily consumed it … and usually a third meal offered 20 minutes after the second was finished. This suggests that part of knowing when to eat is our memory of our last meal. As time passes since we last ate, we anticipate eating again and start feeling hungry.

Taste Preferences: Biology and Culture

Body cues and environmental factors together influence not only the *when* of hunger, but also the *what*—our taste preferences. When feeling tense or depressed, do you tend to take solace in high-calorie foods, as ardent football fans have done after a big loss (Cornil & Chandon, 2013)? Carbohydrates boost the neurotransmitter serotonin, which has calming effects. When dieting and stressed, both rats and many humans find it extra rewarding to gobble up Oreos (Boggiano et al., 2005; Sproesser et al., 2014). And people living stressed lives tend to put on more weight (Mehlig et al., 2020).



"Never get a tattoo when you're drunk and hungry."

Our preferences for sweet and salty tastes are genetic and universal. Other taste preferences are conditioned, as when people given highly salted foods develop a liking for excess salt (Beauchamp, 1987), or when people who have been sickened by a food develop an aversion to

it. (The frequency of children's illnesses provides many chances for them to learn to avoid certain foods.)

Culture affects taste, too. Many people in Southeast Asian countries enjoy *durian*, a fruit that a detractor has described as smelling like "turpentine and onions, garnished with a gym sock" (Sterling, 2003). People from East Asia may be similarly repulsed by what many Westerners love—"the rotted bodily fluid of an ungulate" (a.k.a. cheese, some varieties of which have the same bacteria and odor as stinky feet) (Herz, 2012).

Rats tend to avoid unfamiliar foods (Sclafani, 1995). So do we, especially animal-based foods. Such *neophobia* (dislike of unfamiliar things) surely was adaptive for our ancestors, protecting them from potentially toxic substances. We can overcome harmless food dislikes by repeatedly trying small samples of an unfamiliar food or drink. In experiments, this tends to increase people's appreciation for the new taste (Pliner, 1982; Pliner et al., 1993).



(a)



(b)

a: Bryan and Cherry Alexander/Science Source; b: Mark Bowler/Alamy Stock Photo

An acquired taste People everywhere learn to enjoy the fatty, bitter, or spicy foods common in their culture. (a) For these Alaska Natives, but not for most other North Americans, whale blubber is a tasty treat. (b) For Peruvians, roasted guinea pig is similarly delicious.

Other taste preferences also are adaptive. For example, the spices most commonly used in hot-climate recipes—where food, especially meat, is at risk of spoiling more quickly—inhibit bacteria growth (FIGURE 33.4). Pregnancy-related nausea and food aversions peak about the tenth week, when the developing embryo is most vulnerable to toxins. Thus, many pregnant women naturally avoid potentially harmful foods and other substances, such as alcoholic and caffeinated beverages (Forbes et al., 2018; Gaskins et al., 2018).

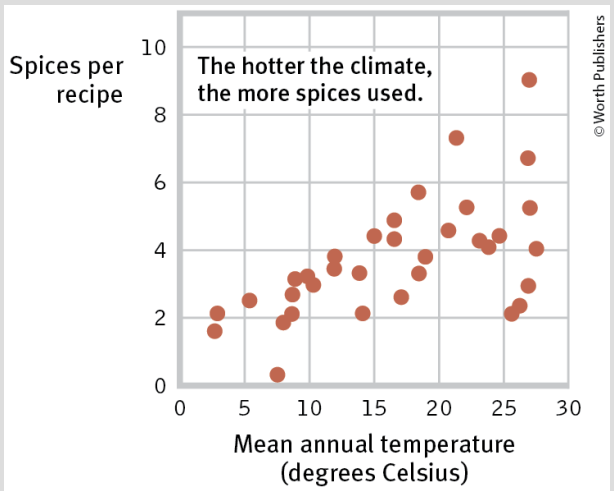


FIGURE 33.4 Hot climates and hot spices
Countries with hot climates, in which food historically spoiled more quickly, feature recipes with more bacteria-inhibiting spices (Sherman & Flaxman, 2001). India averages nearly 10 spices per meat recipe; Finland, 2 spices.

Situational Influences on Eating

To a surprising extent, situations also control our eating—a phenomenon psychologists have called the *ecology of eating*. Here are four situational influences you may have noticed but underestimated:

- ***Friends and food*** Do you eat more when eating with friends? Most of us do (Cummings & Tomiyama, 2019). But when we're trying to impress an attractive date, we often eat less (M. Baker et al., 2019).

- ***Serving size*** Researchers studied the effects of portion size by offering people varieties of free snacks (Geier et al., 2006). For example, in an apartment building's lobby, they laid out full or half pretzels, big or little Tootsie Rolls, or a small or large serving scoop by a bowl of M&M'S. Their consistent result: Offered a supersized portion, people put away more calories. Larger portions induce bigger bites, which may increase intake by decreasing oral exposure time (Herman et al., 2015). Children also eat more when using adult-sized (rather than child-sized) dishware (DiSantis et al., 2013). Portion size matters.
- ***Stimulating selections*** Food variety also stimulates eating. Offered a dessert buffet, people eat more than they do when choosing a portion from one favorite dessert. For our early ancestors, variety was healthy. When foods were abundant and varied, eating more provided a wide range of vitamins and minerals and produced protective fat for winter cold or famine. When a bounty of varied foods was unavailable, eating less extended the food supply until winter or famine ended (Polivy et al., 2008; Remick et al., 2009).
- ***Nudging nutrition*** When carrots appeared early (rather than late) in a lunch line, schoolchildren took four times more carrots (Redden et al., 2015). In other ways, too—nutrition labeling, healthy food defaults, taxing what's unhealthy—we can structure an environment that promotes healthier eating (Roberto, 2020). Such "nudges" show how psychological science can improve our everyday life.

Ask Yourself

Do you usually eat only when your body sends hunger signals? How much does the sight or smell of delicious food tempt you even when you're full?

Retrieval Practice

RP-2 After an 8-hour hike without food, your long-awaited favorite dish is placed in front of you, and your mouth waters in anticipation. Why?

ANSWERS IN APPENDIX E

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To consider how hunger and other factors affect our risk for **obesity**, see Thinking Critically About: The Challenges of Obesity and Weight Control. And for tips on healthy eating and weight management, see **TABLE 33.1**.

LOQ 33-3

How does obesity affect physical and psychological health? What factors are involved in weight management?

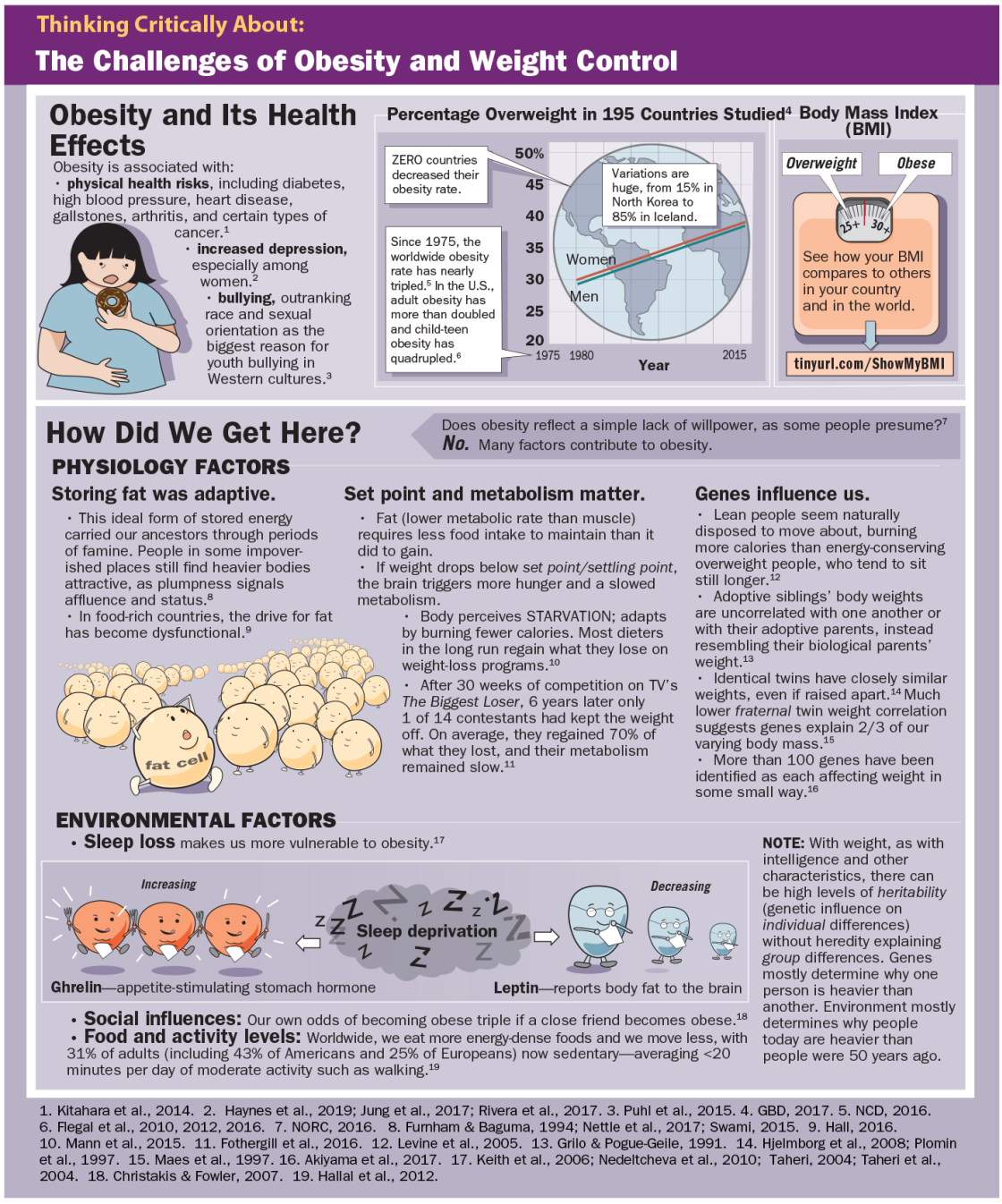

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TABLE 33.1 Tips for Healthy Eating

For those seeking healthier eating habits that can boost energy and longevity, here are some evidence-based guidelines (Moss et al., 2022; Sole-Smith, 2020):

- ***Healthy eating requires a healthy attitude.*** Absent a lifestyle change, there's a slim chance of permanent weight loss (Rothblum, 2018). Yet those most likely to successfully monitor and manage a healthier weight are those who believe their weight is changeable (Ehrlinger et al., 2017).

- ***Exercise and get enough sleep.*** Especially when supported by 7 to 8 hours of sleep a night, exercise empties fat cells, builds muscle, speeds up metabolism, helps lower your settling point, and reduces stress and stress-induced craving for carbohydrate-rich comfort foods (Bennett, 1995; Ruotsalainen et al., 2015; Thompson et al., 1982). Among TV's *Biggest Loser* competitors, exercise predicted less weight regain (Kerns et al., 2017). During the more sedentary months of the Covid pandemic, most people gained some weight (Woolford et al., 2021).

- ***Minimize exposure to unhealthy food cues.*** Food-shop on a full stomach. Stock healthy foods, such as fruits and vegetables. Keep unhealthy foods out of your home, and tuck away special-occasion foods. You can't eat it if you can't reach it.

- ***Limit variety and eat healthy foods.*** Given more variety, people consume more. So, eat simple meals with protein, vegetables, fruits, and whole grains. Healthy fats, such as those found in olive oil and fish, help regulate appetite (Taubes, 2001, 2002). Water- and vitamin-rich veggies can fill the stomach with few calories. Better crispy greens than Krispy Kremes.

- ***Reduce portion sizes and relabel your portions.*** Offered less, people consume less. People also eat less when they think of a portion as a number of items (10 chips) rather than as a general quantity (1 serving of chips) (Lewis & Earl, 2018).

- ***Time your intake.*** We tend to have a healthier weight (and better sleep) when we eat our last meal in the early evening and then hold off eating or drinking more until the next morning's breakfast (Wilkinson et al., 2020). Eating our heavier meals earlier in the day boosts metabolism, and eating a balanced breakfast helps us to feel more alert and less fatigued by late morning (Spring et al., 1992).

- ***Monitor your moods.*** Drinking alcohol or feeling anxious or depressed can unleash the urge to eat unhealthfully (Herman & Polivy, 1980; Mehlig et al., 2020).

- ***Eat unhurriedly.*** Eating slowly often means eating less (Hurst & Fukuda, 2018; Martin et al., 2007). Instead of wolfing down your meal, take time to savor each bite.
- ***Before eating with others, decide what and how much you want to eat.*** Eating with friends can distract us from monitoring our own eating (Ward & Mann, 2000).
- ***Allow for an occasional treat.*** In a healthy lifestyle, a lapse need not become a collapse.
- ***Chart and share your progress.*** Those who record and publicly disclose their progress toward a goal more often achieve it (Harkin et al., 2016).
- ***Connect to a support group.*** Join with others, either face-to-face or online, to share goals and progress updates (Freedman, 2011).

Ask Yourself

How would you rate your eating habits? What would you like to improve, and which healthy-eating strategies would help you the most?

Retrieval Practice

RP-3 Why can two people of the same height, age, and activity level maintain the same weight, even if one of them eats much less than the other does?

ANSWERS IN APPENDIX E

REVIEW

Module 33: Hunger

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 33-1: What physiological factors produce hunger?

LOQ 33-2: What cultural and situational factors influence hunger?

LOQ 33-3: How does obesity affect physical and psychological health? What factors are involved in weight management?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

glucose
set point
basal metabolic rate
obesity

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. Journalist Dorothy Dix once remarked, "Nobody wants to kiss when they are hungry." Which motivation theory best supports her statement?

2. According to the concept of _____ point, our body maintains itself at a particular weight level.

3. Which of the following is a genetically predisposed response to food?
   a. An aversion to eating cats and dogs
   b. An interest in novel foods
   c. A preference for sweet and salty foods
   d. An aversion to carbohydrates

4. Blood sugar provides the body with energy. When it is _____ (low/high), we feel hungry.

5. The rate at which your body expends energy while at rest is referred to as the _____ _____ rate.

6. People who are significantly overweight often struggle to lose weight permanently. This is due to several factors, including

the fact that

a. trying to lose weight triggers neophobia.
b. the set point of people with a higher body weight is lower than average.
c. with food restriction, metabolism increases.
d. there is a genetic influence on body weight.

7. Sanjay eats a diet high in processed foods, fat, and sugar. He knows he may gain weight, but he figures it's no big deal because he can simply lose it in the future. How would you evaluate Sanjay's plan?

MODULE 34: Sexual Motivation

Sex is a part of life. For all but the 1 percent of us who are **asexual** (Bogaert, 2004, 2015), dating and mating often become a high priority from puberty on. Pioneering sex researcher Alfred Kinsey (1894–1956) stumbled into studying sex. Raised in a religious home where money was tight, he was fascinated by nature (PBS, 2019). He spent the first 20 years of his career as a biologist collecting and categorizing insects, but he became concerned that people knew more about insects than about the then-taboo topic of sex. Kinsey's experience teaching a marriage and family course motivated him to spend the rest of his career collecting and categorizing people's sex histories. Kinsey and his colleagues' findings ignited debate and controversy, but they also paved the way for future research on the sexual behavior of men and women. Our **sexuality** consists of feelings and behaviors that reflect both physiological and psychological influences.

The Physiology of Sex

Unlike hunger or sleep, sex is not an actual *need.* (Without sex, we may feel like dying, but we will not.) Yet sex motivates behavior. Had this not been so for your biological ancestors, you would not be alive and reading these words. Sexual motivation is nature's clever way of making people procreate, thus enabling our species' survival. Life is sexually transmitted.

Hormones and Sexual Behavior

LOQ 34-1

How do hormones influence human sexual motivation?

Among the forces driving sexual behavior are the *sex hormones*. The main male sex hormone is *testosterone*, and the main female sex hormones are the *estrogens*, such as estradiol. Sex hormones influence us at several points in the life span:

- During the prenatal period, they direct our sexual development.
- During puberty, a sex hormone surge ushers us into adolescence. In adolescent males, higher testosterone levels predict more male-typical traits and disorders (Vosberg et al., 2021).

After puberty and well into the late adult years, sex hormones facilitate sexual behavior.

In most mammals, nature neatly synchronizes sex with fertility. Females become sexually receptive when their estrogens peak at ovulation, and researchers can cause female animals to become receptive by injecting them with estrogens. Male hormone levels are more constant, and hormone injection does not so easily affect the sexual behavior of male animals. Nevertheless, male hamsters that have had their testosterone-making testes surgically removed will

gradually lose interest in receptive females. They slowly regain it if injected with testosterone (Piekarski et al., 2009).

Hormones do influence human sexual behavior, but more loosely. Researchers have explored whether women's mating preferences change across the menstrual cycle, especially at ovulation, when both estrogens and testosterone rise (Arslan et al., 2021; Boudesseul et al., 2019). Worldwide, women's sexual behavior decreases during menstruation, when estrogen and testosterone levels are low (Pierson et al., 2021).

Women have much less testosterone than men do. But more than other mammalian females, women are responsive to their own testosterone level (Davison & Davis, 2011; Edelstein, 2022). If a woman's natural testosterone drops, as happens with the removal of the ovaries or adrenal glands, her sexual interest may wane. And as experiments with surgically or naturally menopausal women have demonstrated, testosterone-replacement therapy sometimes helps restore diminished arousal, desire, and sexual activity (Braunstein et al., 2005; Buster et al., 2005; Petersen & Hyde, 2011).

In human males with abnormally low testosterone levels, testosterone-replacement therapy often increases sexual desire and also energy and vitality (Khera et al., 2011). But typical fluctuations in testosterone levels, from man to man and hour to hour, have little effect on men's sex drive (Byrne, 1982). Indeed, male hormones sometimes vary in *response* to sexual stimulation (Escasa et al., 2011).

In one study, Australian skateboarders' testosterone surged in the presence of an attractive female, contributing to riskier moves and more crash landings (Ronay & von Hippel, 2010). Thus, sexual arousal can be a *cause* and a consequence of increased testosterone levels.

Large hormonal surges or declines affect sexual desire at two predictable points in the life span, and sometimes at an unpredictable third point:

1. ***The pubertal surge in sex hormones triggers the development of sex characteristics and sexual interest.*** If puberty's hormonal surge is precluded—as it was during the 1600s and 1700s for prepubertal boys who were castrated to preserve their soprano voices for Italian opera—sex characteristics and sexual desire do not develop normally (Peschel & Peschel, 1987).
2. ***In later life, sex hormone levels fall.*** Women experience menopause as their estrogen levels decrease; men experience a more gradual change. Sex remains a part of life, but as hormone levels decline, sexual fantasies and intercourse also decline (Frankenbach et al., 2022).
3. ***For some, surgery or drugs may cause hormonal shifts.*** When adult men were castrated, their sex drive typically fell as testosterone levels declined sharply (Hucker & Bain, 1990). Likewise, when male sex offenders took a drug that reduced their testosterone level to that of a prepubertal boy, they also lost much of their sexual desire (Bilefsky, 2009; Money et al., 1983). Similar effects occur in women. For example, if a woman's testosterone

level drops, as happens with the removal of the ovaries or adrenal glands, her sexual interest may wane (Davison & Davis, 2011; Lindau et al., 2007).

To summarize: We might compare human sex hormones, especially testosterone, to the fuel in a car. Without fuel, a vehicle will not run. But if the fuel level is minimally adequate, adding more won't change how the vehicle runs. The analogy is imperfect because hormones and sexual motivation interact. However, it correctly suggests that biology is a necessary but incomplete explanation of human sexual behavior. The hormonal fuel is essential, but so are the psychological stimuli that turn on the engine, keep it running, and shift it into high gear.

Retrieval Practice

RP-1 The primary female sex hormones are the _____. The primary male sex hormone is _____.

ANSWERS IN APPENDIX E

The Sexual Response Cycle

LOQ 34-2

What is the human *sexual response cycle,* and how do sexual dysfunctions and paraphilias differ?

The scientific process often begins with careful observations of complex behaviors. When William Masters and Virginia Johnson (1966) applied this process to human sexual intercourse in the 1960s, they made headlines. They recorded the physiological responses of volunteers who came to their lab to masturbate or have intercourse. (The volunteers—382 women and 312 men—were a somewhat atypical sample, consisting only of people able and willing to display arousal and orgasm while scientists observed.) Masters and Johnson reported observing more than 10,000 sexual "cycles." Their description of the **sexual response cycle** identified four stages:

1. ***Excitement:*** The genital areas become engorged with blood, causing a woman's clitoris and a man's penis to swell. A woman's vagina expands and secretes lubricant; her breasts and nipples may enlarge.
2. ***Plateau:*** Excitement peaks as breathing, pulse, and blood pressure rates continue to increase. A man's penis becomes fully engorged—to an average length of 5.6 inches, in a study of 1661 men (Herbenick et al., 2014). Some fluid—frequently containing enough live sperm to enable conception—may appear at its tip. A woman's vaginal secretion continues to increase, and her clitoris retracts. Orgasm feels imminent.
3. ***Orgasm:*** Muscle contractions appear all over the body and are accompanied by increased breathing, pulse, and blood pressure rates. The pleasurable feeling of sexual release is much the same for men and women. One panel of experts could not reliably distinguish between descriptions of orgasm written by men and

those written by women (Vance & Wagner, 1976). In both female and male animals, sexual climax is directed by spinal cord neurons linked with the brain's thalamus region (McKenna, 2022).

4. ***Resolution:*** The body gradually returns to its unaroused state as the genital blood vessels release their accumulated blood. For men, this happens relatively quickly if an orgasm has occurred, relatively slowly otherwise. (It's like the nasal tickle that goes away rapidly if you have sneezed, slowly otherwise.) Men then enter a **refractory period** that lasts from a few minutes to a day or more, during which they are incapable of another orgasm. A woman's much shorter refractory period may enable her, if restimulated during or soon after the resolution, to have more orgasms (Prause, 2011).

People vary in how often they repeat this sexual response cycle. In a U.S. sample of 1029 adults, participants reported an average of 10 orgasms each month, through both masturbation and partnered activity (Peters et al., 2022). One in 6 men and 1 in 10 women experienced seven or more orgasms each week (Kingston & Bradford, 2013).

Sexual Dysfunctions and Paraphilias

Masters and Johnson sought not only to describe the human sexual response cycle but also to understand and treat the inability to complete it. **Sexual dysfunctions** are problems that consistently impair sexual arousal or functioning at any point in this cycle. Some involve sexual motivation, especially lack of sexual energy and

arousability. About 1 in 5 men have **erectile disorder** (inability to have or maintain an erection) (Selvin et al., 2007). Another problem is *premature ejaculation*—reaching a sexual climax before the man or his partner wishes. For women, the problem may be pain or **female orgasmic disorder** (distress over weak orgasmic feelings or infrequently or never experiencing orgasm). In separate surveys of some 3000 Boston women and 32,000 other U.S. women, about 4 in 10 reported a sexual problem, such as orgasmic disorder or low desire. Among more than 20,000 Australians surveyed, 52 percent of women —and 28 percent of men—reported a lack of interest in having sex (Richters et al., 2022). Most women who experience sexual distress relate it to their emotional relationship with their partner during sex (Bancroft et al., 2003).

Psychological and medical therapies can help men and women with sexual dysfunctions (Frühauf et al., 2013). In behaviorally oriented therapy, for example, men learn ways to control their urge to ejaculate, and women are trained to bring themselves to orgasm. Starting with the introduction of Viagra in 1998, erectile disorder has been routinely treated by taking a pill. Researchers have struggled to develop reliable drug treatments for *female sexual interest/arousal disorder* (Chivers & Brotto, 2017).

Sexual dysfunction involves problems with arousal or sexual functioning. People with **paraphilias** (primarily men) experience sexual desire, but they direct it in unusual ways that may cause harm

(Baur et al., 2016). The American Psychiatric Association (2013) only classifies such behavior as disordered if

- a person experiences distress from an unusual sexual interest *or*
- it entails harm or risk of harm to one's self or to others.

The serial killer Jeffrey Dahmer had *necrophilia*, a sexual attraction to corpses. Those with *exhibitionism* derive pleasure from exposing themselves sexually to others without consent. People with the paraphilic disorder *pedophilia* experience sexual arousal toward children who haven't entered puberty.

Retrieval Practice

RP-2 Someone who is distressed by impaired sexual arousal may be diagnosed with a _____ _____. Exhibitionism would be considered a _____.

ANSWERS IN APPENDIX E

Sexually Transmitted Infections

LOQ 34-3

How can sexually transmitted infections be prevented?

Every day, more than 1 million people worldwide acquire a *sexually transmitted infection* (*STI;* also called *STD,* for *sexually transmitted disease*). Common STIs include chlamydia, gonorrhea, herpes simplex virus (HSV), and human papillomavirus (HPV) infection. In 2019, the Centers for Disease Control and Prevention reported that compared with older adults, sexually active adolescents (aged 15 to 19 years) and early adults (aged 20 to 24 years) are at higher risk. Teenage girls, for example, are at heightened risk given their not yet fully mature anatomy and lower levels of protective antibodies (Dehne & Riedner, 2005; Guttmacher Institute, 1994).

Condoms offer only limited protection against certain skin-to-skin STIs, such as herpes; but when used correctly, they do reduce other risks (NIH, 2001). The effects were clear when Thailand promoted condom use by sex workers. Over four years, as condom use soared from 14 to 94 percent, the annual number of bacterial STIs plummeted by 93 percent (WHO, 2000). When used by people with an infected partner, condoms have also been 80 percent effective in preventing the transmission of *HIV (human immunodeficiency virus)*—the virus that causes **AIDS** (Weller & Davis-Beaty, 2002; WHO, 2003). Although HIV can be transmitted by other means, such as needle sharing during drug use, its sexual transmission is most common. Half of all those with HIV (and 1 in 5 Americans recently diagnosed with HIV) are women (CDC, 2020). Because the virus is spread more easily from men to women than from women to men, women's proportion of the worldwide AIDS population is growing.

Having sex with one person means also partnering with that person's past partners—any one of whom might have unknowingly transmitted an STI. So, the first step in preventing STIs is knowing one's status, and telling one's sexual partner.

The Psychology of Sex

LOQ 34-4

How do external and imagined stimuli contribute to sexual arousal?

Biological factors powerfully influence our sexual motivation and behavior. Yet the wide variations over time, across place, and among individuals also document the great influence of psychological factors (FIGURE 34.1). What motivates people to have sex? The 281 reasons offered by people in one study ranged widely—from "it feels good" to "to get closer to God" to "I was drunk" (Buss, 2008; Meston & Buss, 2007).

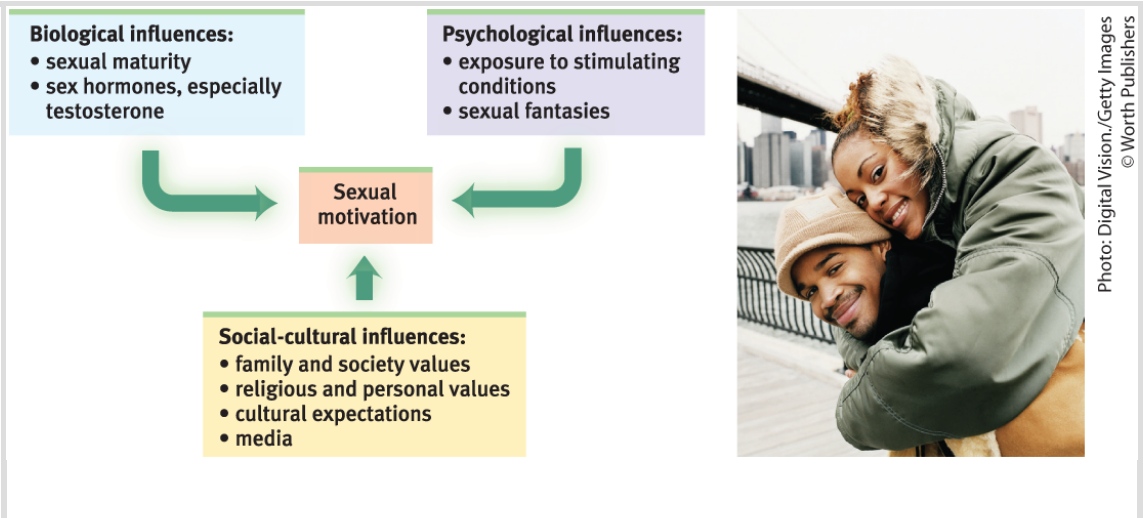


FIGURE 34.1 Biopsychosocial influences on sexual motivation Compared with our motivation for eating, our sexual motivation is less influenced by biological factors. Psychological and social-cultural factors play a bigger role.



External Stimuli

Men and women become aroused when they see, hear, or read erotic material (Heiman, 1975; Stockton & Murnen, 1992). In men more than in women, feelings of sexual arousal closely mirror their (more obvious) physical genital responses (Chivers et al., 2010).

People may find sexual arousal either pleasing or disturbing. (Those who wish to control their arousal often limit their exposure to arousing materials, just as those wishing to avoid overeating limit their exposure to tempting food cues.) With repeated exposure to any stimulus, including an erotic stimulus, the emotional response lessens, or *habituates.* During the 1920s, when Western women's hemlines rose to the knee, an exposed leg made hearts flutter. Today, many would barely notice.

Can exposure to sexually explicit material have other effects? Research indicates that it can, in four ways.

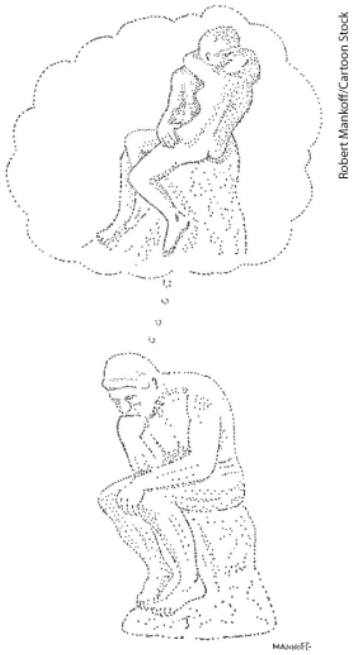
- ***Accelerating sexual activity*** When followed over time, teens with high exposure to pornography later engaged in sexual activity earlier and more often (Pirrone et al., 2022).

- ***Believing rape is acceptable*** Although some modern pornography portrays women in powerful roles, mostly it presents women as subservient sexual objects (Fritz & Paul, 2018; Jones, 2018). Four in 10 pornographic scenes from two major online sites involve physical aggression, such as choking, slapping, and gagging (Fritz et al., 2020). Across 166 studies with 125,000 participants, exposure to violent sexual media increased participants' aggressive thoughts, feelings, and actions (Burnay et al., 2022). Depictions of violence toward women feed the false belief that women want to be sexually overpowered, increasing their risk of sexual victimization.
- ***Reducing satisfaction with a partner's appearance or with a relationship*** After viewing erotic films of sexually attractive women and men, people have judged their own relationship as less satisfying (Perry, 2020). Perhaps reading or watching erotica's unlikely scenarios creates expectations that few people can fulfill.
- ***Desensitization*** Extensive online pornography viewing can warp expectations and desensitize people to normal sexuality. Repeated exposure to this distorted sexual world may contribute to greater risk of psychological distress, lowered sexual desire and satisfaction, diminished brain activation in response to sexual images, and, for men, erectile problems (Mennig et al., 2022; Wright et al., 2018). "Porn is messing with your manhood," argued Philip Zimbardo and colleagues (2016).

Imagined Stimuli

The brain, it has been said, is our most significant sex organ. The stimuli inside our head—our imagination—can influence sexual arousal and desire. Lacking genital sensation because of a spinal-cord injury, people can still feel sexual desire (Willmuth, 1987).

All genders report having sexual fantasies and watching pornography, and have similar brain responses to sexual imagery (Mitricheva et al., 2019; Solano et al., 2018; Wright & Vangeel, 2019). While men and most women need genital stimulation to produce orgasm, sexual fantasies alone can cause some women to experience orgasms (Komisaruk & Whipple, 2011). Men, regardless of sexual orientation, tend to have more frequent, more physical, and more aggressive sexual fantasies (Apostolou & Khalil, 2019; Canivet et al., 2022). They also prefer less personal and faster-paced sexual content in books and videos (Leitenberg & Henning, 1995). Fantasizing about sex does *not* indicate a sexual problem or dissatisfaction. If anything, sexually active people have more sexual fantasies.



Retrieval Practice

RP-3 What factors influence our sexual motivation and behavior?

ANSWERS IN APPENDIX E

Teen Sexual Risk Taking

LOQ 34-5

What factors influence teenagers' sexual behaviors and use of contraceptives?

Sexual attitudes and behaviors vary dramatically across cultures and eras. "Sex between unmarried adults" is "morally unacceptable," agreed 97 percent of Indonesians and 6 percent of Germans (Pew,

2014). Thanks mostly to decreased sexual activity—from 54 percent of high school students in 1991 reporting ever having had intercourse to 38 percent in 2019—U.S. teen pregnancy rates have halved since 2008 (CDC, 2020; Livingston & Thomas, 2019). What environmental factors contribute to some teens' sexual risk taking?

Communication About Birth Control, Sexual Health, and Disease Prevention

Many teenagers are uncomfortable discussing sex and contraception with parents, partners, and peers. But teens who spent at least 10 hours talking freely and openly with their parents about sex were more likely to use contraceptives (Widman et al., 2019).

Impulsivity

When reflecting on their sexual history, young women, more often than men, regret the timing of their sexual debut (Sprecher et al., 2022). If passion overwhelms intentions to use contraceptives or to delay having sex, unplanned sexual activity may result in unsafe sex and pregnancy (Ariely & Loewenstein, 2006; MacDonald & Hynie, 2008).

> **"Condoms should be used on every conceivable occasion."** — Anonymous

Alcohol Use

Among older teens and young adults, most sexual hook-ups (casual encounters outside of a relationship) occur after alcohol use, often without *affirmative consent* (Fielder et al., 2013; Garcia et al., 2013; Johnson & Chen, 2015). Those who use alcohol prior to sexual activity are less likely to use condoms (Kotchick et al., 2001). By depressing the brain centers that control judgment, inhibition, and self-awareness, alcohol disarms normal restraints—a phenomenon well known to sexually coercive people.

Mass Media

Popular media influence teens by providing *social scripts* for sexual behavior. Media also affect peer perceptions: The more sexual content adolescents and young adults view or read (even when controlling for other predictors of early sexual activity), the more likely they are to perceive their peers as sexually active, to develop sexually permissive attitudes, to experience early intercourse, and to use condoms inconsistently (Escobar-Chaves et al., 2005; O'Hara et al., 2012; Parkes et al., 2013; Ward et al. 2018). Perceived peer norms influence teens' sexual behavior (Lyons, 2015; van de Bongardt et al., 2015).



Frank Schuermann/dpa/picture-alliance/Newscom

Distorted social scripts

An analysis of the 60 top-selling video games found 489 characters, 86 percent of whom were male (like most of the game players). The female characters were much more likely than the male characters to be hypersexualized—partially nude or revealingly clothed, with large breasts and tiny waists (Downs & Smith, 2010). Such depictions can lead to unrealistic expectations about sexuality and body ideals, and contribute to the early sexualization of girls (Karsay et al., 2018).

Sexual Restraint

What are the characteristics of teens who delay having sex?

- ***High intelligence*** Teens with high rather than average intelligence test scores more often delay sex, partly because they consider possible negative consequences and delay gratification (Harden & Mendle, 2011).
- ***Religious engagement*** Actively religious teens more often reserve sexual activity for adulthood or long-term relationships (Hull et al., 2011; Schmitt & Fuller, 2015; Štulhofer et al., 2011).
- ***Father presence*** In studies that followed hundreds of New Zealand and U.S. girls from age 5 to 18, having Dad in the household reduced the risk of teen pregnancy and of sexual activity before age 16 (Ellis et al., 2003). These associations held even after adjusting for other influences, such as poverty. Close family attachments—as in families that spend time together and where parents know their teens' activities and friends—also predict later sexual initiation (Coley et al., 2008).
- ***Comprehensive sex education*** Irish teens who received comprehensive sex education at school (including discussion of feelings, relationships, safe sex, and sexual orientation), compared with those who did not, were more likely to delay having sex until they were older (Bourke et al., 2014).
- ***Service-learning participation*** U.S. teens who volunteered as tutors or teachers' aides, or participated in community projects, had lower pregnancy rates than did comparable teens randomly assigned to control conditions (Kirby, 2002; O'Donnell et al.,

2002). Researchers are unsure why. Does service learning promote a sense of personal competence, control, and responsibility? Does it encourage more future-oriented thinking? Or does it simply reduce opportunities for unprotected sex? (After-school activities and later school start times also reduced unplanned pregnancies [Bryan et al., 2016; Steinberg, 2015].)



Shutterstock

Father presence

Ask Yourself

What strategies could your community use to reduce teen pregnancy?

Retrieval Practice

RP-4 Which *three* of the following five factors contribute to sexual risk taking among some teens?

a. Alcohol use
b. Higher intelligence level
c. Father absence

d. Mass media models
e. Participating in service-learning programs

ANSWERS IN APPENDIX E

Sexual Orientation

LOQ 34-6

What do we know about sexual orientation?

To motivate is to energize and direct behavior. So far, we have considered the energizing of sexual motivation but not its *direction*, which is our **sexual orientation**—sexual attraction that may be female-male *(heterosexual* orientation), to our own sex (*same-sex* orientation), to males and females (*bisexual* orientation), or to no one at all (*asexual* orientation). We experience such attractions in our interests and fantasies. (Who appears in your imagination?)

Note that sexual orientation is distinct from *gender identity* (including *transgender* identity).

In one British survey of 18,876 people (and in other surveys since), about 1 percent identified themselves as asexual, having "never felt sexually attracted to anyone at all" (Bogaert, 2004, 2015). People with an asexual orientation are, however, nearly as likely as others to

report masturbating, noting that it feels good, reduces anxiety, or "cleans out the plumbing." Those who are asexual may enjoy nonsexual aspects of relationships (emotional closeness, companionship); 1 in 3 reports being in a romantic relationship (Carvalho & Rodrigues, 2022).

Cultures vary in their attitudes toward same-sex attractions. Should society accept such attractions? *Yes*, say 94 percent of Swedes and 7 percent of Nigerians. Acceptance, however, is increasing worldwide, with women and younger, educated adults being more accepting (Poushter & Kent, 2020). Yet whether a culture condemns or accepts same-sex unions, heterosexuality is most common and same-sex attraction and other variations exist. In the African countries in which same-sex relationships are illegal, the ratio of gay and bisexual people "is no different from other countries in the rest of the world," reports the Academy of Science of South Africa (2015). And in cultures in which same-sex behavior is expected of boys before marriage, most men nevertheless grow up to be heterosexual—or *straight*—adults (Hammack, 2005; Money, 1987). So, same-sex activity spans human history, and sexual behaviors need not indicate *orientation.*

How many people have exclusively same-sex attractions? According to more than a dozen national surveys in Europe and the United States, about 3 or 4 percent of men and 2 percent of women (Chandra et al., 2011; Copen et al., 2016; Savin-Williams et al., 2012). But the percentages vary somewhat over time, with the percentage who feel comfortable self-reporting as gay or bisexual gradually increasing

with increased social acceptance. In 2021, 5.2 percent of Americans reported being gay or bisexual (Jones, 2021). Percentages are also slightly higher when reporting is anonymous (Copen et al., 2016). A larger number of Americans—17 percent of women and 6 percent of men—say they have had some same-sex sexual contact during their lives (Copen et al., 2016). Psychologists have only recently begun to research the experiences of those who are bisexual (Borgogna et al., 2018; Greaves et al., 2019; House et al., 2022; Torres, 2019).

In less tolerant places, people are more likely to hide their sexual orientation. About 3 percent of California men express same-sex attraction on Facebook, for example, as do only about 1 percent in Mississippi. Yet about 5 percent of Google pornography searches in both states are for gay porn. And online ads for men seeking "casual encounters" with other men tend to be at least as common in less tolerant states, where there are also more Google searches for "gay sex" and "Is my husband gay?" (MacInnis & Hodson, 2015; Stephens-Davidowitz, 2013).

What would it be like to be straight in a majority gay culture? If you are straight, imagine that you have found "the one"—your perfect other-sex partner. How would you feel if you weren't sure who you could trust with knowing you had these feelings? How would you react if you overheard people telling crude jokes about straight people, or if most movies, TV shows, and advertisements showed only same-sex relationships? How would you like hearing that many people wouldn't vote for a political candidate who favors other-sex marriage? And how

would you feel if children's organizations and adoption agencies thought you might not be safe or trustworthy because you are attracted to people of another sex?

Facing such reactions, some people with same-sex attractions may at first try to ignore or deny their desires, hoping they will go away. But they don't. And these people may—particularly if they live in a region or a country that condemns same-sex attractions—conceal their orientation, which can harm their mental health (Pachankis et al., 2020). Especially during adolescence or when feeling rejected by their parents or peers, people may struggle against same-sex attractions. Some may wish to change their orientation, but the feelings are typically as enduring as those of straight people—who are similarly unable to change who they are (Haldeman, 1994, 2002; Myers & Scanzoni, 2005).

In surveys of U.S. high schoolers, gay youth have been twice as likely as straight youth to report being bullied, feeling unsafe, and experiencing violence. They have also been 3.6 times more likely to report persistent feelings of sadness or hopelessness in the past 12 months, and 4.5 times more likely to have "seriously considered attempting suicide" (CDC, 2020). When including a wider range of sexual orientations (gay, lesbian, bisexual, queer, questioning, asexual), the risk for attempted suicide is even greater, with 20 percent of these teens having attempted suicide over the past year (Trevor Project, 2022).

Today's psychologists view sexual orientation as neither willfully chosen nor willfully changed. In 1973, the American Psychiatric Association dropped "homosexuality" from its list of mental illnesses. In 2009, the American Psychological Association declared that "Efforts to change sexual orientation are unlikely to be successful and involve some risk of harm." A consensus of British mental health organizations agreed that such attempts are "unethical and potentially harmful" (Gale et al., 2017). Recognizing this, some countries and U.S. states and cities have banned "conversion therapy"—which aims to change people's sexual orientation—with minors.

> **"There is no sound scientific evidence that sexual orientation can be changed."**
> — UK Royal College of Psychiatrists, 2014

Sexual orientation in some ways is like handedness: Most people are one way, some the other. A smaller group experiences some form of ambidexterity. Regardless, the way we are endures, especially in men (Dickson et al., 2013; Norris et al., 2015). Women's sexual orientation tends to be less strongly felt than men's and, for some women, is more *fluid* and changing. For example, 1 in 10 straight U.S. women report having had at least one same-sex sexual partner, which is five times greater than the rate among straight men (Silva, 2022). Straight women may experience genital arousal to either male or female sexual stimuli (Chivers, 2017). Transgender men (assigned a female sex at birth but identifying as male) similarly seem to experience genital arousal to both male and female sexual stimuli (Raines et al.,

2021). But transgender men tend to show much stronger sexual arousal toward whatever gender they are attracted to, as is the case for cisgender men.

In general, men are sexually simpler. Across time, cultures, situations, differing levels of education, religious observance, and peer influence, men's sexual drive and interests have been less flexible and varying than have women's. Women, for example, more often prefer to alternate periods of high sexual activity with periods of almost none (Mosher et al., 2005). Roy Baumeister (2000) calls this flexibility *erotic plasticity*.

Origins of Sexual Orientation

So, if we do not choose our sexual orientation and (especially for men) cannot change it, where do these feelings come from? In an early search for possible environmental influences on sexual orientation, Kinsey Institute investigators in the 1980s interviewed nearly 1000 lesbian/gay and 500 heterosexual people. They assessed nearly every imaginable psychological "cause" of same-sex attraction—parental relationships, childhood sexual experiences, peer relationships, and dating experiences (Bell et al., 1981; Hammersmith, 1982). Their findings: Gay people were no more likely than straight people to have been smothered by maternal love or neglected by their father. And consider this: If "distant fathers" were more likely to produce gay sons, then shouldn't boys growing up in father-absent homes more often be gay? (They are not.) And shouldn't the rising number of such

homes have led to a noticeable increase in the gay population? (It did not.) Most children raised by gay or lesbian parents display gender-typical behavior and are heterosexual (Farr et al., 2018; Gartrell & Bos, 2010). And they grow up with health and emotional well-being similar to children with straight parents (Bos et al., 2016; Farr, 2017).

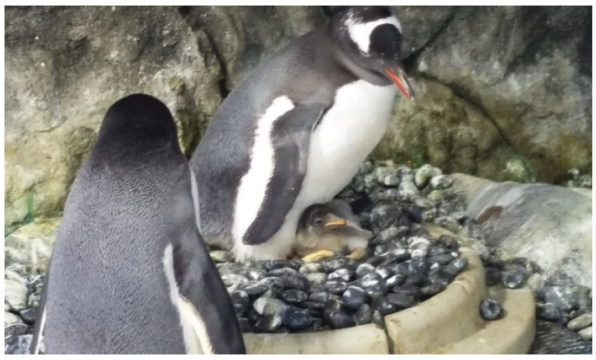
So, what else might influence sexual orientation? One theory has proposed that people develop same-sex erotic attachments if segregated by sex at the time their sex drive matures (Storms, 1981). Indeed, gay men tend to recall going through puberty somewhat earlier, when peers are more likely to be all male (Bogaert et al., 2002). Moreover, though peers' attitudes predict teens' sexual attitudes and behavior, they do not predict same-sex attraction. "Peer influence has little or no effect" on sexual orientation (Brakefield et al., 2014).

Environment likely contributes to sexual orientation—nature and nurture work together—but the inability to pin down specific environmental influences has led researchers to explore several lines of biological evidence. These include same-sex attraction in other species, brain differences, and genetic and prenatal influences.

Same-Sex Attraction in Other Species

In Boston's Public Gardens, caretakers solved the mystery of why a much-loved swan couple's eggs never hatched. Both swans were female. In New York City's Central Park Zoo, penguins Silo and Roy spent several years as devoted same-sex partners. Same-sex sexual behaviors have been observed in several hundred other species,

including grizzlies, gorillas, giraffes, monkeys, flamingos, and owls (Bagemihl, 1999). Among rams, for example, some 7 to 10 percent display same-sex attraction by shunning ewes and seeking to mount other males (Perkins & Fitzgerald, 1997). Same-sex sexual behavior seems a natural part of the animal world.



SEA LIFE Sydney Aquarium

Dad and dad At Sydney's SEA LIFE Aquarium, Sphen and Magic, a bonded same-sex penguin pair, successfully raised a foster chick (appropriately named "Sphengic").

Brain Differences

Might the structure and function of gay and straight brains differ? Neuroscientist Simon LeVay (1991) studied sections of the hypothalamus taken from deceased gay and straight people. His discovery: a cell cluster that was indeed reliably larger in straight men than in straight women and gay men.

It should not surprise us that brains differ with sexual orientation. Remember: *Everything psychological is simultaneously biological.* But when did the brain difference begin? At conception? During

childhood or adolescence? Did experience produce the difference? Or was it genes or prenatal hormones (or genes activating prenatal hormones)?

LeVay does not view the hypothalamus cell network as a sexual orientation center. Rather, he sees it as an important part of the neural pathway linked to sexual behavior. He acknowledges that sexual behavior patterns may influence the brain's anatomy. In fish, birds, rats, and humans, brain structures vary with experience—including sexual experience (Breedlove, 1997). But LeVay believes it is more likely that brain anatomy influences sexual orientation. His hunch seems confirmed by the discovery of a similar hypothalamic difference between male sheep that do and don't display same-sex attraction (Larkin et al., 2002; Roselli et al., 2002, 2004). Moreover, such differences seem to develop soon after birth, and perhaps even before birth (Rahman & Wilson, 2003).

Since LeVay's brain *structure* discovery, other researchers have reported differences in how gay and straight brains *function.* One is in an area of the hypothalamus that governs sexual arousal (Savic et al., 2005). This brain area became active when straight women were given a whiff of a scent derived from men's sweat. Gay men's brains responded similarly to the men's scent. But straight men's brains showed the arousal response only to a female hormone derivative. In a similar study, gay women's responses differed from those of straight women (Kranz & Ishai, 2006; Martins et al., 2005). Researcher Qazi Rahman (2015) sums it up: Compared with straight men and women,

"gay men appear, on average, more 'female typical' in brain pattern responses and [gay] women are somewhat more 'male typical.'"

On several traits, the average gay man and gay woman fall midway between the average straight man and straight woman. Consider the gay-straight difference in spatial abilities. On mental rotation tasks such as the one in **FIGURE 34.2**, straight men tend to outscore straight women, and gay men fall in between (Xu et al., 2020). But straight women and gay men have both outperformed straight men at remembering objects' spatial locations in memory game tasks (Hassan & Rahman, 2007).

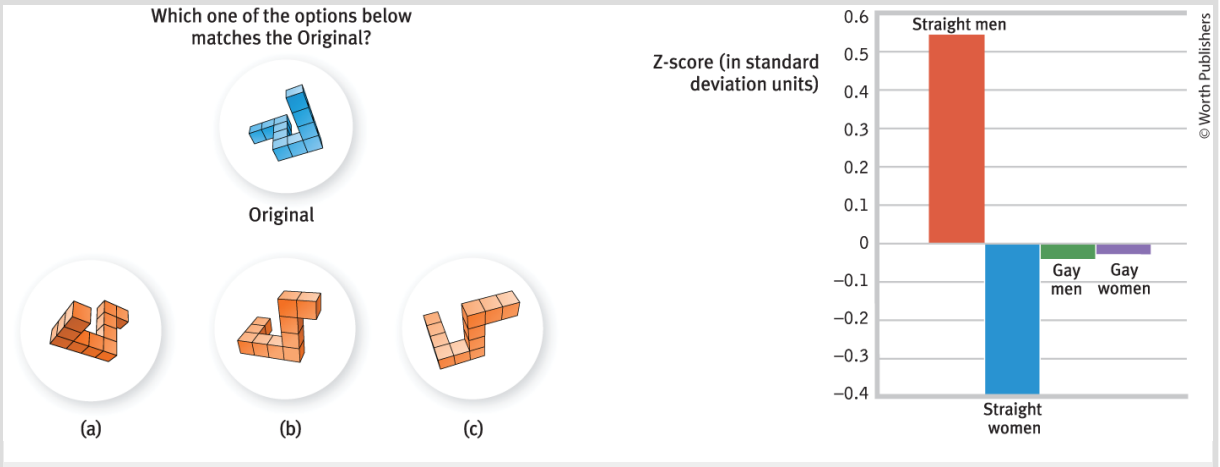


FIGURE 34.2 Spatial abilities and sexual orientation Which of the three figures can be rotated to match the Original figure?[1] Straight men tend to find this type of mental rotation task easier than do straight women, with gay men and gay women falling in between (see graph) (Rahman et al., 2004).

Genetic Influences

Studies indicate that "about a third of variation in sexual orientation is attributable to genetic influences" (Bailey et al., 2016). A same-sex orientation does tend to run in families. And identical twins are somewhat more likely than fraternal twins to share a same-sex orientation (Alanko et al., 2010; Långström et al., 2010). But because sexual orientations differ in many identical twin pairs, especially female twins, we know that other factors besides genes are also at work—including, it appears, *epigenetic marks* that help distinguish gay and straight twins (Balter, 2015; Gavrilets et al., 2018).

By altering a single gene in fruit flies, experimenters have changed the flies' sexual orientation and behavior (Dickson, 2005). In search of genes that influence human sexual orientation, researchers have analyzed the genomes of 409 pairs of gay brothers, and of 1231 straight men and 1077 gay men. They found links between sexual orientation and two genes on chromosomes 13 and 14. The first of those chromosome regions influences a brain area that varies in size with sexual orientation. The second influences thyroid function, which has also been associated with sexual orientation (Sanders et al., 2015, 2017). But we should also recall a familiar lesson: Human traits are *polygenic*—influenced by *many genes having small effects.* Indeed, a giant study of nearly 500,000 peoples' genes confirmed that "Same-sex behavior is influenced by not one or a few genes but many" (Ganna et al., 2019).

Researchers have speculated about possible reasons why same-sex attraction persists, given that it involves a "reproductive cost" (because same-sex couples cannot naturally reproduce) (Apostolou, 2022). One possible answer is *kin selection.* Evolutionary psychologists remind us that many of our genes also reside in our biological relatives. Perhaps, then, gay people's genes live on by supporting their relatives' survival and reproduction. Another possible answer comes from a study that analyzed the entire genome of 360,000 participants, who also reported their same-sex and other-sex sexual behavior (Zietsch et al., 2021). The results were striking: The same genetic patterns that predispose some people to be gay are also found in some straight people who tend to have more sexual partners, thus leading to more offspring.

A *fertile females theory* suggests that maternal genetics may also be at work (Bocklandt et al., 2006). Around the world, gay men tend to have more gay relatives on their mother's side than on their father's (Camperio-Ciani et al., 2004, 2009, 2012; VanderLaan et al., 2012; VanderLaan & Vasey, 2011). And the relatives on the mother's side also produce more offspring than do the maternal relatives of straight men. Perhaps the genes that dispose some women to conceive more children with men also dispose some men to be attracted to men (LeVay, 2011). Thus, the decreased reproduction by gay men appears to be offset by the increased reproduction by their maternal extended family.

Prenatal Influences

Recall that in the womb, sex hormones direct our male and female development. In animals and some humans, prenatal hormone conditions have altered a fetus' sexual orientation, most clearly so for females (Breedlove, 2017). When pregnant sheep were injected with testosterone during a critical period of fetal development, their female offspring later showed same-sex sexual behavior (Money, 1987). A critical period in the human brain's neural-hormonal control system may exist during the second trimester (Ellis & Ames, 1987; Garcia-Falgueras & Swaab, 2010; Meyer-Bahlburg, 1995). Exposure to the hormone levels typically experienced by female fetuses during this period may predispose females later to become attracted to males (Tasos, 2022). And female fetuses most exposed to testosterone appear most likely later to exhibit gender-atypical traits and to experience same-sex desires. "Prenatal sex hormones control the sexual differentiation of brain centers involved in sexual behaviors," noted Simon LeVay (2011, p. 216).

> **"Modern scientific research indicates that sexual orientation is … partly determined by genetics, but more specifically by hormonal activity in the womb."** — Glenn Wilson and Qazi Rahman, *Born Gay: The Psychobiology of Sex Orientation*, 2005

The mother's immune system may also play a role in determining the sexual orientation of the fetus. In a curious but amazingly reliable finding from 35 of 36 samples studied, men with older brothers have

been somewhat more likely to be gay, reports Ray Blanchard (2004, 2018, 2019)—about one-third more likely for each additional older brother (see also Bogaert, 2003). A similar, though weaker, effect is found among men with older sisters (Blanchard & Skorska, 2022). The odds of same-sex attraction are roughly 2 percent among first sons, and they rise to about 2.6 percent among second sons, 3.5 percent for third sons, and so on for each additional older brother (Bailey et al., 2016). This is called the *older-brother effect* (also called the *fraternal birth order effect;* see **FIGURE 34.3**).

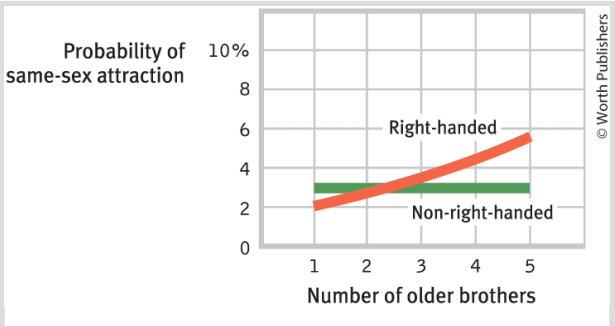


FIGURE 34.3 The older-brother effect These approximate curves depict a man's likelihood of same-sex attraction as a function of the number of biological (not adopted) older brothers he has (Blanchard, 2008; Bogaert, 2006). This correlation has been found in several studies, but only among right-handed men (as about 9 in 10 men are). A similar, though weaker, effect occurs among men with older sisters.

A recent study of more than 9 million Dutch people born between 1940 and 1990—60,000+ of whom had same-sex marriages—strongly

confirmed the older-brother effect (Ablaza et al., 2022). The more older brothers, the more likely a same-sex marriage. Although the older-brother effect is but one of several biological contributions to sexual orientation, it is no longer a mere hypothesis; it is an established fact. (Curiously, in this study, women with older brothers were also more likely to enter a same-sex marriage.) The researchers believe their Dutch data add evidence "that sexual orientation is an innate trait and a reflection of individuals' true selves, rather than the product of lifestyle choices."

The reason for this older-brother effect is unclear. Blanchard and his colleagues (2021) offer a *maternal immune hypothesis:* Male fetuses may stimulate the maternal immune system to produce antibodies. With each pregnancy with a male fetus, the maternal antibodies accumulate and divert brain development from the male-typical pattern (Bogaert et al., 2018). Consistent with this biological explanation, in men, the effect occurs only with older brothers born to the same mother (whether raised together or not). Sexual orientation is unaffected by adoptive brothers (Bogaert, 2006).



"Thanks, but I'm in the midst of a lesbian phase that started the day I was born."

The point to remember: Taken together, the brain, genetic, and prenatal findings offer strong support for a biological explanation of sexual orientation, especially for men (LeVay, 2011; Rahman & Koerting, 2008). Women's greater sexual fluidity suggests there are psychosocial influences as well (Diamond et al., 2017).

***

Still, some people wonder: Should the cause of sexual orientation matter? Perhaps it shouldn't, but people's assumptions matter. Those who believe sexual orientation is a lifestyle choice often oppose equal rights for gay people. For example, in signing a 2014 bill that made some same-sex sexual acts punishable by life in prison, Uganda's president denied that same-sex attraction is inborn, declaring it a matter of "choice" (Balter, 2014; Landau et al., 2014). Those who instead understand sexual orientation as inborn—as shaped by

biological and prenatal influences—more often favor equal rights for gay, lesbian, and bisexual people (Bailey et al., 2016).

Note that the scientific question is not "What causes same-sex orientation?" (or "What causes heterosexual orientation?") but "What causes differing sexual orientations?" In pursuit of answers, psychological science compares the backgrounds and physiology of people whose sexual orientations *differ.*

Ask Yourself

How has learning more about what contributes to sexual orientation influenced your views? How might your learning from this module influence your interactions with people whose sexual orientation differs from yours?

Retrieval Practice

RP-5 Which *three* of the following five factors have researchers found to have an effect on sexual orientation?

a. An over-involved mother
b. The size of a certain cell cluster in the hypothalamus
c. Prenatal hormone exposure
d. A distant or ineffectual father
e. Having multiple older biological brothers

ANSWERS IN APPENDIX E

Sex and Human Relationships

LOQ 34-7

What role do social factors play in our sexuality?

Scientific research on sexual motivation does not aim to define the personal meaning of sex in our own lives. You could know every available fact about sex—that the initial spasms of male and female orgasm come at 0.8-second intervals, that female nipples can expand 10 millimeters at the peak of sexual arousal, that systolic blood pressure can rise some 60 points and respiration rate can reach 40 breaths per minute—but fail to understand the human significance of sexual intimacy.

Sexual desire motivates people to form intimate, committed relationships, which in turn enable satisfying sex (Birnbaum, 2018). Relationship satisfaction and sexual satisfaction often go hand in hand. A loving relationship enhances sex. And good sex, with a lingering "afterglow," enhances a loving relationship (Maxwell & McNulty, 2019). Surely one meaning of such intimacy is its expression of our profoundly social nature.

In one study that followed U.S. participants to age 30, later first sex predicted greater satisfaction with one's marriage or partnership (Harden, 2012). Another study asked 2035 married people when they started having sex (while controlling for education, religious

engagement, and relationship length). Those whose relationship first developed to a deep commitment reported greater relationship satisfaction and stability, and also better sex (Busby et al., 2010; Galinsky & Sonenstein, 2013). For men and women, but especially for women, sex is more satisfying (with more orgasms and less regret) when in a committed relationship, rather than a brief sexual hook-up (Armstrong et al., 2012; Benidixen et al., 2017; Dubé et al., 2017). Partners who share regular meals are more likely than one-time dinner companions to understand what seasoning touches suit each other's food tastes; so, too, with the touches of loyal partners who share a bed.



skynesher/iStock/Getty Images

Life-uniting and love-renewing Being in a committed relationship before having sex leads to better relationships, and better sex.

Increased sex ≠ more happiness

Among married couples, more frequent sex correlates with happiness (Muise et al., 2016). So, would systematically increasing sexual frequency *cause* people to be happier? Alas, heterosexual married couples randomly assigned to double their

intercourse frequency over 3 months became slightly *less* happy (Loewenstein et al., 2015).

Sex is more than an itch that begs to be scratched. It is a socially significant act. Men and women can achieve orgasm alone, yet most people find greater satisfaction—and experience a much greater surge in *prolactin,* the hormone associated with sexual satisfaction and satiety—after intercourse and orgasm with their loved one (Brody & Tillmann, 2006). Among newlyweds in one study, the sexual afterglow lasted 48 hours and increased marital satisfaction (Meltzer et al., 2017). Thanks to their overlapping brain reward areas, sexual desire and love feed each other (Cacioppo et al., 2012). Sex at its human best is life uniting and love renewing.

We realize that sexuality research may create discomfort and invite disagreement. Some may find it awkward to speak frankly about sex and sexuality. Others may feel that acceptance of diverse sexual orientations challenges their personal beliefs (Wilkins et al., 2022). Yet we believe that learning about our sexual motivation can predict positive outcomes, such as greater appreciation of our bodies and brains and greater respect for ourselves and others. We hope you have found the material enriching.

REVIEW

Module 34: Sexual Motivation

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 34-1: How do hormones influence human sexual motivation?

LOQ 34-2: What is the human *sexual response cycle*, and how do sexual dysfunctions and paraphilias differ?

LOQ 34-3: How can sexually transmitted infections be prevented?

LOQ 34-4: How do external and imagined stimuli contribute to sexual arousal?

LOQ 34-5: What factors influence teenagers' sexual behaviors and use of contraceptives?

LOQ 34-6: What do we know about sexual orientation?

LOQ 34-7: What role do social factors play in our sexuality?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

asexual
sexuality
sexual response cycle
refractory period
sexual dysfunction
erectile disorder
female orgasmic disorder
paraphilias
AIDS (acquired immune deficiency syndrome)
sexual orientation

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. A striking effect of hormonal changes on human sexual behavior is the
   a. end of sexual desire in men over 60.

b. sharp rise in sexual interest at puberty.
c. decrease in women's sexual desire at the time of ovulation.
d. increase in testosterone levels in castrated men.

2. In describing the sexual response cycle, Masters and Johnson noted that
   a. a plateau phase follows orgasm.
   b. people experience a refractory period during which they cannot experience orgasm.
   c. the feeling that accompanies orgasm is stronger in men than in women.
   d. testosterone is released equally in women and men.

3. What is the difference between sexual dysfunctions and paraphilias?

4. Using condoms during sex _____ (does/doesn't) reduce the risk of getting HIV and _____ (does/doesn't) fully protect against skin-to-skin STIs.

5. An example of an external stimulus that might influence sexual behavior is
   a. the level of testosterone in the bloodstream.
   b. the onset of puberty.
   c. a sexually explicit film.
   d. an erotic fantasy or dream.

6. Which factors have researchers so far found to be *unrelated* to the development of our sexual orientation?

MODULE 35: Affiliation and Achievement

Affiliation and achievement are among the strongest human motivations. Let's investigate how people fulfill these motivations—and what happens when people's affiliation and achievement needs are not met.

The Need to Belong

LOQ 35-1

What evidence points to our human affiliation need—our need to belong?

Separated from friends or family—at a new school, alone in prison or a foreign land, or isolating to prevent the spread of Covid-19—most people keenly feel their loss of social connection. We are what the ancient Greek philosopher Aristotle called the *social animal.* "Without friends," he wrote in *Nicomachean Ethics*, "no one would choose to live, though he had all other goods." This deep *need to belong*—our **affiliation need**—is a key human motivation (Baumeister & Leary, 1995). Even a chat with a stranger—though we may fear it will be awkward—often gives us an emotional boost (Kardas et al., 2022). It is common and healthy to seek privacy and solitude (Nguyen et al.,

2019). But most of us also seek to affiliate—to become strongly attached to certain others in enduring, close relationships. Across 27 countries, people were most strongly motivated to maintain their romantic relationships and to care for family members (Ko et al., 2020).

The Benefits of Belonging

Social bonds boosted our early ancestors' survival chances. Adults who formed attachments were more likely to survive, reproduce, and co-nurture their offspring to maturity. Attachment bonds motivated caregivers to keep children close, calming and protecting them from threats (Esposito et al., 2013). Indeed, to be "wretched" literally means, in its Middle English origin *(wrecched)*, to be without kin nearby.

Cooperating with friends and acquaintances also enhanced survival. As hunters, our ancestors learned that six hands were better than two. As food gatherers, they gained protection from two-footed and four-footed enemies by traveling in groups. Those who cooperated survived and reproduced most successfully, and their cooperative genes now predominate (Rand & Nowak, 2013). Our innate need to belong drives us to befriend people who cooperate and to avoid those who exploit (Feinberg et al., 2014; Kashima et al., 2019). People in every society on Earth belong to groups and prefer and favor "us" over "them." Having a *social identity*—feeling part of a group—boosts people's health and well-being (Allen et al., 2015; Haslam et al., 2019).

Do you have close friends—people to whom you freely disclose your ups and downs? Having someone who listens and rejoices with us over good news helps us feel better about both the news and the friendship (Itzchakov et al., 2022). Such companionship creates connection and cooperation (Canavello & Crocker, 2017). Warmth and social connection go hand in hand: Feeling physically warm makes us feel socially connected to close others, and close others make us feel physically warm (Inagaki et al., 2019; Inagaki & Ross, 2021). The need to belong runs deeper, it seems, than any need to be rich. Very happy university students are marked not by the amount of money they have but by their "strong social relationships" (Diener et al., 2018).

The need to belong colors our thoughts and emotions. We spend a great deal of time thinking about actual and hoped-for relationships. When new relationships form, we often feel joy. Falling in mutual love, people's cheeks may ache from their irrepressible grins. Asked, "What is necessary for your happiness?" or "What is it that makes your life meaningful?" most people mention—before anything else—close, satisfying relationships with family, friends, or romantic partners (Berscheid, 1985). Happiness hits close to home.

Consider: What was your most satisfying moment this past week? Researchers asked that question of U.S. and South Korean university students, then asked them to rate how much that moment had satisfied various needs (Sheldon et al., 2001). In both countries, the peak moment had satisfied self-esteem, relatedness, and belonging needs. Our drive to connect with others runs deep.

According to **self-determination theory**, we strive to satisfy three needs: *competence, autonomy* (a sense of personal control), and *relatedness* (Deci & Ryan, 2012; Ryan & Deci, 2000). Fulfilling these motives reduces stress and boosts health and self-esteem (Guertin et al., 2017; Uysal et al., 2020). One analysis of 200,000 people from nearly 500 studies concluded that "self-determination is key to explaining human motivation" (Howard et al., 2017, p. 1346).

Self-determination theory can help leaders motivate people. Employees who feel empowered perform better. They also feel more autonomous, competent, and socially included (Slemp et al., 2018; Van den Broeck et al., 2016). This also holds true for teachers motivating their students and military leaders motivating their soldiers (Bakadorova & Raufelder, 2018; Chambel et al., 2015; Hagger & Chatzisarantis, 2016). An empowered mindset fuels motivation by giving people the perception that they have unlimited energy (Sieber et al., 2019).



Keith Birmingham/MediaNews Group/Pasadena Star-News/Getty Images

Creative graduation "ceremonies" As social animals with a need to belong, we thrive on our connections with others. During the Covid

pandemic, social distancing slowed the spread of the virus, but it disrupted our everyday relationships and challenged us to come up with new ways to celebrate important events together.

Small wonder, then, that our social behavior often aims to increase our feelings of belonging, and spending more time with friends and family increases happiness (Li & Kanazawa, 2016; Rohrer et al., 2018). To gain acceptance, we generally conform to group standards. We wait in lines and obey laws. We monitor our behavior, hoping to make a good impression. We spend billions on clothes, cosmetics, and diet and fitness aids—all motivated, in part, by our search for love and acceptance.

Thrown together in groups at school or at work, we form bonds. Parting, we feel distressed. We promise to stay in touch and return for reunions. By drawing a sharp circle around "us," the need to belong feeds both deep attachments to those inside the circle (loving families, faithful friendships, team loyalty) and hostilities toward those outside (as happens with rival gangs, ethnic conflicts, and fanatic nationalism; see the Social Psychology modules). Feeling close with our relationship partner, we expand our self-concept to overlap with theirs (Aron et al., 1991; (**FIGURE 35.1**). Feelings of love activate brain reward and safety systems. In one experiment, deeply in love university students exposed to heat felt less pain when looking at their beloved's picture (Younger et al., 2010). Pictures of our loved ones

activate a brain region—the prefrontal cortex—that dampens feelings of physical pain (Eisenberger et al., 2011). Love is a natural painkiller.

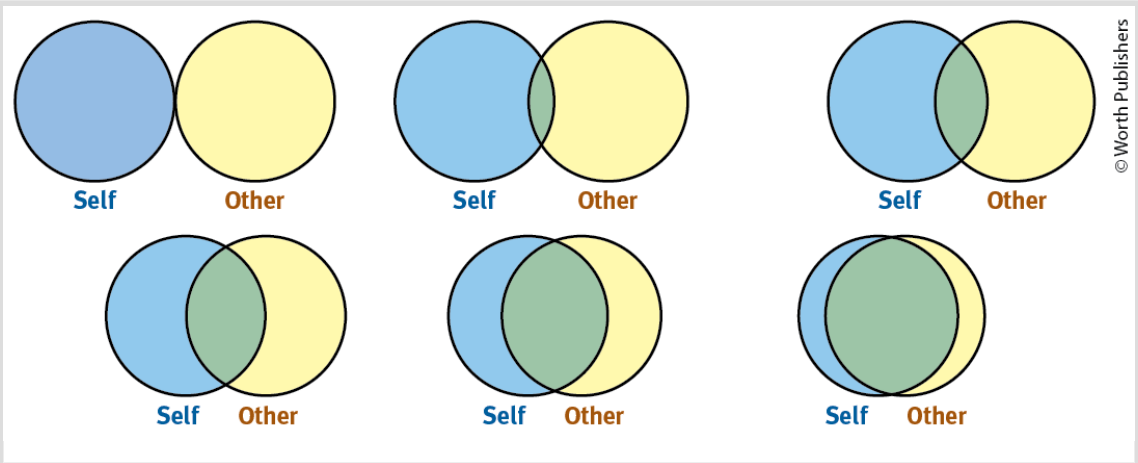


FIGURE 35.1 Inclusion of Other in Self (IOS) Scale Psychologist Arthur Aron developed the IOS scale to measure people's feelings of closeness with others. The more a person's self-concept overlaps with a romantic partner, friend, or acquaintance, the closer they feel and the more they like that other person. Think of a relationship partner and choose the pair of overlapping circles that best describes your relationship. (Information from Aron et al., 1992 and Gächter et al., 2015.)

"When my brothers try to draw a circle to exclude me, I shall draw a larger circle to include them." — Lawyer and civil rights activist Pauli Murray, "An American Credo," 1945

When relationships end, people may suffer. In one 16-nation survey, and in repeated U.S. surveys, separated and divorced people have been half as likely as married people to say they are "very happy" (Inglehart, 1990; NORC, 2022). Is that simply because happy people

more often marry and stay married? A national study following British lives through time revealed that, even after controlling for premarital life satisfaction, "the married are still more satisfied, suggesting a causal effect" of marriage (Grover & Helliwell, 2014). Divorce also predicts earlier mortality. Data from more than 600 million(!) people in 24 countries reveal that, compared with married people, separated and divorced people are at greater risk for early death (Shor et al., 2012). This massive study's finding was no fluke: An independent study of 7.8 million people replicated the association between being separated or divorced and the risk of early death (Wang et al., 2020). A happy marriage is, as one data scientist noted, "perhaps as important as not smoking, which is to say: huge" (Ungar, 2014).

Children who endure a series of foster homes or repeated family relocations experience frequent disruptions of budding relationships. They may then have difficulty forming deep connections with others (Oishi & Schimmack, 2010). The evidence is clearest at the extremes. Children who grow up in institutions without a sense of belonging to anyone, or who are locked away at home and severely neglected tend to become withdrawn, frightened, even speechless.

No matter how secure our early years were, we all—when something threatens or dissolves our social ties—experience anxiety, loneliness, jealousy, or guilt. Much as life's best moments occur when close relationships begin—making a new friend, falling in love, having a baby—life's worst moments happen when close relationships end (Beam et al., 2016). Bereaved, we may feel life is empty or pointless,

and we may overeat to fill that emptiness (Yang et al., 2016). Even the first months of living on campus can be distressing, when new social ties have not yet formed (English et al., 2017).

Gregory Walton and Timothy Wilson (2018) note that a lonely new college student may wonder, "Can people like me belong here?" Entering Black American students who experienced a 1-hour session explaining the commonness of that worry, with reassuring stories from older peers, achieved higher grades over the next 3 years—and greater life and career satisfaction after college. Boosting a sense of belonging had big benefits.

Social isolation can put our mental and physical health at risk (Cacioppo et al., 2015; Cheek et al., 2019). Lonely older adults, for example, make more doctor visits and are at greater risk for dementia (Gerst-Emerson & Jayawardhana, 2015; Holwerda et al., 2014). In separate U.S. surveys during the early months of the Covid pandemic,

- 48 percent of 18- to 29-year-olds reported repeatedly feeling lonely or isolated (Cox & Bowman, 2020);
- 70 percent of all adults reported experiencing "moderate or severe distress"—triple the 22 percent in a prior survey (Twenge & Joiner, 2020); and
- 36 percent of all adults showed signs of clinical depression or anxiety—again, triple the level of a year earlier (NCHS, 2020).

UK, Asian, European, and New Zealand researchers also reported that mental distress surged during the Covid pandemic restrictions (Prati

& Mancini, 2021). The benefits of belonging make it worth the effort to nurture our relationships with family and friends.

The Pleasure of Micro-Friendships

We are made for relationships—not just with our nearest and dearest, but also in our fleeting connections. That's the consistent lesson of experiments on *micro-friendships.*

Connecting while commuting Nicholas Epley and Juliana Schroeder (2014) offered Chicago commuters a $5 gift card to complete a randomly assigned task: to (a) do as they would usually do on their train or bus, (b) sit in solitude, or (c) strike up a conversation with a stranger. Although most expected the attempted conversation would be awkward, it typically was not. Moreover, upon finishing the ride, the talkers were in a happier mood.

Bantering with a barista Gillian Sandstrom and Elizabeth Dunn (2014) similarly offered Starbucks patrons a $5 gift card to participate in an experiment. They asked half of the patrons, when interacting with the barista, to act respectful but *efficient* ("have your money ready, and avoid unnecessary conversation"). They assigned the others to act *social* ("smile, make eye contact to establish a connection, and have a brief conversation"). When later exiting the store, those tasked with being social reported feeling happier and more satisfied.

Complimenting a stranger In five experiments, Erica Boothby and Vanessa Bohns (2021) observed the unexpected power of compliments. For example, they instructed compliment-givers to approach strangers, observe "something about them that you like" (often their hair or clothing), and compliment them. Inevitably, the little act of kindness was warmly received, leaving the compliment-giver feeling better afterward.

The bottom line: Micro-friendships can brighten others' days, and our own.

Easy enough for extraverts, you say? Perhaps, but intentional micro-friendly acts have been found to create an equally happy experience for both extraverts and introverts.

A suggestion: *Try it.* Greet a service worker with a smile. Chat up the ride-share driver. Ask the checkout clerk how their day is going. Can you replicate the happy science of micro-friendships in your daily encounters?

The Pain of Being Shut Out

Recall a time when you felt excluded, ignored, or shunned. Perhaps your texts went unanswered, or you were unfriended or ghosted online. Perhaps others gave you the silent treatment, avoided you, looked away, mocked you, or excluded you in some other way. Or perhaps you have felt excluded among people speaking an unfamiliar

language (Dotan-Eliaz et al., 2009). We feel the sting even from small-scale exclusions like being *phubbed*—an Australian-coined term meaning *phone-snubbed*—when our conversation partner seems more interested in gazing at their phone than interacting with us (Roberts & David, 2016). Frequent phubbing distracts attention and predicts a less satisfying relationship, as well as lower self-esteem and greater suicidal thinking among those feeling ignored (Sbarra et al., 2019; Wang & Qiao, 2022).

These situations are forms of **ostracism**, or social exclusion (Williams, 2007, 2009). Worldwide, humans use many forms of ostracism—shunning, exile, imprisonment, solitary confinement—to punish, and therefore control, social behavior. For children, even a brief time-out in isolation can be punishing. In experiments with adults, simply being excluded from ball tosses during a video game increased suicidal thinking (Chen et al., 2021). Loneliness is less a matter of being alone than of feeling ignored, dismissed, or not cared about.



CBS/Photofest

Social acceptance and rejection Successful participants on the reality TV show *Survivor* form alliances and gain acceptance among their peers. The rest receive the ultimate social punishment by being "voted off the island."

Being ostracized threatens one's basic need to belong (Vanhalst et al., 2015). "It's the meanest thing you can do to someone, especially if you know they can't fight back. I never should have been born," said Lea, a lifelong victim of the silent treatment by her mother and grandmother (Wirth et al., 2010). Like Lea, people often respond to ostracism with initial efforts to restore social acceptance, followed by depressed mood and, finally, withdrawal into solitude (Ren et al., 2021). To many, social exclusion is an inhumane sentence. After more than a quarter century in solitary confinement, Dennis Hope petitioned the U.S. Supreme Court to consider whether such isolation is cruel and unusual punishment. Having "watched men commit suicide, mutilate themselves, try to overdose on pills and slowly lose their minds," he stated, "I said to myself that I was going to try to make a positive change in the way we are housed and treated if it was the last thing I did" (Liptak, 2022).

"If we truly want to be healthy, happy and fulfilled as a society, we have to restructure our lives around people …. We have this powerful force for enhancing health and well-being, in their relationships." — U.S. Surgeon General Vivek Murthy (Leland, 2022).

To experience ostracism is to experience real pain, as social psychologist Kipling Williams and his colleagues were surprised to discover in their studies of exclusion on social media (Gonsalkorale & Williams, 2006). Such ostracism elicits increased activity in brain areas, such as the *anterior cingulate cortex*, that also respond to physical pain (Lieberman & Eisenberger, 2015; Rotge et al., 2015).



The Granger Collection

Enduring the pain of ostracism White cadets at the U.S. Military Academy at West Point ostracized Henry Flipper for years, hoping he would drop out. Somehow, he withstood their cruelty, and in 1877, he became the first African American West Point graduate.

When people view pictures of romantic partners who broke their heart, their brain and body begin to ache (Kross et al., 2011). This

result helps explain some other surprising findings: The pain reliever acetaminophen (as in Tylenol) lessens *social* and physical pain (DeWall et al., 2010). Ditto for marijuana (Deckman et al., 2014). Across cultures, people use the same words (for example, *hurt* or *crushed*) for social pain and physical pain (MacDonald & Leary, 2005). Psychologically, we seem to experience social pain with the same unpleasantness that marks physical pain. Compared with collectivist cultures, rejection tends to hurt more in individualist cultures—where people have weaker social support networks (Heu et al., 2019; Uskul & Over, 2017).

Ostracism can make people disagreeable, uncooperative, and hostile, leading to further ostracism (Rudert et al., 2019; Walasek et al., 2019). In one series of experiments, researchers told some students that people they had met earlier didn't want them in a group that was forming (Gaertner et al., 2008; Twenge et al., 2001).[2] Others heard good news: "Everyone chose you as someone they'd like to work with." Those who were excluded became much more likely to engage in self-defeating behaviors, and to disparage or act aggressively toward those who had excluded them (blasting them with noise, for example).

> **"If no one turned around when we entered, answered when we spoke, or minded what we did, but if every person we met 'cut us dead,' and acted as if we were non-existing things, a kind of rage and impotent despair would ere long well up in us."** — William James, *Principles of Psychology*, 1890/1950, pp. 293–294

Ask Yourself

Have there been times when you felt lonely or ostracized? What are some strategies that might help you to cope the next time you feel this way? On the other hand, can you think of a time when *you* ostracized or ignored someone? How do you think this made them feel?

Retrieval Practice

RP-1 How have students reacted in studies when they were made to feel rejected and unwanted? What helps explain these results?

ANSWERS IN APPENDIX E

Connecting and Social Networking

LOQ 35-2

How does social networking influence us?

As social creatures, we live for connection. Researcher George Vaillant (2013) was asked what he had learned from studying 238 Harvard University men from the 1930s to the end of their lives. His reply: "Happiness is love." A South African Zulu saying captures the idea: *Umuntu ngumuntu ngabantu*—"a person is a person through other persons."

Mobile Networks and Social Media

Look around and see humans connecting: talking, tweeting, texting, posting, gaming, emailing. Today, have you observed more students engaging with each other face-to-face or silently checking their phones—as one research team's phone app counted students doing 56 times per day (Elias et al., 2016)? The changes in how we connect have been fast and vast:

- ***Mobile phones*** By 2021's end, 95 percent of the world's 7.96 billion people lived in an area covered by a mobile-cellular network, and most humans—6.61 billion—had broadband mobile subscriptions (ITU, 2021).
- ***Texting and instant messaging*** In 2020, people in the United States alone sent 2.2 trillion texts and instant messages, up from 1.5 trillion in 2017 (Statista, 2022).
- ***Social networking*** More than half of entering U.S. college students report using social media at least 6 hours per week (Stolzenberg et al., 2020). With our friends online, it's hard to avoid social networks: Check in or miss out.

Increased online time displaces other activities. Compared to teens before 2010, today's teens spend fewer hours dating, driving, talking face-to-face, reading books, and working (Livingston et al., 2019; Twenge, 2019). Technology has radically changed the teen experience.



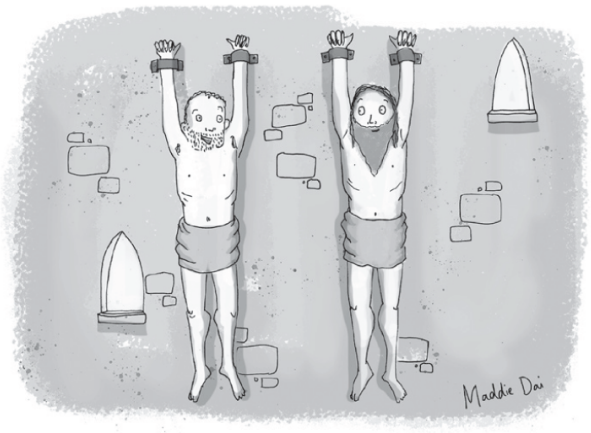
"A bunch of friends are coming over to stare at their phones."

The Net Result: Social Effects of Social Networking

By connecting like-minded people, the internet serves as a social amplifier. In times of social crisis or personal stress, it provides information and supportive connections. The internet can also help you find a romantic partner (as I [ND] can attest: I met my wife online). Keep in mind: Although dating websites aren't adept at matchmaking, they do expand the pool of potential romantic matches (Joel et al., 2017).

But social media also leads people to compare their lives with others. When others—sharing their best and most perfect-looking moments—seem happier, more popular, or more successful, this can trigger envy and depressed feelings (Verduyn et al., 2022; Whillans et al., 2017). In study after study, most people perceive that others' social lives are

more active than their own (Deri et al., 2017). Perhaps you have noticed? Do others seem to party more, dine out more, and have more friends and fun? Take comfort: Most of your friends are thinking the same.



Maddie Dai/Cartoon Stock

"Well, if it's any consolation, your social media makes it look like you're absolutely thriving."

Smartphones have become pervasive—their number tripled between 2011 and 2018 in the United States and rose similarly elsewhere. Worldwide, one meta-analysis suggested that 1 in 4 people now have "smartphone addiction" (Meng et al., 2022). Simultaneously—and merely coincidentally?—teen depression, anxiety, self-harm, and suicide rates have mushroomed (**FIGURE 35.2**). From the first decade of the twenty-first century to the second, the number of adolescents worldwide with depression symptoms increased from 24 percent to 37 percent (Shorey et al., 2022). From 2012 to 2018, loneliness at school also increased globally among 15- and 16-year-old students (Twenge et al., 2022). Rates of depression, anxiety, self-injury, and suicidal thinking have similarly increased for college students (Duffy et al., 2019).

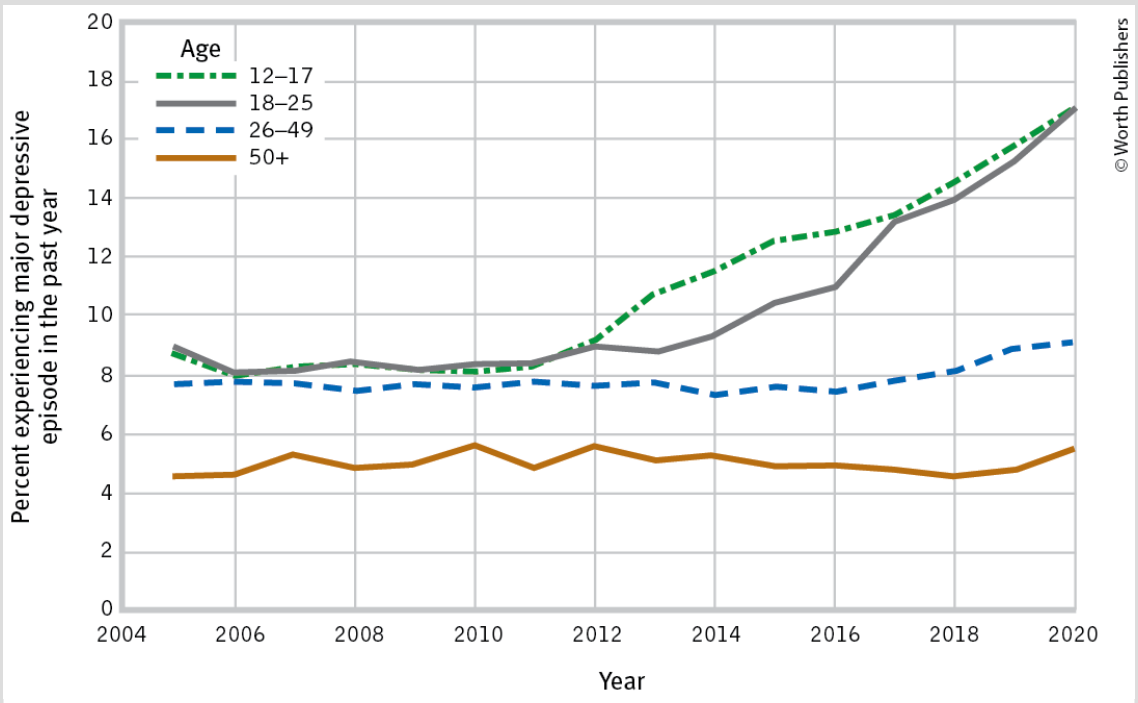


FIGURE 35.2 Depression has risen sharply among teens and young adults, coinciding with the rise of smartphones (SAMHSA, 2021)



Erika Sjule/Cartoon Stock

"…and, for what felt like the millionth time, she opened her phone for the diminishing dopamine hit that never satisfied."

So, is there a causal connection between these concurrent increases in screen time and mental health problems? Under the leadership of Jonathan Haidt and Jean Twenge (2021), researchers are accumulating and debating findings. They have tentative conclusions from three types of explorations:

- **Correlational studies ask:** *Is social media use associated with teen mental health problems?* To an extent, *Yes.* Studies vary, but overall, a small positive correlation exists between adolescents' social media time and their risk of depression, anxiety, and self–harm. The screen time–disorder association is stronger for social media use than for other kinds of screen time, including TV and gaming time (Twenge et al., 2022). The link is greater for teen girls, especially during early puberty (Orben et al., 2022). And it increases only with daily screen time of 3 hours or more—leading some mental health experts to ask social media companies to enforce time limits for teen use (Twenge, 2021). "Any platform that encourages children to upload photos of themselves, to be rated and commented on by strangers, is likely to harm many kids," surmises Haidt (2021a). (See **FIGURE 35.3**.)
- **Longitudinal studies ask:** *Does teen social media use predict teens' future mental health?* The answer is *Maybe.* Of 34 studies, 20 confirmed that excessive teen social media use (defined as more than 3 hours per day) predicted worse future mental health.
- **Experiments ask:** *Do volunteers randomly assigned to restricted social media use fare better than those not assigned on outcomes such as loneliness and depression?* On balance, *Probably*. Of 15

experiments, 11 have indicated a causal effect of social media use on diminished mental health. One experiment, which randomly assigned nearly 3000 paid volunteers to either deactivate their Facebook account or not, found that "four weeks without Facebook improves subjective well-being" (Allcott et al., 2020).

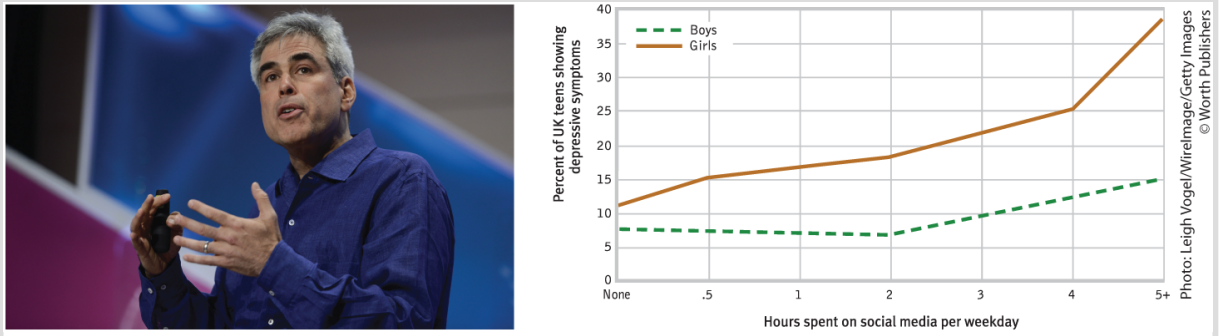


FIGURE 35.3 Depression and teen screens In 2022, psychologist Jonathan Haidt testified before the U.S. Congress: "The United States is experiencing a catastrophic wave of mood disorders (anxiety and depression) and related behaviors (self-harm and suicide) …. The crisis emerged in the exact years when American teens were getting smartphones and becoming daily users of social media platforms such as Instagram. Correlational, experimental, and eye-witness testimony points to social media as a major cause of the crisis. I do not believe that social media is the only cause of the crisis, but there is no alternative hypothesis that can explain the suddenness, enormity, and international similarity" (Haidt, 2022).

Is solitary screen time the primary culprit because of its "opportunity cost"—the other healthy activities it displaces, including face-to-face connection, sleep, exercise, reading, and spending time outdoors? Or is social media emotionally toxic, triggering envy when comparing one's own humdrum life with the lives of cooler-seeming others? If increased screen time—especially social media time—isn't responsible for the surging teen mental health crisis, what is? What other social

forces—common to Canada, the UK, Australia, New Zealand, and the United States—would you suppose might be at work (Haidt, 2021b)? And what can be done to protect and improve youth and young adult well-being? Stay tuned: This important story is still being written.

Online networking is double-edged. Nature has designed us for face-to-face relationships, and people who spend hours online and texting daily are *less* likely to know and draw help from their real-world neighbors. They are also more likely to experience online bullying, which can increase anxiety, depression, and suicidal thinking (Giumetti et al., 2022; Nesi et al., 2021). But social media and mobile phones do help us connect with friends, stay in touch with family, and find support when facing challenges (Clark et al., 2018; Jensen et al., 2021). *When used in moderation*, social networking supports our face-to-face relationships and therefore predicts longer life—especially among middle-aged and older adults (Hobbs et al., 2016; Waytz & Gray, 2018; Wang et al., 2022).

Does Electronic Communication Stimulate Healthy Self-Disclosure?

Self-disclosure is sharing ourselves—our joys, worries, and weaknesses—with others. Confiding can be a healthy way of coping with day-to-day challenges. When communicating electronically rather than face-to-face, we often focus less on others' reactions. We are less self-conscious, and thus less inhibited. Sometimes, disinhibitions become toxic: Political extremists post inflammatory messages, online bullies hound their targets, hate groups promote bigotry, and people send selfies they later regret (Frimer et al., 2019). But more often, the

increased self-disclosure strengthens friendships (Valkenburg & Peter, 2009).



"The women on these dating sites don't seem to believe I'm a prince."

Does Social Networking Promote Narcissism?

Narcissism is self-esteem gone wild. Narcissistic people are self-important, self-focused, and self-promoting. To measure your narcissistic tendencies, you might rate your agreement with personality test items such as "I like to be the center of attention." People who agree with such statements tend to have high narcissism scores—and they are especially active on social networking sites (Casale & Banchi, 2020). They collect more superficial "friends." They offer more staged, glamorous photos. They retaliate more against negative comments. And, not surprisingly, they *seem* more narcissistic to strangers (Buffardi & Campbell, 2008; Weiser, 2015).



BROOK PIFER/Getty Images

Self-esteem or narcissism? Social networking can help people share self-relevant information and stay connected with family and friends. But it can also feed narcissistic tendencies and enable self-glamorization.

For narcissists, social networking sites are more than a gathering place; they are a feeding trough. In one study, college students were randomly assigned either to edit and explain their online profiles for 15 minutes, or to use that time to study and explain a Google Maps routing (Freeman & Twenge, 2010). After completing their tasks, all were tested. Who then scored higher on a narcissism measure? Those who had spent the time focused on themselves.

Maintaining Balance and Focus

It will come as no surprise that excessive online socializing and gaming have correlated with lower grades and with increased anxiety and depression (Brooks, 2015; Lepp et al., 2014; Walsh et al., 2013). In one U.S. survey, 47 percent of the heaviest internet and other media users received mostly C grades or lower, as did just 23 percent of the

lightest users (Kaiser Family Foundation, 2010). In another national survey, young adults who used seven or more social media platforms were three times more likely to be depressed or anxious than those who used two or fewer (Primack et al., 2016).

In today's world, it can be challenging to maintain a healthy balance between our real-world and online time. Experts offer some practical suggestions:

- ***Monitor your time.*** Use a time-tracking app to measure your time online. Then ask yourself, "Does my time use reflect my priorities? Am I spending more time online than I intended? Does it interfere with my school or work performance or my relationships?"
- ***Monitor your feelings.*** Ask yourself, "Am I emotionally distracted by my online interests? Do my online activities cause negative emotions (jealousy or loneliness when comparing myself to others; anger when engaging with combative people)? When I disconnect and move to another activity, how do I feel?"
- ***Break the phone-checking habit.*** Selective attention—the flashlight of your mind—can be in only one place at a time. When we try to do two things at once, we don't do either very well (Willingham, 2010). If you want to study or work productively—or just give a friend your full attention—resist the temptation always to be available. Disable sound alerts, vibrations, and pop-ups. Change your online status to unavailable when you don't want to

be contacted. (To reduce distraction, I [ND] am working on this module while using an app that blocks distracting websites.)

- ***Refocus by taking a nature walk.*** People learn better after connecting with nature, which—unlike a walk on a busy street—refreshes our capacity for focused attention (Berman et al., 2008). Connecting with nature boosts our spirits and sharpens our mind (Pritchard et al., 2019; Zelenski & Nisbet, 2014).

As psychologist Steven Pinker (2010) said, "The solution is not to bemoan technology but to develop strategies of self-control, as we do with every other temptation in life."

Ask Yourself

Do your connections on social media increase your sense of belonging? Sometimes, do they make you feel lonely? Which of the strategies discussed will you find most useful to maintain balance and focus?

Retrieval Practice

RP-2 Social networking tends to _____ (strengthen/weaken) your relationships with people you already know, and _____ (increase/decrease) your self-disclosure.

ANSWERS IN APPENDIX E

Achievement Motivation

LOQ 35-3

What is *achievement motivation,* and what are some ways to encourage achievement?

Some motives seem to have little obvious survival value. Billionaires may be motivated to make more money, internet celebrities to attract more social media followers, politicians to achieve more power. And motives vary across cultures. In individualist cultures, employees may work to receive an "employee of the month" award; in collectivist cultures, they may strive to join a company's hardest-working team. The more we achieve, the more we may need to achieve. Psychologist Henry Murray (1938) called this **achievement motivation**.

Achievement motivation matters. One famous study followed the lives of 1528 California children whose intelligence test scores were in the top 1 percent. Forty years later, researchers compared those who were most and least successful professionally. What did the researchers discover? A motivational difference. The most successful were more ambitious, energetic, and persistent. As children, they had more active hobbies. As adults, they participated in more groups and sports (Goleman, 1980). Gifted children are able learners. Accomplished adults are tenacious doers. Most of us are energetic doers when starting and when finishing a project. It's easiest—have you noticed?—to get stuck in the middle. That's when high achievers keep going (Bonezzi et al., 2011). Once they get in a groove, their motivation keeps

them engaged in goal striving (Foulk et al., 2019; Miller et al., 2021). No wonder people with high achievement motivation tend to have greater financial success, healthy social relationships, and good physical and mental health (Steptoe & Wardle, 2017).

In studies of both secondary school and university students, self-discipline has surpassed intelligence test scores in predicting school performance, attendance, and graduation honors. For school performance, "discipline outdoes talent," concluded researchers Angela Duckworth and Martin Seligman (2005, 2017).

> **"Genius is 1% inspiration and 99% perspiration."** — Thomas Edison (1847–1931)

Discipline focuses and refines talent. By their early twenties, top violinists have fiddled away thousands of lifetime practice hours—in fact, double the practice time of other violin students aiming to be teachers (Ericsson, 2001, 2006, 2007). A study of outstanding scholars, athletes, and artists found that all were highly motivated and self-disciplined, willing to dedicate hours every day to the pursuit of their goals (Bloom, 1985). But as young Mozart composing at age 8 illustrates, native talent matters, too (Hambrick & Meinz, 2011; Ruthsatz & Urbach, 2012). In sports, music, and chess, people's practice-time differences, while significant, account for a third or less of their performance differences (Hambrick et al., 2014a,b; Macnamara et al., 2014, 2016; Ullén et al., 2016). High achievers benefit from their passion and perseverance, but the superstars

among them are also distinguished by their extraordinary natural talent.

Cultures differ in their achievement motivation. Western, individualist cultures emphasize the need for people to "follow their passion." To achieve success, individualists believe they need to experience enjoyment, interest, and confidence. Eastern, collectivist cultures focus less on personal passion and more on fulfilling one's duty and obligations to family and friends. Analyzing 1.2 million students' responses from 59 societies, passion was a greater predictor of high achievement scores in individualist cultures than in collectivist cultures (Li et al., 2021). In collectivist cultures, parental emotional support was more important than passion in predicting students' success.

> **"It's just perseverance, isn't it, that leads to things."** — Agatha Christie's Miss Marple, in *Nemesis*

Duckworth (2016) has a name for dedication to an ambitious, long-term goal: **grit**. Other researchers see grit as similar to conscientiousness and less important than intelligence (Ponnock et al., 2021; Zisman & Ganzach, 2021). Researchers have begun to sleuth the neural and genetic markers of grit (Takahashi et al., 2021; Wang et al., 2018). Passion and perseverance fuel gritty goal-striving, which can produce great achievements (Jachimowicz et al., 2018; Muenks et al., 2018). Consider Elinor Ostrom: After working her way through

college, she was rejected from an economics Ph.D. program. She obtained a Ph.D. in political science instead, and in 2009—four decades later—became the first woman to receive the Nobel Prize in economics.

Gritty students are most likely to avoid burnout and persist in school (Saunders-Scott et al., 2018; Tang et al., 2021). As basketball star Damian Lillard (2015) said, “If you want to look good in front of thousands, you have to outwork thousands in front of nobody.”



From Calum's Road by Roger Hutchinson, reproduced courtesy of Birlinn Ltd.

Calum’s Road: What grit can accomplish
Having spent his life on the Scottish island of Raasay, farming a small patch of land, tending its lighthouse, and fishing, Malcolm (“Calum”) MacLeod (1911–1988) felt anguished. His local government repeatedly refused to build a

road enabling vehicles to reach his island's north end. With the once-flourishing population there having dwindled to two—MacLeod and his wife—he responded with heroic determination. One spring morning in 1964, MacLeod, then in his fifties, gathered a pick-axe, a shovel, and a wheelbarrow. By hand, he began to transform the existing footpath into a 1.75-mile road (Miers, 2009).

"With a road," a former neighbor explained, "he hoped new generations of people would return to the north end of Raasay," restoring its culture (Hutchinson, 2006). Day after day he worked through rough hillsides, along hazardous cliff faces, and over peat bogs. Finally, 10 years later, he completed his supreme achievement. The road, which the government has since surfaced, remains a visible example of what vision plus determined grit can accomplish. It bids us each to ponder: What "roads"—what achievements—might we, with sustained effort, build in the years to come?

> **"You may have to fight a battle more than once to win it."** — Former British Prime Minister Margaret Thatcher

Although intelligence is distributed like a bell curve (see the Intelligence modules), achievements are not. This tells us that achievement involves much more than raw ability. Sometimes, our motivation stems from a natural curiosity and drive to accomplish a

goal. At other times, we're driven to please others, receive awards, or make money.

Promising people a reward for an enjoyable task can backfire. Excessive rewards can destroy **intrinsic motivation**. In experiments, children have been promised a payoff for playing with an interesting puzzle or toy. Later, they played with the toy *less* than did unpaid children (Deci et al., 1999; Tang & Hall, 1995). Likewise, rewarding children with toys or candy (or money or screen time) for reading diminishes the time they spend reading (Marinak & Gambrell, 2008). It is as if they think, "If I have to be bribed into doing this, it must not be worth doing!"

To sense the difference between intrinsic motivation and **extrinsic motivation**, think about your experience in this course. Like most students, you probably want to earn a high grade. But what motivates your actions to achieve your goal? Do you feel pressured to finish this reading before a deadline? Are you worried about your grade? Eager for the credits that will count toward graduation? Hoping to do well to please your family? If *Yes*, then you are extrinsically motivated (as, to some extent, all students must be). Do you also find the material interesting? Does learning it make you feel more competent? If there were no grade at stake, might you be curious enough to want to learn the material for its own sake? If *Yes*, intrinsic motivation also fuels your efforts.

People who focus on their work's meaning and significance do better work *and* ultimately earn more extrinsic rewards (Wrzesniewski et al., 2014). Elementary school students with greater-than-average academic intrinsic motivation—who love learning for its own sake—go on to perform better in school, take more challenging classes, and earn more advanced degrees (Fan & Williams, 2018; Gottfried et al., 2006). *Wanting* to do something, rather than having to do something, seems to pay off (Converse et al., 2019).

Extrinsic rewards work well when people perform tasks that don't naturally inspire complex, creative thinking (Hewett & Conway, 2015). They're also effective when used to signal a job well done (rather than to bribe or control someone) (Boggiano et al., 1985). When administered wisely, rewards can improve performance and spark creativity (Eisenberger & Aselage, 2009; Henderlong & Lepper, 2002). "Most improved player" awards, for example, can boost feelings of competence and increase enjoyment of a sport. And the rewards that often follow academic achievement, such as scholarships and job opportunities, can have long-lasting benefits.

Organizational psychologists seek ways to engage and motivate ordinary people doing ordinary jobs (see Appendix C: Psychology at Work).

Goal Setting

Do you have a specific goal you'd like to achieve? Each of us can adopt some research-based strategies for achieving our goals:

1. ***Make that resolution.*** Challenging goals motivate achievement (Harkin et al., 2016). SMART goals are *s*pecific, *m*easurable, *a*chievable, *r*ealistic, and *t*imely. Such goals—"finish my psychology assignment by Tuesday"—direct attention and motivate persistence.
2. ***Announce the goal to friends or family.*** We're more likely to follow through after making a public commitment.
3. ***Develop an implementation plan.*** Be specific about when, where, and how you'll progress toward your goal. Identify potential challenges and how you'll revisit and adjust your plan. People who flesh out goals with detailed plans become more focused and more likely to succeed (Duckworth et al., 2018; Gollwitzer & Oettingen, 2012). Better to concentrate on small steps—spending 5 to 10 minutes learning words from a foreign language each week—than to fantasize about speaking that language fluently.
4. ***Create short-term rewards that support long-term goals.*** Although delayed rewards motivate us to set goals, immediate rewards best predict our persistence toward those goals (Woolley & Fishbach, 2018).
5. ***Monitor and record progress.*** For example, if you are striving for more exercise, use a fitness tracker or enter your activity in a free fitness app. It's even more motivating when progress is shared rather than hidden (Harkin et al., 2016).
6. ***Create a supportive environment.*** When trying to eat healthily, keep junk food out of the cupboards. When focusing on a project, hole up in the library. When sleeping, shut off your phone. Have your gym bag ready the night before. Such "situational self-

control strategies" prevent tempting impulses (Duckworth et al., 2016; Schiffer & Roberts, 2018).

7. ***Transform the hard-to-do behavior into a must-do habit.*** Habits form when we repeat behaviors in a given context. Do something every day for about two months and see it become an ingrained habit.

To achieve important life goals, we often know what to do. We *know* that a full night's sleep boosts our alertness, energy, and mood. We *know* that exercise lessens depression and anxiety, builds muscle, and strengthens our heart and mind. We *know* that what we put into our body—junk food or balanced nutrition, addictive substances or clean air—affects our health and longevity. Alas, as T. S. Eliot foresaw, "Between the idea / And the reality … / Falls the Shadow." Nevertheless, we can create a bridge between the idea and reality by taking these seven steps: resolving, announcing, planning, rewarding, monitoring, controlling, and persistently acting.

Ask Yourself

What goal would you like to achieve? How might you use the seven strategies offered in this section to meet that goal?

Retrieval Practice

RP-3 What have researchers found to be an even better predictor of school performance than intelligence test scores?

ANSWERS IN APPENDIX E

REVIEW

Module 35: Affiliation and Achievement

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 35-1: What evidence points to our human affiliation need—our need to belong?

LOQ 35-2: How does social networking influence us?

LOQ 35-3: What is *achievement motivation,* and what are some ways to encourage achievement?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

affiliation need
self-determination theory
ostracism
narcissism
achievement motivation
grit
intrinsic motivation
extrinsic motivation

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. Which of the following is NOT evidence supporting the view that humans are strongly motivated by a need to belong?
   a. Students who rated themselves as "very happy" also tended to have satisfying close relationships.
   b. Social exclusion—such as exile or solitary confinement—is considered a severe form of punishment.
   c. As adults, adopted children tend to resemble their biological parents.
   d. Children who are extremely neglected become withdrawn, frightened, and sometimes even speechless.

2. What are some ways to manage our social networking time successfully?

3. If we want to increase our chance of success in achieving a new goal, such as stopping smoking, we _____ (should/should not) announce the goal publicly, and we _____ (should/should not) share with others our progress toward achieving that goal.

CHAPTER 12
Emotions, Stress, and Health (Modules 36–40)



FG Trade/E+/Getty Images

Module 36 Introduction to Emotion

Emotion: Arousal, Behavior, and Cognition

Embodied Emotion

THINKING CRITICALLY ABOUT: Lie Detection

Module 37 Expressing Emotion
Detecting Emotion in Others
Gender, Emotion, and Nonverbal Behavior
Culture and Emotional Expression
The Effects of Facial Expressions
Module 38 Experiencing Emotion
Anger
Happiness and Well-Being
Module 39 Stress and Illness
Stress: Some Basic Concepts
Stress and Vulnerability to Disease
THINKING CRITICALLY ABOUT: Stress and Health
Module 40 Health and Coping
Coping With Stress
Reducing Stress

No one needs to tell you that feelings add color to your life, or that in times of stress they can disrupt your life, or save it. Fear, anger, sadness, joy, and love are psychological states that also entail physical reactions. Nervous about an important encounter, we feel stomach butterflies. Anxious over public speaking, we frequent the bathroom. Smoldering over a family conflict, we get a splitting headache.

You can surely recall a time when emotion overwhelmed you. I [DM] retain a flashbulb memory of the day I went to a huge store and brought along Peter, my toddler first-born child. As I set Peter down on his feet for a moment to do some paperwork, a passerby warned, “You’d better be

careful or you'll lose that boy!" Not more than a few breaths later, I turned and found no Peter beside me.



Courtesy of David Myers

With mild anxiety, I looked around one end of the customer service counter. No Peter in sight. With slightly more anxiety, I peered around the other side. No Peter there, either. Now, with my heart accelerating, I circled the neighboring counters. Still no Peter anywhere. As anxiety turned to panic, I began racing up and down the store aisles. He was nowhere to be found. The alerted store manager used the intercom to ask customers to assist in looking for a missing child. Soon after, I passed the customer who had warned me. "I told you that you were going to lose him!" he now scolded. With visions of kidnapping (strangers routinely adored that beautiful child), I braced for the unthinkable possibility that my negligence had caused me to lose what I loved above all else, and that I might have to return home and face my wife without our only child.

But then, as I passed the customer service counter yet again, there he was, having been found and returned by some obliging customer. In an

instant, the arousal of terror spilled into ecstasy. Clutching my son, with tears suddenly flowing, I found myself unable to speak my thanks and stumbled out of the store awash in grateful joy.

Emotions are subjective. But they are real. As researcher Lisa Feldman Barrett (2012, 2013) noted, “My experience of anger is not an illusion. When I’m angry, I feel angry. That’s real.” Where do our emotions come from? Why do we have them? What are they made of?

Emotions are an adaptive response—"our body’s way of ensuring we do what is best for us,” noted primate researcher Frans de Waal (2019). Anger can elicit a concession. Gratitude strengthens relationships. Pride motivates hard work (Weidman & Kross, 2021). When we face challenges, emotions focus our attention and energize our actions (Cyders & Smith, 2008). Our heart races. Our pace quickens. All our senses go on high alert. By integrating data from our environment, our body, and our experiences, we feel emotional stress (Francis, 2018).

Emotions can also be positive. Receiving unexpected good news, we may find our eyes tearing up. We raise our hands triumphantly. We feel exuberance and a newfound confidence. Yet negative and prolonged emotions can harm our health.

In Modules 36, 37, and 38, we explore how psychologists think about and study our emotional expression and experiences. In Modules 39 and 40, we take a close look at the challenges of stress and some ways of coping that help us meet those challenges.

MODULE 36: Introduction to Emotion

Like most psychological phenomena—vision, sleep, memory, sex—emotion can be approached in three ways: physiologically, behaviorally, and cognitively. Researchers explore these manifestations of emotion and their interactions.

Emotion: Arousal, Behavior, and Cognition

Learning Objective Question LOQ 36-1

How do arousal, expressive behavior, and cognition interact in emotion?

As my [DM's] panicked search for Peter illustrates, **emotions** are a mix of

- *bodily arousal* (heart pounding),
- *expressive behaviors* (quickened pace), and
- *conscious experience* (Is this a kidnapping?) *and feelings* (panic, fear, joy).

The puzzle for psychologists is fitting these three pieces together. To do that, the first researchers of emotion considered two big questions:

1. A chicken-and-egg debate: Does your bodily arousal come *before* or *after* your emotional feelings? (Did I first notice my racing heart and faster step, and then feel terror about losing Peter? Or did my sense of fear come first, stirring my heart and legs to respond?)
2. How do *thinking* (cognition) and *feeling* interact? Does cognition always come before emotion? (Did I think about a kidnapping threat before I reacted emotionally?)

The psychological study of emotion began with the first question: How do bodily responses relate to emotions? Two of the earliest emotion theories offered different answers.

James-Lange Theory: Arousal Comes Before Emotion

Common sense tells most of us that we cry because we are sad, lash out because we are angry, tremble because we are afraid. But to pioneering psychologist William James, this commonsense view of emotion had things backward. Rather, "We feel sorry because we cry, angry because we strike, afraid because we tremble" (1890, p. 1066). To James, emotions result from attention to our bodily activity. James' idea was also proposed by Danish physiologist Carl Lange, and so is called the **James-Lange theory**. James and Lange would have guessed that I noticed my racing heart and then, shaking with fright, felt the

whoosh of emotion—that my feeling of fear *followed* my body's response.



MATT SULLIVAN/REUTERS/Newscom

Joy expressed According to the James-Lange theory, we don't just smile because we share our teammates' joy. We also share the joy because we are smiling with them.

Cannon-Bard Theory: Arousal and Emotion Occur Simultaneously

Physiologist Walter Cannon (1871–1945) disagreed with the James-Lange theory. Does a racing heart signal fear or anger or love? The

body's responses—heart rate, perspiration, and body temperature—are too similar, and they change too slowly, to *cause* the different emotions, said Cannon. He, and later another physiologist, Philip Bard, concluded that our bodily responses and experienced emotions occur separately but simultaneously. So, according to the **Cannon-Bard theory**, my heart began pounding *as* I experienced fear. The emotion-triggering stimulus traveled to my sympathetic nervous system, causing my body's arousal. *At the same time*, it traveled to my brain's cortex, causing my awareness of my emotion. My pounding heart did not cause my feeling of fear, nor did my feeling of fear cause my pounding heart.

But are they really independent of each other? Countering the Cannon-Bard theory are studies of people with severed spinal cords, including a survey of 25 World War II soldiers (Hohmann, 1966). Those with *lower-spine injuries*, who had lost sensation only in their legs, reported little change in their emotions' intensity. Those with *high spinal cord injury*, who could feel nothing below the neck, did report changes: Some of their reactions were much less intense than before the injuries. Anger, one man with this injury type revealed, "just doesn't have the heat to it that it used to. It's a mental kind of anger." Other emotions, those expressed mostly in body areas above the neck, were felt *more* intensely. These men reported increases in weeping, lumps in the throat, and getting choked up when saying good-bye, worshiping, or watching a touching movie. Such evidence has led some researchers to view feelings as "mostly shadows" of our bodily responses and behaviors (Damasio, 2003).

But our emotions also involve cognition (Averill, 1993; Feldman Barrett, 2006, 2017). Here we arrive at psychology's second big emotion question: How do thinking and feeling interact? Whether we fear the person behind us on a dark street depends entirely on whether or not we interpret them as threatening.

Retrieval Practice

RP-1 According to the Cannon-Bard theory, (a) our *physiological response* to a stimulus (for example, a pounding heart), and (b) the *emotion we experience* (for example, fear) occur _____ (simultaneously/sequentially). According to the James-Lange theory, (a) and (b) occur _____ (simultaneously/sequentially).

ANSWERS IN APPENDIX E

Schachter-Singer Two-Factor Theory: Arousal + Label = Emotion

LOQ 36-2

To experience emotions, must we consciously interpret and label them?

Stanley Schachter and Jerome Singer (1962) demonstrated that how we *appraise* (interpret) our experiences also matters. Our physical reactions *and our thoughts* (perceptions, memories, and interpretations) together create emotion. In their **two-factor theory**,

emotions have two ingredients: physical arousal and cognitive appraisal. An emotional experience, they argued, requires a conscious interpretation of arousal.

Consider how arousal spills over from one event to the next. Imagine completing an intense session at the gym and then receiving a message that you got your dream job. With arousal lingering from the workout, would you feel more elated than if you heard this news after staying awake all night studying?

To explore this *spillover effect*, Schachter and Singer injected college men with the hormone epinephrine, which triggers feelings of arousal. One group of men was told to expect feelings of arousal from the injection. Others were told by the trickster researchers that it would help test their eyesight. Picture yourself as a participant: After receiving the injection, you go to a waiting room, where you find yourself with another person (actually an accomplice of the experimenters) who is acting either euphoric or irritated. As you observe this person, you begin to feel your heart race, your skin flush, and your breathing become more rapid. What would you feel if you had been in the group told to expect these effects from the injection?

In the experiment, these volunteers felt little emotion—because they correctly attributed their arousal to the drug. But if you had been told the injection would help assess your eyesight, what would you feel? Perhaps you would react as this group of participants did. They "caught" the apparent emotion of the other person in the waiting

room. They became happy if the accomplice was acting euphoric, and testy if the accomplice was acting irritated.



OLEG POPOV/REUTERS/Newscom

The spillover effect Arousal from a soccer match can fuel anger, which can descend into rioting or other violent confrontations.

This discovery—that a stirred-up state can be experienced as one emotion or another, depending on how we interpret and label it—has been replicated in dozens of experiments and continues to influence modern emotion research (MacCormack & Lindquist, 2016; Reisenzein, 1983; Sinclair et al., 1994). *The point to remember:* Arousal fuels emotion; cognition channels it.

Retrieval Practice

RP-2 According to Schachter and Singer, two factors lead to our experience of an emotion: (a) physiological arousal and (b) _____ appraisal.

ANSWERS IN APPENDIX E

Zajonc, LeDoux, and Lazarus: Does Cognition Always Precede Emotion?

But is the heart always subject to the mind? Must we *always* interpret our arousal before we can experience an emotion? Robert Zajonc [ZI-yence] (1923–2008) didn't think so. He contended that we actually have many emotional reactions apart from, or even before, our conscious interpretation of a situation (1980, 1984). Perhaps you can recall liking (or disliking) something or someone immediately, without knowing why.

Thanks to the *mere exposure effect* (see the Social Psychology modules), we come to like what is familiar. Even when people repeatedly view stimuli flashed too briefly for them to interpret, they come to prefer those stimuli (Kunst-Wilson & Zajonc, 1980). Unaware of having previously seen them, they nevertheless like them. We also have an acutely sensitive automatic radar for emotionally significant information; even a subliminally flashed stimulus can prime us to feel better or worse about a follow-up stimulus (Murphy et al., 1995; Zeelenberg et al., 2006).

Neuroscientists are charting the neural pathways of emotions (Ochsner et al., 2009). Our emotional responses can follow two different brain pathways. Some emotions (especially more complex feelings like hatred and love) travel a "high road." A stimulus following

this path would travel (by way of the thalamus) to the brain's cortex (FIGURE 36.1). There, it would be analyzed and labeled before the response command is sent out, via the amygdala (an emotion-control center).

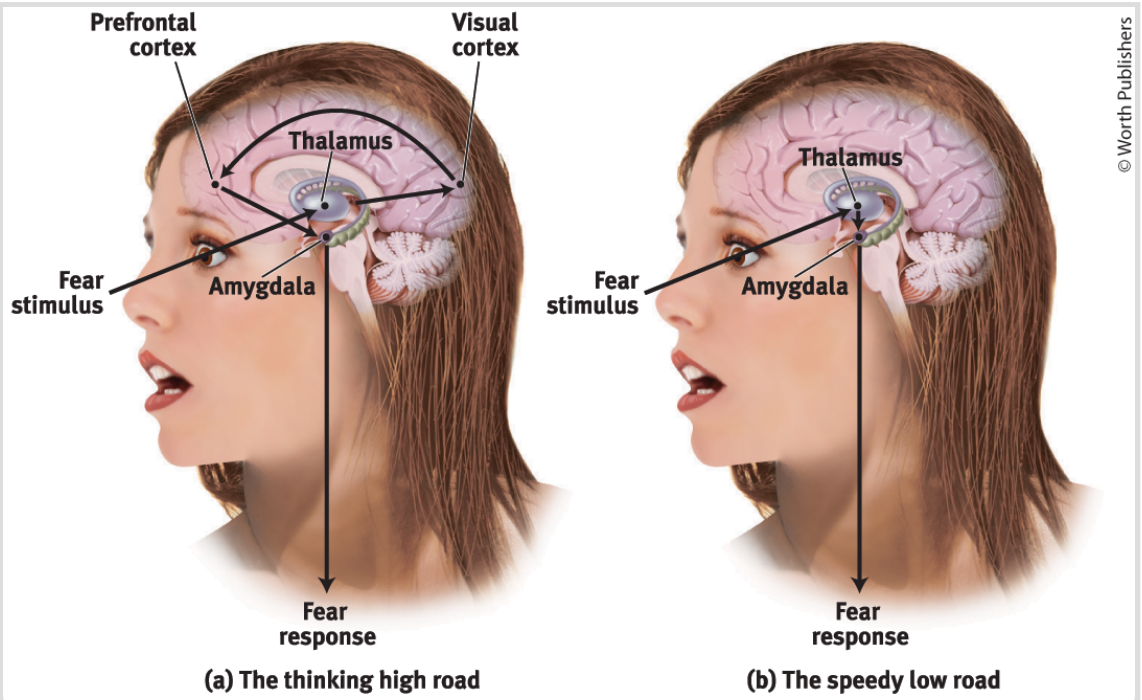


FIGURE 36.1 The brain's pathways for emotions In the two-track brain, sensory input may be routed (a) to the cortex (via the thalamus) for analysis and then transmission to the amygdala; or (b) directly to the amygdala (via the thalamus) for an instant emotional reaction.

But sometimes our emotions (especially simple likes, dislikes, and fears) take what Joseph LeDoux (2002, 2015) has called the more direct "low road," a neural shortcut that bypasses the cortex. Following the low road, a fear-provoking stimulus would travel from the eye or ear (again via the thalamus) directly to the amygdala (Figure 36.1b). This

shortcut enables our lightning-quick emotional response before our intellect intervenes. Like speedy reflexes (that also operate separately from the brain's thinking cortex), the amygdala's reactions are so fast that we may be unaware of what's transpired (Dimberg et al., 2000). A conscious fear experience then occurs as we become aware that our brain has detected danger (LeDoux & Brown, 2017).

The amygdala sends more neural projections up to the cortex than it receives back, which makes it easier for our feelings to hijack our thinking than for our thinking to rule our feelings (LeDoux & Armony, 1999). Thus, in the forest, we can jump at the sound of rustling bushes nearby, leaving it to our cortex to decide later whether the sound was made by a snake or by the wind. Such experiences support Zajonc's and LeDoux's belief that *some* of our emotional reactions involve no deliberate thinking.

Emotion researcher Richard Lazarus (1991, 1998) agreed that our brain processes vast amounts of information without our conscious awareness, and that some emotional responses do not require *conscious* thinking. Much of our emotional life operates via the automatic, speedy low road. But he further wondered: How would we *know* what we are reacting to if we did not in some way appraise the situation? The appraisal may be effortless and unconscious, but it is still a mental function. To know whether a stimulus is good or bad, the brain must have some idea of what it is (Storbeck et al., 2006). Thus, said Lazarus, emotions arise when we *appraise* an event as harmless or

dangerous. We appraise the sound of the rustling bushes as the presence of a threat. Then we realize that it was "just the wind."

So, let's sum up (see also **TABLE 36.1**). As Zajonc and LeDoux have demonstrated, some simple emotional responses involve no conscious thinking. When I [ND] see a big spider trapped behind glass, I experience fear, even though I *know* the spider can't hurt me. Such responses are difficult to alter by changing our thinking. Within a fraction of a second, we may perceive one person as more likable or trustworthy than another (Willis & Todorov, 2006). This instant appeal can even influence our political decisions if we vote (as many people do) for the candidate we *like* over the candidate who expresses positions closer to our own (Westen, 2007).

TABLE 36.1 Summary of Emotion Theories

Theory	Explanation of Emotions	Example
James-Lange	Emotions arise from our awareness of our specific bodily responses to emotion-arousing stimuli.	We observe our heart racing after a threat and then feel afraid.
Cannon-Bard	Emotion-arousing stimuli trigger our bodily responses and simultaneous subjective experience.	Our heart races at the same time that we feel afraid.
Schachter-Singer	Our experience of emotion depends on two factors: general arousal and a conscious cognitive label.	We may interpret our arousal as fear or excitement, depending on the context.

Zajonc; LeDoux	Some embodied responses happen instantly, without conscious appraisal.	We automatically feel startled by a sound in the forest before labeling it as a threat.
Lazarus	Cognitive appraisal ("Is it dangerous or not?")—sometimes without our awareness—defines emotion.	We feel frightened when we believe the rustling in the bushes signals a wild animal; we feel relieved when we realize it's just the wind.

But other emotions—including depressive moods and complex feelings—are greatly affected by our conscious and unconscious information processing: our memories, expectations, and interpretations. For these emotions, we have more conscious control. When we feel emotionally overwhelmed, we can change our interpretations (Gross, 2013). Such *reappraisal* often reduces distress and the corresponding amygdala response (Ford & Troy, 2019; Liu et al., 2019). Reappraisal not only reduces stress, it also helps students achieve better school performance (Borman et al., 2019). So don't stress about your stress. Embrace it, and approach your next exam with this mindset, "Stress evolved to help maintain my focus and solve problems." Although the emotional low road functions automatically, the thinking high road allows us to retake some control over our emotional life. *The bottom line:* Together, automatic emotion and conscious thinking weave the fabric of our emotional lives.

Retrieval Practice

RP-3 Emotion researchers have disagreed about whether emotional responses occur in the absence of cognitive processing. How would you characterize the approach of each of the following researchers: Zajonc, LeDoux, Lazarus, Schachter, and Singer?

ANSWERS IN APPENDIX E

Embodied Emotion

Whether you are falling in love or grieving a death, you need little convincing that emotions involve the body. Feeling without a body is like breathing without lungs. Some physical responses are easy to notice. Other emotional responses we experience without awareness.

Emotions and the Autonomic Nervous System

LOQ 36-3

What is the link between emotional arousal and the autonomic nervous system?

In a crisis, the *sympathetic division* of your *autonomic nervous system (ANS)* mobilizes your body for action (**FIGURE 36.2**). It directs your adrenal glands to release the stress hormones epinephrine (adrenaline) and norepinephrine (noradrenaline). To provide energy, your liver pours extra sugar (glucose) into your bloodstream. To help

burn the sugar, your respiration increases to supply needed oxygen. Your heart rate and blood pressure increase. Your digestion slows, diverting blood from your internal organs to your muscles. With blood sugar driven into the large muscles, action becomes easier. Your pupils dilate, letting in more light. To cool your stirred-up body, you perspire. If wounded, your blood would clot more quickly.

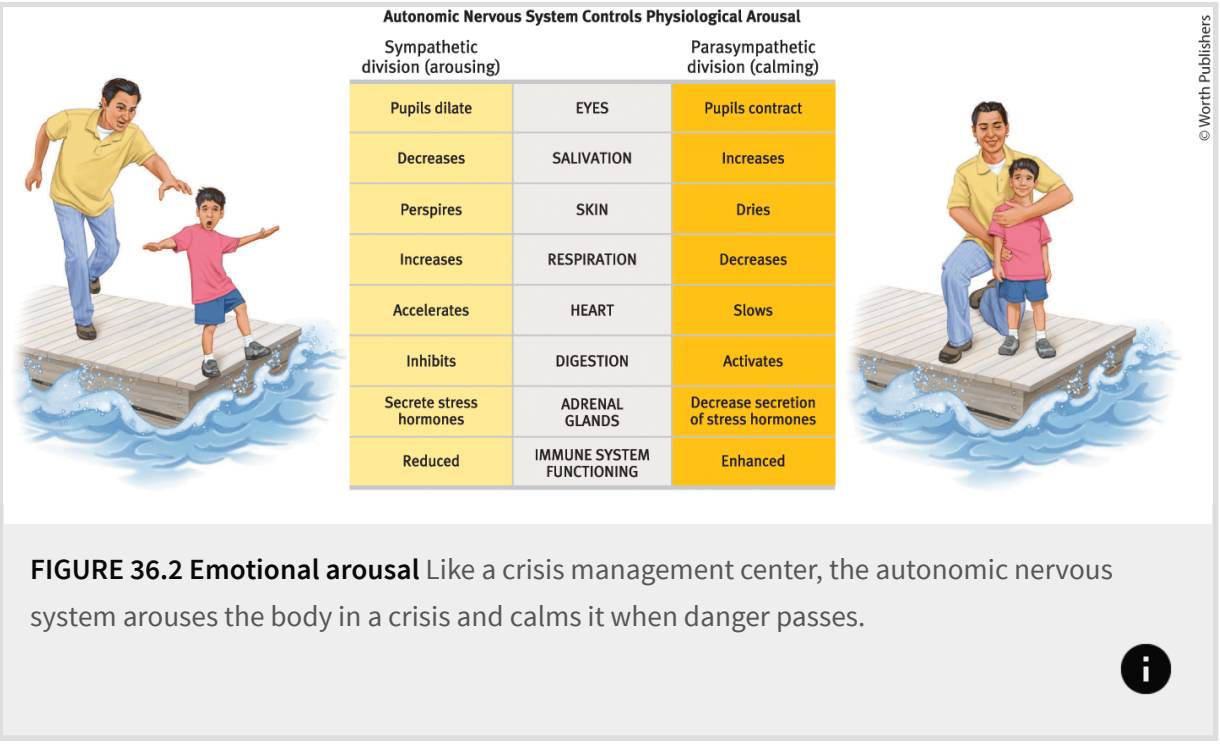


FIGURE 36.2 Emotional arousal Like a crisis management center, the autonomic nervous system arouses the body in a crisis and calms it when danger passes.

When the crisis passes, the *parasympathetic division* of your ANS gradually calms your body, as stress hormones slowly leave your bloodstream. After your next crisis, think of this: Without any conscious effort, your body's response to danger is wonderfully coordinated and adaptive—preparing you to *fight* or *flee*. So, do the different emotions have distinct arousal fingerprints?

"Fear lends wings to his feet." — Virgil, *Aeneid*, 19 B.C.E.

Ask Yourself

Can you think of a time when you noticed your body's reactions to an emotionally charged situation, such as a tense social setting, or perhaps before an important test or performance? How would you describe your sympathetic nervous system's responses?

The Physiology of Emotions

LOQ 36-4

How do emotions activate different physiological and brain-pattern responses?

Imagine conducting an experiment measuring the physiological responses of different emotions. In each room, participants watch one of four movies: a horror film, an anger-provoking film, a sexually arousing film, or an utterly boring film. From the control center, you monitor participants' perspiration, pupil size, breathing, and heart rate. Could you tell who is frightened? Who is angry? Who is sexually aroused? Who is bored?

With training, you could probably pick out the bored viewer. But discerning physiological differences among fear, anger, and sexual

arousal is much more difficult (Siegel et al., 2018). Different emotions can share common biological signatures.

> **"No one ever told me that grief felt so much like fear. I am not afraid, but the sensation is like being afraid. The same fluttering in the stomach, the same restlessness, the yawning. I keep on swallowing."** — C. S. Lewis, *A Grief Observed*, 1961

A single brain region can also serve as the seat of seemingly different emotions. Consider the broad emotional portfolio of the *insula*, a neural center deep inside the brain. The insula is activated when we experience various negative social emotions, such as lusting after another's partner, pridefulness, and disgust. In brain scans, it becomes active when people bite into some disgusting food, smell disgusting food, think about biting into a disgusting cockroach, or feel moral disgust over a sleazy businessperson exploiting a saintly widow (Sapolsky, 2010). Similar multitasking regions are found in other brain areas.

Yet our varying emotions *feel* different to us, and they often *look* different to others. We may appear "paralyzed with fear" or "ready to explode." Fear and joy prompt a similar increased heart rate, but they stimulate different facial muscles. When fearful, your brow muscles tense. When joyful, muscles in your cheeks and under your eyes pull into a smile (Witvliet & Vrana, 1995). When guppies get ready to

attack, their eye color changes from silver to black (Heathcote et al., 2018).



Jacob Lund/Shutterstock

Scary thrills Elated excitement and panicky fear involve similar physiological arousal. This allows us to flip rapidly between the two emotions.

Some of our emotions also have distinct brain circuits (Dixon et al., 2017; Panksepp, 2007). Observers watching fearful faces show more amygdala activity than do other observers who view angry faces (Whalen et al., 2001). Emotions also activate different areas of the brain's cortex. When you experience a negative emotion such as disgust, your right prefrontal cortex tends to be more active than the left. Depression-prone people, and those with generally negative perspectives, have also shown more right frontal lobe activity (Harmon-Jones et al., 2002).

Positive moods tend to trigger more left frontal lobe activity. People with positive personalities—from exuberant infants to alert, energized, and persistently goal-directed adults—have also shown

more activity in the left frontal lobe than in the right (Davidson et al., 2000; Urry et al., 2004). Indeed, the more a person's baseline frontal lobe activity tilts left—or is made to tilt left by perceptual activity—the more upbeat the person typically is (Drake & Myers, 2006).

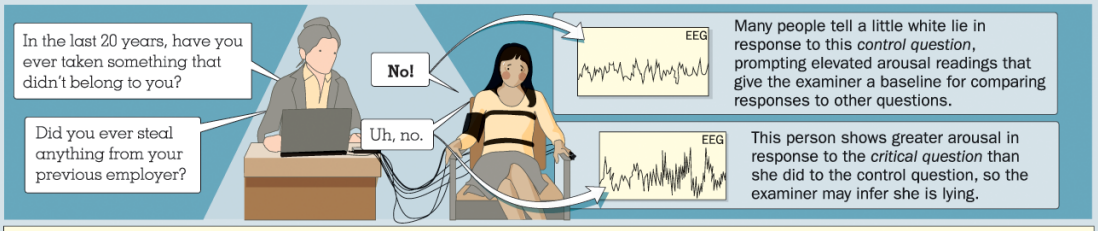
To sum up, we can't easily see differences in emotions from tracking heart rate, breathing, and perspiration. But facial expressions and brain activity can vary with the emotion. So, do we, like Pinocchio, give off telltale signs when we lie? (For more on that question, see Thinking Critically About: Lie Detection.)

LOQ 36-5

How effective are polygraphs in using body states to detect lies?

Thinking Critically About:
Lie Detection

Polygraphs are not actually lie detectors, but rather arousal detectors. They measure emotion-linked changes in breathing, heart rate, and perspiration. Can we use these results to detect lies?



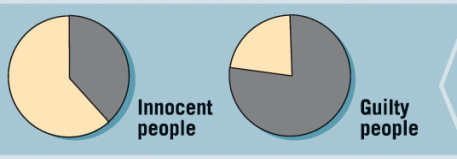
Many people tell a little white lie in response to this *control question*, prompting elevated arousal readings that give the examiner a baseline for comparing responses to other questions.

This person shows greater arousal in response to the *critical question* than she did to the control question, so the examiner may infer she is lying.

But is it true that *only a thief becomes nervous when denying a theft?*

1. We have similar bodily arousal in response to anxiety, irritation, and guilt. So, is she really guilty, or just anxious?
2. Many innocent people do get tense and nervous when accused of a bad act. (Many of those sexually assaulted, for example, have "failed" these tests because they had strong emotional reactions while telling the truth about the event.[1])

About one-third of the time, polygraph test results are ***just wrong***.[2]



If these polygraph experts had been the judges, more than one-third of the innocent would have been declared guilty, and nearly one-fourth of the guilty would have gone free.

The CIA and other U.S. agencies have spent millions of dollars testing tens of thousands of employees. Yet the U.S. National Academy of Sciences (2002) has reported that "no spy has ever been caught [by] using the polygraph."

***The Concealed Information Test* is more effective.** Innocent people are seldom wrongly judged to be lying.

Questions focus on specific crime-scene details known only to the police and the guilty person.[3] (If a camera and computer had been stolen, for example, only a guilty person should react strongly to the brand names of the stolen items. A slow response time may also indicate a lie. It typically takes less time to tell the truth than to make up a lie.[4])

1. Lykken, 1991. 2. Kleinmuntz & Szucko, 1984. 3. Ben-Shakhar & Elaad, 2003; Verschuere & Meijer, 2014; Vrij & Fisher, 2016. 4. Suchotzki et al., 2017.

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Retrieval Practice

RP-4 What roles do the two divisions of the autonomic nervous system play in our emotional responses?

ANSWERS IN APPENDIX E

REVIEW

Module 36: Introduction to Emotion

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 36-1: How do arousal, expressive behavior, and cognition interact in emotion?

LOQ 36-2: To experience emotions, must we consciously interpret and label them?

LOQ 36-3: What is the link between emotional arousal and the autonomic nervous system?

LOQ 36-4: How do emotions activate different physiological and brain-pattern responses?

LOQ 36-5: How effective are polygraphs in using body states to detect lies?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

emotion
James-Lange theory
Cannon-Bard theory
two-factor theory
polygraph

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. The _____-_____ theory of emotion maintains that our emotional experience occurs after our awareness of a physiological response.

2. Imagine that after returning from an hour-long run, you receive a letter saying that your scholarship application has been approved. The two-factor theory of emotion would predict that your physical arousal will

a. weaken your happiness.
b. intensify your happiness.
c. transform your happiness into relief.
d. have no particular effect on your happiness.

3. Zajonc and LeDoux have maintained that some emotional reactions occur before we have had the chance to consciously label or interpret them. Lazarus noted the importance of how we appraise events. These psychologists differ in the emphasis they place on _____ in emotional responses.
   a. physical arousal
   b. the hormone epinephrine
   c. cognitive processing
   d. learning

4. What does a polygraph measure, and why are its results questionable?

MODULE 37: Expressing Emotion

Expressions imply emotions. Sloths, with serene smiles seemingly plastered on their faces, appear happy. Basset hounds, with their long faces and droopy eyes, seem sad. Are our own faces a window into our feelings? To decipher people's emotions, we study their faces. We listen to their vocal tones. We read their bodies. Does nonverbal language vary with culture—or is it universal? Are women more emotional and empathic than men—or are all people roughly equal? And do our outward emotional expressions influence our internally experienced emotions—or are our bodies and minds separate?





Left: GeorgePeters/Getty Images; right: Petrut Romeo Paul/Shutterstock

Detecting Emotion in Others

LOQ 37-1

How do we communicate emotions nonverbally?

To people from Western cultures, a firm handshake conveys an outgoing, expressive personality (Chaplin et al., 2000). A gaze can communicate intimacy, while darting eyes may signal anxiety (Kleinke, 1986; Perkins et al., 2012). When two people are in love, they often gaze into each other's eyes, smile, and nod (Bolmont et al., 2014; Cowen & Keltner, 2020; Gonzaga et al., 2001). Would such gazes stir loving feelings between strangers? To find out, researchers have placed unacquainted straight people in pairs and asked them to gaze intently for 2 minutes either at each other's hands, or into each other's eyes. After separating, the eye gazers reported feeling a tingle of attraction and affection (Kellerman et al., 1989).

Our brain is an amazing detector of subtle expressions. We are adept at detecting a hint of a smile (Maher et al., 2014). Shown 10 seconds of video from the end of a speed-dating interaction, people can often tell whether one person is attracted to another (Place et al., 2009). Observing *thin slices* of behavior (brief samples) revealed that the intensity of women's high school yearbook smiles predicted their well-being and marital satisfaction up to 30 years later (Harker & Keltner, 2001). More cheerful smiles in kindergarteners' class photos reflected

warmer family relationships (Oveis et al., 2009). Even brief smiles convey more than meets the eye.

Signs of status are also easy to spot. When shown someone with arms raised, chest expanded, and a downward head tilt, people from diverse cultures—including Fijian villagers, Canadian undergraduates, and Indigenous peoples of Nicaragua—perceive that person as experiencing pride and having dominant status (Tracy et al., 2013; Witkower et al., 2022). Even a fleeting tenth-of-a-second glimpse of a face has enabled viewers to judge people's trustworthiness, or to rate politicians' competence and predict their voter support (Willis & Todorov, 2006). "First impressions … occur with astonishing speed," noted Christopher Olivola and Alexander Todorov (2010).



Zohaib Hussain/Getty Images

A silent language of emotion Hindu classic dance uses the face and body to effectively convey 10 different emotions (Hejmadi et al., 2000).

We also excel at quickly detecting nonverbal threats. An angry face can "pop out" of a crowd (Öhman et al., 2001; Stjepanovic & LaBar, 2018). Even children as young as 2 years old attend to angry faces, suggesting that we instinctively detect threats (Burris et al., 2019).

Experience sensitizes us to particular emotions, as shown by experiments using a series of faces (like those in **FIGURE 37.1**) that morph from anger to fear (or sadness). Shown a face that is 50 percent fear and 50 percent anger, children who have been physically abused are more likely than other children to perceive anger (Pollak & Kistler, 2002; Pollak & Tolley-Schell, 2003). Their perceptions become attuned to swiftly spotting glimmers of danger.

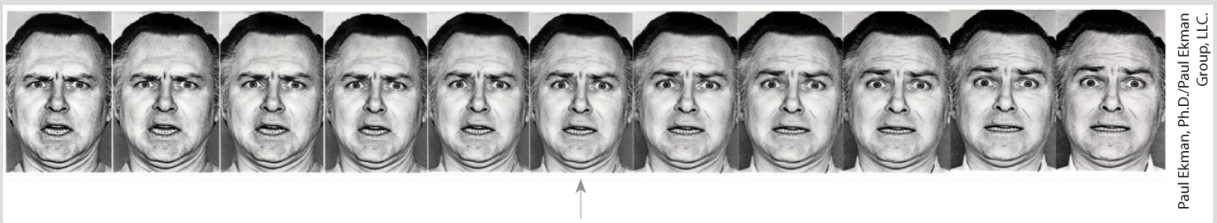

FIGURE 37.1 Experience influences how we perceive emotions Viewing the morphed middle face, evenly mixing anger with fear, children who had been physically abused were more likely than other children to perceive the face as angry.

Hard-to-control facial muscles can reveal signs of emotions you may be trying to conceal. Lifting just the inner part of your eyebrows, which few people do consciously, reveals distress or worry. Eyebrows raised and pulled together signal fear. Raised cheeks and activated muscles under the eyes suggest a natural smile, called a *Duchenne* smile (in honor of the French physician who described it). These

authentic smiles reveal our honest positive emotions (Sheldon et al., 2021). While a fake smile—such as one we make for a photographer—is often frozen in place for several seconds, then suddenly switched off, genuine happy smiles tend to be briefer but to fade less abruptly (Ekman et al., 1990) (**FIGURE 37.2**). True smiles cause others to perceive us as trustworthy, authentic, and attractive (Gunnery & Ruben, 2016). When smiling, we can fake it, but our facial muscles won't make it.

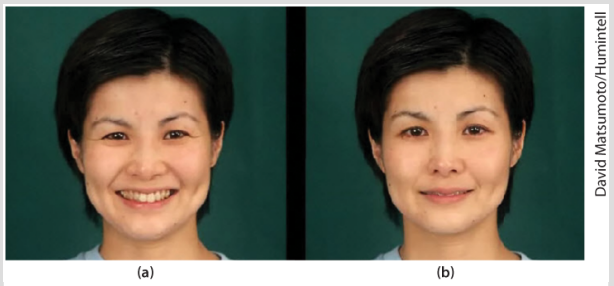

FIGURE 37.2 Which smile is natural, which is feigned? Smile (a) engages the facial muscles of a natural smile.

Despite our brain's emotion-detecting skill, we find it difficult to discern deceit. Computer algorithms outperform humans when detecting deception, because liars' and truth-tellers' behavioral differences are often too minute for the human eye (Hartwig & Bond, 2011; Monaro et al., 2022). One digest of 206 studies found that people were just 54 percent accurate in discerning truth from lies—barely better than a coin toss (Bond & DePaulo, 2006). Virtually no one—except perhaps police professionals in high-stakes situations—beats

chance by much, not even when detecting children's lies (Gongola et al., 2017; O'Sullivan et al., 2009; ten Brinke et al., 2016).

Gestures, facial expressions, and vocal tones, which are absent in written communication, convey important information. The difference was clear when study participants in one group heard 30-second recordings of people describing their marital separations. Participants in the other group read a transcript of the recording. Compared with those who had read it, participants who *heard* the description were better able to predict the people's current and future adjustment (Mason et al., 2010). Just hearing a stranger say "hello" is enough to give listeners some clue to the speaker's personality.

Our texts, emails, and other online communications lack vocal and facial emotional nuances. Without the usual expressive cues, we run the risk of what developmental psychologist Jean Piaget called *egocentrism*—difficulty taking another's point of view. We may, for example, fail to perceive how others interpret our "just kidding" message (Kruger et al., 2005). So, to help people understand our personality and whether our online comment is serious, kidding, or sarcastic, we may insert emojis (Kaye et al., 2017). 😊

Gender, Emotion, and Nonverbal

Behavior

LOQ 37-2

How do men and women differ in nonverbal communication?

Do women have greater sensitivity than men to nonverbal cues? An analysis led by Judith Hall (2016) of 176 thin slice studies indicated that women outperformed men at emotion detection. This advantage emerges early in infancy (McClure, 2000). Women's nonverbal sensitivity might explain their greater emotional literacy.

When invited to describe how they would feel in certain situations, men tend to describe simpler emotional reactions (Barrett et al., 2000). You might like to try this yourself: Ask some people how they might feel when saying good-bye to friends after graduation. Research suggests men are more likely to say, simply, "I'll feel bad," and women to express more complex emotions: "It will be bittersweet; I'll feel both happy and sad."

Women's skill at decoding others' emotions may also contribute to their greater emotional responsiveness and expressiveness, especially for positive emotions (Fischer & LaFrance, 2015; McDuff et al., 2017). In studies of 23,000 people from 26 cultures, women more than men reported themselves open to feelings (Costa et al., 2001). Girls tend to express stronger emotions than boys do, hence the extremely strong perception that emotionality is "more true of women"—a perception

expressed by nearly 100 percent of U.S. 18- to 29-year-olds (Chaplin & Aldao, 2013; Newport, 2001). In conversation, young girls and their parents—more than young boys and their parents—tend to discuss emotions and use more emotion-related words (Fivush et al., 2000).

One exception: Quickly—imagine an angry face. What gender is the person? If you're like 3 in 4 Arizona State University students, you imagined a man (Becker et al., 2007). The same researchers also manipulated a computer-generated, gender-neutral face to display different emotions. People were more likely to perceive the face as male when it wore an angry expression and as female when it wore a smile (Becker et al., 2007). Anger strikes most people as a more masculine emotion. Women who express "male-typed" anger pay a penalty in the workplace, such as being labeled "out of control" (Brescoll & Uhlmann, 2008).

The perception of women's emotionality also feeds—and is fed by—people's attributing women's emotionality to their disposition and men's to their circumstances: "She's emotional" versus "He's having a bad day" (Feldman Barrett & Bliss-Moreau, 2009). Nevertheless, there are some gender differences in descriptions of emotional experiences. When surveyed, women are far more likely than men to describe themselves as empathic (Benenson et al., 2021). If you have *empathy*, you identify with others and imagine being in their skin. You appraise a situation as they do, rejoicing with those who rejoice and weeping with those who weep (Wondra & Ellsworth, 2015). Fiction readers,

who immerse themselves in others' lives, report higher empathy levels (Mar et al., 2009).

> **"Empathy's most important role … is to inspire kindness: our tendency to help each other, even at a cost to ourselves."** — Jamil Zaki, *The War for Kindness*, 2019

Women are also more likely to *express* empathy—to display more emotion when observing others' emotions (Depow et al., 2021). This gender difference was clear when college students watched film clips that were sad (children with a dying parent), happy (slapstick comedy), or frightening (a man nearly falling off the ledge of a tall building) (Kring & Gordon, 1998; Vigil, 2009).

You may wonder: Are gender differences in empathy the result of nature or nurture? As we have seen repeatedly, nature and nurture often interact. Evolutionary biologists and neuroscientists note that similar female-male empathy differences occur in nonhuman animals (Christov-Moore et al., 2014). To these researchers, biology powerfully predicts empathy. But cultural learning also matters. People with high power and privilege are less motivated to empathize (Dietze & Knowles, 2021; Kraus et al., 2012). Those lower in power, as women historically have been, may feel a strong motivation to understand others' emotions (Dietze & Knowles, 2016).

Retrieval Practice

RP-1 _____ (Women/Men) report experiencing emotions more deeply, and they tend to be more adept at reading nonverbal behavior.

ANSWERS IN APPENDIX E

Culture and Emotional Expression

LOQ 37-3

How are gestures and facial expressions understood within and across cultures?

Where you live, do people often smile when passing a stranger on an otherwise empty sidewalk? Where your authors live—in the U.S. Midwest [DM], the Rocky Mountains [JG], and the U.S. South [ND]—that's the norm. Elsewhere, making eye contact and smiling at a stranger might seem strange, or even suspicious (Niedenthal, et al., 2019). Culture matters.

The meaning of *gestures* also varies from culture to culture. In 1968, North Korea publicized photos of supposedly happy officers from a captured U.S. Navy spy ship. In the photo, three men had raised their middle finger, telling their captors it was a "Hawaiian good luck sign" (Fleming & Scott, 1991). I [ND] have taught my young children the thumbs-up gesture so they can let me know that something is good.

But I will also teach them not to make that gesture if we travel to certain West African and Middle Eastern countries, where it can mean "up yours!" (Koerner, 2003).

Do *facial expressions* also have different meanings in different cultures? To find out, researchers have traveled the world, showing people photos of different posed faces and asking them to guess the emotion (Ekman & Friesen, 1975; Izard, 1994; Mesquita, 2022). You can try one such task yourself by labeling the emotions in **FIGURE 37.3**.



FIGURE 37.3 Culture-specific or culturally universal expressions? Which face expresses disgust? Anger? Fear? Happiness? Sadness? Surprise?[1]

You probably labeled the smiling face as “happiness”—and so would most people worldwide. One analysis of 6 million videos from 144 countries found reliable associations between facial expressions and

social contexts (Cowen et al., 2021). Across humanity, expressions conveying amusement occurred in videos with practical jokes, pained expressions with weight training, and triumphant expressions with sports.

But people also differ in some expressions, especially anger and fear, even when matching exaggerated poses to a limited set of emotion words (Crivelli et al., 2016a; **FIGURE 37.4**). We're also better at judging faces from our own culture; it's as if we learn a local emotional dialect (Crivelli et al., 2016b; Elfenbein & Ambady, 2002; Laukka & Elfenbein, 2021).

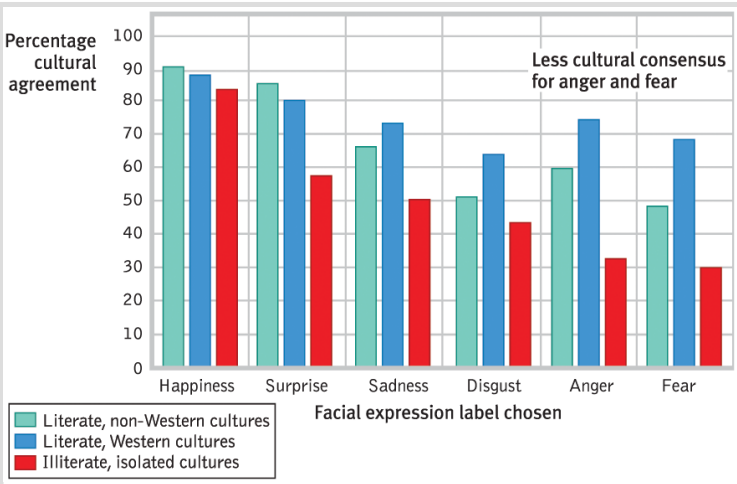



Photo: Roman Samborskyi/Alamy Stock Photo
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FIGURE 37.4 Cultural consensus in question In global studies, most people agree that a smiling face represents happiness. Other expressions, such as in the face shown here, have offered less cross-cultural consensus (Nelson et al., 2013). What emotion do you see in this face?

Some emotion categories are clear universals: A smile's a smile the world around. The same with laughter: People everywhere can discriminate real from fake laughs (Bryant et al., 2018). Even people blind from birth spontaneously exhibit the common facial expressions associated with such emotions as joy, sadness, fear, anger, and pride (Galati et al., 1997; Tracy & Matsumoto, 2008).

Such results would not have surprised evolutionary theorist Charles Darwin (1809–1882), who argued that before our prehistoric ancestors communicated in words, they communicated threats, greetings, and submission with facial expressions. These shared expressions helped them survive (Hess & Thibault, 2009). In confrontations, for example, a human sneer retains elements of an animal baring its teeth in a snarl (**FIGURE 37.5**). Emotional expressions may enhance our survival in other ways, too. Surprise raises the eyebrows and widens the eyes, enabling us to take in more information. Disgust wrinkles the nose and sticks out the tongue, reducing intake of foul odors or foods.

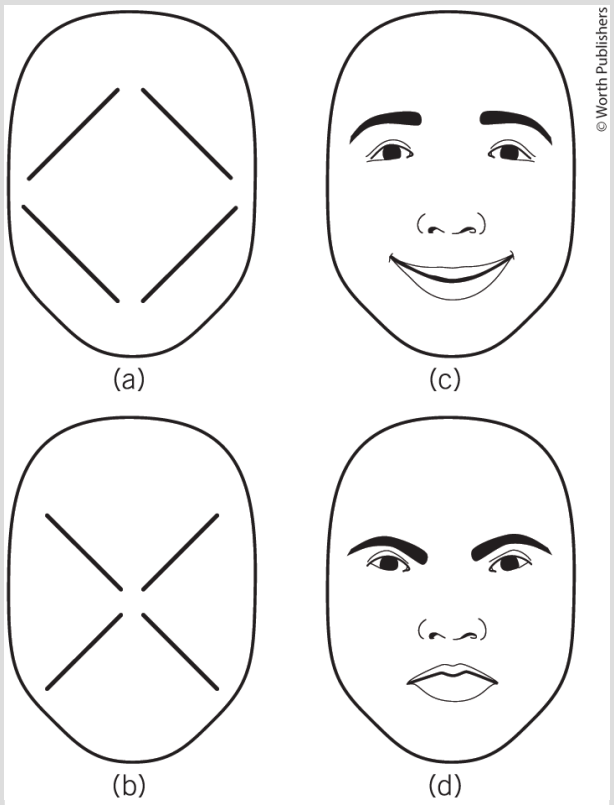


FIGURE 37.5 Anger expressed Cover up faces (c) and (d) and ask a friend if they would select image (a) or image (b) as the angry one. Even without the obvious facial cues, most people choose (b) (Franklin et al., 2019).

"For news of the heart, ask the face." — Guinean proverb

Yet facial expressions are not crystal balls to our emotions. We routinely control our faces to fit in with, influence, or deceive others. Euphoric Olympic gold-medal winners typically don't smile when they

are waiting alone for their award ceremony. But they wear broad grins when interacting with officials and when facing the crowd and cameras (Fernández-Dols & Ruiz-Belda, 1995). Depending on the situation, the same expression may also convey different messages (Feldman Barrett et al., 2019). When worn by a villain, a smile may be terrifying. A fearful face set in a painful situation looks pained (Carroll & Russell, 1996). Film directors harness this phenomenon by creating scenes and soundtracks that amplify our perceptions of particular emotions.



Rotman Institute of Philosophy

Emotion construction Pioneering emotion researcher Lisa Feldman Barrett is exploring how people construct emotions based on their body, brain, and culture.

Facial expressions are also cultural occurrences, with *display rules* guiding *when* to express an emotion, *which* emotion is appropriate, and *how much* of an emotion to express. Compared with job applicants

in Hong Kong, where calmness is emphasized, European American applicants use excited smiles and words more frequently. Likewise, European American leaders showed broad smiles six times more frequently in their official photos (Bencharit et al., 2019; FIGURE 37.6).



Left: Peter Probst/Alamy Stock Photo; right: AP Photo

FIGURE 37.6 Culture and smiling U.S. President Joe Biden's broad smile and Chinese President Xi Jinping's more reserved one illustrate a cultural difference in facial expressiveness. (Stimuli from Tsai et al., 2016.)



Left: Masashi Hara/Getty Images; right: Elsa/Getty Images

(a) (b)

Display rules differ Soccer players from more collectivist cultures, such as Japanese Yū Kobayashi, tend to celebrate a goal with fellow players in a way that deflects attention from themselves (a). Those from more individualist cultures, such as American Megan Rapinoe—shown here after scoring at the 2019 Women's World Cup—are more comfortable making themselves distinct (b).

In cultures that encourage individuality and personal influence, as in Western Europe, Australia, New Zealand, and North America, people prefer high-intensity positive emotions (Tsai, 2007). Cultures that encourage collectivism with a focus on others, as in Japan, China, and Korea, often value less intense emotional displays (Cordaro et al., 2018; Matsumoto et al., 2009). Moreover, in Japan, the mouth—often so expressive in North Americans—conveys less emotion than do the telltale eyes (Masuda et al., 2008; Yuki et al., 2007). If we're happy and we know it, our culture will teach us how to show it.

Cultural differences also exist *within* nations. Irish people and their Irish American descendants have tended to be more expressive than Scandinavian people and their Scandinavian American descendants, even though both groups share a common nationality (Tsai & Chentsova-Dutton, 2003). And that reminds us of a familiar lesson: Like most psychological events, facial expressions are best understood not only as biological and cognitive phenomena, but also as social-cultural phenomena.

Retrieval Practice

RP-2 How are facial expressions rooted in biology and culture?

ANSWERS IN APPENDIX E

The Effects of Facial Expressions

LOQ 37-4

How do our external facial expressions influence our internal feelings?

As William James (1890) struggled with feelings of depression and grief, he came to believe that we can control emotions by going "through the outward movements" of any emotion we want to experience. "To feel cheerful," he advised, "sit up cheerfully, look around cheerfully, and act as if cheerfulness were already there." In *The Expression of the Emotions in Man and Animals*, Charles Darwin (1872) contended that "the free expression by outward signs of an emotion intensifies it.... He who gives way to violent gestures will increase his rage."

Were they right? You can test their hypothesis: Fake a big grin. Now scowl. Can you feel the "smile therapy" difference? Participants in dozens of experiments have felt a difference. Researchers subtly induced students to make a frowning expression by asking them to contract certain muscles and pull their brows together (supposedly to help the researchers attach facial electrodes) (Laird, 1974, 1984; Laird & Lacasse, 2014). The results? The students reported feeling a little angry, as do people naturally frowning (by squinting) when facing the

Sun (Marzoli et al., 2013). So, too, for other basic emotions. For example, people reported feeling more fear than anger, disgust, or sadness when made to construct a fearful expression: "Raise your eyebrows. And open your eyes wide. Move your whole head back, so that your chin is tucked in a little bit, and let your mouth relax and hang open a little" (Duclos et al., 1989).

James and Darwin had it right: Expressions not only communicate emotion, they also amplify and regulate it. This **facial feedback effect** has been found many times, in many places, for many basic emotions (Coles et al., 2019; see **FIGURE 37.7**). We're just a little happier when smiling, angrier when scowling, and sadder when frowning. Merely activating one of the smiling muscles by holding a pen in the teeth (rather than gently between the lips, which produces a neutral expression) makes stressful situations less upsetting (Kraft & Pressman, 2012). A hearty smile—made not just with the mouth but with raised cheeks that crinkle the eyes—enhances positive feelings even more when you are reacting to something pleasant or funny (Soussignan, 2001). When happy we smile, and when smiling we become happier, unless we're distracted by being videotaped (Marsh et al., 2019; Noah et al., 2018; Strack, 2016). In a saying often attributed to Vietnamese Buddhist monk Thích Nhất Hạnh, "Sometimes your joy is the source of your smile, but sometimes your smile can be the source of your joy."

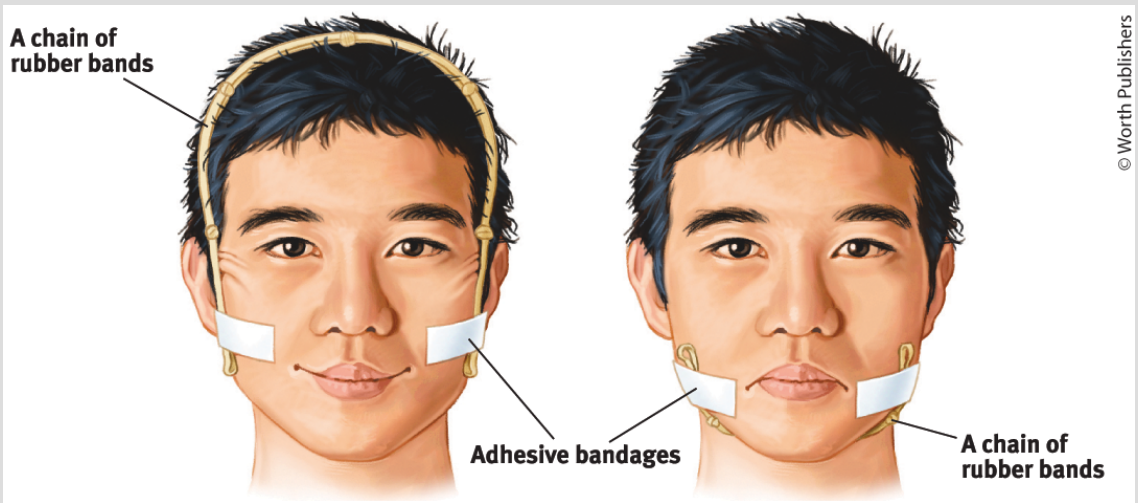


FIGURE 37.7 How to make people smile without telling them to smile Do as Kazuo Mori and Hideko Mori (2009) did with students in Japan: Attach rubber bands to the sides of the face with adhesive bandages, and then run them either over the head or under the chin.

So, your face is more than a billboard that displays your feelings; it also fuels your feelings. Scowl and the whole world scowls back. No wonder some people with depression or borderline personality disorder have reported feeling better after Botox injections paralyzed their facial frowning muscles (Kruger et al., 2022; Schultze et al., 2021). However, Botox paralysis of the frowning muscles also slows activity in emotion-related brain circuits and weakens emotional experiences (Davis et al., 2010; Hennenlotter et al., 2008). The opposite happens when Botox paralyzes laughter muscles: People feel worse (Lewis, 2018).

A request from your authors: Smile often as you read this book.

Researchers have also observed a broader **behavior feedback effect** (Carney et al., 2015; Flack, 2006). You can duplicate the participants' experience: Walk for a few minutes with short, shuffling steps, keeping your eyes downcast. Now walk around taking long strides, with your arms swinging and your eyes looking straight ahead. Can you feel your mood shift? Or when angry, lean back in a reclined sitting position and feel the anger lessen (Krahé et al., 2018). Going through the motions awakens the emotions. The next time you're angry or stressed, lean back and take a few deep breaths.

You can use your understanding of feedback effects to become more empathic: Let your own face mimic another person's expression. Acting as another acts helps us feel what another feels (Hess & Fischer, 2016; Iacoboni, 2009). Losing this ability to mimic others can leave us struggling to make emotional connections, as social worker Kathleen Bogart, who has Moebius syndrome (a rare facial paralysis disorder), discovered while working with Hurricane Katrina refugees: When people made a sad expression, "I wasn't able to return it. I tried to do so with words and tone of voice, but it was no use. Stripped of the facial expression, the emotion just dies there, unshared" (Carey, 2010).

Ask Yourself

Imagine a situation in which you would like to change the way you feel. How could you do so by altering your facial expressions or the way you carry yourself? In what

other settings could you apply your knowledge of these feedback effects?

Retrieval Practice

RP-3 (a) Based on the *facial feedback effect,* how might students report feeling when the rubber bands raise their cheeks as though in a smile? (b) How might students report feeling when the rubber bands pull their cheeks downward?

ANSWERS IN APPENDIX E

REVIEW

Module 37: Expressing Emotion

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 37-1: How do we communicate emotions nonverbally?

LOQ 37-2: How do men and women differ in nonverbal communication?

LOQ 37-3: How are gestures and facial expressions understood within and across cultures?

LOQ 37-4: How do our external facial expressions influence our internal feelings?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

facial feedback effect
behavior feedback effect

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. When people are induced to assume a fearful expression, they often report feeling some fear. This result is known as the _____ _____ effect.

2. Aiden has a bad cold and finds himself shuffling to class with his head down. How might his posture, as well as his cold, affect his emotional well-being?

MODULE 38: Experiencing Emotion

LOQ 38-1

What are some of the basic emotions?

How many distinct emotions are there? When surveyed, most emotion scientists agreed on five basic emotions: anger, fear, disgust, sadness, and happiness (Ekman, 2016). Carroll Izard (1977) isolated 10: joy, interest-excitement, surprise, sadness, anger, disgust, contempt, fear, shame, and guilt, most present in infancy (**FIGURE 38.1**). Others recognize as many as 28, including different flavors of happiness like awe, love, and pride (Cowen & Keltner, 2020).



FIGURE 38.1 Some naturally occurring infant emotions To identify the emotions generally present in infancy, Carroll Izard analyzed the facial expressions of infants.

Emotions are categorized along two dimensions: *valence* (positive versus negative) and *arousal* (low versus high) (Feldman Barrett & Russell, 1998; Tsai et al., 2006; FIGURE 38.2). But are emotions biologically distinct? Does our body, for example, know the difference between fear and anger? Can our brain distinguish happiness from interest?

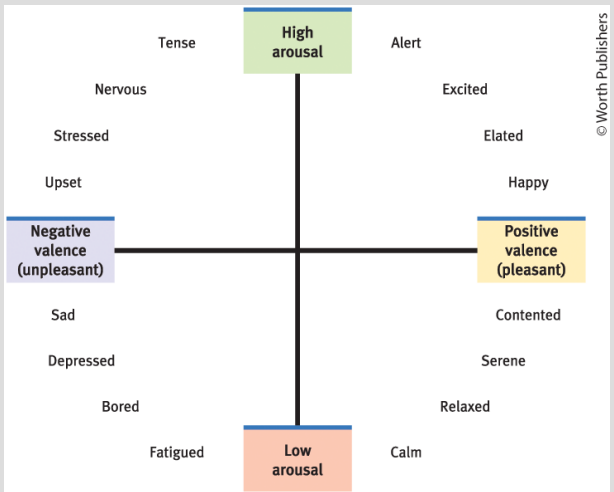


FIGURE 38.2 A tale of two emotional dimensions You can feel good with little arousal (the calmness that often accompanies meditation) or lots of arousal (excitement at seeing friends). Likewise, negative feelings can involve low arousal (boredom during a long-winded lecture) or high arousal (nervousness before a job interview).

Let's take a closer look at anger and happiness. What functions do they serve? What influences our experience of each?

Anger

LOQ 38-2

What are the causes and consequences of anger?

Anger, the sages have said, "carries the mind away" (Virgil, 70–19 B.C.E.) and can be "many times more hurtful than the injury that caused it" (Thomas Fuller, 1654–1734). But they have also said that "noble anger" (William Shakespeare, 1564–1616) "makes any coward brave" (Cato, 234–149 B.C.E.) and "brings back … strength" (Virgil).

What makes us angry? When we face a threat or challenge, fear triggers flight but anger triggers fight—each at times an adaptive behavior. Sometimes anger is a response to someone's perceived misdeeds, especially when the person's act seems willful, unjustified, and avoidable (Averill, 1983). But small hassles and blameless annoyances—foul odors, high temperatures, a traffic jam, aches and pains, stressful interactions—can also make us angry.

Anger can harm us, especially when it is chronic. Anger boosts our heart rate, increases *inflammation*—weakening our defenses against disease—and increases our testosterone (Barlow et al., 2019; Herrero et al., 2010; Peterson & Harmon-Jones, 2012). Anger can fuel aggression and prime prejudice. But anger can also help us in some situations, such as playing a competitive game or facing confrontations in daily life (Kim et al., 2015; Tamir, 2009). Anger isn't all bad.



MIKE HUTCHINGS/REUTERS/Newscom

When anger is all the rage Fans seem to experience a *temporary* release while cheering at World Cup soccer matches, such as this one in South Africa. My [DM's] daughter, a resident, noted, "Every time I got angry at Uruguay, blowing that vuvuzela and joining the chorus of dissent released something in me."

How do we manage our anger? Individualist cultures encourage people to vent their rage. The Western vent-your-anger advice presumes that aggression enables emotional release, or *catharsis*. Joining others in venting shared angry feelings can increase our feelings of closeness, intimacy, and attachment (Fischer & Roseman, 2007). But does this venting calm us (Bushman, 2002)? Researchers

report that *sometimes* when people retaliate against a provoker, they may calm down if they direct their counterattack toward the provoker, their retaliation seems justifiable, and their target is not intimidating. Expressing anger can be temporarily calming if it does not leave us feeling guilty or anxious (Geen & Quanty, 1977; Hokanson & Edelman, 1966; Verona & Sullivan, 2008). However, *acting* angry more often makes us *feel* angrier (Flack, 2006; Snodgrass et al., 1986). Anger's backfire potential appeared in a study of people asked to wallop a punching bag while ruminating about a person who had recently angered them (Bushman, 2002). Had the opportunity to "drain off" their anger reduced it? Quite the contrary. Later, when given a chance for revenge, those who had vented their anger became even more aggressive.

Advice to release anger is seldom heard in cultures where people's identity is centered more on "we" than "me." People who keenly sense their *inter*dependence see anger as a threat to group harmony (Markus & Kitayama, 1991). In Tahiti, for instance, people learn to be considerate and gentle. In Japan, from infancy on, angry expressions are less common than in Western cultures.

What are some healthy ways to manage your anger? Experts offer these suggestions:

- ***Wait.*** Doing so will reduce your physiological arousal. "What goes up must come down," noted Carol Tavris (1982). "Any emotional arousal will simmer down if you just wait long enough."

- ***Think about the situation differently.*** Reappraisal—thinking about things in a different way—can reduce anger and help us tolerate frustration (Szasz et al., 2011). The next time you're angry about something, consider: In the long run, will this matter? Is there another side to the story?
- ***Find a healthy distraction or support instead of ruminating.*** Calm yourself by exercising, reading, or talking things through with a friend. Brain scans show that ruminating inwardly about why you are angry increases blood flow to the brain's anger-processing amygdala (Fabiansson et al., 2012).
- ***Distance yourself.*** Try to move away from the situation mentally, as if you are watching it unfold from a distance or the future. Self-distancing reduces rumination, anger, and aggression (Kross & Ayduk, 2011; Mischkowski et al., 2012; White et al., 2015).

> **"Anger will never disappear so long as thoughts of resentment are cherished in the mind."** — The Buddha, 500 B.C.E.

Used wisely, anger communicates strength and competence (Tiedens, 2001). Anger also motivates people to act courageously and achieve goals (Aarts & Custers, 2012; Halmburger et al., 2015). Controlled expressions of anger are more adaptive than either hostile outbursts or pent-up angry feelings. Civility means not only keeping silent about trivial irritations but also communicating important ones clearly and assertively. A nonjudgmental statement of feeling—perhaps letting a roommate know that "I feel upset when I have to clean up your dirty

dishes"—can help resolve conflicts. Anger that expresses a grievance in ways that promote reconciliation and cooperation rather than retaliation can benefit a relationship (Van Kleef & Côté, 2007).

What if someone's behavior really hurts you, and you cannot resolve the conflict? Research commends the age-old response of forgiveness (Worthington & Wade, 2019). Without letting the offender off the hook or inviting further harm (sometimes we need to distance ourselves from an abusive person), forgiveness may release anger and calm the body. Forgiveness doesn't just apply to other people: We also benefit from forgiving ourselves (Webb et al., 2017). One summary of 17 studies reported that self-forgiveness predicted less suicidal ideation and self-harm (Cleare et al., 2019).

Retrieval Practice

RP-1 Which one of the following is an effective strategy for reducing angry feelings?

a. Retaliate verbally or physically.
b. Wait or "simmer down."
c. Express anger in our behavior.
d. Review the grievance silently.

ANSWERS IN APPENDIX E

Happiness and Well-Being

LOQ 38-3

What is happiness? Why does happiness matter?

The Greek philosopher Aristotle (350 B.C.E.) believed that "happiness is the meaning and the purpose of life, the whole aim and end of human existence." The psychologist William James (1902) called happiness "the secret for all [we] do." The Dalai Lama (2009) agreed: "The very purpose of our life is to seek happiness."

Happiness (our having more positive than negative feelings) matters in our daily lives. Our happiness or unhappiness colors our thoughts and our actions. Happy people perceive the world as safer (Cunningham & Kirkland, 2014). They also smile more, and act more playfully (Gardiner et al., 2022). Their eyes are drawn toward emotionally positive images (Raila et al., 2015). Positive feelings enhance our memory of positive facts and pleasant times (Bower, 1981; Isen et al., 1978). Happy feelings also "broaden and build" our thinking, allowing us to relax, become more creative, and connect more easily with others (Fredrickson, 2013; Shiota et al., 2017).

Happiness also promotes a flourishing life. Happy babies tend to become successful adults, and happier adults experience more career success (Coffey, 2020; Walsh et al., 2018). Happier adults also live healthier and more satisfied lives (Boehm et al., 2015; Kushlev et al.,

2020; Willroth et al., 2020). When researchers surveyed thousands of U.S. college students in 1976 and restudied them 2 decades later, happy students had gone on to earn significantly more money than their less-happy-than-average peers (Diener et al., 2002). When we are happy, our relationships, self-image, and hopes for the future also seem more promising.

Happiness benefits society, too. Happy people not only feel good, they also do good. This **feel-good, do-good phenomenon** is one of psychology's most consistent findings (Salovey, 1990). Happier people are more helpful and kind to others (Kushlev et al., 2022). A mood-boosting experience (finding money, succeeding on a challenging task, recalling a happy event) has made people more likely to give money, pick up someone's dropped papers, and volunteer time (Isen & Levin, 1972).

The reverse is also true: Doing good also promotes good feeling. Spending money on others, rather than on ourselves, increases happiness (Aknin et al., 2020). Young children also show more positive emotion when they give, rather than receive, gifts (Aknin et al., 2015). In a Spanish corporate workplace, employees who helped their co-workers experienced greater well-being, and those they helped also became happier and more helpful (Chancellor et al., 2018). Even donating a kidney, despite the pain, leaves donors feeling good (Brethel-Haurwitz & Marsh, 2014). The benefits of helping are not limited to exceptional altruists. People with a history of criminal

behavior also feel good when they do good (Hanniball et al., 2019). *The bottom line:* Helping others helps us all feel happy.

Why does doing good feel so good? One reason is that it strengthens our social relationships (Aknin & Human, 2015; Yamaguchi et al., 2015). Some happiness coaches assign people to perform a daily "random act of kindness" and to record the results.

Positive Psychology

Psychologist William James was writing about the importance of happiness ("the secret motive for all [we] do") as early as 1902. By the 1960s, the *humanistic psychologists* were interested in advancing human fulfillment. In the twenty-first century, under the leadership of American Psychological Association past-president Martin Seligman, **positive psychology** is using scientific methods to study human flourishing. This rapidly growing subfield includes studies of **subjective well-being**. One ongoing longitudinal study is following 240,000 people in 24 countries to understand the key elements in human experience that help us thrive and feel a greater sense of purpose and meaning (VanderWeele, 2021).



Courtesy of Martin Seligman

Martin E. P. Seligman "The main purpose of a positive psychology is to measure, understand, and then build the human strengths and the civic virtues."

Taken together, satisfaction with the past, happiness with the present, and optimism about the future define the positive psychology movement's first pillar: *positive well-being*.

Positive psychology is about building not just a pleasant life, says Seligman, but also a good life that engages one's skills, and a meaningful life that points beyond oneself. Thus, the second pillar, *positive traits*, focuses on exploring and enhancing creativity, courage, compassion, integrity, self-control, leadership, wisdom, and spirituality. Happiness is a by-product of a pleasant, engaged, and meaningful life.

The third pillar, *positive groups, communities, and cultures*, seeks to foster a positive social world. This includes healthy families, supportive neighborhoods, effective schools, socially responsible media, and civil dialogue.

"Positive psychology," Seligman and colleagues have said (2005), "is an umbrella term for the study of positive emotions, positive character traits, and enabling institutions." Its focus differs from psychology's traditional interests in understanding and alleviating negative states—abuse and anxiety, depression and disease, prejudice and poverty. (Psychology articles published since 1887 mentioning "depression" still outnumber those mentioning "happiness" by about 16 to 1.) The positive psychology movement has gained strength, with supporters in more than 100 countries (IPPA, 2022). Worldwide, centers such as the Greater Good Science Center in Berkeley, California, support the science of thriving and happiness.

When Are We Happiest?

LOQ 38-4

How do time, wealth, adaptation, and comparison affect our happiness levels?

So, happiness matters. But what factors influence when people are happiest? For example, are some days of the week happier than others? One social psychologist (Kramer, 2010) did a *naturalistic observation* of emotion words in billions (!) of Facebook posts. He

tracked the frequency of people's positive and negative emotion words by day of the week. The days with the most positive moods? Friday and Saturday (FIGURE 38.3). Similar analyses of questionnaire responses and 59 million Twitter messages found Friday, Saturday, and Sunday to be the week's happiest days (Golder & Macy, 2011; Helliwell & Wang, 2015; Young & Lim, 2014). For you, too?

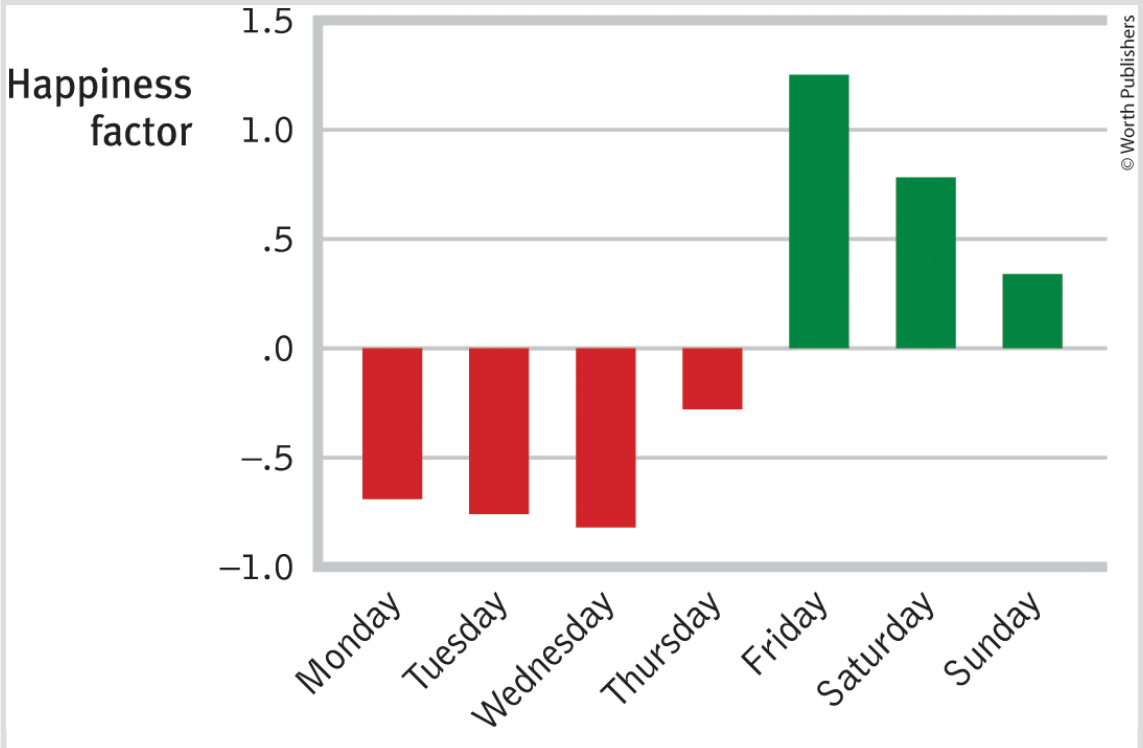


FIGURE 38.3 Emotion notification A pattern emerged in tracked positive and negative emotion words in many "billions" (the exact number is proprietary information) of status updates of U.S. Facebook users over a 3-year period (Kramer, 2010).

Positive emotions also tend to rise in the early to middle part of most days, and they tend to decline later in the day (Kahneman et al., 2004; Watson, 2000). So, too, with day-to-day moods. A stressor—an

argument, a bad test grade, a car problem—triggers a bad mood. No surprise there. But by the next day, the gloom nearly always lifts (Affleck et al., 1994; Bolger et al., 1989; Stone & Neale, 1984). Our overall judgments of our lives often show lingering effects of good or bad events, but our daily moods typically rebound (Luhmann et al., 2012). If anything, people tend to bounce back from a bad day to a *better*-than-usual good mood the following day. Sadness helps us appreciate happiness. The surprising reality: *We overestimate the duration of our emotions and underestimate our resiliency and capacity to adapt.* (As one who inherited hearing loss with a trajectory toward that of my mother, who spent the last 13 years of her life completely deaf, I [DM] take heart from these findings.)

Our current happiness is also shaped by our recent experience. Psychologist Harry Helson (1898–1977) identified this **adaptation-level phenomenon**: We judge new events by comparing them with our past experiences. Our past experiences define neutral levels—sounds that seem neither loud nor soft, temperatures that seem neither hot nor cold, events that seem neither pleasant nor unpleasant. We then notice and react to variations up or down from these levels. Have you noticed how a chilly fall day, after summer, feels colder than the same temperature in late winter?



Caitlin Cass/Cartoon Stock

People who have experienced a recent windfall—from the lottery, an inheritance, or a surging economy—typically feel joy and satisfaction (Diener & Oishi, 2000; Gardner & Oswald, 2007; Lindqvist et al., 2020). You would, too, if you woke up tomorrow with all your wishes granted—perhaps a world with no bills, no ills, and perfect grades? But eventually, you would adapt to this new normal. Before long, you would again sometimes feel joy and satisfaction (when events exceed your expectations), sometimes feel let down (when they fall below), and sometimes feel neither up nor down. *The point to remember:* Feelings of satisfaction and dissatisfaction, success and failure are based partly on expectations formed by our recent experience (Rutledge et al., 2014).

What Predicts Happiness?

LOQ 38-5

What predicts happiness, and how can we be happier?

Happy people share many characteristics (TABLE 38.1). But what makes one person filled with joy, day after day, while others seem dark or aloof? Here, as in so many other areas, the answer is found in the interplay between nature and nurture.

TABLE 38.1 Happiness Is ...

Researchers have found that happy people tend to	However, happiness seems not much related to other factors, such as
Be older.	Gender (women often self-report more joy, but also more depression).
Have high self-esteem (in individualist countries).	Physical attractiveness.
Be optimistic, outgoing, and agreeable, and have a humorous outlook.	
Have close, positive, and lasting relationships.	
Have work and leisure that engage their skills.	
Have an active religious faith (especially in	

more religious cultures).	
Sleep well and exercise.	
Experience awe and wonder.	

Information from Anglim et al., 2020; Bai et al., 2021; Batz-Barbarich et al., 2018; Carstensen et al., 2011; De Neve & Cooper, 1998; Diener et al., 2003, 2011; Headey et al., 2010; Lucas et al., 2004; Lyubomirsky, 2013; Myers, 1993, 2000; Myers & Diener, 1995, 1996; Newport, 2022; Steel et al., 2008. Veenhoven, 2014, 2015 offers a database of 13,000+ correlates of happiness at WorldDatabaseofHappiness.eur.nl

Genes matter. In one analysis of over 55,000 identical and fraternal twins, 36 percent of the differences among people's happiness ratings was heritable—attributable to genes (Bartels, 2015). Even identical twins raised apart have similar happiness levels. The challenging quest for specific genes that influence happiness confirms a familiar lesson: Human traits are influenced by many genes having small effects (Røysamb & Nes, 2019).

But our personal history and our culture matter, too. Values vary; one group's recipe for happiness might differ from another group's. Self-esteem matters more in Western cultures, which value individualism. Social acceptance and harmony matter more in communal cultures, such as Japan, that stress family and community (Diener et al., 2003; Fulmer et al., 2010; Uchida & Kitayama, 2009). In East Asia, most people prefer a "calm" to an "exciting" life (Crabtree & Lai, 2021).

Depending on our genes, outlook, and recent experiences, our happiness seems to fluctuate around a "happiness set point," which disposes some people to be more upbeat and others, more negative.

Even so, our satisfaction with life can change (Sheldon & Lyubomirsky, 2021). Happiness rises and falls, and we can control some of what makes us more or less happy on a given day or in a given situation.

Your happiness, like your cholesterol level, is partially shaped by genetics. Yet as cholesterol is also influenced by diet and exercise, some of your happiness is under your personal control (Nes, 2010; Sin & Lyubomirsky, 2009). See **TABLE 38.2** for some research-based suggestions to build your personal strengths and increase your happiness and well-being.

TABLE 38.2 Evidence-Based Suggestions for a Happier Life

- ***Take control of your time.*** Happy people feel in control of their lives and less time-stressed (Whillans, 2019). Too little time is stressful; too much is boring. So, set goals and divide them into manageable daily aims. We all tend to overestimate how much we will accomplish in any given day, but the good news is that we generally *underestimate* how much we can accomplish in a year, given just a little daily progress.
- ***Label your feelings.*** Research shows that people who chose a word that fit their feelings actually felt more positive and less negative (Vlasenko et al., 2021). So, label your feelings. We can often find our way into a happier state of mind by understanding what we are feeling.
- ***Seek work and leisure that engage your skills.*** Happy people often are in a zone called *flow*—absorbed in tasks that challenge but don't overwhelm them. Passive forms of leisure (streaming movies and television shows) often provide less flow experience than exercising, socializing, or expressing artistic interests.
- ***Seek experiences rather than things.*** For those who are not struggling financially, money buys more happiness when spent on experiences—especially socially shared experiences—that you look forward to, enjoy, remember, and talk about (Caprariello & Reis, 2013; Kumar &

Gilovich, 2013, 2015; J. C. Lee et al., 2018). As pundit Art Buchwald said, “The best things in life aren’t things.”

- ***Join the “movement” movement.*** Aerobic exercise not only promotes health and energy, it also helps relieve mild depression (McIntyre et al., 2020; Willis et al., 2018). Researchers have found that certain kinds of body movement while exercising, such as reaching our arms up or bouncing to a beat, may be especially good at elevating feelings of joy (McGonigal, 2019; Shafir et al., 2013). Sound minds often reside in sound bodies.

- ***Give your body the sleep it wants.*** Happy people live active lives yet reserve time for renewing, refreshing sleep. Sleep debt results in fatigue, diminished alertness, poor physical health, and gloomy moods. If you sleep now, you’ll smile later.

- ***Give priority to close relationships.*** Compared with unhappy people, happy people engage in more meaningful conversations (Milek et al., 2018). Resolve to nurture your closest relationships by *not* taking your loved ones for granted: Give them the sort of kindness and affirmation you give others. Relationships matter.

- ***Focus and find meaning beyond self.*** Reach out to those in need. Perform acts of kindness. Happiness increases helpfulness, but doing good for others also fills us with happiness, meaning, and purpose (Kumar & Epley, 2022). And meaning matters mightily: A meaningful life is often a long, active, and healthy life (Alimujiang et al., 2019; Hooker & Masters, 2018).

- ***Challenge your negative thinking.*** Remind yourself that a disappointment today may not seem like that big a deal in a month, or a year.

- ***Count your blessings and record your gratitude.*** Keeping a gratitude journal heightens well-being (Davis et al., 2016). Take time to savor positive experiences and achievements, and to appreciate why they occurred (Sheldon & Lyubomirsky, 2012). Share your gratitude with others and prepare for smiles all around (Dickens, 2017; Kumar & Epley, 2018).

- ***Nurture your spiritual self.*** Relaxation and meditation help us stay emotionally steady. And for many people, faith provides a support community, a reason to focus beyond self, and a sense of purpose and hope. That helps explain why, worldwide, people active in faith communities report greater-than-average happiness and often cope well with crises (Pew, 2019).

- ***Take an "awe walk."*** Experiencing a sense of awe or wonder can reduce stress and increase well-being (Bai et al., 2021; Sturm et al., 2020). Taking a 15-minute outdoor awe walk can help you appreciate the presence of something bigger than yourself.



Matthew Diffee/Cartoon Stock

"Have you ever tried buying lots of stuff?"



nortonrsx/iStock/Getty Images

Experiencing awe in nature improves well-being.

If we can enhance our happiness on an *individual* level, could we use happiness research to refocus our *collective* priorities? Psychologists believe we could. Thanks to information resources such as the Gallup World Poll, researchers can track human happiness and misery over time (2021 was the unhappiest year of the past two decades). Many political leaders are also making use of such research: 43 nations have begun measuring their citizens' well-being, and many have undertaken interventions to boost national well-being (Diener et al., 2015, 2019). Britain's Annual Population Survey, for example, asks its citizens how satisfied they are with their lives, how worthwhile they judge their lives, and how happy and how anxious they felt yesterday (ONS, 2018).

Happy societies are not only prosperous, but also places where people trust one another, feel free, and enjoy close relationships (Helliwell et al., 2013; Oishi & Schimmack, 2010). This knowledge may guide nations toward policies that decrease stress, foster human flourishing, and promote "the pursuit of happiness." Debates about economic inequality, tax rates, divorce laws, parental leave, health care, and city planning can all consider people's psychological well-being.

Questioning Some Myths About Happiness

People believe many myths about happiness. Let's review the most common and see what the science has to say.

Does Money Buy Us Happiness?

Would you be happier if you made more money? How important is "Being very well off financially"? "Very important" or "essential," say 84 percent of entering U.S. college students (Stolzenberg et al., 2019). But *can* money buy happiness?

Personal income predicts happiness—but the more you have, the more it takes to raise your happiness. Having enough money to eat, to feel control over your life, and to occasionally treat yourself to something special predicts greater happiness (Fischer & Boer, 2011; Ruberton et al., 2016). This is especially true for people during their midlife working years (Cheung & Lucas, 2015). But money's power to buy happiness also depends on your current income. Although nearly everyone welcomes more money, a $3000 wage increase does much more for someone making $30,000 per year than for someone making $300,000 (Killingsworth, 2021).

Those living in countries where most people have a secure livelihood tend to be happier than those living in very low-income countries (Diener & Tay, 2015). Money may not buy happiness, but extreme poverty often means misery, which can be lessened by more fairly distributed economic growth (Roser, 2021). Once we have enough money for comfort and security, however, we reach an "income satiation" point beyond which piling up more and more matters less and less (Donnelly et al., 2018; Jebb et al., 2018).

Economic growth in higher-income countries has provided no apparent boost to people's morale or social well-being. Since the late 1950s, the average U.S. citizen's buying power has almost tripled, and with it came new home entertainment systems, safer cars, fresh fruit in winter, and easy information access. Did it also buy more happiness? As **FIGURE 38.4** shows, Americans have become no happier. In 1957, some 35 percent said they were "very happy," as did slightly fewer—31 percent—in 2018 (and 19 percent during the Covid pandemic in 2021). The same thing happened in China and India, where living standards have risen but happiness and life satisfaction have not (Easterlin & O'Connor, 2020). The good life is not the goods life.

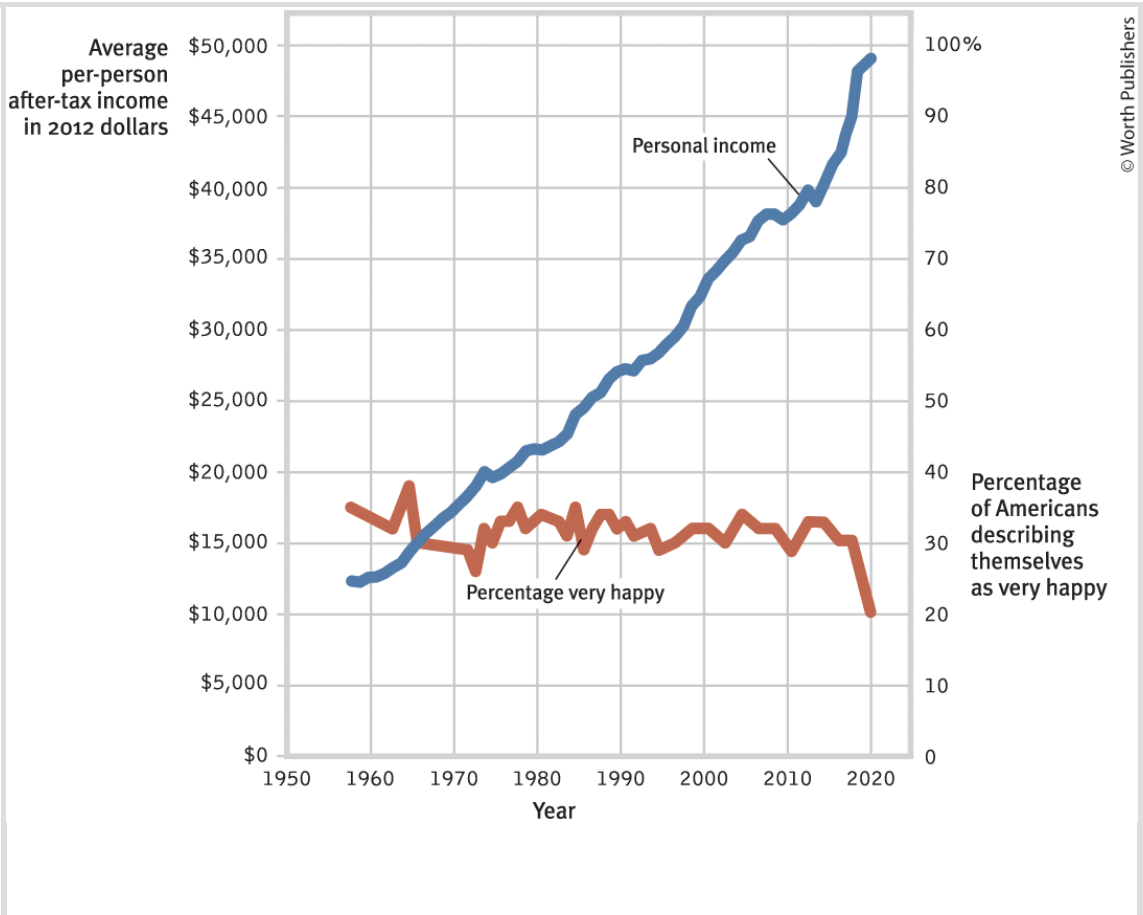


FIGURE 38.4 Money didn't buy happiness (Happiness data from National Opinion Research Center surveys; income data from *Historical Statistics of the United States and Economic Indicators.*)



Extreme inequality is socially toxic. Why has economic growth not made us happier? Economic growth has been accompanied by rising *inequality*, which, across time and place, predicts unhappiness (Cheung & Lucas, 2016; Graafland & Lous, 2019). In countries such as the United States, China, and India, the last half-century's rising economic tide has lifted the yachts faster than the rowboats (Hasell, 2018). In countries and states with greater inequality, people with lower incomes tend to experience more physical, emotional, and social problems than they do in places with less inequality (Payne, 2017; Sommet et al., 2018; Vyas et al., 2022). One study following over 40,000 Canadian children found that those experiencing poverty had greater odds of having asthma and a psychological disorder, and were less ready for school (Roos et al., 2019).

Thus, the more unequal a country's income, the more money predicts happiness (Macchia, 2020; Quispe-Torreblanca et al., 2021). Across the world, we seem to understand that extreme inequality is socially toxic. Regardless of their political party, most people say they would prefer smaller pay gaps between people with high incomes and people with low incomes (Arsenio, 2018; Kiatpongsan & Norton, 2014).

Ironically, in every culture, those who strive hardest for wealth have tended to live with lower well-being, especially when they seek money to prove themselves, gain power, or show off rather than support their families (Donnelly et al., 2016; Niemiec et al., 2009; Srivastava et al., 2001). Those who instead strive for intimacy, personal growth, and community contribution experience a higher quality of life (Kasser, 2018; Ward et al., 2020).

The bottom line: Money by itself does not *buy* happiness, but if you spend it on others in ways that promote kindness, it can *predict* happiness.

Is Our Happiness Independent of Others?

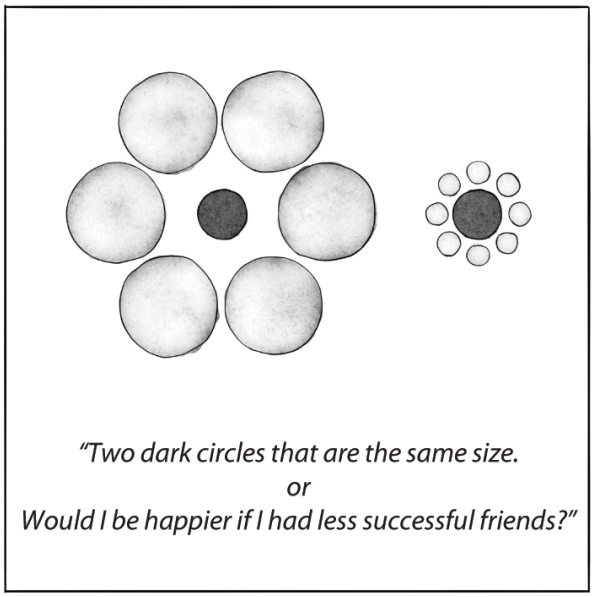
Are you happy? Many people, especially those from individualist cultures, believe our happiness is independent of others. "If you want to live a happy life, tie it to a goal, not to people," advised Albert Einstein.

Yet the reality is that we are social animals. We often compare ourselves to others—our looks, our achievements, and our happiness. Whether we feel good or bad depends on our perception of just how successful those others are (Lyubomirsky, 2001). Most new university students perceive their peers as more socially connected, which diminishes their well-being and makes it harder to form friendships (Whillans et al., 2017; Zell et al., 2018). Across many studies, people ranging from mall shoppers to online respondents have perceived others' social lives as more active than their own (Deri et al., 2017). Do

such social comparisons—which social media may encourage—leave you, too, feeling like your life is a bit dull and unromantic compared to that of your friends? If so, you likely are experiencing **relative deprivation**.

> Students tend to have a higher academic self-concept if they attend a school where most other students are not exceptionally able (Marsh et al., 2020, 2021). If you were near the top of your graduating class, you might feel inferior or discouraged upon entering a college or university where all students were near the top of their class. As Theodore Roosevelt reportedly observed, "Comparison is the thief of joy."

When expectations soar above attainments, we feel disappointed. Worldwide, life satisfaction suffers when people with low incomes compare themselves to those with higher incomes (Macchia et al., 2020). One analysis of 2.4 million participants in 357 studies found that happiness depended less on actual financial success than on how participants *compared* themselves financially to their peers (Tan et al., 2020). As British philosopher Bertrand Russell (1930/1985) noted, "Napoleon envied Caesar, Caesar envied Alexander, and Alexander, I daresay, envied Hercules, who never existed. You cannot, therefore, get away from envy by means of success alone, for there will always be in history or legend some person even more successful than you are" (pp. 68–69).



Relative deprivation Comparing ourselves with more successful others, we feel diminished; comparing ourselves with those who are worse off, we feel contented. How does the cartoon illustrate this *relative deprivation* principle?

Just as comparing ourselves with those who are better off creates envy, so counting our blessings as we compare ourselves with those worse off boosts our contentment. In one study, when mildly depressed people read about someone who was even more depressed, they felt somewhat better (Gibbons, 1986). "I cried because I had no shoes," states a Persian saying, "until I met a man who had no feet."

Must Bad Events Cause Long-Term Unhappiness?

Extremely stressful events—the loss of a spouse or a job—can drag us down for a long time (Infurna & Luthar, 2016). But eventually, most bad moods end. We may feel that our heart has broken during a romantic breakup, but in time the wound heals. In one study, faculty members up for tenure expected a negative decision would deflate their lives. Actually, 5 to 10 years later, their happiness level was about the same as for those who received tenure (Gilbert et al., 1998).

Grief over the loss of a loved one or anxiety after a severe trauma can linger. But tragedy and trauma are usually not permanently depressing. People who become blind or paralyzed may not completely recover their previous well-being, but many—especially those with an agreeable personality—eventually approach their prior levels of day-to-day happiness (Bonanno, 2004; Boyce & Wood, 2011; Hall et al., 1999). Although the 9/11 terrorist attacks and Covid-19 pandemic caused widespread immediate distress, a year later many people had returned to their baseline levels of happiness (Aknin et al., 2021). "Distress is a normal reaction to mass tragedy," said psychologist George Bonanno (2021), "but so is a relatively prompt climb back to good mental health." In the poetry of an ancient Psalm, "Weeping may linger for the night, but joy comes with the morning."

Think back to some significant event that either elated or depressed you. How long did your extreme emotions last before returning to more typical levels?

Bonanno (2021) told the story of Jed, who lost his leg when he was run over by a garbage truck. Despite this traumatic accident and the challenges he faced adapting to life with one less limb, Jed demonstrated **resilience**. After recovery, he returned to being a happy person whose endless optimism could light up a room. Overcoming serious setbacks, as Jed did, can even foster a deeper sense of life's purpose and meaning (Seery, 2011).

Ask Yourself

Were you surprised by any of the findings related to happiness? How might you increase your happiness?

Retrieval Practice

RP-2 Which of the following factors does *not* predict self-reported happiness?

a. Age
b. Personality traits
c. Sleep and exercise
d. Active religious faith

ANSWERS IN APPENDIX E

REVIEW

Module 38: Experiencing Emotion

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 38-1: What are some of the basic emotions?

LOQ 38-2: What are the causes and consequences of anger?

LOQ 38-3: What is happiness? Why does happiness matter?

LOQ 38-4: How do time, wealth, adaptation, and comparison affect our happiness levels?

LOQ 38-5: What predicts happiness, and how can we be happier?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

happiness
feel-good, do-good phenomenon

positive psychology
subjective well-being
adaptation-level phenomenon
relative deprivation
resilience

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. One of the most consistent findings of psychological research is that happy people are also
   a. more likely to express anger.
   b. generally luckier than others.
   c. concentrated in the wealthier nations.
   d. more likely to help others.

2. _____ psychology is a scientific field of study focused on how humans thrive and flourish.

3. After moving to a new apartment, you find the street noise irritatingly loud, but after a while it no longer bothers you. This reaction illustrates the
   a. relative deprivation principle.

b. adaptation-level phenomenon.
c. feel-good, do-good phenomenon.
d. catharsis principle.

4. There will always be someone more successful, more accomplished, or more popular with whom to compare ourselves. In psychology, this phenomenon is referred to as the _____ _____ principle.

MODULE 39: Stress and Illness

"It's killing me inside. I'm kind of broken. I'm broken. And my colleagues are broken. And people say, 'It's not that big a deal.' And I want to take them by the collar and say you don't know what you're talking about. Come see my world." So explained Montana nurse Joey Traywick (2020), choking back tears while his hospital's intensive care unit was overwhelmed with Covid patients.

When restricted from visiting, patients' loved ones also experienced deep distress. Such was witnessed by Nebraska nurse Antonia Brune (2021) as she accompanied a patient to life's finish line: "I could feel how my patient's three daughters were tormented by not being able to be there physically with their mom." Brune used an iPad to enable the daughters to spend "the whole night talking to their mother—sharing stories, laughter, tears, memories, and music." When their mother's breathing ceased, Brune recalled, "[the daughters] asked me, 'Could you touch her face?' I softly stroked her forehead. 'Could you touch her cheek?' I caressed her cheek. 'Could you hold her hand?' I took her hand. Her daughters gained peace from the sense that they were touching their mom, through me. We were all united in a beautiful, ephemeral moment—patient, family, and caregiver—as they said their final goodbyes."[2]

The Covid pandemic caused major stress: loss of loved ones, illness, fear of becoming ill, social isolation, job loss, and the upheaval of normal routines. How did you cope? The impact of Covid illustrates what this module explores: what causes stress, and how stress affects us.



Dasha Petrenko/Alamy Stock Photo

Covid nursing stress

To live is to experience stress. Worldwide, 41 percent of people reported experiencing "a lot of stress" the day before (Gallup, 2022). People from Afghanistan and Lebanon (74 percent) were the most stressed. Those from Uzbekistan and Kazakhstan were the least stressed (12 percent). People from the United States (52 percent) and Canada (49 percent) were about in the middle. A third of U.S. college students recently considered withdrawing from school, reported a Gallup survey—and 7 in 10 blamed emotional stress (Marken, 2022).

Some stresses we anticipate. An important exam is not an unexpected event, but it will still make you tense. Although well-intended, *trigger warnings* that alert people to possibly disturbing content do little to

prevent distress, and may even increase anxiety (Bellet et al., 2020; Sanson et al., 2019). Even when trigger-warned about a literary passage describing an assault (and given the option of reading a neutral passage), 96 percent of students in one study chose to read the triggering passage. Two weeks later, the students (even those with preexisting posttraumatic stress disorder) showed no increased distress (Kimble et al., 2021).

Other stress strikes without warning. Imagine being 21-year-old Ben Carpenter, who experienced the world's wildest and fastest wheelchair ride. As he was crossing a highway intersection, the light changed, and a big truck moved into the intersection. When they bumped, Carpenter's wheelchair handles got stuck in the truck's grille. The driver, who hadn't seen Carpenter and couldn't hear his cries for help, took off down the highway, pushing the wheelchair at 50 miles per hour until, after two miles, passing police flagged down the truck. Meanwhile, Carpenter reacted to the loss of control: His heart raced, his hands sweated, and his breathing sped up. "It was very scary," he recalled.

Stress may be extreme but brief, as Carpenter experienced. It may be deep and prolonged, as Covid nurses Traywick and Brune endured. Ordinary life transitions and everyday hassles also cause stress and produce similar, though weaker, physical and psychological responses. And as we will see, stress—from the catastrophic to the everyday—can harm our health.

Stress: Some Basic Concepts

LOQ 39-1

How does our appraisal of an event affect our stress reaction, and what are the three main types of stressors?

Stress is a slippery concept. We sometimes use the word informally to describe threats or challenges ("Nurse Brune was under a lot of stress"), and at other times to describe our responses ("She felt very stressed"). Psychologists use more precise terms. The challenge or event (Brune's distressing time treating Covid patients) is a *stressor.* Her physical and emotional responses are a *stress reaction.* And the process by which she interpreted the threat was *stress.*

Stress often arises less from events themselves than from how we think about or *appraise* them (Lazarus, 1998). One person, alone in a house, ignores its creaking sounds and experiences no stress; another suspects an intruder and becomes alarmed. One person regards a difficult new class as a welcome challenge; another appraises it as risking failure (**FIGURE 39.1**). Once we've appraised an event as a stressor (the *primary appraisal*), we assess our ability to respond to it (the *secondary appraisal*).

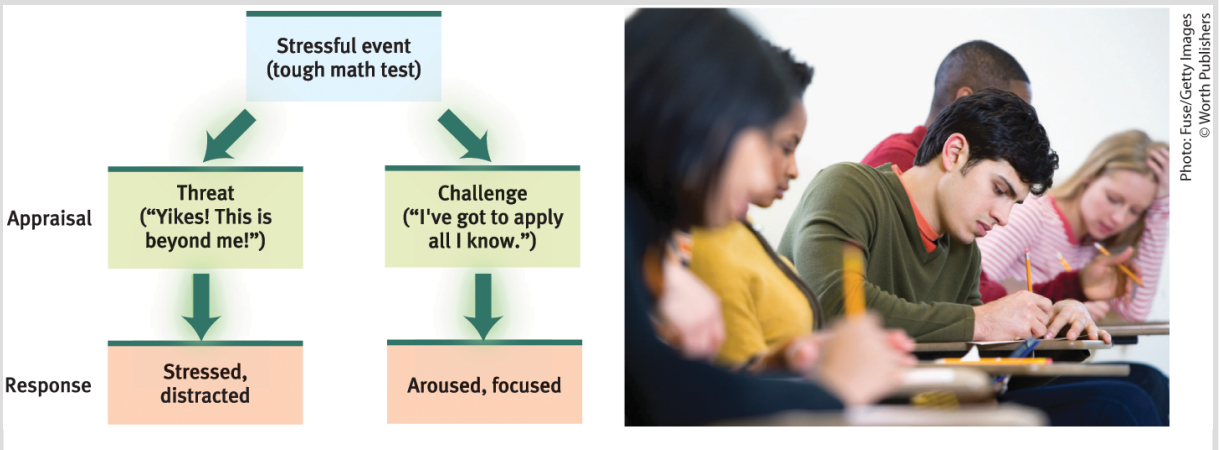


FIGURE 39.1 Stress appraisal The events of our lives flow through a psychological filter. How we appraise an event influences how much stress we experience and how effectively we respond.

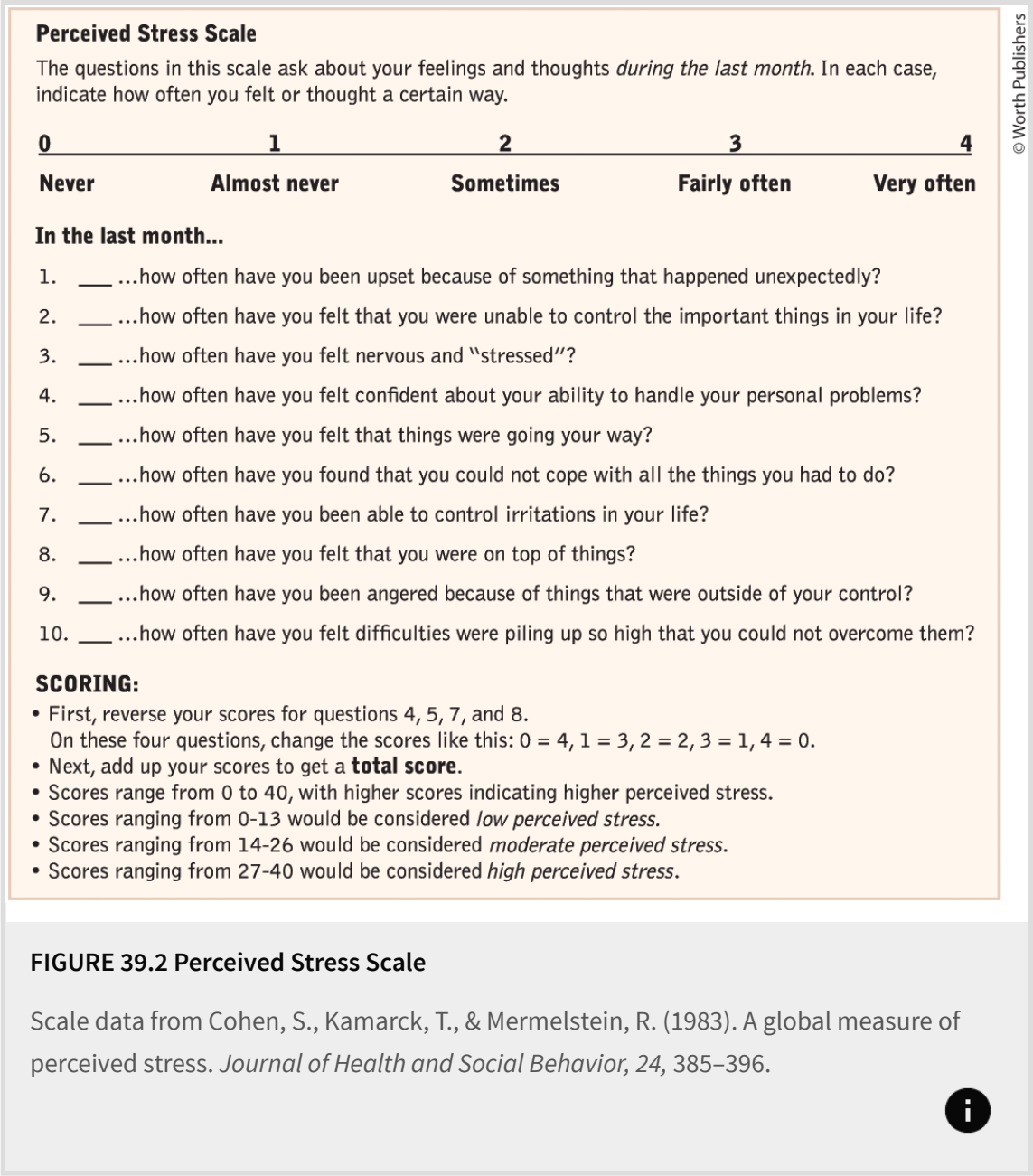
When short-lived, or when perceived as challenges, stressors can have positive effects. Momentary stress can mobilize the immune system to fend off infections and heal wounds (Segerstrom, 2007). Stress also arouses and motivates us to conquer problems. In a Gallup World Poll, those who were stressed, but not depressed, reported being energized and satisfied with their lives. This is the opposite of the lethargy reported by those who were depressed, but not stressed (Ng & Feldman, 2009).

Championship athletes, successful entertainers, motivated students, and great teachers and leaders often thrive and excel when aroused by a challenge (Blascovich & Mendes, 2010; Z. Wang et al., 2015). When we think about our stress as being helpful to us, we show less cardiovascular stress and even attend less to negativity (Jamieson et al., 2012). In games and athletic contests, the stress of not knowing

who will win makes the competition enjoyable (Abuhamdeh et al., 2015). Having conquered cancer or rebounded from a lost job, some people emerge with stronger self-esteem and a deepened spirituality and sense of purpose. Indeed, experiencing some stress builds *resilience*—our ability to adapt to, cope with, and rebound from life's challenges (Bonanno, 2021; Wu et al., 2019). When we experience hardship, we sometimes discover the hidden power of our talents and relationships (Nuñez et al., 2022; Schwartz et al., 2022). By teaching us how to cope with life's twists and turns, occasional stressors can even build a healthier immune system (Epel et al., 1998). Adversity can produce growth.

> **"Too many parents make life hard for their children by trying, too zealously, to make it easy for them."** — German author Johann Wolfgang von Goethe (1749–1832)

But stress can also harm us. Stress can trigger risky decisions and unhealthy behaviors (Cohen et al., 2016; Starcke & Brand, 2016). And stress can affect health directly, by increasing infectious-disease-related illnesses and even deaths (Epel et al., 2004; Hamer et al., 2019). Those who endure extreme stress during pregnancy tend to have shorter pregnancies, which pose health risks for infants (Ding et al., 2021). What is your perceived stress level (**FIGURE 39.2**)?



Perceived Stress Scale

The questions in this scale ask about your feelings and thoughts *during the last month*. In each case, indicate how often you felt or thought a certain way.

0	1	2	3	4
Never	Almost never	Sometimes	Fairly often	Very often

In the last month...

1. ___ ...how often have you been upset because of something that happened unexpectedly?
2. ___ ...how often have you felt that you were unable to control the important things in your life?
3. ___ ...how often have you felt nervous and "stressed"?
4. ___ ...how often have you felt confident about your ability to handle your personal problems?
5. ___ ...how often have you felt that things were going your way?
6. ___ ...how often have you found that you could not cope with all the things you had to do?
7. ___ ...how often have you been able to control irritations in your life?
8. ___ ...how often have you felt that you were on top of things?
9. ___ ...how often have you been angered because of things that were outside of your control?
10. ___ ...how often have you felt difficulties were piling up so high that you could not overcome them?

SCORING:

- First, reverse your scores for questions 4, 5, 7, and 8.
  On these four questions, change the scores like this: 0 = 4, 1 = 3, 2 = 2, 3 = 1, 4 = 0.
- Next, add up your scores to get a **total score**.
- Scores range from 0 to 40, with higher scores indicating higher perceived stress.
- Scores ranging from 0-13 would be considered *low perceived stress.*
- Scores ranging from 14-26 would be considered *moderate perceived stress.*
- Scores ranging from 27-40 would be considered *high perceived stress*.

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FIGURE 39.2 Perceived Stress Scale

Scale data from Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior, 24,* 385–396.

So, there is an interplay between our head and our health. That isn't surprising: *Mind and body interact; everything psychological is simultaneously physiological.* Before exploring that interplay, let's look more closely at stressors and stress reactions.

Stressors—Things That Push Our Buttons

Stressors fall into three main types: catastrophes, significant life changes, and daily hassles (including social stress).

Catastrophes

Catastrophes are large-scale disasters: think earthquakes, hurricanes, wildfires, wars. Their damage to emotional and physical health can be significant. In the four months after Hurricane Katrina in 2005, New Orleans' suicide rate tripled (Saulny, 2006). And in surveys taken in the three weeks after the 9/11 terrorist attacks, 58 percent of Americans said they were experiencing greater-than-average arousal and anxiety (Silver et al., 2002). People were especially likely to report such symptoms in the New York City area, and sleeping pill prescriptions rose by 28 percent (HMHL, 2002; NSF, 2001). Worldwide, a similar uptick in anxiety and depression occurred during the initial months of the Covid pandemic (Aknin et al., 2022).



Marta Lavandier/AP Photo

A hurricane of stress and destruction

Hurricane Ian raged across Florida in 2022,

killing more than 100 people and destroying the homes and possessions of thousands more. Alice Pujols (shown here) survived the storm but her home was destroyed. “I’m trying to make it to the next day,” she said. “That’s all I can do. It’s really depressing” (Calvan & Melley, 2022).

For those who respond to catastrophes, the stress may be twofold. The trauma of uprooting and family separation may combine with the challenges of adjusting to a new culture’s language, ethnicity, and social norms (Pipher, 2002). Newcomers often feel marginalized and experience culture shock, leading to stress-related inflammation (Gonzales et al., 2018; Scholaske et al., 2018). This *acculturative stress* can decline over time, especially when people engage in meaningful activities and connect socially (Bostean & Gillespie, 2017; Kim et al., 2012).

Significant Life Changes

Life transitions—leaving home, having a loved one die, taking on student debt, losing a job, getting divorced—are often keenly felt. Even happy transitions, such as graduating or getting married, can be stressful. Many stresses peak during adolescence and young adulthood: A massive Canadian survey investigating people’s responses to difficult problems revealed that adolescents struggled the most (Statistics Canada, 2019). In another survey, nearly two-thirds of U.S. 15- to 29-year-olds—but less than half of those over 50—

reported experiencing stress during "a lot of the day yesterday" (Ray, 2019).

Some psychologists study the health effects of life changes by following people over time. Others compare the life challenges previously endured by those who have (or have not) experienced a health problem, such as a heart attack. In such studies, recently widowed, fired, or divorced people have been more vulnerable to disease (Dohrenwend et al., 1982; Sbarra et al., 2015; Strully, 2009). One Finnish study of 96,000 widowed people found that the survivor's risk of death doubled in the week following a partner's death (Kaprio et al., 1987). A cluster of crises—losing a job, home, and partner—puts one at even greater risk.

Daily Hassles and Social Stress

Events don't have to remake our lives to cause stress. Stress also comes from *daily hassles*—aggravating housemates, incessant social media notifications, bumper-to-bumper traffic, and overflowing to-do lists (Lazarus, 1990; Pascoe & Richman, 2009; Ruffin, 1993). We might have to give a speech or do difficult math problems (Dickerson & Kemeny, 2004; Meier et al., 2022; **FIGURE 39.3**).

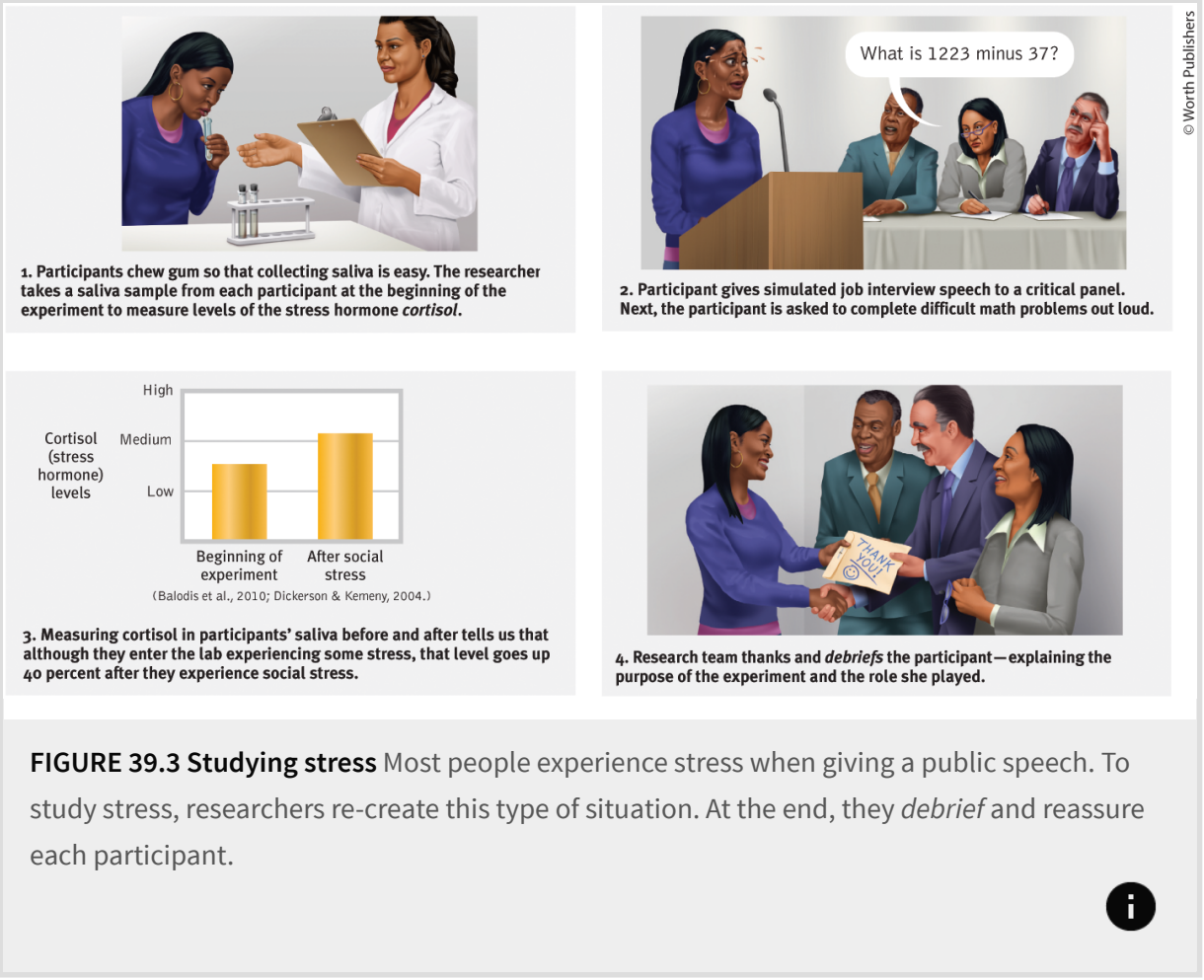


FIGURE 39.3 Studying stress Most people experience stress when giving a public speech. To study stress, researchers re-create this type of situation. At the end, they *debrief* and reassure each participant.

Some people shrug off such hassles; others cannot. Daily pressures can become especially toxic when they are serious and ongoing. Chronic workplace stress can cause worker "burnout"—feeling ineffective, emotionally depleted, and disconnected (Guthier et al., 2020). Others may wake up each day facing housing problems, unreliable child care, budgets that won't stretch to the next payday, physical or emotional challenges, or poor health. Such daily hassles can harm physical health years later—and even shorten life (Chiang et al., 2018; Leger et al., 2022).

Daily pressures may be compounded by social stressors, such as prejudice. Like other stressors, prejudice can have significant psychological and physical consequences (Michaels et al., 2022; Pascoe et al., 2022). Thinking that some of the people you encounter each day will dislike, distrust, or doubt you is a toxic stressor. Many transgender and gender-nonconforming people experience the stress of stigma and discrimination (Valentine & Shipherd, 2018). People with a same-sex sexual orientation who face frequent prejudice in their communities have died, on average, 12 years earlier than have those who live in more accepting communities (Hatzenbueler, 2014). For many Black Americans, the stress of racial discrimination can lead to unhealthy blood pressure and insulin levels and inflammation (Ajilore & Thames; 2020; Brody et al., 2018; Lawrence et al., 2022). Black Americans who have experienced police brutality are also at greater risk of depression, anxiety, and heart disease (Alang et al., 2022; Freedman et al., 2022).

Stress also arises from the daily conflicts we face between our different **approach and avoidance motives** (Hovland & Sears, 1938; Lewin, 1935). Least stressful are the *approach-approach* conflicts, in which two attractive but incompatible options pull us—to choose tacos or pizza, a dance or music class, the green or the gray hoodie. Other times, we face an *avoidance-avoidance* conflict between two undesirable alternatives. Do you avoid studying a disliked subject, or avoid failure by doing your reading? Do you suffer someone's wrath for admitting the truth, or feelings of guilt for having lied?

In times of *approach-avoidance* conflict, we feel simultaneously attracted and repelled. You may enjoy your job but dislike its lack of remote work flexibility. From a distance, the goal—making a good living—looks appealing. But as you approach that goal, your avoidance tendency may begin to overtake your approach tendency and you feel an urge to escape. Stepping back, the negative aspects fade, and you again feel attracted. Stress multiplies when we face several approach-avoidance conflicts simultaneously—where to work, which courses to take, whom to date.

The Stress Response System

LOQ 39-2

How do we respond and adapt to stress?

Medical interest in stress began with Hippocrates (460–377 B.C.E.). Centuries later, Walter Cannon (1929) confirmed that the stress response is part of a unified mind-body system. He observed that extreme cold, lack of oxygen, and emotion-arousing events all trigger an outpouring of the adrenal stress hormones epinephrine and norepinephrine. When alerted by any of a number of brain pathways, the sympathetic nervous system arouses us, preparing the body for the wonderfully adaptive response Cannon called the **fight-or-flight response**. It increases heart rate and breathing, diverts blood from digestion to the skeletal muscles for greater mobility, dulls feelings of pain, and releases sugar and fat from the body's energy stores. The

sympathetic nervous system helps more with immediate or *acute* threats (a poisonous snake nearby) than with distant or looming threats (a climate apocalypse). By fighting or fleeing, we increase our chances of survival.

Since Cannon's time, physiologists have identified an additional stress response system. On orders from the cerebral cortex (via the hypothalamus and pituitary gland), the outer part of the adrenal glands secretes *glucocorticoid* stress hormones such as *cortisol.* The two systems work at different speeds, explained biologist Robert Sapolsky (2003): "In a fight-or-flight scenario, epinephrine is the one handing out guns; glucocorticoids are the ones drawing up blueprints for new aircraft carriers needed for the war effort." The epinephrine guns were firing at high speed during an experiment inadvertently conducted on a British Airways San Francisco to London flight. Three hours after takeoff, a mistakenly played message told passengers the plane was about to crash into the sea. Although the flight crew immediately recognized the error and tried to calm the terrified passengers, several required medical assistance (Associated Press, 1999).

Canadian scientist Hans Selye's (1936, 1976) 40 years of research on stress extended Cannon's findings. Selye's studies of animals' reactions to various stressors, such as electric shock and surgery, helped make stress a major concept in both psychology and medicine. Selye proposed that the body's adaptive response to stress is so general that, like a burglar alarm, it sounds, no matter what intrudes. He named

this response the general adaptation syndrome (GAS), which he saw as a three-phase process.

Let's say you're experiencing physical or emotional trauma:

- In ***Phase 1***, you have an ***alarm reaction***, as your sympathetic nervous system is suddenly activated. Your heart rate zooms. Blood is diverted to your skeletal muscles. With your resources mobilized, you are now ready to fight back.
- During ***Phase 2, resistance***, your temperature, blood pressure, and respiration remain high. Your adrenal glands pump epinephrine and norepinephrine into your bloodstream. You are fully engaged, summoning all your resources to meet the challenge. As time passes, with no relief from stress, your body's reserves begin to dwindle.
- You have reached ***Phase 3, exhaustion***. With exhaustion, you become more vulnerable to illness or, in extreme cases, collapse and even death.



Roz Chast/Cartoon Stock

Selye's basic point: Although the human body copes well with temporary stress, prolonged stress can damage it. Syria's civil war, for example, has taken a toll on Syrians' physical health and increased their risk for PTSD (Al Ibraheem et al., 2017; **FIGURE 39.4**). Severe childhood stress gets under the skin, leading to greater adult stress, sleeplessness, and heart disease (Jakubowski et al., 2018; Puterman et al., 2016; Talvitie et al., 2019). Some examples:

- In one 2-decade study, severely stressed Welsh children were three times more likely to develop heart disease as adults (Ashton et al., 2016).
- Black Americans who experience frequent racial discrimination develop shorter *telomeres*—DNA pieces protecting the chromosome ends (Chae et al., 2020). That helps explain why, compared with White Americans, Black Americans have a shorter life expectancy (CDC, 2020; Puterman et al., 2020).
- In studies of abused youth and stressed caregivers, those who were most stressed had cells that looked older than their chronological age (Nelles-McGee et al., 2022).

Severe stress ages people.

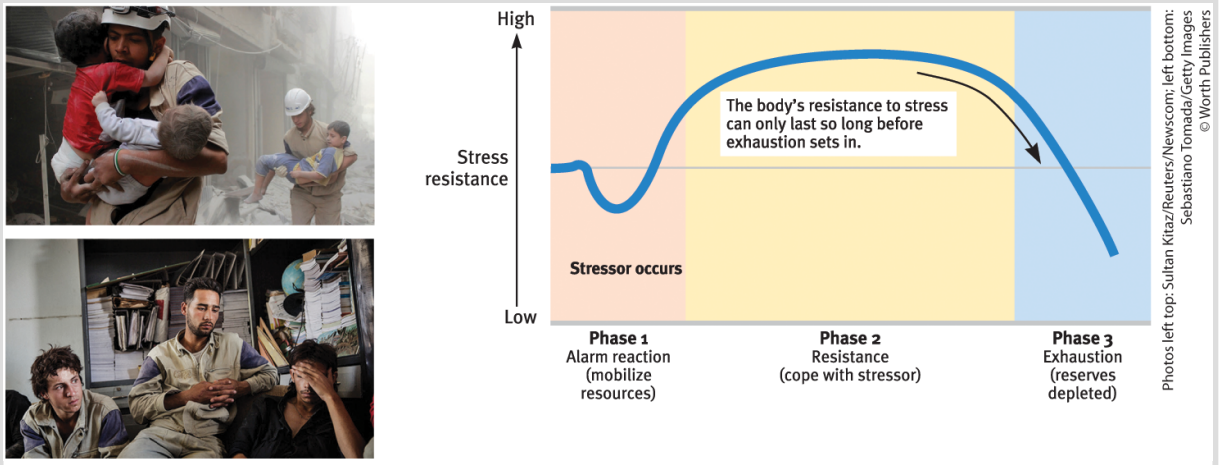


FIGURE 39.4 Selye's general adaptation syndrome Due to ongoing conflict, Syria's White Helmets (volunteer rescuers) were perpetually in "alarm reaction" mode, rushing to pull victims from the rubble after each fresh attack. As their resistance depleted, they risked exhaustion.

"We sleep afraid, we wake up afraid, and leave our homes afraid." — 15-year-old girl's Facebook post, describing her family's daily life in war-torn Yemen (al-Asaadi, 2016).

We respond to stress in other ways, too. One response is common after severe stress: Withdraw. Isolate. Conserve energy. Or act like a mouse, whose stressed-out brain induces them to recharge by taking a nap (Yu et al., 2022). (Do you also get sleepy when you're stressed?) Faced with an extreme disaster, such as a ship sinking, some people become paralyzed by fear. Another response, found among women more often than men, is to give and receive support—what's called the **tend-and-befriend response** (Lim & DeSteno, 2016; Taylor, 2006; von Dawans et al., 2019).



Streeter Lecka/Getty Images

Friendly foes Tending and befriending helped U.S. marathon rivals and good friends Kara Goucher and Shalane Flanagan cope with stress and excel. During the 2012 London Olympic Marathon, they battled intense rain and physical pain, finishing 1 second apart.

Bring to mind a personal experience related to the Covid pandemic. What stressors affected you? What stress responses did you experience? How did you cope?

Retrieval Practice

RP-1 When alerted to a negative, uncontrollable event, our _____ nervous system arouses us. Heart rate and respiration _____ (increase/decrease). Blood is diverted from digestion to the skeletal _____. The body releases sugar and fat. All this prepares the body for the _____-_____-_____ response.

ANSWERS IN APPENDIX E

Stress and Vulnerability to Disease

LOQ 39-3

How does stress make us more vulnerable to disease?

It often pays to spend our resources in fighting or fleeing an external threat. But we do so at a cost. When stress is momentary, the cost is small. When stress persists, the cost may be greater, in the form of lowered resistance to infections and other threats to mental and physical well-being.

To study how stress—and healthy and unhealthy behaviors—influence health and illness, psychologists and physicians created the interdisciplinary field of *behavioral medicine*, integrating behavioral and medical knowledge. **Health psychology** provides psychology's contribution to behavioral medicine. A branch of health psychology called **psychoneuroimmunology** focuses on mind-body interactions (Kiecolt-Glaser, 2009; Kipnis, 2018). This awkward name makes sense: Your thoughts and feelings *(psycho)* influence your brain *(neuro)*, which influences the endocrine hormones that affect your disease-fighting *immune* system. And this subfield is the study *(ology)* of those interactions.

> **"I've stopped turning the telly on. I've had to because the news was making me ill."** — U.K. nurse explaining how she coped with stress during the Covid pandemic (Kinsella et al., 2022).

If you've ever had a stress headache, or felt your blood pressure rise with anger, you know that our psychological states have physiological effects. Stress can even leave you less able to fight off disease because your nervous and endocrine systems influence your immune system (Sternberg, 2009). You can think of the immune system as a complex surveillance system. When it functions properly, it keeps you healthy by isolating and destroying bacteria, viruses, and other invaders. Four types of cells are active in these search-and-destroy missions (**FIGURE 39.5**).

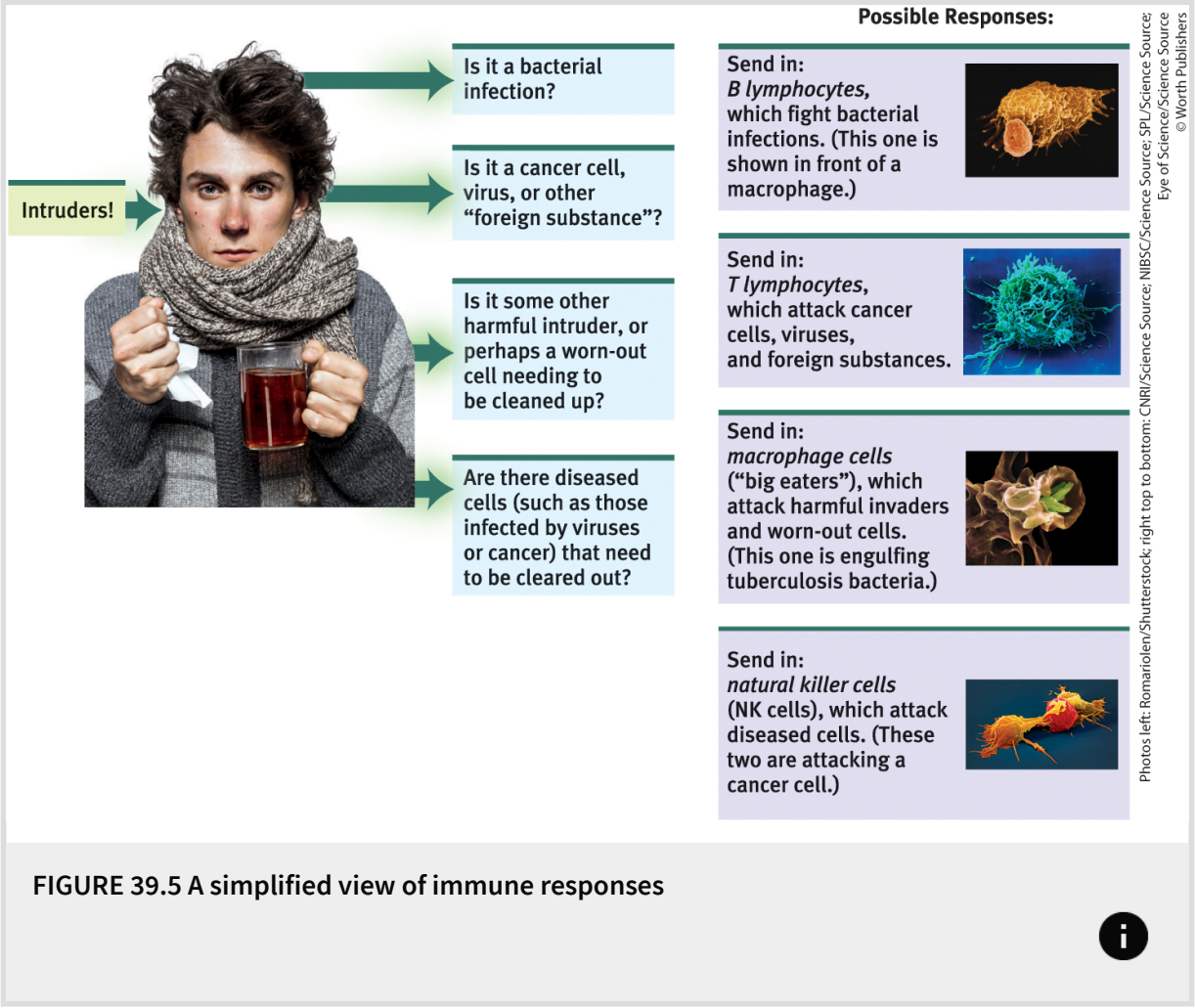


FIGURE 39.5 A simplified view of immune responses

Your age, nutrition, genetics, and stress level all influence your immune system's activity. When your immune system doesn't function properly, it can err in two directions:

1. ***Overreacting.*** The immune system may attack the body's own tissues, causing an allergic reaction or a self-attacking disease, such as lupus, multiple sclerosis, or some forms of arthritis. Women, who are immunologically stronger than men, are more susceptible to such *autoimmune diseases* (Nussinovitch & Schoenfeld, 2012; Schwartzman-Morris & Putterman, 2012).

2. ***Underreacting.*** The immune system may allow a bacterial infection to flare, a dormant virus to erupt, or cancer cells to multiply. To protect transplanted organs, which the recipient's body treats as foreign invaders, a patient's immune system may be deliberately suppressed.

Immune system suppression has been observed in animals stressed by physical restraints, unavoidable electric shocks, noise, crowding, cold water, social defeat, or separation from their mothers (Maier et al., 1994). One study monitored immune responses in 43 monkeys over 6 months (Cohen et al., 1992). Half were left in stable groups. The rest were stressed by being housed with new roommates—three or four new monkeys each month. By the end of the experiment, the socially disrupted monkeys had weaker immune systems.

Human immune systems react similarly. Three examples:

- ***Surgical wounds heal more slowly in stressed people.*** In one experiment, dental students received punch wounds (precise small holes punched in the skin). Compared with wounds placed during summer vacation, those placed three days before a major exam healed 40 percent more slowly (Kiecolt-Glaser et al., 1998). In other studies, marriage conflict has also slowed punch-wound healing (Kiecolt-Glaser et al., 2005).
- ***Stressed people are more vulnerable to illness.*** Major life stress increases the risk of a respiratory infection (Pedersen et al., 2010). When psychologist Sheldon Cohen and his colleagues dropped a cold virus into people's noses, 47 percent of those

living stress-filled lives developed colds (FIGURE 39.6). Among those living relatively free of stress, only 27 percent did. In a U.K. study, high stress levels at the outset of the Covid pandemic predicted a greater likelihood of Covid infection eight months later (Ayling et al., 2022).

- ***Stress can hasten the course of disease.*** As its name tells us, *AIDS (acquired immune deficiency syndrome)* is an immune disorder, caused by the *human immunodeficiency virus (HIV).* Stress cannot give people AIDS. But a global analysis of 33,252 found that stress and negative emotions sped the transition from HIV infection to AIDS. And stress predicted a faster decline in those with AIDS (Chida & Vedhara, 2009).

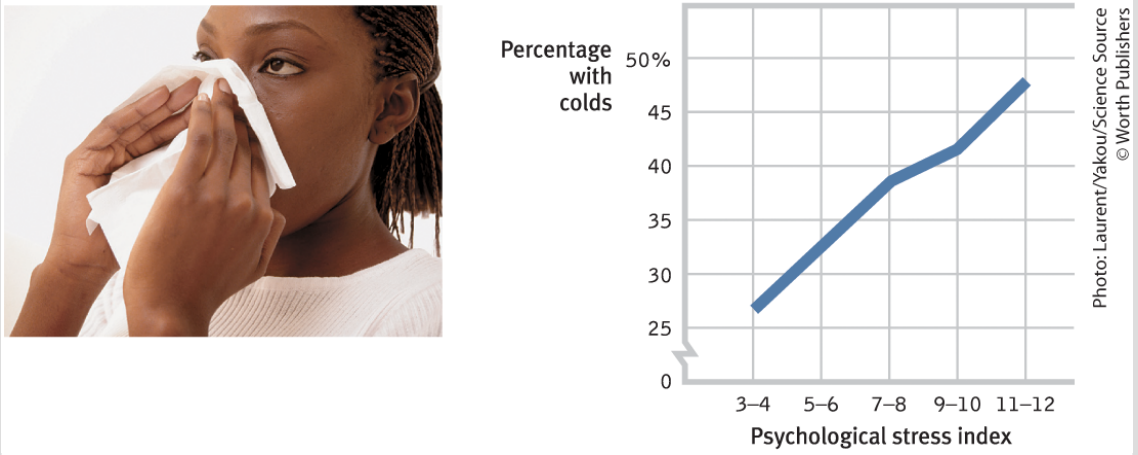


FIGURE 39.6 Stress and colds People with the highest life stress scores were also most vulnerable when exposed to an experimentally delivered cold virus (Cohen et al., 1991).

The stress effect on immunity makes physiological sense. It takes energy to track down invaders, produce swelling, and maintain fevers.

Thus, when diseased, your body reduces its muscular energy output by decreasing activity (and increasing sleep). Stress creates a competing energy need. During an aroused fight-or-flight reaction, your stress responses divert energy from your disease-fighting immune system and send it to your muscles and brain. This renders you more vulnerable to illness. Even within twin pairs, the less happy twin tends to die first (Saunders et al., 2018). *The point to remember:* Stress gets under the skin. It does not make us sick, but it does alter our immune functioning, which leaves us less able to fight infection and more likely to get sick.

Retrieval Practice

RP-2 The field of _____ studies mind-body interactions, including the effects of psychological, neural, and endocrine functioning on the immune system and overall health.

RP-3 What general effect does stress have on our health?

ANSWERS IN APPENDIX E

Stress and Heart Disease

LOQ 39-4

Why are some of us more prone than others to coronary heart disease?

Imagine a world where you wake up each day, make your breakfast, and check the news. Among the headlines, you see that 64 jumbo jets crashed again yesterday, killing another 25,000 passengers. You finish your breakfast and go on with your morning. It's just an average day.

Replace airline crashes with **coronary heart disease**, the United States' leading cause of death, and you have reentered reality. More than 9 million people die annually from heart disease (Roth et al., 2020). High blood pressure and a family history of the disease increase the risk. So do smoking, obesity, an unhealthy diet, physical inactivity, and a high cholesterol level. Such factors—along with more opioid deaths, the Covid pandemic, and economic inequality—help explain why, despite spending much more on health care, U.S. life expectancy is lower than in other high-income countries, and has been declining since 2014 (Rabin, 2022; Roser, 2021). Worldwide, coronary heart disease kills more men than women (Zhang et al., 2021).

Stress and personality also play a big role in heart disease. The more ongoing stress people experience, the more their bodies generate inflammation, which is associated with heart and other health problems, including depression (Madison et al., 2022). Plucking a hair and measuring its level of the stress hormone cortisol can help indicate whether women were exposed to violence or children have experienced prolonged stress (Bürgin et al., 2022; Lynch et al., 2022). Cortisol in a fingernail clipping can also indicate people's prior stress exposure and current heart problems and depression (Izawa et al., 2017; Phillips et al., 2021).

The Effects of Personality, Pessimism, and Depression

In a classic study, Meyer Friedman, Ray Rosenman, and their colleagues tested the idea that stress increases vulnerability to heart disease. At different times of the year, they measured the blood cholesterol level and clotting speed of 40 U.S. male tax accountants (Friedman & Ulmer, 1984). The test results were initially typical, but as the accountants scrambled to finish their clients' tax returns before the April 15 filing deadline, their cholesterol and clotting measures rose to dangerous levels. After the deadline, the measures returned to typical levels. For these men, stress predicted heart attack risk.

The researchers then launched a *longitudinal study* of more than 3000 healthy middle-aged men. They interviewed each man for 15 minutes, noting his work and eating habits, manner of talking, and other behavior patterns, and then identified him as either **Type A** or **Type B** (with a roughly equal number of each type).

> In India and the United States, Type A bus drivers are literally hard-driving: They brake, pass, and honk their horns more often than their more easygoing Type B colleagues (Evans et al., 1987).

Nine years later, 257 men had experienced heart attacks—69 percent of them Type A. Moreover, not one of the "pure" Type Bs—the most mellow and laid-back of their group—had experienced a heart attack.

As often happens in science, this exciting discovery provoked both enormous public interest and researchers' curiosity. Was the finding reliable? If so, what was the toxic component of the Type A profile? Time-consciousness? Competitiveness? Anger?

Hundreds of other studies have since explored possible psychological predictors of cardiovascular disease (Chida & Hamer, 2008; Chida & Steptoe, 2009). These reveal that Type A's toxic core is negative emotions—especially the anger associated with an aggressively reactive temperament. Their often-active sympathetic nervous system redistributes blood flow to their muscles, pulling it away from their internal organs. The liver, which usually removes cholesterol and fat from the blood, can't do its job. Thus, excess cholesterol and fat may continue to circulate in the blood and later get deposited around the heart. Hostility also correlates with other risk factors, such as smoking, drinking, and obesity (Bunde & Suls, 2006). Our mind and heart interact.

In Western cultures, suppressing negative emotions increases gloomy moods, relationship problems, and health risks (Cameron & Overall, 2018; Kitayama et al., 2015). Many studies have also found that people who react with anger over little things are the most coronary-prone. Rage "seems to lash back and strike us in the heart muscle" (Spielberger & London, 1982). To have a healthy body and mind, learn how to reframe unpleasant events ("I have overcome obstacles like this before" or "There are other positive aspects of my life") and pause

when agitated rather than letting your anger erupt. (For some tips on managing anger, see Module 38.)

> **"A cheerful heart is a good medicine, but a downcast spirit dries up the bones."**
> — Proverbs 17:22

Ask Yourself

Do you think you are Type A, Type B, or somewhere in between? In what ways has this tendency been helpful to you, and in what ways has it been a challenge?

Chronic pessimism may be similarly toxic. In 10 longitudinal studies, researchers compared health records among 215,000 people who scored as optimists, pessimists, or neither (Krittanawong et al., 2022). When the researchers followed up with participants years later, they found that pessimists were 43 percent more likely than optimists to develop heart disease and 13 percent more likely to be dead (**FIGURE 39.7**). Pessimism's pestilence even emerged among people in their eighties and nineties, with pessimistic participants at greater risk of dying over the next 5 years (Jacobs et al., 2021).

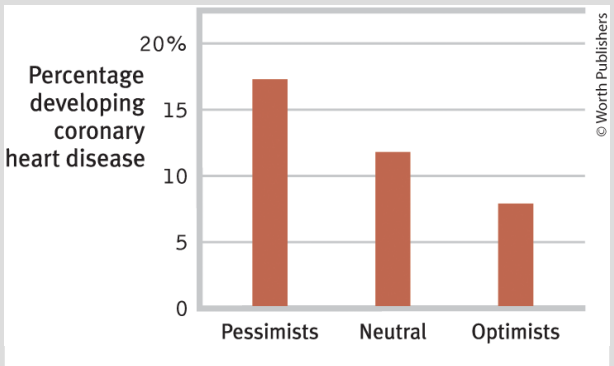


FIGURE 39.7 Pessimism and heart disease
(Data from Krittanawong et al., 2022.)

Happiness also matters. Happy and consistently satisfied people tend to be healthy and to outlive their unhappy peers (Diener et al., 2017; Gana et al., 2016; Martín-María et al., 2017). People with big smiles tend to have extensive social networks, which predict longer life (Hertenstein et al., 2009). Boosting people's happiness (with a 10-week educational and skills-building experimental intervention) reduced their subsequent sick days (Kushlev et al., 2020). Having a happy spouse also predicts better health (Chopik & O'Brien, 2017). Happy you, healthy me.

As we noted earlier, depressed people tend to age faster and die sooner (Han et al., 2018). This is in part because depressed people often smoke more and exercise less (Whooley et al., 2008). In one study, nearly 4000 English adults (ages 52 to 79) provided mood reports from a single day. Compared with those in a good mood, those in a depressed mood were twice as likely to be dead 5 years later (Steptoe & Wardle, 2011). In a U.S. survey of 164,102 adults, those who

had experienced a heart attack were twice as likely to report also having been depressed at some point in their lives (Witters & Wood, 2015). And in the years following a heart attack, people with high scores for depression were four times more likely than their low-scoring counterparts to develop further heart problems (Frasure-Smith & Lesperance, 2005). Depression is disheartening.

Retrieval Practice

RP-4 Which component of the Type A personality has been linked most closely to coronary heart disease?

ANSWERS IN APPENDIX E

Stress and Inflammation

Stress is also disheartening: Work stress, involuntary job loss, and trauma-related stress symptoms increase heart disease risk (Allesøe et al., 2010; Gallo et al., 2006; Kubzansky et al., 2009; Slopen et al., 2010).



Robin Jerstad/ZUMAPRESS/Newscom

A broken heart? Two days after Irma Garcia was tragically killed in the Uvalde, Texas, elementary school massacre, her husband Joe Garcia died of a heart attack at age 50. Might grief-related depression and stress hormones have contributed to his death? In a British study, older adults were at increased risk for a stroke or heart attack in the month following a partner's death (Carey et al., 2014).

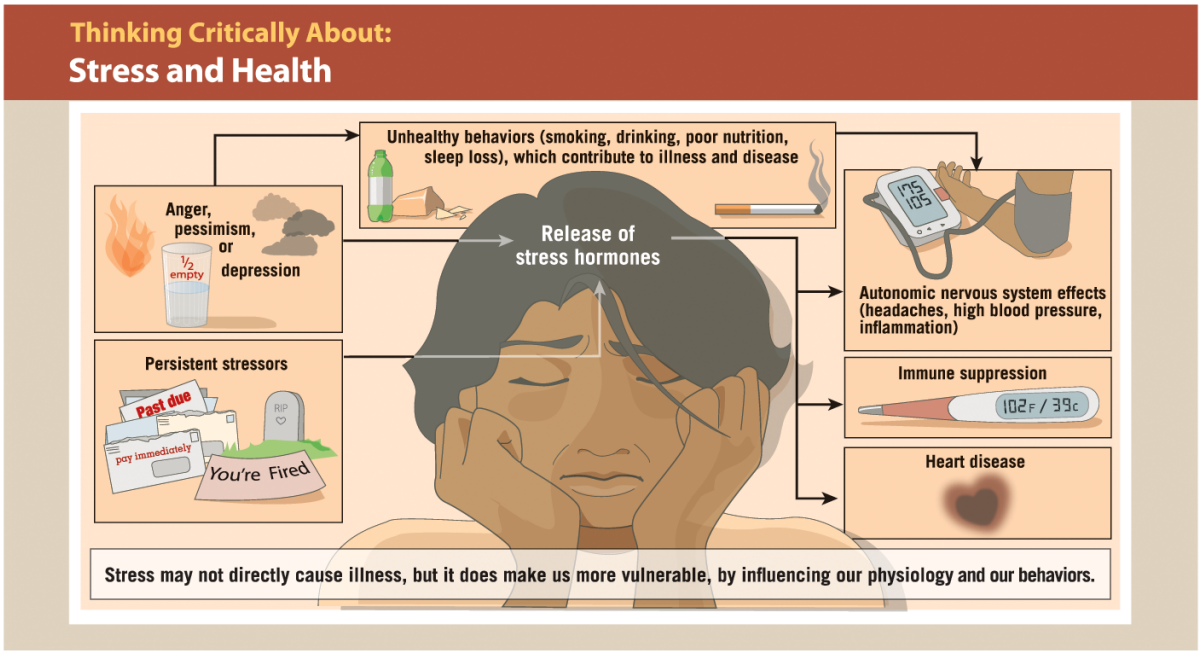
Both heart disease and depression may result when chronic stress triggers blood vessel inflammation, disrupting the body's disease-fighting immune system (Miller & Blackwell, 2006; Mommersteeg et al., 2016). People who experience social threats, including harshly raised children, are more prone to inflammation responses (Chiang et al., 2022; Dickerson et al., 2009). So are bereaved spouses experiencing severe grief (Brown et al., 2022). Inflammation fights infections. But

persistent inflammation can produce problems such as asthma or clogged arteries, and worsen depression (Enache et al., 2019; Sforzini et al., 2019).

So, stress can affect our health in many ways. (See Thinking Critically About: Stress and Health.) The stress-illness connection is a price we pay for the benefits of stress. Stress invigorates our lives by arousing and motivating us (see the What Drives Us modules for a discussion of motivation). An unstressed life would hardly be challenging, productive, or even safe.

LOQ 39-5

So, does stress *cause* illness?



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Research on stress and health reminds us that psychological states are physiological events that influence other parts of our physiological system. Just pausing to *think* about biting into an orange wedge—imagine the sweet, tangy juice from the pulpy fruit flooding across your tongue—can trigger salivation. As the ancient Indian text the Mahābhārata recognized, "Mental disorders arise from physical causes, and likewise physical disorders arise from mental causes." We are biopsychosocial systems.

REVIEW

Module 39: Stress and Illness

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 39-1: How does our appraisal of an event affect our stress reaction, and what are the three main types of stressors?

LOQ 39-2: How do we respond and adapt to stress?

LOQ 39-3: How does stress make us more vulnerable to disease?

LOQ 39-4: Why are some of us more prone than others to coronary heart disease?

LOQ 39-5: So, does stress *cause* illness?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

stress
approach and avoidance motives
fight-or-flight response
general adaptation syndrome (GAS)
tend-and-befriend response
health psychology
psychoneuroimmunology
coronary heart disease
Type A
Type B

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. The number of short-term illnesses and stress-related psychological disorders was higher than usual in the months following an earthquake. Such findings suggest that
   a. daily hassles have adverse health consequences.
   b. experiencing a very stressful event increases a person's vulnerability to illness.
   c. the amount of stress a person feels is directly related to the number of stressors experienced.
   d. daily hassles don't cause stress, but catastrophes can be toxic.

2. Which of the following is NOT one of the three main types of stressors?
   a. Catastrophes
   b. Significant life changes
   c. Daily hassles
   d. Pessimism

3. Selye's general adaptation syndrome (GAS) consists of an alarm reaction followed by _____, then _____.

4. When faced with stress, women are more likely than men to show a _____-and-_____ response.

5. Stress can suppress the _____ _____ by prompting a decrease in the release of cells that ordinarily attack bacteria, viruses, cancer cells, and other foreign substances.

6. A Chinese proverb warns, “The fire you kindle for your enemy often burns you more than him.” How is this true of Type A people?

MODULE 40: Health and Coping

Promoting health begins with implementing strategies that prevent illness and enhance wellness. Traditionally, people have thought about their health only when something goes wrong and they visit a physician. That, say health psychologists, is like ignoring a car's maintenance and going to a mechanic only when the car breaks down. Health maintenance includes alleviating stress, preventing illness, and promoting well-being.

Coping With Stress

LOQ 40-1

In what two ways do people try to alleviate stress?

Stressors are unavoidable. This fact, coupled with the fact that persistent stress correlates with heart disease, depression, and lowered immunity, gives us a clear message. We need to learn to **cope** with the stress in our lives.

Coping Strategies

We address some stressors directly, with **problem-focused coping**. If our impatience leads to a family fight, we may go directly to that

family member to work things out. We tend to use problem-focused strategies when we feel a sense of control over a situation and think we can change the circumstances, or at least change ourselves to deal with the circumstances more capably. We turn to **emotion-focused coping** when we believe we cannot change a situation. If, despite our best efforts, we cannot get along with that family member, we may relieve stress by reaching out to friends for support and comfort. Some emotion-focused strategies can harm our health, such as when we respond by eating unhealthy comfort foods. When challenged, some of us tend to respond with problem-focused coping, others with emotion-focused coping (Connor-Smith & Flachsbart, 2007). Our feelings of personal control, our explanatory style, our sense of humor, and our supportive connections all influence our ability to cope successfully.

Retrieval Practice

RP-1 To cope with stress when we feel in control of our world, we tend to use _____ (emotion/problem)-focused strategies. To cope with stress when we believe we cannot change a situation, we tend to use _____ (emotion/problem)-focused strategies.

ANSWERS IN APPENDIX E

Perceived Lack of Control

LOQ 40-2

How does a perceived lack of control affect health?

Picture the scene: Two rats receive simultaneous shocks. Only one of them can turn a wheel to stop the shocks. The helpless rat, but not the wheel turner, becomes more susceptible to ulcers and lowered immunity to disease (Laudenslager & Reite, 1984). In humans, too, uncontrollable threats trigger the strongest stress responses (Dickerson & Kemeny, 2004).

Any of us may feel helpless, hopeless, and depressed after experiencing a series of bad events beyond our **personal control**. One Syrian refugee in Canada reflected on life during the Covid-19 pandemic: "We have all been made refugees by this virus, trapped and terrified. We are all in this together, facing the same pandemic" (Al-Kontar, 2020). Martin Seligman and his colleagues have shown that for some animals and people, a series of uncontrollable events creates a state of **learned helplessness**. In experiments (which likely would not be repeated today), dogs were strapped in a harness and given repeated shocks, with no opportunity to avoid them (Seligman & Maier, 1967). Later, when placed in another situation where they *could* escape the punishment by simply leaping a hurdle, the dogs displayed learned helplessness; they cowered as if without hope. Other dogs that had been able to escape the first shocks reacted differently. They had

learned they were in control and easily escaped the shocks in the new situation (Seligman & Maier, 1967). People have shown similar patterns of learned helplessness (Abramson et al., 1978, 1989; Seligman, 1975).

Perceiving a loss of control, we become more vulnerable to ill health. This is an especially serious problem for older people, who are highly susceptible to health problems and also perceive the greatest loss of control (Drewelies et al., 2017). In a famous study of elderly nursing home residents, those who perceived the least amount of control over their activities declined faster and died sooner than those given more control (Rodin, 1986). Workers able to adjust office furnishings and control interruptions and distractions in their work environment have also experienced less stress (O'Neill, 1993). Such findings help explain why British executives have tended to outlive those in clerical or laboring positions, and why Finnish workers with low job stress have been less than half as likely to die of stroke or heart disease as those with a demanding job and little control. The more control workers have, the longer they live (Bosma et al., 1997, 1998; Kivimaki et al., 2002; Marmot et al., 1997).

Poverty entails less control of one's life, which helps explain a link between economic status and longevity (Jokela et al., 2009). In one study of 843 grave markers in an old cemetery in Glasgow, Scotland, those with the costliest, highest pillars (indicating the most affluence) tended to have lived the longest (Carroll et al., 1994). Likewise, U.S. presidents, who are generally high-income and well-educated, have

had above-average life spans (Olshansky, 2011). Across cultures, high economic status predicts a lower risk of heart and respiratory diseases (Sapolsky, 2005). High-income parents also tend to have healthy, advantaged children (Savelieva et al., 2016). With higher economic status comes reduced risk of low birth weight, infant mortality, smoking, and violence. Even among other primates, those at the bottom of the social pecking order have been more likely than their higher-status counterparts to become sick when exposed to a cold virus (Cohen et al., 1997).

When rats cannot control shock or when humans or other primates feel unable to control their environment, stress hormone levels rise, blood pressure increases, and immune responses drop (Rodin, 1986; Sapolsky, 2005). The greater nurses' workload, the higher their cortisol level and blood pressure—but only among nurses who reported little control over their environment (Fox et al., 1993). The crowding in high-density neighborhoods, prisons, and college and university dorms is another source of diminished feelings of control—and of elevated levels of stress hormones and blood pressure (Fleming et al., 1987; Ostfeld et al., 1987).



Adrees Latif/Reuters/Newscom

Separation stress In 2018, new U.S. immigration policies led to thousands of immigrating children being separated from their parents at the southern border. Children isolated from parents and held in detention camps lose a sense of control, making them vulnerable to physical and psychological problems.

Benefits of Boosting Control

Increasing control—allowing prisoners to move chairs and to control room lights and the TV, having workers participate in decision making, allowing people to personalize their workspace—has often improved health and morale (Humphrey et al., 2007; Ng et al., 2012; Ruback et al., 1986). In the case of nursing home residents, 93 percent of those who were given more control over how they arranged their room and spent their time became more alert, active, and happy (Langer & Rodin, 1976). As researcher Ellen Langer concluded, "Perceived control is basic to human functioning" (1983, p. 291). "For the young and old alike," she suggested, environments should

enhance people's sense of control over their world. No wonder mobile devices and online streaming, which enhance our control of the content and timing of our entertainment, are so popular.

People thrive when they live in conditions of personal freedom and empowerment. At the national level, citizens of stable democracies report higher levels of happiness (Inglehart et al., 2008). Freedom and personal control foster human flourishing. But does ever-increasing choice breed ever-happier lives? Today's Western cultures may offer an "excess of freedom"—too many choices. The result can be decreased life satisfaction, increased depression, or even behavior paralysis (Schwartz, 2000, 2004). In one study, people offered a choice of one of 30 brands of jam or chocolate were less satisfied with their decision than were others who had chosen from only 6 options (Iyengar & Lepper, 2000). This *tyranny of choice* brings information overload and a greater likelihood that we will feel regret over some of the things we left behind (Chernev et al., 2015). Do you, too, ever waste time agonizing over too many choices?

Internal Versus External Locus of Control

Consider your own perceptions of control, and how they have been influenced by your upbringing and culture. Do you believe that your life is beyond your control? That getting a good job depends mainly on being in the right place at the right time? Or do you more strongly believe that you control your own fate? That being a success is a matter of hard work?

Hundreds of studies have compared people who differ in their perceptions of control. On one side are those who have what psychologist Julian Rotter called an **external locus of control**. In one study of more than 1200 Israeli people exposed to missile attacks, those with an external locus of control experienced the most *posttraumatic stress* symptoms (Hoffman et al., 2016). On the other side are those who perceive an **internal locus of control**. In study after study, the "internals" have achieved more in school and work, acted more independently, enjoyed better health, and felt less depressed than did the "externals" (Lefcourt, 1982; Ng et al., 2006). In longitudinal research on more than 7500 people, those who had expressed a more internal locus of control at age 10 exhibited less obesity, lower blood pressure, and less distress at age 30 (Gale et al., 2008). Compared with nonleaders, military and business leaders have lower-than-average levels of stress hormones and report less anxiety, thanks to their greater sense of control (Sherman et al., 2012).

Compared with their parents' generation, today's U.S. youth more often express an external locus of control (Twenge et al., 2004). This shift may help explain an associated increase in rates of depression and other psychological disorders in young people (Twenge et al., 2010).

We tend to believe we are in control of our own life when we say we have *free will.* Studies show that people who believe they have free will behave more helpfully, learn better, and persist and perform better at work (Job et al., 2010; J. Li et al., 2018; Stillman et al., 2010). Across

varied cultures, those who believe in free will also experience greater job satisfaction (Feldman et al., 2018). Belief in free will feeds *self-control*—to which we turn next.

Ask Yourself

How much control do you have over your life? How much do others (family members, friends, work supervisors) control your life? What changes could you make to increase your sense of control?

Building Self-Control

LOQ 40-3

Why is self-control important, and can our self-control be depleted?

When we have a sense of personal control over our lives, we are more likely to develop **self-control**—the ability to control impulses and delay short-term gratification for longer-term rewards. Self-control predicts good health, higher income, and better school performance (Bub et al., 2016; Keller et al., 2016; Moffitt et al., 2011). In studies of American, Asian, and New Zealander children, self-control outdid intelligence test scores in predicting future academic and life success (Duckworth & Seligman, 2005, 2017; Poulton et al., 2015; Wu et al., 2016).



Brian Fairbrother/LatitudeStock/Alamy Stock Photo

Extreme self-control Our ability to exert self-control increases with practice, and some of us have a lot of practice! This performer has made her living as a very convincing human statue on The Royal Mile in Edinburgh, Scotland.

Strengthening self-control is key to coping effectively with stress. Doing so requires attention and energy—similar to strengthening a muscle. It's easy to form bad habits, but it takes hard work to break them. With frequent practice in overcoming unwanted urges, people have improved their self-management of anger, dishonesty, smoking, and impulsive spending (Beames et al., 2017; Wang et al., 2017).

Although self-control grows stronger with exercise, it may also weaken after use and need rest to recover (Baumeister & Vohs, 2016). While some researchers debate the reliability of this effect (Hagger et al., 2016), others have shown that exercising willpower can temporarily consume the mental energy we need for self-control on other tasks (Dang et al., 2021; Vohs et al., 2021). In one famous experiment, hungry people expended willpower to resist eating tasty cookies. They then abandoned a frustrating task sooner than those who hadn't had to deal with the cookies (Baumeister et al., 1998).

The bottom line: Research on self-control teaches us that developing self-discipline can lead to a healthier, happier, and more successful life (Baumeister et al., 2018; Tuk et al., 2015). Delaying a little fun now can lead to bigger future rewards. And persevering through today's struggles builds an inner strength that enables us to tackle tomorrow's challenges.

Explanatory Style: Optimism Versus Pessimism

LOQ 40-4

How does an optimistic outlook affect health and longevity?

Our outlook—what we expect from the world—influences how we cope with stress. Pessimists expect things to go badly (Aspinwall & Tedeschi, 2010). They attribute their poor performance to a basic lack

of ability ("I can't do this") or to situations enduringly beyond their control ("There is nothing I can do about it"). Optimists do the opposite by expecting more control, coping ability, and better health (Aspinwall & Tedeschi, 2010; Boehm & Kubzansky, 2012; Hernandez et al., 2015). During a semester's final month, optimistic students reported the least fatigue and fewer coughs, aches, and pains. And during the stressful first few weeks of law school, optimists enjoyed better moods and stronger immune systems (Segerstrom et al., 1998). Optimists tend to have optimal health.

Optimists have tended to get better grades because they respond to setbacks with a hopeful attitude that they can improve (Noel et al., 1987; Peterson & Barrett, 1987). Optimists and their romantic partners generally manage conflict constructively, resulting in feeling more supported and satisfied with the resolution and with their relationship (Srivastava et al., 2006). Optimism relates to well-being and success in many places, from Europe and North America to China and Japan (Qin & Piao, 2011).

> **"I do the very best I can to look upon life with optimism and hope and looking forward to a better day."** — Civil rights activist Rosa Parks, "Standing Up for Freedom," 2005

Consider the consistency and startling magnitude of the optimism and positive emotions factor in several longitudinal studies:

- *Long lives.* One research team followed 70,021 nurses over time; those scoring in the top quarter on optimism were nearly 30 percent less likely to have died than those scoring in the bottom quarter (Kim et al., 2017). Even greater optimism-longevity differences have been found in studies of Finnish men and U.S. Vietnam War veterans (Everson et al., 1996; Phillips et al., 2009). In long-term studies of nurses and veterans, the most optimistic were 50 to 70 percent more likely than pessimists to live beyond age 85 (Lee et al., 2019). In fact, just being not-pessimistic predicts good health (Scheier et al., 2021).
- *The famous "Nuns Study."* A classic study followed up on 180 Catholic nuns who had written brief autobiographies at about 22 years of age and had thereafter lived similar lifestyles. Those who had expressed happiness, love, and other positive feelings in their autobiographies lived an average 7 years longer than their more dour counterparts (Danner et al., 2001). By age 80, some 54 percent of those expressing few positive emotions had died, as had only 24 percent of the most positive-spirited.
- *Optimism and the end of life.*Optimists not only live longer lives, they approach the end of life positively. One study followed more than 68,000 U.S. women, ages 50 to 79 years, for nearly 2 decades (Zaslavsky et al., 2015). As death grew nearer, the optimists tended to feel more life satisfaction than did the pessimists.

Optimism runs in families, so some people are born with a sunny, hopeful outlook. If one identical twin is optimistic, the other typically will be, too (Bates, 2015; Mosing et al., 2009).

The good news is that all of us, even the most pessimistic, can learn to become more optimistic. Compared with a control group of pessimists who simply kept diaries of their daily activities, pessimists in a skill-building group—who learned ways of seeing the bright side of difficult situations and of viewing their goals as achievable—reported lower levels of depression (Sergeant & Mongrain, 2014). In other experiments, people instructed to imagine their best possible future—one where they have worked hard and succeeded in all their life goals—became more optimistic (Malouff & Schutte, 2017). Positive expectations often motivate eventual success: Optimism is the light bulb that can brighten anyone's life.

Emotion Regulation

LOQ 40-5

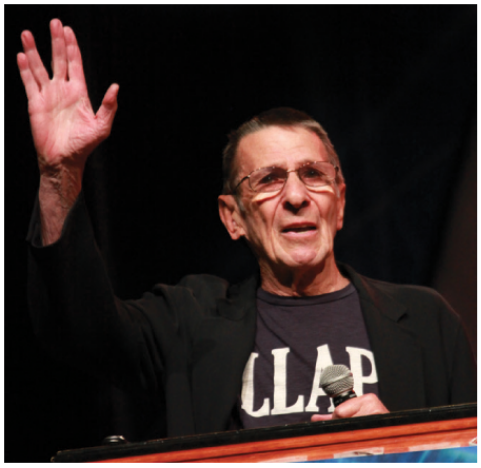
How does controlling our feelings affect our well-being and health?

Life is full of emotions. A frustrating conversation with a friend can throw us off for the rest of the day. An upcoming class presentation can strike us with fear and get our heart pounding. People vary in how often and how well we manage our feelings. And how we navigate our emotional ups and downs matters for our health.

> **"Getting angry … is easy and everyone can do it; but doing it … in the right amount, at the right time, and for the right end, and in the right way is no longer**

easy, nor can everyone do it." — Aristotle, *Nicomachean Ethics* (II.9, 1109a27)

Our emotions can be our best friends or our worst enemies—it all depends how well we manage them (Gross, 2013). Think back to a time when you felt really upset. Were you able to control your feelings? Healthy **emotion regulation** enables more happiness, better life satisfaction, closer social relationships, and even less depression and anxiety (Aldao et al., 2010; Gross, 1998).





Left: David Livingston/Getty Images; right: Photofest

Control contrasts Some actors seem to have complete control over their feelings (Leonard Nimoy, who was nearly as calm in real life as his *Star Trek* character, Spock). Others seem to have much less emotional control (Tom Cruise famously expressing his feelings for a new girlfriend on the Oprah Winfrey Show).

In what ways do we change our feelings? We can increase or decrease emotional intensity and how long our feelings last, and we can control which kinds of emotions we feel (Gross et al., 2011). People most often report trying to decrease their negative feelings (sadness, anger, worry) and increase their positive feelings (joy, love, contentment)

(Gross et al., 2006; Quoidbach et al., 2010). But sometimes people aim for the reverse: They may embrace their anger at social justice protests. And any parent knows the importance of helping young children calm excited feelings before bedtime (FIGURE 40.1).

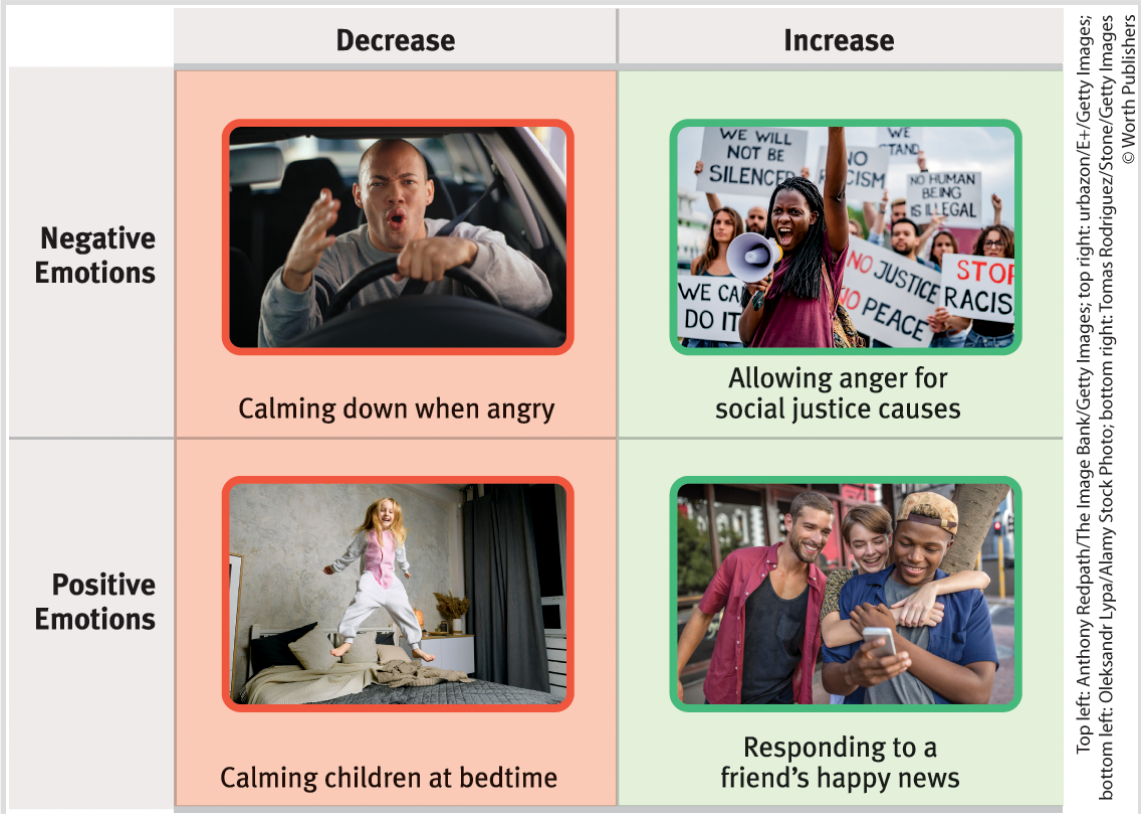


FIGURE 40.1 How do we change our feelings? We can decrease or increase all of our feelings, both negative and positive.

The idea that changing our thoughts upstream can shape our moods and feelings downstream is at the heart of modern-day cognitive therapy for depression and anxiety (see the Therapy modules). Psychologist James Gross (1998, 2015) describes three strategies

people often use—with the first two usually being more helpful than the third.

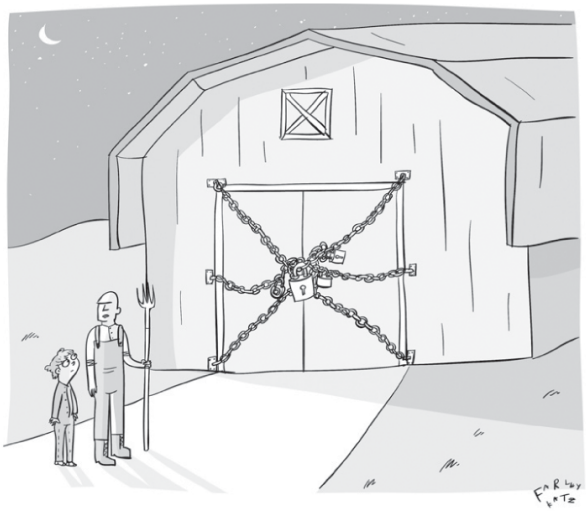
- ***Situation selection*** Change your situation to alter your feelings, such as by getting new roommates.
- ***Cognitive reappraisal*** Think about a situation in a more neutral way to dampen its negativity, such as reminding yourself that a mediocre grade on an exam could have been worse.
- ***Suppression*** Contain those feelings, as when forcing a smile after an argument. (As we will see, this strategy can backfire.)

Some strategies seem to benefit us more than others. In one study, participants watched a disturbing video of a gory medical procedure. Researchers had asked some viewers to step back and "adopt a detached and unemotional attitude" *(reappraisal)*, and others to "behave so that someone watching you would not know that you are feeling anything at all" *(suppression)*. Compared with those in the emotion suppression group, participants who used the reappraisal strategy had a lower bodily stress response and experienced fewer negative emotions (Gross, 1998). Using reappraisal regularly also promotes health and well-being. Using *situation selection* is associated with greater emotional well-being and happiness, and less depression (Webb et al., 2017; **TABLE 40.1**).

Table 40.1 Consequences of Three Emotion Regulation Strategies

Emotion Regulation Strategy	Definition	Consequences

Situation selection	Changing your situation to influence your feelings	• Greater well-being and happiness • More positive emotions; fewer negative emotions • Less depression
Reappraisal	Changing how you *think* about a situation to influence your feelings	• Better social relationships • Better coping with stress • More positive emotions
Suppression	Hiding or dampening your emotional expression	• Feeling less authentic in social life • Poorer coping with stress • Fewer positive emotions; more negative emotions



Farley Katz/Cartoon Stock

"This is the barn where we keep our feelings. If a feeling comes to you, bring it out here and lock it up."

Unhealthy emotion regulation

Four Tips for Managing Emotions

Psychology's toolkit offers four tips for managing your emotions.

1. ***Accept rather than criticize your feelings, and embrace a diversity of emotions.*** We navigate many emotional ups and downs throughout our day. That is perfectly okay—our emotions are pieces of information about our world that help us get through tough times and appreciate good ones. A sad mood may remind us of what matters to us, and a dose of fear can keep us alert and safe. We are healthier when we let ourselves feel our natural negative and positive emotions rather than pressuring ourselves to be happy all the time (Quoidbach et al., 2014; see also emodiversity.org). Adopting an accepting, matter-of-fact attitude toward emotions helps our mental and physical health.
2. ***Develop an emotion road map.*** Rather than wandering among emotions, decide when, where, and how you can enable your desired emotions. For example, you might strategize about how to reduce angry outbursts or how to replace jealousy with excitement when congratulating a friend on their accomplishments. People who flesh out their emotional goals with detailed plans more often stay on track and achieve their desired emotional endpoint (Mauss & Tamir, 2014).
3. ***Create a supportive environment.*** When something good happens, share the joyful news with someone to feel even better (Peters et al., 2018). When feeling upset, reach out to someone close for perspective and social support. Choose your friends wisely. Supportive friends can help you sustain the good feelings longer and bounce back from down times more quickly.
4. ***Remember that emotions are temporary.*** Emotions are usually short-lived. As psychologist Marsha Linehan (2016) explains:

Emotions are like an ocean wave—however intense and high they peak they will eventually come down. Riding through an emotional wave may mean sitting with that emotion until it passes.

Ask yourself

Which of these tips will you employ to improve your own emotion regulation?

Retrieval Practice

RP-2 Which of the following emotion regulation strategies tends to lead to *fewer* positive emotions and *more* negative emotions?

a. Reappraisal
b. Suppression
c. Situation selection

ANSWERS IN APPENDIX E

Social Support

LOQ 40-6

How does social support promote good health?

Social support—feeling liked, encouraged, and helped-when-needed by friends and family—promotes both happiness and health. When

randomly prompted by a researcher's phone app, people report more happiness when with others (Quoidbach et al., 2019). In international studies following thousands of people over several years, close relationships have predicted happiness and health in both individualist and collectivist cultures (Brannan et al., 2013; Chu et al., 2010; Rueger et al., 2016). People supported by close relationships tend to enjoy better health and longer lives (Holt-Lunstad, 2021; Vila, 2021). When researchers combined data from 70 studies of 3.4 million people worldwide, they confirmed a striking social support benefit: Compared with those who had ample social connections, socially isolated or lonely people had a 30 percent greater death rate during the 7-year study period (Holt-Lunstad et al., 2010, 2015, 2017). "Loneliness [predicts] a reduction of life span," former U.S. Surgeon General Vivek H. Murthy (2017) noted, that is "similar to that caused by smoking 15 cigarettes a day."

To combat social isolation, we need to do more than collect acquaintances. We need people who genuinely care about us (Cacioppo et al., 2014; Hawkley et al., 2008). Some fill this need by connecting with friends, family, co-workers, members of a faith community, or support groups. Others connect in positive, supportive marriages. Happy marriages bathe us in social support, leading to less weight gain and a longer life (Chen et al., 2018; VanderWeele, 2017). One 7-decade-long study found that at age 50, healthy aging was better predicted by a good marriage than by a low cholesterol level (Vaillant, 2002). On the flip side, divorce predicts poor health. In one analysis of 600 million people in 24 countries, separated and divorced people

were more likely to die early (Shor et al., 2012). But it's less marital status than marital *quality* that predicts health—to about the same extent as a healthy diet and physical activity do (Bookwala & Gaugler, 2020; Smith & Baucom, 2017).





Left: Jesse Dittmar; right: Tim Robberts/Getty Images

Left: **Funny business** Part of our pleasure in authoring this text—and, we hope, yours in reading it—is finding cartoons that offer comic relief while illustrating and reinforcing psychological concepts. Many have come from the *New Yorker*, whose longtime cartoonist and cartoon editor was Bob Mankoff—a former psychology major who lectures on the psychology of humor and is president of CartoonCollections.com. Mankoff explains: "Humor, like other forms of play, has three main benefits. First, it's physically and psychologically healthy, especially in the way it blocks stress. Second, humor makes us mentally flexible—able to manage change, take risks, and think creatively. And third, humor serves as a social lubricant, making us more effective in dealing with colleagues and clients."

Right: **Laughter among friends is good medicine** Laughter arouses us, massages muscles, and leaves us feeling relaxed (Robinson, 1983). Humor (though not hostile sarcasm) may ease pain, and strengthen immune activity (Ayan, 2009; Berk et al., 2001; Dunbar et al., 2011). Humor buffers stress (H. Fritz et al., 2017). People who laugh a lot have also tended to have lower rates of heart disease (Clark et al., 2001).

Research suggests that social support has many health benefits:

Social support calms us, improves our sleep, and reduces blood pressure (Baron et al., 2016; Kent de Grey et al., 2018; Uchino & Way, 2017). To see if social support might calm people's response to threats, one research team asked happily married women to lie in an fMRI machine, and subjected them to the threat of electric shock to an ankle (Coan et al., 2006). During the experiment, some women held their husband's hand. Others held a stranger's hand or no one's hand. While awaiting the occasional shocks, women holding their husband's hand showed less activity in threat-responsive brain areas. This soothing benefit was greatest for those reporting the highest-quality marriages. Simply holding your romantic partner's hand while resolving a conflict may help you handle stress and improve communication (Jakubiak & Feeney, 2019).



Social support fosters stronger immune functioning. Stress hampers immune functioning, but social connections strengthen it (Leschak & Eisenberger, 2019). Recognizing this, some physicians have begun providing "social prescriptions" for patients that advise connecting with others. These have helped people with conditions ranging from

dementia to diabetes to Parkinson's disease (Hanc, 2021). Volunteers exposed to cold viruses showed the health-promoting effect of social support while being quarantined for 5 days (Cohen, 2004; Cohen et al., 1997). (In these experiments, the more than 600 participants were well-paid volunteers.) Age, race, sex, and health habits being equal, those with close social ties were least likely to catch a cold. People whose daily life included frequent hugs likewise experienced fewer cold symptoms (Cohen et al., 2015). The cold fact: The effect of social ties is nothing to sneeze at!



FluxFactory/E+/Getty Images

Pets are friends, too Having a pet may increase the odds of survival after a heart attack, relieve depression among people with AIDS, and lower blood pressure and other coronary risk factors (Allen, 2003; McConnell et al., 2011; Wells, 2009). Pets are no substitute for effective drugs and exercise. But for people who enjoy animals, and especially for those who live alone, pets are a healthy pleasure (Reis et al., 2017; Siegel, 1990). The Covid-19 pandemic made many of us new pet

owners, as we sought to cope with stress and social isolation.

> **"Woe to one who is alone and falls and does not have another to help."** — Ecclesiastes 4:10

Close relationships give us an opportunity for "open heart therapy"—a chance to confide painful feelings (Frattaroli, 2006). Talking about a stressful event can temporarily arouse us, but in time it calms us (Lieberman et al., 2007; Mendolia & Kleck, 1993; Niles et al., 2015). In one study, 33 Holocaust survivors spent 2 hours recalling their experiences, many in intimate detail never before disclosed (Pennebaker et al., 1989). Those who disclosed the most had the most improved health 14 months later. In another study of surviving spouses of people who had died by suicide or in car accidents, those who bore their grief alone had more health problems than those who shared it with others (Pennebaker & O'Heeron, 1984). Confiding is good for the body and the soul (see the Therapy modules).

Suppressing emotions can be detrimental to physical health. When psychologist James Pennebaker (1985) surveyed more than 700 undergraduate women, those who had experienced a traumatic sexual experience in childhood reported more headaches and stomach ailments than those who had experienced other traumas—possibly because survivors of sexual abuse are less likely than other trauma survivors to confide in others. Another study, of 437 Australian

ambulance drivers, confirmed the ill effects of suppressing one's emotions after witnessing traumas (Wastell, 2002).

Even writing about personal traumas in a diary can help (Burton & King, 2008; Kállay, 2015; Lyubomirsky et al., 2006). For trauma survivors, writing therapy reduces posttraumatic stress (Pavlacic et al., 2019). In one experiment, volunteers who kept trauma diaries had fewer health problems during the ensuing 4 to 6 months (Pennebaker, 1990). As one participant explained, "Although I have not talked with anyone about what I wrote, I was finally able to deal with it, work through the pain instead of trying to block it out. Now it doesn't hurt to think about it."

If we are aiming to exercise more, drink less, quit smoking, or be a healthy weight, our social ties can tug us away from, or toward, our goal. If you are trying to achieve some goal, think about whether your social network is helping or hindering you.

Ask Yourself

Can you remember a time when you felt better after discussing a problem with a friend or family member? How did doing so help you to cope—either emotionally (emotion-focused), or by resolving the problem (problem-focused)?

"These mountains that you are carrying, you were only supposed to climb." — Poet Najwa Zebian, *The Nectar of Pain,* 2016

Reducing Stress

Having a sense of control, developing more optimistic thinking, and building social support can help us experience less stress and thus improve our health. People who have been upbeat about themselves and their future also have tended to enjoy health-promoting social ties (Stinson et al., 2008). But sometimes we cannot alleviate stress and simply need to *manage* our stress. Aerobic exercise, relaxation, meditation, and spiritual communities have helped people gather inner strength and lessen stress effects.

Aerobic Exercise

LOQ 40-7

How effective is aerobic exercise as a way to manage stress and improve well-being?

It's hard to find a medicine that works for most people most of the time. But **aerobic exercise**—sustained, oxygen-consuming exertion—is one of those rare near-perfect "medicines." Estimates vary, but some studies suggest that exercise adds to your quantity of life—about *7 hours longer life for every exercise hour* (Lee et al., 2017; Mandsager et al., 2018; Zahrt & Crum, 2017). Think about it: Nature generously gives a 7-to-1 return for time spent exercising. It also boosts your quality of life, with more energy, better mood, and stronger relationships (Buecker et al., 2020; Wiese et al., 2018). As author Bill Bryson (2019) noted, "If someone invented a pill that could do for us all that a

moderate amount of exercise achieves, it would instantly become the most successful drug in history."

In the late 1940s, British government doctor Jeremy Morris and his colleagues (1953) sought a low-cost way to test their belief that exercise reduced people's risk of heart attacks. While riding the bus to work one day, Morris realized that every double-decker bus offered a perfect laboratory: Each had a driver who sat while working, and a conductor who moved constantly and climbed 600 steps in a typical shift. After following 31,000 drivers and conductors for 2 years and adjusting for other factors, he had the first causal evidence of exercise affecting health: Compared with drivers, the conductors experienced fewer than half as many heart attacks.

Exercise helps fight heart disease by strengthening the heart, increasing blood flow, keeping blood vessels open, lowering blood pressure, and reducing the hormone and blood pressure reaction to stress (Ford, 2002; Manson, 2002). Compared with inactive adults, people who exercise experience about half as many heart attacks (Evenson et al., 2016; Visich & Fletcher, 2009). Among older women, those who take 4400 steps per day have a lower risk of death than those who take 2700 or fewer steps (Lee et al., 2019). Until 7500 or so steps, the risk continues to drop; more steps = less death.

It's a fact: Fitness predicts longevity (Moholdt et al., 2018). Dietary fat contributes to clogged arteries, but exercise makes our muscles hungry for those fats and cleans them out of our arteries (Barinaga,

1997). A study of 1.44 million Americans and Europeans found that exercise predicted “lower risks of many cancer types” (Moore et al., 2016). Scottish mail carriers, who spend their days walking, have lower heart disease risk than Scottish mail office workers (Tigbe et al., 2017). Regular exercise in later life also predicts better cognitive functioning and reduced risk of neurocognitive disorder and Alzheimer’s disease (Kramer & Erickson, 2007).

The genes passed down to us from our distant ancestors enabled the physical activity essential to hunting, foraging, and farming (Raichlen & Polk, 2013; Shave et al., 2019). In muscle cells, those genes, when activated by exercise, respond by producing proteins. We are made for exercise. In the modern inactive person, these genes produce lower quantities of proteins and leave us susceptible to more than 20 chronic diseases, such as type 2 diabetes, coronary heart disease, stroke, and cancer (Booth & Neufer, 2005). Inactivity is thus potentially toxic. Physical activity can weaken the influence of some genetic risk factors. In one analysis of 45 studies, the risk of obesity fell by 27 percent (Kilpeläinen et al., 2012).

Does exercise also boost the spirit? In a 21-country survey of university students, physical exercise was a strong and consistent predictor of life satisfaction (Grant et al., 2009). People from the United States, Canada, and the United Kingdom who do aerobic exercise at least three times a week manage stress better, exhibit more self-confidence, have more vigor, and feel less depressed and fatigued than their inactive peers (Rebar et al., 2015; Smits et al., 2011). One

analysis of 1.2 million Americans compared exercisers with nonexercisers. After controlling for other physical and social differences among them, the exercisers experienced 43 percent "fewer days of poor mental health in the last month" (Chekroud et al., 2018). "Exercise has a large and significant antidepressant effect," concluded one digest of 49 controlled studies (Schuch et al., 2018).

But remember, correlation does not imply causation. We could state this observation another way: Stressed and depressed people exercise less. To sort out cause and effect, researchers experiment. They *randomly assign* stressed, depressed, or anxious people either to an aerobic exercise group or to a control group. Next, they measure whether aerobic exercise (compared with a control activity not involving exercise) produces a change in stress, depression, anxiety, or some other health-related outcome. One classic experiment randomly assigned mildly depressed female college students to three groups. One-third participated in a program of aerobic exercise. Another third took part in a program of relaxation exercises. The remaining third (the control group) formed a no-treatment group (McCann & Holmes, 1984). As **FIGURE 40.2** shows, 10 weeks later, the women in the aerobic exercise program reported the greatest decrease in depression. Many had, quite literally, run away from their troubles.

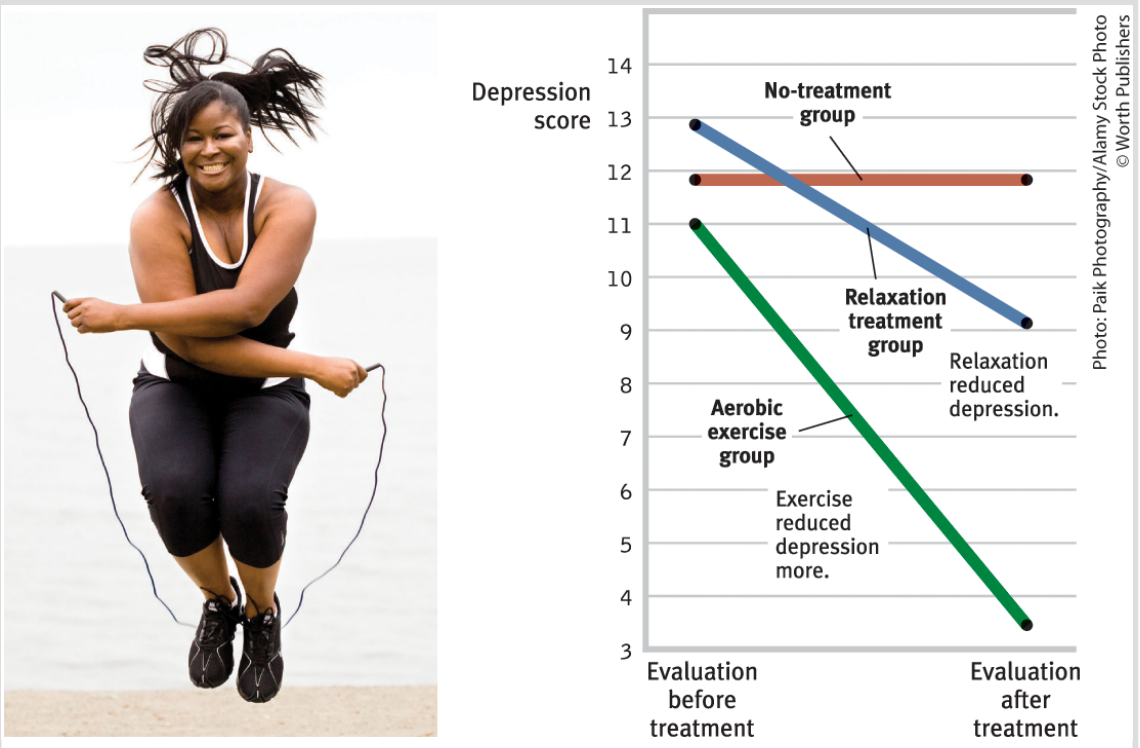


FIGURE 40.2 Aerobic exercise reduces mild depression (Data from McCann & Holmes, 1984.)

Dozens of other experiments and longitudinal studies confirm that exercise reduces or prevents depression and anxiety (Catalan-Matamoros et al., 2016; Harvey et al., 2018; Stubbs et al., 2017). When experimenters randomly assigned depressed people to an exercise group, an antidepressant group, or a placebo pill group, exercise diminished depression as effectively as antidepressants—and with longer-lasting effects (Hoffman et al., 2011).

Vigorous exercise provides a substantial and immediate mood boost (Watson, 2000). Even a 10-minute walk stimulates 2 hours of increased well-being by raising energy levels and lowering tension (Thayer,

1987, 1993). Exercise works its magic in several ways. It increases arousal, thus counteracting depression's low arousal state. It enables muscle relaxation and sounder sleep. It produces toned muscles, which filter out a depression-causing toxin (Agudelo et al., 2014). Like an antidepressant drug, it orders up mood-boosting chemicals from our body's internal pharmacy—neurotransmitters such as norepinephrine, serotonin, and the endorphins (Jacobs, 1994; Salmon, 2001). Exercise also fosters *neurogenesis.* In mice, exercise causes the brain to produce a molecule that stimulates the production of new, stress-resistant neurons (Hunsberger et al., 2007; Reynolds, 2009; van Praag, 2009).

On a simpler level, the sense of accomplishment and improved physique and body image that often accompany a successful exercise routine may enhance one's self-image, leading to a better emotional state. Frequent exercise is like a drug that prevents and treats disease, increases energy, calms anxiety, and boosts mood—a drug we would all take, if available. Yet few people (only 1 in 4 in the United States) take advantage of it (Mendes, 2010).

Relaxation and Meditation

LOQ 40-8

In what ways might relaxation and meditation influence stress and health?

Knowing the damaging effects of stress, could we learn to counteract our stress responses by altering our thinking and lifestyle? In the late 1960s, psychologists began experimenting with *biofeedback*, a system of recording, amplifying, and feeding back information about subtle physiological responses in an effort to help people control them. After a decade of study, however, the initial claims for biofeedback seemed overblown and oversold (Miller, 1985).

Simple relaxation methods, which require no expensive equipment, produce many of the results biofeedback once promised. Massage relaxes both premature infants and those experiencing pain, and it also helps reduce depression (Hou et al., 2010). Figure 40.2 pointed out that aerobic exercise reduces depression. But did you notice in that figure that depression also decreased among women in the relaxation treatment group? More than 60 studies have found that relaxation procedures can also relieve headaches, hypertension, anxiety, and insomnia (Nestoriuc et al., 2008; Stetter & Kupper, 2002).

Such findings would not surprise Meyer Friedman, Ray Rosenman, and their colleagues. They tested relaxation in a program designed to help hard-driving *Type A* heart attack survivors (who are more prone to heart attacks than their relaxed *Type B* peers) reduce their risk of future attacks. Among hundreds of randomly assigned middle-aged men, half received standard advice from cardiologists about medications, diet, and exercise habits. The other half received similar advice, but they also learned to slow down and relax by walking, talking, and eating more slowly; to smile at others and laugh at

themselves; to admit their mistakes; to take time to enjoy life; and to renew their religious faith. The training paid off (FIGURE 40.3). During the next 3 years, those who learned to modify their lifestyle had half as many repeat heart attacks as did the group that received standard advice. This, wrote the exuberant Friedman, was an unprecedented, spectacular reduction in heart attack recurrence. A smaller-scale British study spanning 13 years similarly showed a halved death rate among high-risk people trained to alter their thinking and lifestyle (Eysenck & Grossarth-Maticek, 1991). After experiencing a heart attack at age 55, Friedman started taking his own behavioral medicine—and lived to age 90 (Wargo, 2007). Learning to chill → less risk of getting ill.

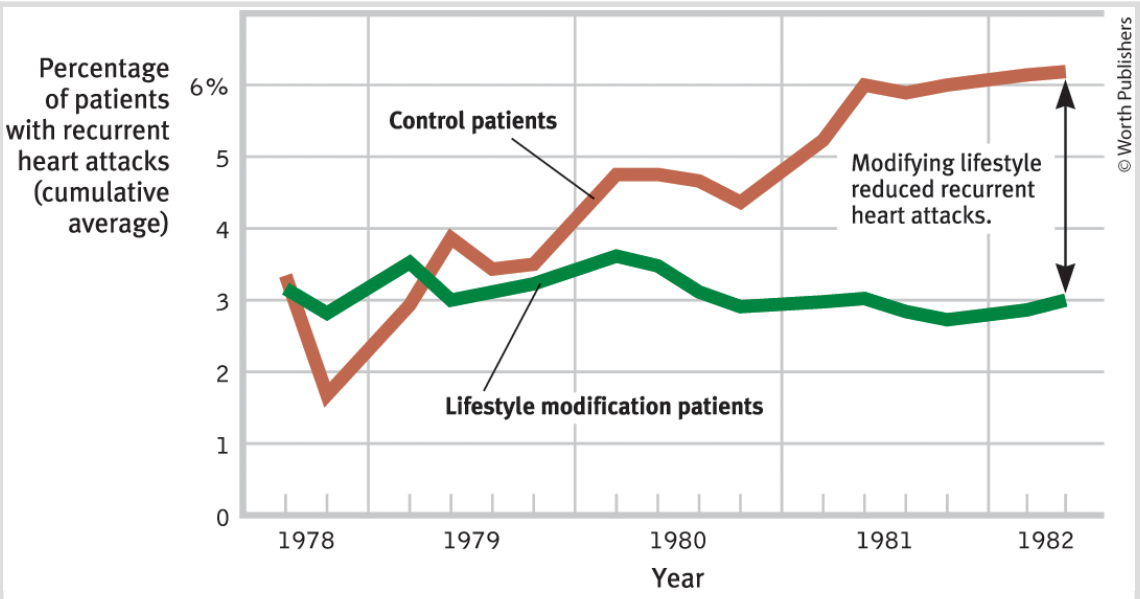


FIGURE 40.3 Recurrent heart attacks and lifestyle modification (Data from Friedman & Ulmer, 1984.)

Time may heal all wounds, but relaxation can help speed that process. In one study, surgery patients were randomly assigned to two groups. Both groups received standard treatment, but the second group also experienced a 45-minute relaxation session and received relaxation recordings to use before and after surgery. A week after surgery, patients in the relaxation group reported lower stress and showed better wound healing (Broadbent et al., 2012).



shapecharge/Getty Images

Is music a natural antistress medicine? One analysis of more than 100 studies showed that listening to music (especially slower tempo music) reduced heart rate, blood pressure, and psychological distress (de Witte et al., 2019). The next time you find yourself stressed, remember that music may help you mellow out. When exercising, however, up-tempo music is energizing—it reduces perceived exertion (Terry et al., 2020).

Meditation is a practice with a long history. In many world religions, meditation has been used to reduce suffering and improve awareness, insight, and compassion. Today, meditation apps offer free, guided

techniques that can improve health (Adams et al., 2018). Numerous studies have confirmed meditation's benefits (Goyal et al., 2014; Rosenberg et al., 2015; Sedlmeier et al., 2012). One type, **mindfulness meditation**, has found a new home in stress management programs. If you learned this practice, you would relax and silently attend to your inner state, without judging it (Goldberg et al., 2018, 2019; Kabat-Zinn, 2001). You would sit down, close your eyes, and mentally scan your body from head to toe. Zooming in on certain body parts and responses, you would remain aware and accepting. You would also pay attention to your breathing, attending to each breath as if it were a material object.

> Meditation is an ancient practice with deep roots in many world religions. Gregory of Sinai (d. 1346) offered this guidance: **"Sit down alone and in silence. Lower your head, shut your eyes, breathe out gently, and imagine yourself looking into your own heart.... As you breathe out, say 'Lord Jesus Christ, have mercy on me.' ... Try to put all other thoughts aside. Be calm, be patient, and repeat the process very frequently."**

For many people, practicing mindfulness boosts happiness and lessens anxiety and depression (Goldberg et al., 2021; van Agteren et al., 2021). In one experiment, Korean participants were asked to think about their own mortality. Compared with nonmeditators, those who meditated were less anxious when reminded of their inevitable death (Park & Pyszczynski, 2019). Mindfulness practices have also been linked with improved sleep, helpfulness, and immune system functioning (Donald et al., 2018; Rusch et al., 2019; Villalba et al.,

2019). They also increase the length of the *telomeres* protecting our chromosome tips, which reduces the risk of cancer and heart disease (Conklin et al., 2018). Just a few minutes of daily mindfulness meditation is enough to improve concentration and decision making (Hafenbrack et al., 2014; Rahl et al., 2017).

Nevertheless, some researchers caution that mindfulness is overhyped (Britton, 2019; Van Dam et al., 2018). For some people, mindfulness meditation produces self-absorption or even adverse effects (Britton, 2019; Van Dam et al., 2018; Vonk & Visser, 2021). Moreover, say critics, meditation's stress relief is mirrored by mere solitude, which can similarly relax us and reduce stress (Nguyen et al., 2018). Even so, meditation's positive results make us wonder: What's going on in the brain as we practice mindfulness? Correlational and experimental studies offer three explanations. Mindfulness

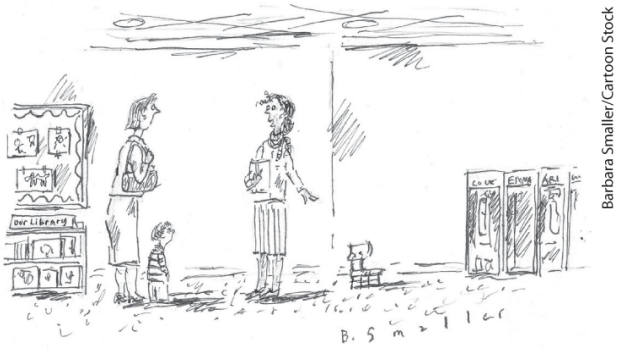
- ***strengthens connections among brain regions.*** The affected regions are those associated with focusing our attention, processing what we see and hear, and being reflective and aware (Berkovich-Ohana et al., 2014; Ives-Deliperi et al., 2011; Kilpatrick et al., 2011).
- ***activates brain regions associated with emotion regulation*** (Davidson et al., 2003; Way et al., 2010). When labeling emotions, mindful people show less activation in the amygdala, a brain region associated with fear, and more activation in the prefrontal cortex, which aids emotion regulation (Creswell et al., 2007; Gotink et al., 2016).

- ***calms brain activation in emotional situations.*** This lower activation was clear in one study in which participants watched two movies—one sad, one neutral. Those in the control group, who were not trained in mindfulness, showed strong brain activation differences when watching the two movies. Those who had received mindfulness training showed little change in brain response to the two movies (Farb et al., 2010). Emotionally unpleasant images also trigger weaker electrical brain responses in mindful people than in their less mindful counterparts (Brown et al., 2013). A mindful brain is strong, reflective, and calm.



AP Photo

Furry friends relieve stress Some schools bring cuddly critters on campus to help students relax and lower disruptive stress levels. In one study, exam-stressed college students who interacted with therapy dogs felt less stressed 10 hours later (Ward-Griffin et al., 2018).



Barbara Smaller/Cartoon Stock

"We don't have a time-out chair in our Classroom Community. That's our mindfulness chair."

And then there are the mystics who seek to use the mind's power to enable Novocain-free cavity repair. Their aim: transcend dental medication.

Faith Communities and Health

LOQ 40-9

What is the *faith factor*, and what are some possible explanations for the link between faith and health?

A wealth of studies—more than 2000 in the twenty-first century's first two decades alone—has revealed a curious correlation called the *faith factor* (Oman & Syme, 2018; VanderWeele, 2018). Religiously active people (especially in more religious cultures) tend to live longer than those not religiously active (Ebert et al., 2020). One such study compared the death rates for 3900 people living in two Israeli communities. The first contained 11 religiously orthodox collective settlements; the second contained 11 matched, nonreligious collective

settlements (Kark et al., 1996). Over a 16-year period, “belonging to a religious collective was associated with a strong protective effect” not explained by age or economic differences. In every age group, religious community members were about half as likely to have died as were their nonreligious counterparts. This difference is roughly comparable to the gender difference in mortality. Another study followed 74,534 U.S. nurses over 20 years. When controlling for various health risk factors, those who attended religious services more than weekly were a third less likely to have died than were nonattenders, and were much less likely to have died by suicide (Li et al., 2016; VanderWeele et al., 2016). In U.S. obituaries, mention of a religious affiliation predicted 7.5 years of additional life compared with no religious affiliation (Wallace et al., 2018).

How should we interpret such findings, recalling that researchers cannot randomly assign people to be religiously engaged or not? Correlations are not cause-effect statements, and they leave many factors uncontrolled (Sloan, 2005; Sloan & Bagiella, 2002; Sloan et al., 1999, 2000). Here is another possible interpretation: Women are more religiously active than men, and women outlive men. Might religious involvement merely reflect this gender-longevity link?



Top left to right: AlisaNata/Shutterstock; Fuse/Getty Images; Sura Nualpradid/Shutterstock; casejustin/Shutterstock; bottom left to right: Georgios Kollidas/Alamy Stock Photo; Georgios Kollidas/Shutterstock; ppart/Shutterstock

Apparently not. One 8-year National Institutes of Health study followed 92,395 women, ages 50 to 79. After controlling for many factors, researchers found that women attending religious services at least weekly experienced an approximately 20 percent reduced risk of death during the study period (Schnall et al., 2010). Moreover, the association between religious involvement and life expectancy is also found among men (Benjamins et al., 2010; McCullough et al., 2000; McCullough & Laurenceau, 2005). A 28-year study that followed 5286 Californians found that, after controlling for age, gender, ethnicity, and education, frequent religious attenders were 36 percent less likely to have died in any year (**FIGURE 40.4**). In another 8-year controlled study of more than 20,000 people (Hummer et al., 1999), this effect translated into a life expectancy of 83 years for those frequently attending religious services and 75 years for nonattenders.

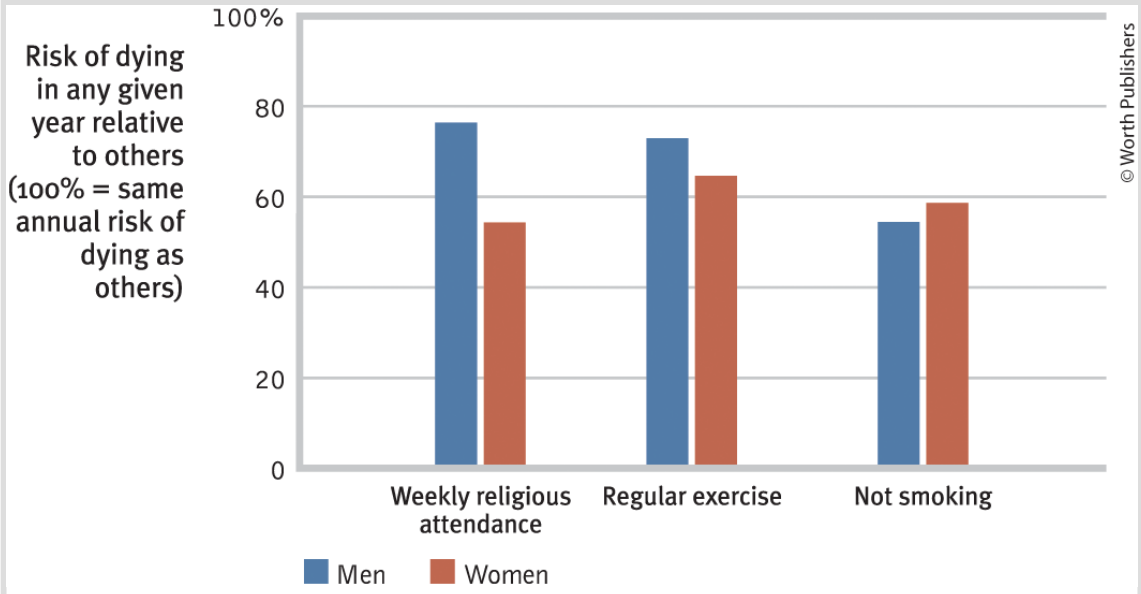


FIGURE 40.4 Predictors of longer life Researchers found that among adult participants, religious attendance, regular exercise, and not smoking all predicted a lowered risk of death in any given year (Oman et al., 2002; Strawbridge, 1999; Strawbridge et al., 1997). Women attending weekly religious services, for example, were only 54 percent as likely to die in a typical study year as were nonattenders.

Research points to three possible explanations for the religiosity-longevity correlation (FIGURE 40.5):

- ***Healthy behaviors*** Religion promotes self-control (DeWall et al., 2014; McCullough & Willoughby, 2009). This helps explain why religiously active people tend to smoke and drink much less and to have healthier lifestyles (Islam & Johnson, 2003; Koenig & Vaillant, 2009; Masters & Hooker, 2013; Park, 2007). In one large U.S. Gallup survey, 15 percent of the very religious were smokers, as were 28 percent of the nonreligious (Newport et al., 2010). But such lifestyle differences are not great enough to explain the

dramatically reduced mortality in the Israeli religious settlements. In U.S. studies, too, about 75 percent of the longevity difference remained when researchers controlled for unhealthy behaviors, such as inactivity and smoking (Musick et al., 1999).

- ***Social support*** To belong to a faith community is to participate in a support network. Religiously active people are often there for one another when misfortune strikes. In the 20-year nurses study, for example, religious people's social support was the best predictor of their good health. Moreover, religion encourages marriage, another predictor (when happy) of health and longevity (Bookwala & Gaugler, 2020).
- ***Positive emotions*** Even after controlling for social support, unhealthy behaviors, gender, and preexisting health problems, studies have found that religiously engaged people tend to live longer (Chida et al., 2009). Researchers speculate that religiously active people may benefit from a stable, coherent worldview, a sense of hope for the long-term future, feelings of ultimate acceptance, and the relaxed meditation of prayer or other religious observances. The religiously active have had healthier immune functioning, fewer hospital admissions, and, for people with AIDS, fewer stress hormones and longer survival (Ironson et al., 2002; Koenig & Larson, 1998; Lutgendorf et al., 2004).

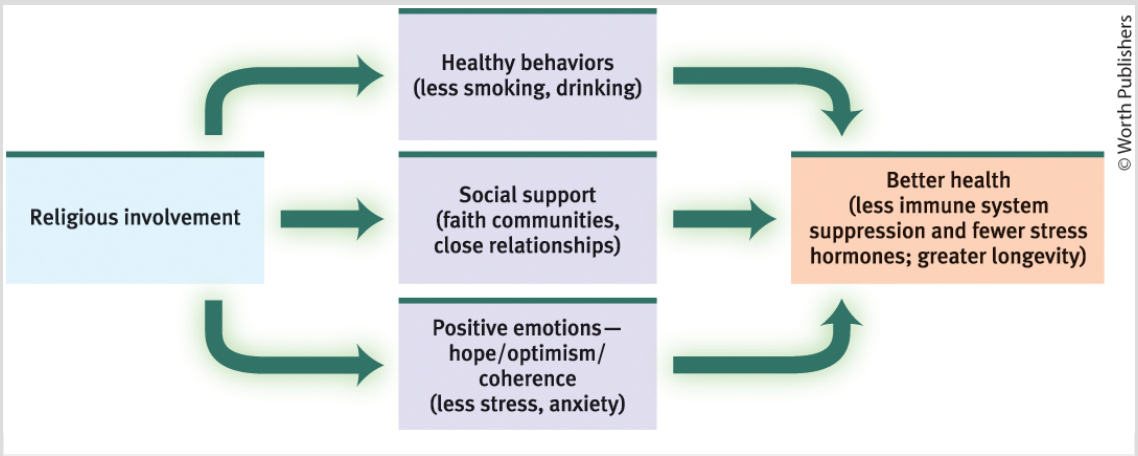


FIGURE 40.5 Possible explanations for the correlation between religious involvement and health/longevity

Ask Yourself

What strategies have you used to cope with stress in your life? How well have they worked? What other strategies could you try?

Retrieval Practice

RP-3 What are some of the tactics we can use to successfully manage the stress we cannot avoid?

ANSWERS IN APPENDIX E

REVIEW

Module 40: Health and Coping

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 40-1: In what two ways do people try to alleviate stress?

LOQ 40-2: How does a perceived lack of control affect health?

LOQ 40-3: Why is self-control important, and can our self-control be depleted?

LOQ 40-4: How does an optimistic outlook affect health and longevity?

LOQ 40-5: How does controlling our feelings affect our well-being and health?

LOQ 40-6: How does social support promote good health?

LOQ 40-7: How effective is aerobic exercise as a way to manage stress and improve well-being?

LOQ 40-8: In what ways might relaxation and meditation influence stress and health?

LOQ 40-9: What is the *faith factor,* and what are some possible explanations for the link between faith and health?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

coping
problem-focused coping
emotion-focused coping
personal control
learned helplessness
external locus of control
internal locus of control
self-control
emotion regulation
aerobic exercise
mindfulness meditation

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in

Appendix E.

1. When faced with a situation over which you feel you have little control, you are more likely to turn to _____ (emotion/problem)-focused coping.

2. Seligman's classic research showed that a dog will respond with learned helplessness if it has received repeated shocks and has had
   a. the opportunity to escape.
   b. no control over the shocks.
   c. pain or discomfort.
   d. no food or water prior to the shocks.

3. When nursing home residents take an active part in managing their own care and surroundings, their morale and health tend to improve. Such findings indicate that people do better when they experience an _____ (internal/external) locus of control.

4. How does accepting our feelings help us regulate our emotions more healthfully?

5. People who have close relationships are less likely to die prematurely than are those who do not, supporting the idea that
   a. social ties can be a source of stress.
   b. gender influences longevity.

c. Type A behavior is responsible for many premature deaths.
d. social support has a beneficial effect on health.

6. Because it triggers the release of mood-boosting neurotransmitters, such as norepinephrine, serotonin, and the endorphins, _____ exercise raises energy levels and helps alleviate depression and anxiety.

7. Research on the faith factor has found that
   a. pessimists tend to be healthier than optimists.
   b. our expectations influence our feelings of stress.
   c. religiously active people tend to outlive those who are not religiously active.
   d. religious engagement promotes social isolation and repression.

CHAPTER 13
Social Psychology (Modules 41–44)



Maskot/Getty Images

MODULE 41 Social Thinking

The Fundamental Attribution Error

Attitudes and Actions

Persuasion

THINKING CRITICALLY ABOUT: How to Be Persuasive
MODULE 42 Social Influence
Conformity: Complying With Social Pressures
Obedience: Following Orders
Lessons From the Conformity and Obedience Studies
Group Behavior
THINKING CRITICALLY ABOUT: The Internet as Social Amplifier
MODULE 43 Antisocial Relations
Prejudice
Aggression
MODULE 44 Prosocial Relations
Attraction
Altruism
From Conflict to Peace

Dirk Willems faced a moment of decision in 1569. Threatened with torture and death as a member of a persecuted religious group, he escaped from his Asperen, Holland, prison and fled across an ice-covered pond. His stronger and heavier jailer pursued him but fell through the ice. Unable to climb out, the jailer pleaded for help.

With his freedom in front of him, Willems acted with ultimate selflessness. He turned back and rescued his pursuer, who, under orders, took him back to captivity. A few weeks later Willems was condemned to be "executed with fire, until death ensues." For his martyrdom, present-day Asperen has a street named in honor of its folk hero (Toews, 2004).



Mennonite Library and Archives/Bethel College

An etching of Dirk Willems by Dutch artist Jan Luyken (From *The Martyrs Mirror,* 1685.)

What drives groups, such as Willems' community, to act so heartlessly toward those who differ from them? What motivates people, such as Willems' jailer, to carry out unjust orders? And what inspired the selflessness of Willems' response, and the selflessness of so many who have died trying to save others? Indeed, what motivates any of us who volunteer kindness and generosity?

We are social animals. We cannot live for ourselves alone. Many of us felt this keenly during the Covid-19 pandemic, when social distancing meant going without the face-to-face social interactions we'd once taken for granted. *Social psychologists* explore our connections by scientifically studying how we *think about* and *influence* others (Modules 41 and 42), and also how we *relate* to one another (Modules 43 and 44).

MODULE 41: Social Thinking

Learning Objective Question LOQ 41-1

What do social psychologists study? How do we tend to explain others' behavior and our own?

Personality psychologists focus on the person. They study the personal traits and dynamics that explain why, in a given situation, *different people* act differently. (Would you have helped your jailer out of the icy water?) **Social psychologists** focus on the situation. They study the social influences that explain why *the same person* acts differently in *different situations.* (Might Willems' jailer have released him under other circumstances?)

> Unlike sociology, which studies societies and social groupings, social psychologists focus more on how *individuals* view and affect one another.

The Fundamental Attribution Error

Our social behavior arises from our social cognition. We all want to understand and explain why people act as they do. After studying how people explain others' behavior, Fritz Heider (1958) proposed an

attribution theory: We can attribute the behavior to the person's stable, enduring traits (a *dispositional attribution*), or we can attribute it to the situation (a *situational attribution*).

For example, in class, we notice that Jill seldom talks. Over coffee, Jack talks nonstop. That must be the sort of people they are, we decide. Jill must be shy and Jack outgoing. Such attributions—to their dispositions—can be valid. People do have enduring personality traits. But sometimes we fall prey to the **fundamental attribution error** (Ross, 1977, 2018). In class, Jack may be as quiet as Jill. Catch Jill at a party and you may hardly recognize your quiet classmate.

Researchers demonstrated this tendency in an experiment with college students (Napolitan & Goethals, 1979). Students talked, one at a time, with a woman who acted either cold and critical or warm and friendly. Before the conversations, the researchers told half the students that the woman's behavior would be spontaneous. They told the other half the truth—that they had instructed her to *act* friendly or unfriendly.

Did hearing the truth affect students' impressions of the woman? Not at all! If the woman acted friendly, both groups decided she was a warm person. If she acted unfriendly, both decided she was a cold person. They attributed her behavior to her personal disposition *even when told that her behavior was situational*—that she was merely acting that way for the experiment.

We all commit the fundamental attribution error. Consider: Is your psychology instructor shy or outgoing? If you answer "outgoing," remember that you know your instructor from one situation—the classroom, where teaching demands talking. Your instructor might disagree: "Me, outgoing? It all depends on the situation. In class or with good friends, yes, I'm outgoing. But at professional meetings I'm really rather shy." Outside their assigned roles, professors seem less professorial, presidents less presidential, managers less managerial.

What Factors Affect Our Attributions?

One factor is culture. Westerners more often attribute behavior to people's personal traits. People in China and Japan are more sensitive to the power of the situation (Feinberg et al., 2019; Miyamoto & Kitayama, 2018). In experiments in which people viewed scenes, such as a big fish swimming among smaller fish and plants, Americans focused more on the attributes of the big fish. Japanese viewers focused more on the setting and context—the situation (Chua et al., 2005; Nisbett, 2003).

Whose behavior also matters. When we explain *our own* behavior, we are sensitive to how behavior changes with the situation (Idson & Mischel, 2001). We also are sensitive to the power of the situation when we explain the behavior of people we have seen in many different contexts. We more often commit the fundamental attribution error when a stranger behaves badly. Having only seen that enraged fan screaming at the referee in the heat of competition, we may

assume a negative, disagreeable temperament. But outside the stadium, this person may be a good neighbor and a loving parent.

Would taking an observer's viewpoint make us more aware of our own behavior? Researchers tested this idea by using separate cameras to film two people interacting. When they showed each person a replay of the interaction—filmed from the other person's perspective—participants credited their own behavior more to their *disposition* (personal character), much as an observer typically would (Lassiter & Irvine, 1986; Storms, 1973). Similarly, when people assess a police officer's actions from the officer's body cam perspective (rather than a dashcam that also shows the officer), they become more attuned to the situation—and more sympathetic to the officer (Turner et al., 2019).

Two important exceptions to our usual view of our own actions: Our deliberate and *admirable* actions we often attribute to our own good reasons, not to the situation (Malle, 2006; Malle et al., 2007). And as we age, we tend to attribute our younger selves' behavior mostly to our traits (Pronin & Ross, 2006). In 5 or 10 years, your current self may seem like another person.

How Do Our Attributions Matter?

The way we explain others' actions, attributing them to the person or the situation, can have important real-life effects (Fincham & Bradbury, 1993; Fletcher et al., 1990). Does a warm greeting reflect

romantic interest or social courtesy? Does a manager's tart-tongued remark reflect a job threat or just a bad day? Was a shooting malicious or an act of self-defense? In one study, 181 U.S. state judges gave lighter sentences to a violent offender who a scientist testified had a gene that altered brain areas related to aggressiveness (Aspinwall et al., 2012). Attributions matter.



Keith Srakocic/AP Photo

Personal versus situational attributions

Should the 2018 slaughter of 11 Jewish worshippers at Pittsburgh's Tree of Life synagogue be attributed to the shooter's hateful disposition? To social media, where the shooter and like-minded others promoted anti-Semitism and white nationalism? To the U.S. gun culture? (The shooter used four guns.) Or to all of these? And to what should we attribute the compassion of the emergency room nurse (a Jewish person and the son of a rabbi) who treated the hate-spewing shooter (Flynn, 2018)?

Some 7 in 10 college women report having experienced a man misattributing her friendliness as a sexual come-on (Jacques-Tiura et al., 2007).

Do you attribute poverty and unemployment to social circumstances, or to personal traits and bad choices? In Britain, India, Australia, and the United States, political conservatives have tended to attribute responsibility to the personal dispositions of people who are unemployed or living in poverty (Dunn, 2018; Furnham, 1982; Pandey et al., 1982; Wagstaff, 1982; Zucker & Weiner, 1993). They assume that people make their choices and that anybody who works hard can still get ahead. In experiments, those who reflect on the power of choice—either by recalling their own choices or by taking note of another's choices—become more likely to think that people get what they deserve (Savani & Rattan, 2012). Political liberals, and those not primed to consider the power of choice, are more likely to blame past and present situations. They assume that anyone who lacks access to quality education and other opportunities, and faces discrimination, would struggle to get ahead, no matter how hard they work.

The point to remember: Our attributions—to a person's disposition or to the situation—have real consequences.

Attitudes and Actions

LOQ 41-2

How do attitudes and actions interact?

Attitudes predispose our reactions to objects, people, and events. If we *believe* someone is threatening us, we may *feel* fear and anger toward the person and *act* defensively. The traffic between our attitudes and our actions is two-way. Our attitudes affect our actions. Hateful attitudes feed violent behavior. And our actions affect our attitudes (much as our emotional expressions affect our emotions).

Attitudes Affect Actions

Attitudes affect our behavior. U.S. regions where people most often express hostile attitudes toward women (as evident in 1.8 billion tweets) are also regions that have high rates of domestic violence against women (Blake et al., 2021). But situational factors, such as intense social pressures, can override the attitude-behavior connection (Wallace et al., 2005). Politicians may vote as their supporters demand, despite privately disagreeing (Nagourney, 2002). Or they may publicly espouse behaviors they don't privately practice (as when one adulterous member of the U.S. Congress was said to be "pro-life in the streets, pro-choice in the sheets" [Weiner, 2017]).

Attitudes are especially likely to affect behavior when external influences are minimal, and when the attitude is stable, specific to the behavior, and easily recalled (Glasman & Albarracín, 2006). One experiment used vivid, easily remembered information to convince White sun-tanning college students that repeated tanning put them at risk for future skin cancer. One month later, 72 percent of the participants, and only 16 percent of those in a control group, had lighter skin (McClendon & Prentice-Dunn, 2001). Changed attitudes (about skin cancer risk) changed behavior (less tanning).

Actions Affect Attitudes

Now consider a more surprising principle: Not only will we stand up for what we believe, but we also will more strongly believe in what we have stood up for. Many streams of evidence confirm the *attitudes follow behavior* principle (**FIGURE 41.1**).



Photo: Matthias Hangst/Getty Images
© Worth Publishers

FIGURE 41.1 Attitudes follow behavior
Cooperative actions, such as those performed by people on sports teams (including Germany's, shown here celebrating a World Cup victory), feed mutual liking. Such attitudes, in turn, promote positive behavior.

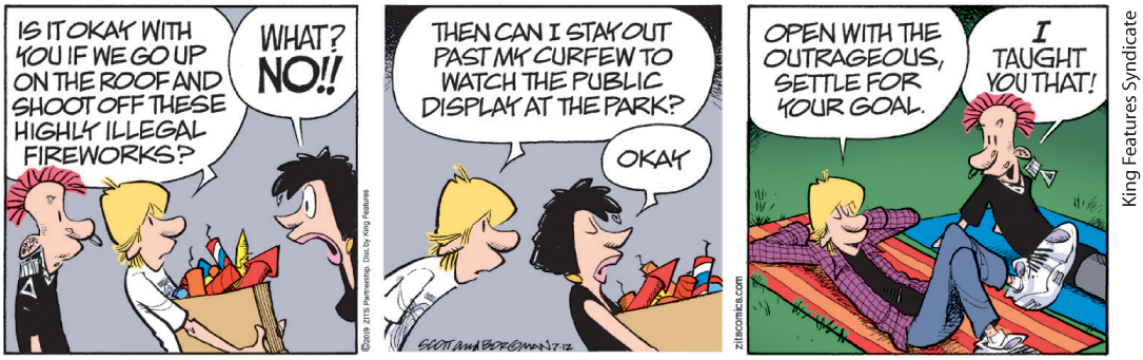
The Foot-in-the-Door Phenomenon

How would you react if someone induced you to act against your beliefs? In many cases, people adjust their attitudes. During the Korean war, many U.S. prisoners were held in Chinese communist war camps. The captors secured prisoners' collaboration in various activities, ranging from simple tasks (running errands to gain privileges) to more serious actions (false confessions, informing on

other prisoners, and divulging U.S. military information). After doing so, the prisoners sometimes adjusted their beliefs to be more consistent with their public acts (Lifton, 1961). When the war ended, 21 prisoners chose to stay with the communists. Some others returned home convinced that communism was good for Asia (though not actually "brainwashed," as has often been said).

The Chinese captors succeeded in part thanks to the **foot-in-the-door phenomenon**: They knew that people who agreed to a small request would find it easier to comply later with a larger one. The captors began with harmless requests, such as copying a trivial statement, but gradually escalated their demands (Schein, 1956). The next statement to be copied might list flaws of capitalism. Then, to gain privileges, the prisoners would move up to participating in group discussions, writing self-criticisms, and, finally, uttering public confessions. The point is simple: To get people to agree to something big, start small and build (Cialdini, 1993). A small lie paves the way to a bigger lie. Fibbers may become fraudsters. Succumb to a temptation and the next temptation becomes harder to resist.

Experiments also reveal a *door-in-the-face* effect (Cialdini et al., 1975; Genschow et al., 2021): Approach someone with an unreasonable request ("Could you volunteer daily for the next two weeks?"). After you get turned down (the door in the face), a follow-up moderate request becomes more acceptable ("Could you volunteer for the next 30 minutes?").



In dozens of experiments, researchers have coaxed people into acting against their attitudes or violating their moral standards, with the same result: Doing becomes believing. After giving in to an order to harm an innocent victim—by making nasty comments or delivering presumed electric shocks—people begin to disparage their victim. After speaking or writing on behalf of a position they have qualms about, they begin to believe their own words.

Fortunately, the attitudes-follow-behavior principle works with good deeds as well. In one classic experiment, researchers sought permission to place a large “Drive Carefully” sign in people’s front yards (Freedman & Fraser, 1966). The 17 percent rate of agreement soared to 76 percent among those who first did a small favor—placing a 3-inch-high “Be a Safe Driver” sign in their window.

The foot-in-the-door tactic has helped boost charitable contributions and blood donations. When mandates required seat belt use or Covid vaccination, many people at first protested—but then, after behaving

in accord with the mandate—came to accept it. Behaving became believing.

Likewise, after U.S. schools were desegregated and Congress passed the 1964 Civil Rights Act, White Americans expressed diminishing racial prejudice. And as Americans in different regions came to *act* more alike—thanks to more uniform national standards against discrimination—they began to *think* more alike. Experiments confirm the point: *Moral actions strengthen moral convictions.*

Ask Yourself

Do you have an attitude or tendency you would like to change? Using the *attitudes-follow-behavior* principle, how might you go about changing that attitude?

Role-Playing Affects Attitudes

When you adopt a new **role**—when you become a college student, become a parent, or begin a new job—you strive to follow the social prescriptions. At first, your behaviors may feel phony, because you are acting a role. Soldiers may at first feel they are playing war games. Before long, however, what began as play-acting in the theater of life becomes *you*. To choose a vocation is also to choose who you will become (Woods et al., 2020).



rez-art/iStock/Getty Images

New nurse Pulling on scrubs for the first time can feel like playing dress-up. But over time, that role defines the players, as they jump into the day-to-day work and follow the social cues in their new environment.

> **"Fake it until you make it."** — Alcoholics Anonymous saying

Step-by-step role-playing has even been used to train torturers (Staub, 1989). In the early 1970s, the Greek military government eased men into their roles. First, a trainee played the role of guard outside an interrogation cell. After this foot-in-the-door step, he stood guard inside. Only then was he ready to become actively involved in the questioning-and-torture role. In one study of German men, military

training toughened their personalities, leaving them less agreeable even 5 years later, after leaving the military (Jackson et al., 2012). What we do, we gradually become: Every time we act like the people around us, we slightly change ourselves to be more like them and less like who we used to be.

Yet people differ. In real-life atrocity-producing situations, some people have succumbed to the situation and others have not (Haslam & Reicher, 2007, 2012; Mastroianni & Reed, 2006; Zimbardo, 2007). Person and situation interact.

Cognitive Dissonance: Relief From Tension

We have seen that actions can affect attitudes, sometimes turning prisoners into collaborators and role-players into believers. But why? One explanation is that when we become aware that our attitudes and actions don't coincide, we experience tension, or *cognitive dissonance.* To relieve this mental tension, according to Leon Festinger's (1957) **cognitive dissonance theory**, we often bring our attitudes into line with our past actions.

Dozens of experiments have tested cognitive dissonance theory (Levy et al., 2018). Many have made people feel responsible for behavior that clashed with their attitudes and had foreseeable consequences. As a participant in one of these experiments, you might agree, for a small sum of money, to write an essay supporting something you don't believe in (perhaps a tuition increase). Feeling responsible for your written statements (which are inconsistent with your attitudes), you

would probably feel dissonance, especially if you thought your essay might influence an administrator. To reduce the uncomfortable tension, you might start believing your phony words. It's as if we rationalize, "If I chose to do it (or say it), I must believe in it." The less coerced and more responsible we feel for a troubling act, the more dissonance we feel. The more dissonance we feel, the more motivated we are to find and project consistency, such as changing our attitudes to justify the act.

The attitudes-follow-behavior principle has a heartening implication: We cannot directly control all our feelings, but we can influence them by altering our behavior. If we are depressed, we can change our attributions and explain events in more positive terms, with more self-acceptance and fewer self-put-downs (Rubenstein et al., 2016). If we are unloving, we can become more loving by behaving *as if* we were—by doing thoughtful things, expressing affection, giving affirmation. We can stay home or wear a mask when feeling sick. "Each time you ask yourself, 'How should I act?,'" observes Robert Levine (2016), "you are also asking, 'Who is the person I want to become?'" That helps explain why teens doing volunteer work promotes a compassionate identity. Act as if you like someone, and you soon may. Pretense can become reality. Conduct sculpts character. What we do we become.

"Sit all day in a moping posture, sigh, and reply to everything with a dismal voice, and your melancholy lingers.... If we wish to conquer undesirable emotional tendencies in ourselves, we must ... go through the outward

movements of those contrary dispositions which we prefer to cultivate." — William James, *Principles of Psychology* (1890)

The point to remember: Not only can we think ourselves into action, but we can also act ourselves into a way of thinking.

Retrieval Practice

RP-1 Driving to school one snowy day, Marco narrowly misses a car that slides through a red light. "Slow down! What a terrible driver," he thinks. Moments later, Marco himself slips through an intersection and yelps, "Wow! These roads are awful. The city plows need to get out here." What social psychology principle has Marco just demonstrated? Explain.

RP-2 How do our attitudes and our actions affect each other?

RP-3 When people act in a way that is not in keeping with their attitudes, and then change their attitudes to match those actions, _____ _____ theory attempts to explain why.

ANSWERS IN APPENDIX E

Persuasion

LOQ 41-3

How do *peripheral route persuasion* and *central route persuasion* differ?

Often, people may try to influence our actions by *persuading* us to change our attitudes. Public health officials aimed to persuade people of the Covid pandemic's threat, and of the protective power of vaccination and mask-wearing. Persuasion efforts generally take two forms:

- **Peripheral route persuasion** uses attention-getting cues to trigger speedy, emotion-based judgments. One experiment gave some people information that debunked the vaccines-cause-autism myth; others viewed photos of unvaccinated children suffering mumps, measles, or rubella, along with a parent's description of their child's suffering with measles. Only those given the vivid photos and description became more supportive of vaccines (Horne et al., 2015). Endorsements by beautiful or famous people can also influence people, whether they're choosing a political candidate or a perfume. When environmental activist and actor Cate Blanchett urges action to counter climate change disaster, or when Pope Francis (2015) states that "Climate change is a global problem with grave implications," they hope to harness their appeal for peripheral route persuasion. The same is true of advertisements that use heart-tugging imagery to sell products.
- **Central route persuasion** offers evidence and arguments that trigger careful thinking. To persuade consumers to purchase a new gadget, an ad might itemize all the latest features. To marshal support for climate change intervention, convincing arguments have focused on the accumulating greenhouse gases, melting arctic ice, rising world temperatures and seas, and increasing

extreme weather (van der Linden et al., 2015). Central route persuasion works well for people who are naturally analytical or involved in an issue. And because it is more thoughtful and less superficial, it is more durable. When people actively process a message—when they mentally elaborate on it—they more often retain it (a phenomenon described by the *elaboration likelihood model*).



Shannon Stapleton/Pool/Getty Images

Peripheral route persuasion New York nurse Sandra Lindsay made history when she became the first American vaccinated for the coronavirus. Mindful of historically unequal and racist medical treatment of people of color, Lindsay said she wanted to "inspire people who look like me, who are skeptical in general about taking vaccines" (Otterman, 2020).

"Have you ever noticed how one example—good or bad—can prompt others to follow? How one illegally parked car can give permission for others to do likewise? How one racial joke can fuel another?" — Marian Wright Edelman, *The Measure of Our Success,* 1994

With time and persuasion, attitudes can change dramatically. What yesterday's people accepted without question—slavery, climate destruction, anti-gay policies, orca captures—today's people mostly mourn. So how can we be more successful at getting others to see our point of view? And how can we more effectively counter misinformation, such as from anti-vaccine activists or conspiracy theorists? For more on effective persuasion strategies, see Thinking Critically About: How to Be Persuasive.

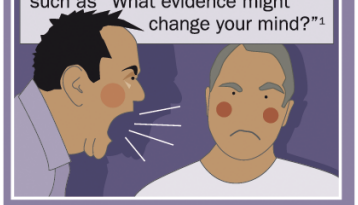
LOQ 41-4

How can we share our views more effectively?

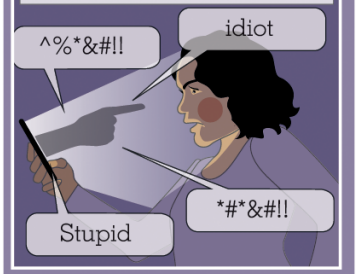
Thinking Critically About:
How to Be Persuasive

Do not:

Loudly argue your position before listening. But do use respectful questions that help people assess the evidence, such as "What evidence might change your mind?"[1]



Humiliate people, or imply that they are ignorant. Insults breed defensiveness.

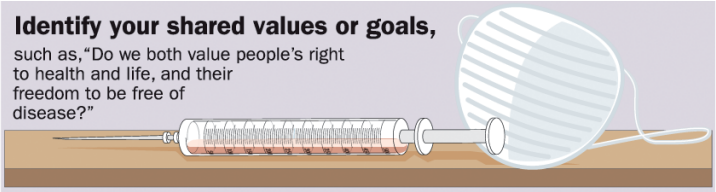


Bore people with complex and forgettable information. But do "pre-suade" people by "prebunking" misinformation before they encounter it.[2]

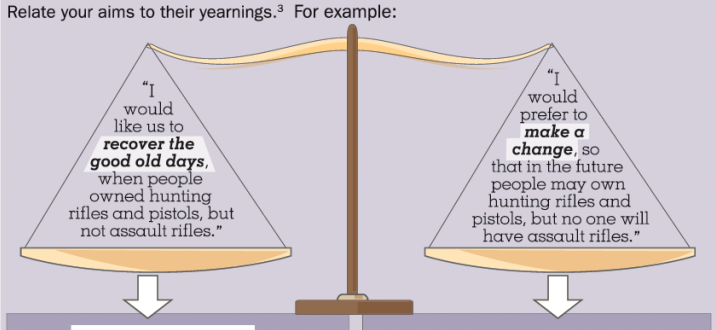
Therefore, with that said, direct your attention to this very dull and wonky and boring statistic that you will never remember. Now, however, on the other hand, here are yet more data points that are even more dry and overly complicated than the last... Let us continue...

Do:

Identify your shared values or goals, such as, "Do we both value people's right to health and life, and their freedom to be free of disease?"



Appeal to others' admirable motives.
Relate your aims to their yearnings.[3] For example:



Political conservatives tend to respond to nostalgia. Those promoting gun safety legislation to this group should frame their message as an affirmation of yesteryear.

Political liberals respond better to future-focused messages.

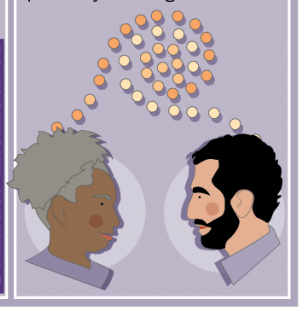
Make your message vivid. People remember dramatic visual examples. Pictures of unvaccinated children suffering from preventable diseases, or hungry children starving speak to the heart as well as the head.



Repeat your message.
People often come to believe repeated falsehoods, but they also tend to believe oft-repeated truths.



Engage your audience in restating your message or, better yet, acting on it. Engage them in actively owning it—not just passively listening.



1. McIntyre, 2021. 2. Jolley & Douglas, 2017. 3. Lammers & Baldwin, 2018.

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Ask Yourself

Have you found yourself using any of the ineffective persuasive strategies identified in the infographic? How might you improve your approach the next time you are having an important discussion?

Retrieval Practice

RP-4 What are some evidence-based ways to effectively persuade others?

ANSWERS IN APPENDIX E

REVIEW

Module 41: Social Thinking

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 41-1: What do social psychologists study? How do we tend to explain others' behavior and our own?

LOQ 41-2: How do attitudes and actions interact?

LOQ 41-3: How do *peripheral route persuasion* and *central route persuasion* differ?

LOQ 41-4: How can we share our views more effectively?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

social psychology
attribution theory
fundamental attribution error
attitude
foot-in-the-door phenomenon
role
cognitive dissonance theory
peripheral route persuasion
central route persuasion

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. A study indicated that most teen boys and girls believe the women they see in online porn are experiencing real sexual pleasure (Jones, 2018). But the situation—being in front of the camera—suggests the women are acting their role. Social psychologists might explain the teens' misperception as the _____ _____ error.

2. We tend to agree to a larger request more readily if we have already agreed to a small request. This tendency is called the _____-_____-_____-_____ phenomenon.

3. Jamala's therapist has suggested that Jamala should "act as if" she is confident, even though she feels insecure and shy. Which social psychological theory would best support this suggestion, and what might the therapist be hoping to achieve?

4. Celebrity endorsements in advertising often lead consumers to purchase products through _____ (central/peripheral) route persuasion.

MODULE 42: Social Influence

Social psychology's great lesson is the enormous power of social influence. This influence stems in part from social **norms**. On campus, workout clothes are the norm; on New York's Wall Street or London's Bond Street, business attire is expected. When we know how to act, how to groom, how to talk, life functions smoothly.

But sometimes social pressure moves people in dreadful directions. Isolated with others who share their grievances, dissenters may gradually become rebels, and rebels may become terrorists. Shootings, suicides, and bomb threats all have a curious tendency to come in clusters. After a mass killing (of four or more people), the probability of another such attack increases for the ensuing 13 days (Towers et al., 2015). Let's examine the pull of these social strings. How strong are they? How do they operate? When do we break them?

Conformity: Complying With Social Pressures

LOQ 42-1

How is social contagion a form of conformity, and how do conformity experiments reveal the power of social influence?

Social Contagion

Fish swim in schools. Birds fly in flocks. And humans, too, tend to go with their group, to do what it does and think what it thinks. Behavior is influenced by *social contagion.* A lion that sees another member of its pride yawn becomes 100+ times more likely to yawn in the next 3 minutes (Casetta et al., 2021). If one of us humans yawns, laughs, coughs, scratches, stares at the sky, or checks our phone, others in our group will often do the same (Holle et al., 2012). Even just reading about yawning increases people's yawning (Provine, 2012), as perhaps you've just noticed?

Tanya Chartrand and John Bargh (1999) call this social contagion the *chameleon effect,* likening it to chameleon lizards' ability to mimic the color of their surroundings. They captured the effect by having students work in a room alongside another person (actually an *accomplice* working for the experimenters). Sometimes the accomplices rubbed their own face. Sometimes they shook their foot. Sure enough, students tended to rub their face along with the face-rubbing person and shake their foot along with the foot-shaking person.



Social contagion also affects emotions. We human chameleons take on the emotional tones of those around us—their expressions, postures, inflections—and even their grammar (Ireland & Pennebaker, 2010). Just hearing someone reading a neutral text in either a happy- or sad-sounding voice creates *mood contagion* in listeners (Neumann & Strack, 2000).

This natural mimicry enables us to *empathize.* We smile and frown when others do, and then feel what others feel. This helps explain why we feel happier around happy people than around depressed people. It also helps explain why studies of groups of British workers have revealed *mood linkage,* the sharing of moods (Totterdell et al., 1998). Empathic mimicking—as when a conversation partner nods their head as you do—fosters fondness (Chartrand & van Baaren, 2009; Lakin et al., 2008). We tend to mimic those we like, and to like those

who mimic us (Kämpf et al., 2018). Just going for a walk with someone —perhaps someone with whom you disagreed—not only synchronizes your movements but increases rapport and empathy (Webb et al., 2017).

> **"When I see synchrony and mimicry—whether it concerns yawning, laughing, dancing, or aping—I see social connection and bonding."** — Primatologist Frans de Waal, "The Empathy Instinct," 2009

Social networks serve as contagious pathways for moods, such as happiness and loneliness, drug use, and even the behavior patterns that lead to obesity and sleep loss (Christakis & Fowler, 2009). On websites, positive ratings generate more positive ratings—a phenomenon called *positive herding* (Muchnik et al., 2013). In a massive experiment on the 2010 U.S. congressional election day, Facebook showed 61 million people a message that encouraged voting, with a link to a local voting place and a clickable "I voted" button. For some recipients, the messages also contained pictures of Facebook friends who had already voted. Those who received "tell your friends you voted" messages were slightly more likely to vote, and that difference generated an estimated 282,000 additional votes.

Suggestibility and mimicry can also lead to tragedy. Following highly publicized mass shootings, people are more likely to purchase guns and threaten violence (Cooper, 1999; Porfiri et al., 2019). Spikes in

suicide rates sometimes also follow a highly publicized suicide (Phillips, 1985; Phillips et al., 1989).

What causes behavior clusters? Do people act similarly because they influence one another? Or because they are simultaneously exposed to the same events and conditions? Seeking answers to such questions, social psychologists have conducted experiments on conformity.



Conformity and Social Norms

Suggestibility and mimicry are subtle types of **conformity**. To study conformity, Solomon Asch (1955) devised a simple test. Imagine yourself as a participant in a supposed study of visual perception. You arrive in time to take a seat at a table with five other people. The experimenter asks the group members to state, one by one, which of three comparison lines is identical to a standard line. You see clearly that the answer is Line 2, and you wait your turn to say so. Your

boredom begins to show when the next set of lines proves equally easy.

Now comes the third trial, and the correct answer seems just as clear-cut (FIGURE 42.1). But the first person gives what strikes you as a wrong answer: "Line 3." When the second person and then the third and fourth give the same wrong answer, you sit up straight and squint. When the fifth person agrees with the first four, you feel your heart begin to pound. The experimenter then looks to you for your answer. Torn between the unanimity voiced by the five others and the evidence of your own eyes, you feel tense and suddenly unsure. You hesitate before answering, wondering whether you should suffer the discomfort of being the oddball. What answer do you give?

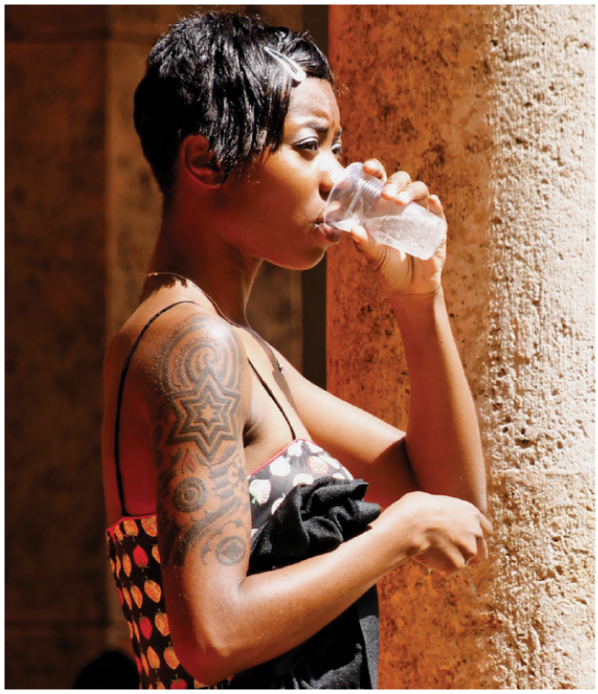


FIGURE 42.1 Asch's conformity experiments Which of the three comparison lines is equal to the standard line? What do you suppose most people would say after hearing five others say, "Line 3"? In this photo from one of Asch's experiments, the student in the center shows the severe discomfort that comes from disagreeing with the responses of other group members (in this case, accomplices of the experimenter).

In Asch's experiments, college students, answering questions alone, erred less than 1 percent of the time. But what happened when several others—accomplices of the experimenter—answered incorrectly? Although most people told the truth even when others did not, Asch was disturbed by his result: More than one-third of the time, these "intelligent and well-meaning" college students were "willing to call white black" by going along with the group (Asch, 1955).

Later investigations have not always found as much conformity as Asch found, but they have revealed that we are more likely to conform when we

- are made to feel incompetent or insecure.
- are in a group with at least three other people.
- are in a group in which everyone else agrees. (If just one other person disagrees, the odds of our disagreeing greatly increase.)
- admire the group's status and attractiveness.
- have not made a prior commitment to any response.
- know that others in the group will observe our behavior.
- are from a culture that strongly encourages respect for social standards.



Gerda & Helmut Schill/Anzenber/Redux Pictures

Tattoos: Yesterday's nonconformity, today's conformity? Steven Pinker (2019) recalls the unnoticed irony of the college administrator who bragged: "Our students are nonconformists. They all have tattoos and piercings."

Why do we so often do as others do and think as they think? Why, when asked controversial questions, are students' answers more similar when they raise their hands and more diverse when they use anonymous electronic clickers (Stowell et al., 2010)? Why do we clap when others clap, eat as others eat, believe what others believe, say what others say, even see what others see?

Frequently, we conform to avoid rejection or to gain social approval. In such cases, we are responding to **normative social influence**. We need to belong. People are most conforming to social norms in

collectivist and tight cultures, which prize group harmony (Stamkou et al., 2019). People also are responsive to "dynamic norms"—to how norms are *changing,* such as toward eating less meat, consuming fewer sugary drinks, or supporting gay rights (Sparkman & Walton, 2017, 2019).

At other times, we conform because we want to be accurate. Groups provide information, and only an uncommonly stubborn person will never listen to others. When we accept others' opinions about reality, as when reading online movie and product reviews, we are responding to **informational social influence.** Sometimes it pays to assume others are right and to follow their lead. One Welsh driver set a record for the longest distance driven on the wrong side of a British divided highway—30 miles, with only one minor sideswipe, before the motorway ran out and police were able to puncture her tires. The driver, who was intoxicated, later explained that she thought the hundreds of other drivers coming at her were all on the wrong side of the road (Woolcock, 2004).

Is conformity bad or good? Conformity can be bad—leading people to agree with falsehoods or go along with bullying. Or it can be good—leading people to give more generously after observing others' generosity (Nook et al., 2016). The answer also depends partly on our culturally influenced values. People in many Asian, African, and Latin American countries place a high value on *collectivism* (emphasizing group standards). Western Europeans and people in most English-speaking countries tend to prize *individualism* (emphasizing an

independent self). Experiments across more than two dozen countries have found lower conformity rates in individualist and loose cultures (Bond & Smith, 1996; Gelfand et al., 2011).



"I love the little ways you're identical to everyone else."

"I don't know where we're going, but I'm following the crowd." — Derrick Evans (January 6, 2021), live-streaming himself among the mob invading the U.S. Capitol

Like humans, migrating and herding animals conform for both informational and normative reasons (Claidière & Whiten, 2012). Following others is informative; compared with a solo goose, a flock of geese migrates more accurately. (There is wisdom in the crowd.) And staying with the herd also sustains group membership.

Ask Yourself

How have you found yourself conforming, or perhaps "conforming to nonconformity"? In what ways have you seen others identifying themselves with those of the same culture or subculture?

Retrieval Practice

RP-1 Which of the following strengthens conformity to a group?

a. Finding the group attractive
b. Feeling secure
c. Coming from an individualist culture
d. Having made a prior commitment

RP-2 Despite her mother's pleas to use a more ergonomic backpack, Antonia insists on carrying all of her books to school in an oversized purse, the way her fashionable friends do. Antonia is affected by what type of social influence?

ANSWERS IN APPENDIX E

Obedience: Following Orders

LOQ 42-2

What did Milgram's obedience experiments teach us about the power of social influence?

Social psychologist Stanley Milgram (1963, 1974), a student of Solomon Asch, knew that people often give in to social pressures. But what about outright commands? Would they respond as did those who carried out Holocaust atrocities? (Some of Milgram's family members had survived Nazi concentration camps.) To find out, the 26-year-old Yale professor undertook what have become social psychology's most famous and controversial experiments (Benjamin & Simpson, 2009).



Macmillan Learning

Stanley Milgram (1933–1984) This social psychologist's obedience experiments "belong to the self-understanding of literate people in our age" (Sabini, 1986).

Imagine yourself as one of the nearly 1000 people, mostly White men aged 20 to 50, who took part in Milgram's 23 experiments. You respond to an ad for participants in a Yale University psychology study of the effect of punishment on learning. Professor Milgram's assistant asks you and another person to draw slips from a hat to see who will be the "teacher" and who will be the "learner." You draw a "teacher" slip (unknown to you, both slips say "teacher"). The supposed learner, a mild and submissive-seeming man, is led to an adjoining room and strapped into a chair. From the chair, wires run through the wall to a shock machine. You sit down in front of the machine and are given your task: Teach and then test the learner on a list of word pairs. If the learner gives a wrong answer, you are to flip a switch to deliver a brief

electric shock. For the first wrong answer, you will flip the switch labeled "15 Volts—Slight Shock." With each succeeding error, you will move to the next higher voltage. With each flip of a switch, lights flash and electronic switches buzz.

The experiment begins, and you deliver the shocks after the first and second wrong answers. If you continue, you hear the learner grunt when you flick the third, fourth, and fifth switches. After you activate the eighth switch ("120 Volts—Moderate Shock"), the learner cries out that the shocks are painful. After the tenth switch ("150 Volts—Strong Shock"), he begins shouting: "Get me out of here! I won't be in the experiment anymore! I refuse to go on!" You draw back, but the stern experimenter prods you: "Please continue—the experiment requires that you continue." You resist, but the experimenter insists, with statements such as, "It is absolutely essential that you continue," or "You have no other choice, you *must* go on."

If you obey, you hear the learner shriek in apparent agony as you continue to raise the shock level after each new error. After the 330-volt level, the learner refuses to answer and falls silent. Still, the experimenter pushes you toward the final, 450-volt switch. "Ask the question," he says, "and if no correct answer is given, administer the next shock level."

Would you follow the experimenter's commands to shock someone? At what level would you refuse to obey? Previously, Milgram had asked nonparticipants what they would do. Most were sure they would stop

soon after the learner first indicated pain, certainly before he shrieked in agony. Forty psychiatrists agreed with that prediction. Were the predictions accurate? Not even close. When Milgram actually conducted the experiment, he was astonished. More than 60 percent complied fully—right up to the last switch. When he ran a new study, with 40 new "teachers" and a learner who complained of a "slight heart condition," the results were similar. A full 65 percent of the new teachers obeyed the experimenter, right up to 450 volts (**FIGURE 42.2**). In 10 later studies, women obeyed at rates similar to men's (Blass, 1999).

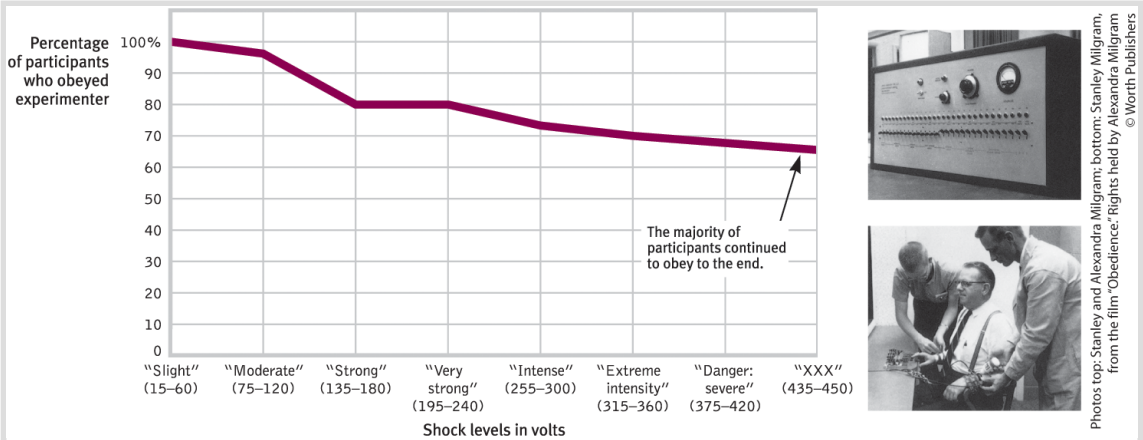


FIGURE 42.2 Milgram's follow-up obedience experiment

Were Milgram's results a product of the 1960s U.S. mindset? *No.* In a decades-later replication, 70 percent of the California participants obeyed up to the 150-volt point (only a modest reduction from Milgram's 83 percent at that level) (Burger, 2009). A Polish research team found 90 percent obedience to the same level (Doliński et al.,

2017). And when a French reality TV show replicated Milgram's study, 81 percent of participants, egged on by a cheering audience, obeyed and tortured a screaming "victim" (Beauvois et al., 2012).

Did Milgram's teachers figure out the hoax—that no real shock was being delivered and the learner was in fact an accomplice pretending to feel pain? Did they realize the experiment was really testing their willingness to comply with commands to inflict punishment? Some did, and then became willing to play along, report Milgram's critics (Griggs et al., 2020), though Milgram reported that the teachers were often genuinely distressed: Many sweated, trembled, laughed nervously, and bit their lips.

Milgram's use of deception and stress triggered a debate over his research ethics. In his own defense, Milgram pointed out that, after the participants learned of the deception and actual research purposes, virtually none regretted taking part (though perhaps by then the participants had reduced their *cognitive dissonance*—the discomfort they felt when their actions conflicted with their attitudes). When a psychiatrist later interviewed 40 of the teachers who had agonized most, none appeared to be suffering emotional aftereffects. All in all, said Milgram, the experiments provoked less enduring stress than university students experience when facing and failing big exams (Blass, 1996). Other scholars, however, after delving into Milgram's archives, report that his debriefing was less extensive and his participants' distress greater than he had suggested (Nicholson, 2011; Perry, 2013). Critics have also speculated that participants may

have been identifying with the researcher and his scientific goals rather than merely being blindly obedient (Haslam et al., 2014, 2016).

In later experiments, Milgram discovered some conditions that influence people's behavior. When he varied the situation, full obedience ranged from 0 to 93 percent. Obedience was highest when

- ***the person giving the orders was close at hand and was perceived as a legitimate authority figure.*** This was the case in 2005 when Temple University's basketball coach sent a 250-pound bench player, Nehemiah Ingram, into a game with instructions to commit "hard fouls." Following orders, Ingram fouled out in 4 minutes after breaking an opposing player's right arm.
- ***a powerful or prestigious institution supported the authority figure.*** Compliance was somewhat lower when Milgram dissociated his experiments from Yale University. People have wondered: Why, during the 1994 Rwandan genocide, did so many Hutu citizens slaughter their Tutsi neighbors? It was partly because they were part of "a culture in which orders from above, even if evil," were understood as having the force of law (Kamatali, 2014).
- ***the victim was depersonalized or at a distance, even in another room.*** Similarly, many soldiers in combat either have not fired their rifles at an enemy they could see, or have not aimed them properly. Such refusals to kill are rarer among soldiers operating long-distance artillery or aircraft weapons (Padgett, 1989). Those who kill from a distance—by operating remotely piloted drones—

also suffer stress, though much less posttraumatic stress than do veterans of on-the-ground conflict in Afghanistan and Iraq (G. Miller, 2012).

- ***there were no role models for defiance.*** "Teachers" did not see any other participant disobey the experimenter.

The power of legitimate, close-at-hand authorities was apparent among those who followed orders to carry out the Nazis' Holocaust atrocities. Obedience alone does not explain the Holocaust—anti-Semitic ideology produced eager killers as well (Fenigstein, 2015; Mastroianni, 2015). But obedience was a factor. In the summer of 1942, nearly 500 middle-aged German reserve police officers were dispatched to German-occupied Jozefow, Poland. On July 13, the group's visibly upset commander informed his recruits, mostly family men, of their orders. They were to round up the village's Jews, who were said to be aiding the enemy. Able-bodied men would be sent to work camps, and the rest would be shot on the spot.

> **"The Holocaust… did not start from gas chambers. This hatred gradually developed from words, stereotypes & prejudice through legal exclusion, dehumanisation & escalating violence."** — Auschwitz Museum tweet, 2018

The commander gave the recruits a chance to refuse to participate in the executions. Only about a dozen immediately refused. Within 17 hours, the remaining 485 officers killed 1500 helpless citizens, including women, children, and the elderly, shooting them in the back of the head as they lay face down. Hearing the victims' pleas, and

seeing the gruesome results, some 20 percent of the officers did dissent eventually, managing either to miss their victims or to slip away and hide until the slaughter was over (Browning, 1992). In real life, as in Milgram's experiments, those who resisted were the minority.

A different story played out in the French village of Le Chambon. There, villagers openly defied orders to cooperate with the "New Order": They sheltered French Jews destined for deportation to Germany, and they sometimes helped them escape across the Swiss border. The villagers' Protestant ancestors had themselves been persecuted, and their pastors taught them to "resist whenever our adversaries will demand of us obedience contrary to the orders of the Gospel" (Rochat, 1993). Ordered by police to give a list of sheltered Jews, the head pastor modeled defiance: "I don't know of Jews, I only know of human beings." At great personal risk, the people of Le Chambon made an initial commitment to resist. They suffered from poverty and were punished for their disobedience. Still, supported by their beliefs, their role models, their interactions with one another, and their own initial acts, they remained defiant to the war's end.

Lest we presume that obedience is always evil and resistance is always good, consider the heroic obedience of British soldiers who, in 1852, were traveling with civilians aboard the steamship *Birkenhead.* As they neared their South African port, the *Birkenhead* became impaled on a rock. The soldiers calmed passengers and helped them onto three available lifeboats—not nearly enough for everyone. "Steady, men!,"

ordered their officer as the lifeboats filled. Heroically, no one frantically rushed to claim a lifeboat seat. As the boat sank, all left onboard were plunged into the sea, most to be drowned or devoured by sharks. For almost a century, noted James Michener (1978), "the Birkenhead drill remained the measure by which heroic behavior at sea was measured."

Lessons From the Conformity and Obedience Studies

LOQ 42-3

What do the social influence studies teach us about ourselves? How much power do we have as individuals?

How do the laboratory experiments on social influence relate to everyday life? How does judging the length of a line or flicking a shock switch relate to everyday social behavior? Psychology's experiments aim not to re-create the actual, complex behaviors of everyday life but to capture and explore the underlying processes that shape those behaviors. Solomon Asch and Stanley Milgram devised experiments that forced a familiar choice: Do I adhere to my own standards, even when they conflict with the expectations of others?

In Milgram's experiments and their modern replications, participants were torn. Should they respond to the pleas of the victim or the orders of the experimenter? Their moral sense warned them not to harm

another, yet it also prompted them to obey the experimenter and to be a good research participant. With kindness and obedience on a collision course, obedience usually won.

These experiments demonstrated that strong social influences induce many people to conform to falsehoods or capitulate to cruelty. Milgram saw this as the fundamental lesson of this work: "Ordinary people, simply doing their jobs, and without any particular hostility on their part, can become agents in a terrible destructive process" (1974, p. 6).

Focusing on the end point—450 volts, or someone's real-life violence—we can hardly comprehend the inhumanity. But Milgram did not entrap his teachers by asking them first to zap learners with enough electricity to make their hair stand on end. Using the *foot-in-the-door* technique, he instead began with a little tickle of electricity and escalated step by step. To those throwing the switches, the small action became justified, making the next act tolerable. So it happens when people succumb, gradually, to evil.

> **"All evil begins with 15 volts."** — Philip Zimbardo, Stanford lecture, 2010

In any society, great evils often grow out of people's compliance with lesser evils. The Nazi leaders suspected that most German civil servants would resist shooting or gassing Jews directly, but they found them willing to handle the paperwork of the Holocaust (Silver &

Geller, 1978). Milgram found a similar reaction in his experiments. When he asked 40 men to administer the learning test while someone else did the shocking, 93 percent complied. Cruelty does not require devilish villains. All it takes is ordinary people corrupted by an evil situation. Ordinary students may follow orders to haze initiates into their group. Ordinary employees may follow orders to produce and market harmful products. Among people abducted into a violent group, those forced to perpetrate violence are most likely then to identify with the group (Littman, 2018). Attitudes follow behavior.

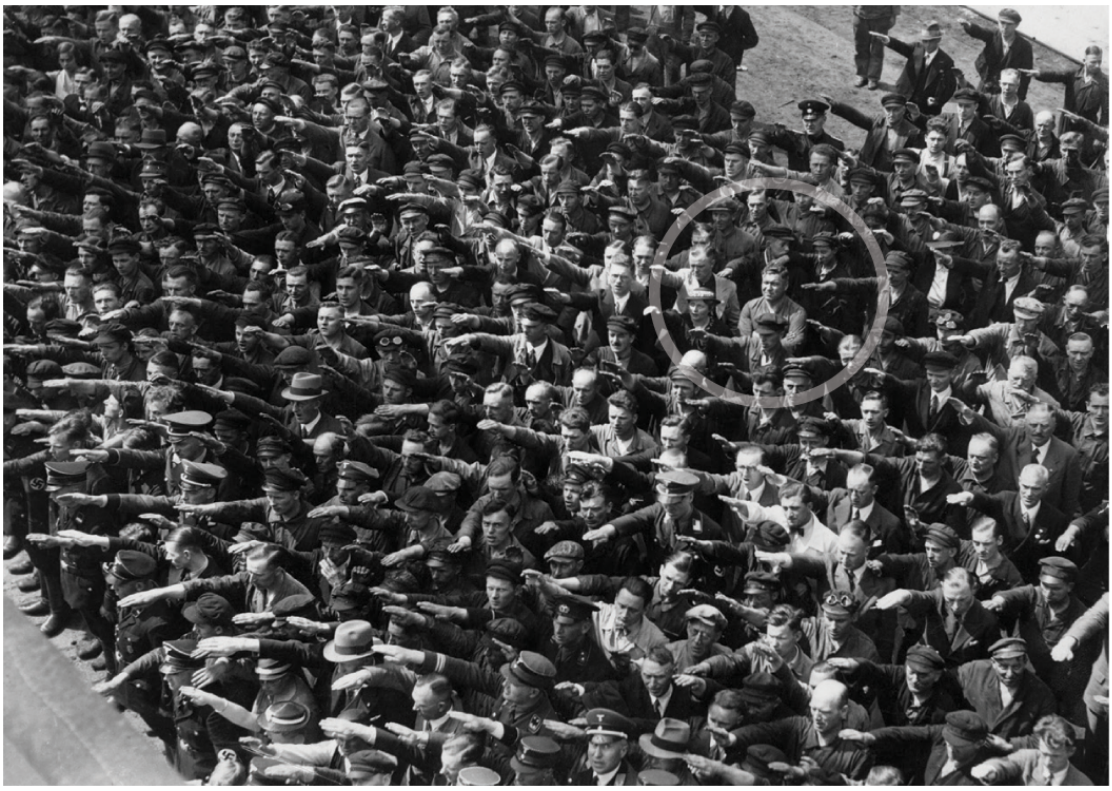
> **"I was only following orders."** — Adolf Eichmann, Director of Nazi deportation of Jews to concentration camps

In Jozefow and Le Chambon, as in Milgram's experiments, those who resisted usually did so early. After the first acts of compliance or resistance, attitudes began to follow and justify behavior.

What have social psychologists learned about the power of the individual? *Social control* (the power of the situation) and *personal control* (the power of the individual) interact. Much as water dissolves salt but not sand, so rotten situations turn some people into bad apples while others resist (Johnson, 2007).

When feeling pressured, some people react by doing the opposite of what is expected (Rosenberg & Siegel, 2018). The power of one or two individuals to sway majorities is *minority influence* (Moscovici, 1985).

One research finding repeatedly stands out. When you are the minority, you are far more likely to sway the majority if you hold firmly to your position and don't waffle. This tactic won't make you popular, but it may make you influential, especially if your self-confidence stimulates others to consider why you think as you do. Even when a minority's influence is not yet visible, people may privately develop sympathy for the minority position and rethink their views (Wood et al., 1994).



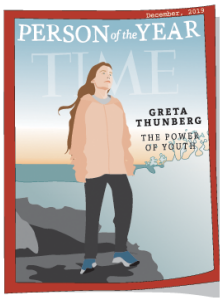
Sueddeutsche Zeitung Photo/Alamy Stock Photo

Minority influence To be August Landmesser, standing defiantly with arms folded as everyone else salutes their allegiance to the Nazi Party and Adolf Hitler, requires extraordinary courage. But sometimes such individuals have inspired others, demonstrating the power of minority influence.

The powers of social influence are enormous, but so are the powers of the committed individual. Were this not so, communism would have remained an obscure theory, Christianity would be a small Middle Eastern sect, and Rosa Parks' refusal to sit at the back of the bus would not have ignited the U.S. civil rights movement. Social forces matter. But individuals matter, too.







Left to right: Michael Campanella/Getty Images; Michael Nigro/Pacific Press Agency/Alamy Stock Photo; Macmillan Learning

The power of one In August, 2018, 15-year-old Greta Thunberg sat alone outside the Swedish Parliament—the first school strike protesting climate change. Thirteen months after her act ignited a movement, some 4 million people worldwide joined her for the September, 2019, climate strike, and *Time* magazine honored her as their 2019 Person of the Year.

Retrieval Practice

RP-3 Psychology's most famous obedience experiments, in which most participants obeyed an authority figure's demands to inflict presumed painful, dangerous shocks on an innocent participant, were conducted by social psychologist _____ _____.

RP-4 What situations have researchers found to be most likely to encourage obedience in participants?

ANSWERS IN APPENDIX E

Group Behavior

LOQ 42-4

How does the presence of others influence our actions, via social facilitation, social loafing, and deindividuation?

Imagine standing in a room holding a fishing pole. Your task is to wind the reel as fast as you can. On some occasions you wind in the presence of another participant, who is also winding as fast as possible. Will the other's presence affect your own performance?

In one of social psychology's first experiments, Norman Triplett (1898) reported that adolescents would wind a fishing reel faster in the presence of someone doing the same thing. Although a modern reanalysis revealed that the difference was modest (Stroebe, 2012), Triplett inspired later social psychologists to study how others' presence affects our behavior. Group influences operate both in simple groups—one person in the company of another—and in more complex groups.

Social Facilitation

Triplett's claim—of strengthened performance in others' presence—is called **social facilitation.** But further studies revealed that the truth is

more complicated. The presence of others strengthens our most *likely* response—the correct one on an easy task, an incorrect one on a difficult task (Guerin, 1986; Zajonc, 1965). Why? Because when others observe us, we become aroused, and this arousal amplifies our reactions. Perhaps you, like most people, tend to eat more when eating with others (Ruddock et al., 2019)? Or consider the expert pool players who made 71 percent of their shots when alone, and 80 percent when four people came to watch them (Michaels et al., 1982). Poor shooters, who made 36 percent of their shots when alone, made only 25 percent when watched.



Hope College

Social facilitation Skilled athletes often find they are "on" before an audience. What they

do well, they do even better when people are watching.

The energizing effect of an enthusiastic audience helps explain the home-team advantage. Studies of more than a quarter-million college and professional athletic events in various countries have shown a home team advantage of 54 percent in Major League Baseball games, 60 percent in National Basketball Association games, and 63 percent in English Premier League football (soccer) games (Allen & Jones, 2014; Jamieson, 2010; Moskowitz & Wertheim, 2011). But in pandemic-era empty stadiums, the home advantage dissipated or disappeared in European professional football matches (Hamilton, 2021; Leitner & Richlan, 2021; Tilp & Thaller, 2020).

The point to remember: What you do well, you are likely to do even better in front of an audience, especially a friendly audience. What you usually find difficult may seem all but impossible when you are being watched.

Social facilitation also helps explain a funny effect of crowding. Comedians know that a "good house" is a full one. What they may not know is that crowding triggers arousal. Comedy routines that are mildly amusing in an uncrowded room seem funnier in a densely packed room (Aiello et al., 1983; Freedman & Perlick, 1979). When seated close to one another, people like a friendly person even more and an unfriendly person even less (Schiffenbauer & Schiavo, 1976;

Storms & Thomas, 1977). So, to energize your next event, choose a room or set up seating that will just barely accommodate everyone.

Social Loafing

Social facilitation experiments test the effect of others' presence on the performance of an individual task, such as shooting pool. But what happens when people perform as a group—say, in a team tug-of-war? Would you exert more, less, or the same effort as in a one-on-one match?

To find out, a University of Massachusetts research team asked blindfolded students "to pull as hard as [they] can" on a rope. When they fooled the students into believing three others were also pulling behind them, students exerted only 82 percent as much effort as when they knew they were pulling alone (Ingham et al., 1974). And consider what happened when blindfolded people seated in a group clapped or shouted as loudly as they could while hearing (through headphones) other people clapping or shouting loudly (Latané, 1981). When they thought they were part of a group effort, the participants produced about one-third less noise than when clapping or shouting "alone."

This diminished effort is called **social loafing** (Jackson & Williams, 1988; Latané, 1981). Experiments in the United States, India, Thailand, Japan, China, and Taiwan have found social loafing on various tasks, though it was especially common among men in individualist cultures (Karau & Williams, 1993). What causes social loafing? When people act as part of a group, they may

- ***feel less accountable*** and therefore worry less about what others think.
- ***view individual contributions as dispensable*** (Harkins & Szymanski, 1989; Kerr & Bruun, 1983).
- ***overestimate their own contributions,*** downplaying others' efforts (Schroeder et al., 2016).
- ***free ride on others' efforts.*** Unless highly motivated and strongly identified with the group, people may slack off (as you may have observed on group assignments)—especially when they share equally in the benefits, regardless of how much they contribute.

Ask Yourself

What steps could you take to reduce social loafing in your next group project assignment?

Deindividuation

We've seen that the presence of others can arouse people (social facilitation), or it can diminish their feelings of responsibility (social loafing). But sometimes the presence of others does both. The uninhibited behavior that results can range from a food fight to vandalism or rioting. This process of losing self-awareness and self-restraint, called **deindividuation**, often occurs when group participation makes people both *aroused* and *anonymous*. Compared with identifiable women in a control group, New York University

women dressed in depersonalizing Ku Klux Klan–style hoods delivered twice as much presumed electric shock to a victim (Zimbardo, 1970).



Jessica Kourkounis/Reuters/Newscom

Deindividuation In the excitement that followed the Philadelphia Eagles winning their first National Football League Super Bowl in 2018, some fans, disinhibited by social arousal and the anonymity provided by their "underdog" masks, became destructive.

"Groups tend to be more immoral than individuals." — Martin Luther King, Jr., "Letter from Birmingham Jail," 1963

Deindividuation thrives in many settings. Internet anonymity enables people to feed and freely express their anger, sometimes with bullying and hate speech (Chetty & Alathur, 2018; Kowalski et al., 2018). Online trolls report enjoying their unleashed abuse of others (Buckels et al., 2014; Sest & March, 2017). They might never say "You're disgusting!" to someone's face, but they can hide behind their anonymity online. One study showed that tribal warriors wearing face paint or masks were more likely than those with exposed faces to kill, torture, or mutilate captured enemies (Watson, 1973). When we shed self-awareness and self-restraint—whether in a mob, at a concert, at a ball game, or at worship—we become more responsive to the group experience, bad or good. For a comparison of social facilitation, social loafing, and deindividuation, see **TABLE 42.1**.

TABLE 42.1 Behavior in the Presence of Others: Three Phenomena

Phenomenon	Social context	Psychological effect of others' presence	Behavioral effect
Social facilitation	Individual being observed	Increased arousal	Amplified dominant behavior, such as doing better what one does well, or doing worse what is difficult
Social loafing	Group projects	Diminished feelings of responsibility when not individually accountable	Decreased effort
Deindividuation	Group setting that fosters	Reduced self-awareness	Lowered self-restraint

	arousal and anonymity		

***

We have examined the conditions under which the *presence* of others can motivate people to exert themselves or tempt them to free ride on the efforts of others, make easy tasks easier and difficult tasks harder, and enhance humor or fuel mob violence. Research also shows that *interacting* with others can similarly have both bad and good effects.

Group Polarization

LOQ 42-5

How can group interaction enable group polarization?

We live in an increasingly polarized world. The Middle East is torn by warring factions. The European Union is struggling with nationalist divisions. In 1990, a 1-minute speech in the U.S. Congress would enable you to guess the speaker's party just 55 percent of the time; by 2009, partisanship was evident 83 percent of the time (Gentzkow et al., 2016). In 2016, for the first time in survey history, most U.S. Republicans and Democrats reported having "*very* unfavorable" views of the other party (Doherty & Kiley, 2016). People in both parties believe that "my side" is objective, and the other side is biased (Schwalbe et al., 2020). U.S. polarization reached an extreme in early

2021, when pro-Trump insurrectionists invaded the U.S. Capitol and anti-Trump citizens were outraged.

A powerful principle helps us understand this increasing polarization: The beliefs and attitudes we bring to a group grow stronger as we discuss them with like-minded others. This process, called **group polarization**, can have beneficial results, as when low-prejudice students become even more accepting while discussing racial issues. As George Bishop and I [DM] discovered, it can also be socially toxic, as when high-prejudice students who discuss racial issues together become *more* prejudiced (Myers & Bishop, 1970) (**FIGURE 42.3**). Our repeated finding: Like minds polarize.

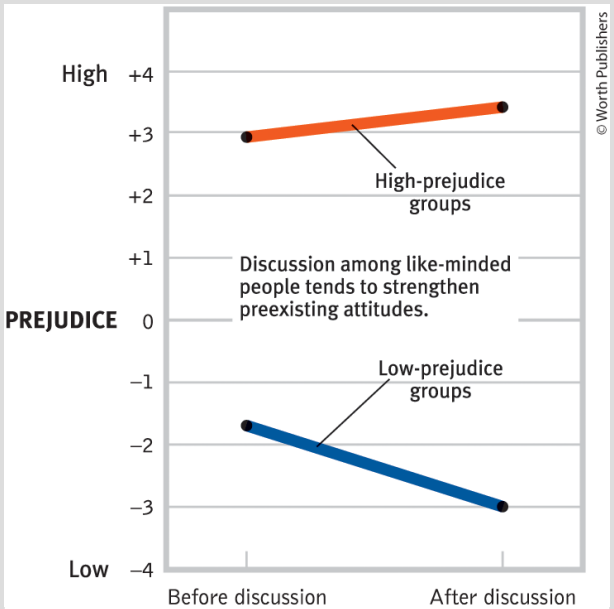


FIGURE 42.3 Group polarization

Analyses of terrorist organizations reveal that the terrorist mentality emerges slowly among those who share a grievance (McCauley, 2002; McCauley & Segal, 1987; Merari, 2002). As susceptible individuals interact in isolation (sometimes with other "brothers" and "sisters" in camps or prisons), their views grow more extreme. Increasingly, they categorize the world as "us" against "them" (Chulov, 2014; Moghaddam, 2005). Knowing that group polarization occurs when like-minded people segregate, a 2006 U.S. National Intelligence estimate speculated that "the operational threat from self-radicalized cells will grow."



Shay Horse/NurPhoto/Getty Images

Toxic group polarization As illustrated in this 2017 Charlottesville, Virginia, white nationalist rally, the interaction of like minds—both online and face-to-face—can strengthen preexisting attitudes. The 2019 U.S. Department of Homeland Security's *Strategic Framework for Countering Terrorism and Targeted Violence* declared, "Similar to how ISIS inspired and connected with potential terrorists, white supremacist violent extremists connect with like-minded individuals online."



Technology is a Mixed Bag by Andy Singer/Cagle Cartoons, Inc.

The internet offers us a connected global world, yet also provides an easily accessible medium for group polarization. When I [DM] got my start in social psychology with experiments on group polarization, I never imagined the potential power of polarization in *virtual* groups. Progressives friend progressives and share links to sites that affirm their shared views. Conservatives connect with conservatives and likewise share conservative perspectives. With news feeds and retweets, we fuel one another with information—and misinformation—and click on content we agree with (Hills, 2019). Social media echo chambers may amplify extremist messages, which tend to be more visible and more likely to be shared (Bail, 2021). The result is an outrage machine: Our biases may lead us to welcome and share misinformation that supports our beliefs, which strengthens our

biases, and leads to even more polarization. In 2018, a U.S. man sent over a dozen pipe bombs to prominent Democrats and their perceived supporters after venting his partisan resentments on the internet, which "echoed them back. It validated and cultivated them. It took something dark and colored it darker still" (Bruni, 2018).

> **"Dear Satan, thank you for having my internet news feeds tailored especially for ME!"** — Comedian Steve Martin, 2016

Mindful of the viral false-news phenomenon, tech companies are working on ways to promote media information literacy. For more on the internet's role in group polarization—toward ends that are good as well as bad—see Thinking Critically About: The Internet as Social Amplifier.

LOQ 42-6

What role does the internet play in group polarization?

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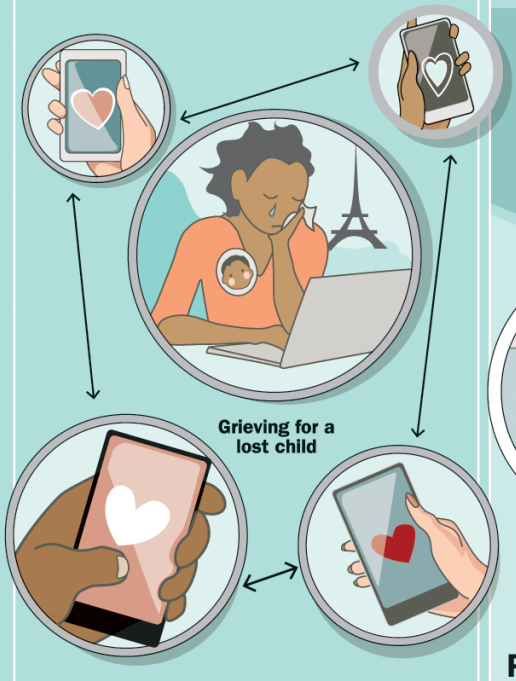
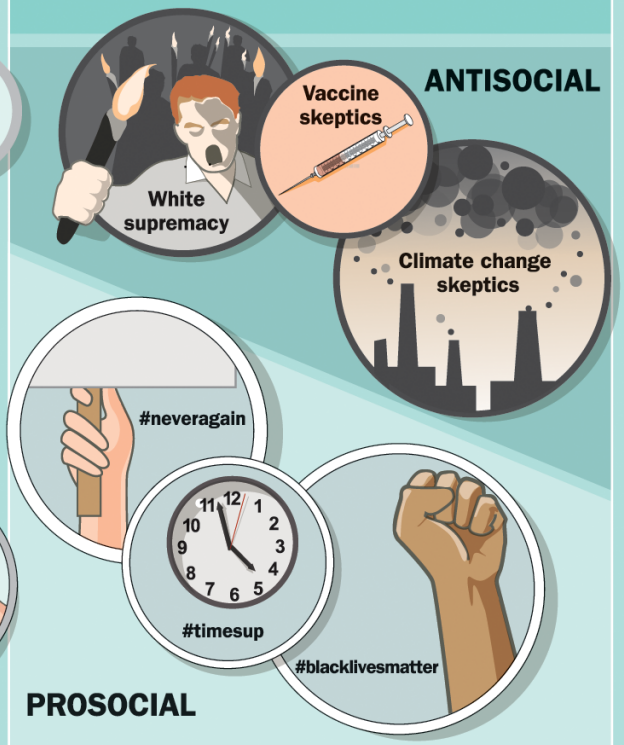
Thinking Critically About:
The Internet as Social Amplifier

The internet connects like-minded people.

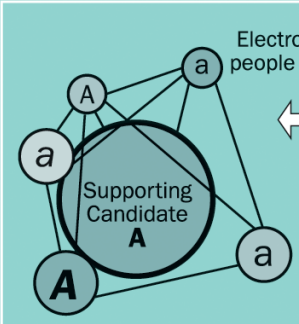
These connections can bring ***emotional healing***, such as for cancer survivors and bereaved parents.



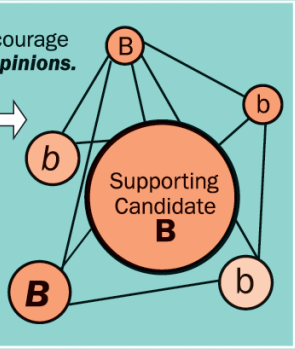
Online sharing can also ***strengthen social movements***.



Electronic communication and social networking can encourage people to ***isolate themselves from those with different opinions.***



On social media, we often share political content with like-minded others.[1]



Like-minded separation + conversation

↓

group polarization

1. Bakshy et al., 2015; Barberá et al., 2015.

Groupthink

LOQ 42-7

How can group interaction enable groupthink?

Does group influence ever distort important national decisions? Consider the Bay of Pigs fiasco. In 1961, U.S. President John F. Kennedy and his advisers decided to invade Cuba with 1400 CIA-trained Cuban exiles. When the invaders were easily captured and quickly linked to the U.S. government, Kennedy wondered aloud, "How could I have been so stupid?"

Social psychologist Irving Janis (1982) studied the decision-making process leading to the ill-fated invasion. He discovered that the soaring morale of the recently elected president and his advisers fostered undue confidence. To preserve the good feeling, group members suppressed or self-censored their dissenting views, especially after President Kennedy voiced his enthusiasm for the scheme. Since no one spoke strongly against the idea, everyone assumed the support was unanimous. To describe this harmonious but unrealistic group thinking, Janis coined the term **groupthink**.

Later studies showed that groupthink—fed by overconfidence, conformity, self-justification, and group polarization—contributed to other fiascos. Among them were the failure to anticipate the 1941 Japanese attack on Pearl Harbor; the escalation of the Vietnam war;

the U.S. Watergate cover-up; the Chernobyl nuclear reactor accident (Reason, 1987); the U.S. space shuttle *Challenger* explosion (Esser & Lindoerfer, 1989); and the Iraq war, launched on the false belief that Iraq had weapons of mass destruction (U.S. Senate Intelligence Committee, 2004).

> **"One of the dangers in the White House, based on my reading of history, is that you get wrapped up in groupthink and everybody agrees with everything, and there's no discussion and there are no dissenting views."** — Barack Obama, December 1, 2008, press conference

Despite the dangers of groupthink, two heads are often better than one. Great minds often don't think alike. Knowing this, Janis also studied instances in which U.S. presidents and their advisers collectively made good decisions, such as when the Truman administration formulated the Marshall Plan, which offered assistance to Europe after World War II, and when the Kennedy administration successfully prevented the Soviets from installing missiles in Cuba. His conclusion? Groupthink is prevented when a leader—whether in government or in business—welcomes various opinions, invites experts' critiques of developing plans, and assigns people to identify possible problems. Just as the suppression of dissent bends a group toward bad decisions, open debate often shapes good ones. This is especially the case with small but diverse groups, whose varied backgrounds and perspectives often enable creative or

superior outcomes (Shi et al., 2019; J. Wang, et al., 2019; L. Wu et al., 2019). None of us is as smart as all of us.

"If evil is contagious, so is goodness." — Pope Francis tweet, 2017

Ask Yourself

Have you witnessed or experienced group polarization online?

Retrieval Practice

RP-5 What is *social facilitation,* and why does it improve performance with a well-learned task?

RP-6 People tend to exert less effort when working with a group than they would alone, which is called _____ _____.

RP-7 You are organizing a meeting of fiercely competitive political candidates and their supporters. To add to the fun, friends have suggested handing out masks of the candidates' faces for supporters to wear. What phenomenon might these masks engage?

RP-8 When like-minded groups discuss a topic, and the result is the strengthening of the prevailing opinion, this is called _____ _____.

RP-9 When a group's desire for harmony overrides its realistic analysis of other options, _____ has occurred.

ANSWERS IN APPENDIX E

REVIEW

Module 42: Social Influence

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 42-1: How is social contagion a form of conformity, and how do conformity experiments reveal the power of social influence?

LOQ 42-2: What did Milgram's obedience experiments teach us about the power of social influence?

LOQ 42-3: What do the social influence studies teach us about ourselves? How much power do we have as individuals?

LOQ 42-4: How does the presence of others influence our actions, via social facilitation, social loafing, and deindividuation?

LOQ 42-5: How can group interaction enable group polarization?

LOQ 42-6: What role does the internet play in group polarization?

LOQ 42-7: How can group interaction enable groupthink?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

norms
conformity
normative social influence
informational social influence
social facilitation
social loafing
deindividuation
group polarization
groupthink

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. Researchers have found that a person is most likely to conform to a group if

a. the group members have diverse opinions.
b. the person feels competent and secure.
c. the person admires the group's status.
d. no one else will observe the person's behavior.

2. In Milgram's experiments, the rate of obedience was highest when
   a. the "learner" was at a distance from the "teacher."
   b. the "learner" was close at hand.
   c. other "teachers" refused to go along with the experimenter.
   d. the "teacher" disliked the "learner."

3. Dr. Huang, a popular music professor, delivers fascinating lectures on music history but gets nervous and makes mistakes when describing exam statistics in front of the class. Why does his performance vary by task?

4. In a group situation that fosters arousal and anonymity, a person sometimes loses self-consciousness and self-control. This phenomenon is called _____.

5. Sharing our opinions with like-minded others tends to strengthen our views, a phenomenon referred to as _____ _____.

MODULE 43: Antisocial Relations

Social psychology studies how we think about and influence one another, and also how we *relate* to one another. What causes people sometimes to hate and harm, and other times to love and help? And when conflicts arise, how can we move toward a just peace? In this section we ponder insights into *antisocial* relations gleaned by researchers who have studied prejudice, aggression, and conflict.

Prejudice

LOQ 43-1

What is *prejudice?* How do explicit and implicit prejudice differ?

Prejudice means "prejudgment." It is an unjustifiable and usually negative *attitude* toward a group and its members, who often are people of a particular racial or ethnic group, gender, mental health or physical ability group, or sexual orientation. Attitudes are feelings, influenced by beliefs, that predispose us to act in certain ways. The ingredients in prejudice's three-part mixture are

- *negative emotions,* such as fear or disgust. Strong negative emotions are not problematic alone, but when they are projected toward another group without justification, they can be harmful.

Feeling scared when approached by someone with mental illness can lead us to avoid or reject them (Hinshaw, 2009). Feeling disgust in response to others' differing sexual orientation can lead to disapproval of such differences (Inbar et al., 2009).

- **stereotypes**, or generalized beliefs about a group of people such as "corrupt media" or "vulture capitalists." Our stereotypes sometimes reflect reality (Jussim & Honeycutt, 2021). Senator Ted Cruz of Texas once observed, "It's a stereotype that Texans like barbecue. It also happens that pretty much all Texans like barbecue" (Flegenheimer, 2018). Other stereotypes—like those based on astrological signs—fail to predict personality or performance (Lu et al., 2020). Stereotypes often overgeneralize or exaggerate group traits and behaviors, and can even push people into undesirable roles that fit the stereotype (Eagly & Koenig, 2021). In the United States, for example, strongly partisan Republicans and Democrats exhibit a "perception gap"—they overestimate the extremism of the other side (Yudkin et al., 2019). Moreover, Democrats greatly overestimate the percent of Republicans who earn more than $250,000 a year and Republicans greatly overestimate the percent of Democrats who are LGBTQ (Ahler & Sood, 2018).
- a predisposition to **discriminate**—to *act* in harmful and unjustifiable ways toward members of the group. Sometimes prejudice is blatant. People with anti-Black attitudes, for example, are less likely to judge as guilty a White police officer who killed a Black man (Cooley et al., 2019). Other times, it is more subtle, taking the form of *microaggressions,* such as being ignored at the

deli counter (Williams, 2021). In experiments, people seeking Airbnb reservations have received worse treatment when calling themselves Jamal rather than John, or Lakisha rather than Emily (Edelman et al., 2017).

People also experience prejudice because of their weight, age, or physical appearance (Lippens et al., 2022; Stier & Hinshaw, 2017; Zhu et al., 2022). To automatically perceive an older person as incapable or a less attractive person as incompetent is to be prejudiced. To reject a qualified job candidate who is older than most other applicants or is a woman instead of a man is to discriminate.

Body weight bias: In data collected from 4 million U.S. adults, explicit biases against those of a particular sex, disability, age, or race were greatly exceeded by biases in response to body weight (Charlesworth & Banaji, 2019).

Explicit and Implicit Prejudice

Again and again, we have seen that our brain processes thoughts, memories, and attitudes on two different tracks. Sometimes that processing is *explicit*—on the radar screen of our awareness. More often, it is *implicit*—an unthinking knee-jerk response operating below the radar, leaving us unaware of how our attitudes influence our behavior. In 2015, the U.S. Supreme Court, in upholding the Fair Housing Act, recognized **implicit bias** research, noting that

"unconscious prejudices" can cause discrimination even when people do not consciously intend to discriminate.

Psychologists study implicit prejudice by

- ***testing for automatic group associations.*** Tests in which people quickly pair a person's image with a trait demonstrate that even people who deny any racial prejudice may exhibit negative associations (Greenwald & Banaji, 2017). Millions of people have taken the Implicit Association Test (as you can, too, at Implicit.Harvard.edu). Critics question the test's reliability and caution against using it to assess or label individuals (Kvam et al., 2022; Oswald et al., 2015). But defenders counter that implicit biases predict behaviors ranging from simple acts of friendliness to work quality (Greenwald et al., 2022). Implicit biases have also mirrored cultural trends toward greater acceptance of various groups. In the United States between 2007 and 2020, for example, people's implicit biases regarding sexual orientation and race decreased (Charlesworth & Banaji, 2022).
- ***considering automatic patronization.*** In one experiment, White university women assessed flawed student essays they believed had been written by either a White or a Black student. The women gave low evaluations, often with harsh comments, to the essays supposedly written by a White student. Their assessment was more positive when the same essay was attributed to a Black student (Harber, 1998). In follow-up studies, male and female research participants similarly patronized female authors. When evaluating an author's essay, participants offered uplifting but

inaccurate feedback to women, but not to men (Jampol & Zayas, 2021). In real-world evaluations, such low expectations and the resulting "white lies" of inflated praise and insufficient criticism could hinder minority student and female achievement. To reduce implicit bias, teachers may read essays without knowing the authors' race and gender.

- ***monitoring reflexive bodily responses.*** Even people who consciously express little prejudice may give off telltale signals as their body responds selectively to an image of a person from another ethnic group. Neuroscientists can detect signals of implicit prejudice in the viewer's facial-muscle responses and in the activation of the emotion-processing amygdala (Cunningham et al., 2004; Eberhardt, 2005; Stanley et al., 2008).

> **"But who can detect their errors? Clear me from hidden faults."** — Psalm 19:12



Left: Beata Zawrzel/NurPhoto/Getty Images; right: KEREM YUCEL/AFP/Getty Images

Implicit bias, explicit prejudice? In May, 2020, a White police officer killed George Floyd by kneeling on his neck for more than 9 minutes while Floyd cried "I can't breathe!" and compliant

subordinate officers stood by without intervening. Had Floyd been White, would he have been perceived and treated the same way?

Targets of Prejudice

LOQ 43-2

What groups tend to experience prejudice?

Racial and Ethnic Prejudice

Expressed racial attitudes in the United States have undergone a sea change. Support for interracial marriage between Black and White people, for example, increased from a mere 4 percent approval in 1958 to 94 percent in 2021 (Gallup, 2021). Three in four Americans (including nearly 9 in 10 college graduates) now agree that their nation's having "many different races and ethnicities" is good for the country (Horowitz, 2019). The diversity benefit appeared in one analysis of 9 million scientific papers and 6 million scientists: Ethnically diverse scientific teams produced the most influential research (AlShebli et al., 2018).

> **"Data show [long-term] plunges in extreme poverty, illiteracy, war, violent crime, racism, sexism, homophobia, domestic violence, disease, lethal accidents and just about every other scourge."** — Psychologist Steven Pinker, "Scared by the News? Take the Long View," 2018

Yet interracial prejudice persists:

- ***Colorism.*** Among Black and Hispanic people, and also among people in India and some East Asian cultures, those with darker skin tones experience greater prejudice and discrimination (Bettache, 2020; Gonzales-Barrera, 2019; Landor & Smith, 2019; Yasir & Gettleman, 2020).
- ***Criminal stereotypes.*** Black men are judged more harshly than White men when they commit "stereotypically Black" crimes (drive-by shooting, gang violence, street gambling). But this bias disappears when Black men commit "stereotypically White" crimes (embezzlement, computer hacking, and insider trading) (Petsko & Bodenhausen, 2019).
- ***Medical care.*** Health professionals allocate more resources to treat White patients than to treat equally unhealthy Black patients (Obermeyer et al., 2019). In one study of medical care in Louisiana, inequalities in medical treatment helped explain why Black Americans were more likely than White Americans to die from Covid (Hu et al., 2022).

Why does such prejudice persist? One reason is that few people muster the courage to challenge prejudicial or hate speech. Although many *say* they would feel upset with someone making racist (or homophobic) comments, they often respond indifferently when hearing prejudice-laden language (Kawakami et al., 2009). *The bottom line:* If you disapprove of prejudice, ask yourself, "What message am I sending when I remain silent while others make racist, homophobic, or sexist remarks?"

As noted, prejudice is not just subtle, but often automatic and unintended (implicit). An Implicit Association Test found 9 in 10 White respondents taking longer to identify pleasant words (such as *peace* and *paradise*) as "good" when presented with Black-sounding names (such as *Latisha* and *Darnell*) than when shown White-sounding names (such as *Katie* and *Ian*). Moreover, people who more quickly associate good things with White names or faces also are the quickest to perceive anger and apparent threat in Black faces (Hugenberg & Bodenhausen, 2003). Those demonstrating explicit *or* implicit prejudice were less likely to vote for then-presidential candidate Barack Obama. Multiple studies showed, however, that Obama's election reduced implicit prejudice (Bernstein et al., 2010; Payne et al., 2010; Stephens-Davidowitz, 2014).

Implicit bias can literally get "under the skin." Although the number of Black medical students has increased, only 5 percent of U.S. physicians are Black (AAMC, 2019; Murphy, 2022). Because Black medical providers may challenge people's stereotypes of doctors, researchers examined whether White patients would show less responsiveness to Black medical providers' treatment. In one experiment, White patients were exposed to a treatment that caused a mild allergic reaction (Howe et al., 2022). By random assignment, patients received "an antihistamine cream that will reduce allergic reaction and itching" from a Black, Asian, or White medical provider. In actuality, the cream was a placebo containing no medicine. Even after controlling for explicit attitudes toward Black medical providers, White patients who were assigned a Black medical provider showed

the strongest initial allergic reaction and the weakest response to the placebo medical treatment.

Implicit bias can have deadly consequences. In 1999, Amadou Diallo, who was Black, was accosted as he approached his New York doorway by police officers looking for a rapist. When he pulled out his wallet, the officers, perceiving a gun, riddled his body with 19 bullets from 41 shots. In one analysis of 59 unarmed suspect shootings in Philadelphia over seven years, 49 involved the misidentification of an object (such as a phone) or movement (such as pants tugging). Black suspects were more than twice as likely to be misperceived as threatening, even by Black officers (Blow, 2015). Similarly, Black men are about 2.5 times more likely than White men to be killed by a police officer in the United States, even when unarmed (Edwards et al., 2019; Peeples, 2020). Researchers have analyzed implicit bias scores from more than 2 million Americans, while accounting for several other factors. Their finding: A region's implicit bias toward Black Americans predicted its number of Black Americans stopped and killed by police (Hehman et al., 2018; Stelter et al., 2022). And an analysis of more than 2 million U.S. 911 calls revealed that White officers sent to Black neighborhoods fired their guns five times as often as Black officers sent for similar calls in the same neighborhoods (Peeples, 2020).

Recognizing the reality of implicit bias, many police departments, colleges, and companies have given their staff implicit bias training. (Microsoft makes its online implicit bias training available to anyone at tinyurl.com/BiasTrain.) Although such single-session diversity or

bias training sessions may modestly change attitudes, real behavior is harder to modify (Greenwald et al., 2022). “The enthusiasm for, and monetary investment in, diversity training,” say social psychologists Patricia Devine and Tory Ash (2022), “has outpaced the available evidence that such programs are effective.”

To better understand implicit prejudice, researchers have also simulated situations (Correll et al., 2007, 2015; Plant & Peruche, 2005; Sadler et al., 2012). They asked viewers to press buttons quickly to “shoot” or not shoot men who suddenly appeared on screen. Some of the on-screen men held a gun. Others held a harmless hand tool. People (both Black and White, including police officers) more often shot Black men holding harmless objects than they shot White men holding harmless objects. Priming people with a flashed Black face rather than a White face also made them more likely to misperceive a flashed tool as a gun (**FIGURE 43.1**). Fatigue, which diminishes one’s conscious control and increases automatic reactions, amplifies racial bias in shooting decisions (Ma et al., 2013).

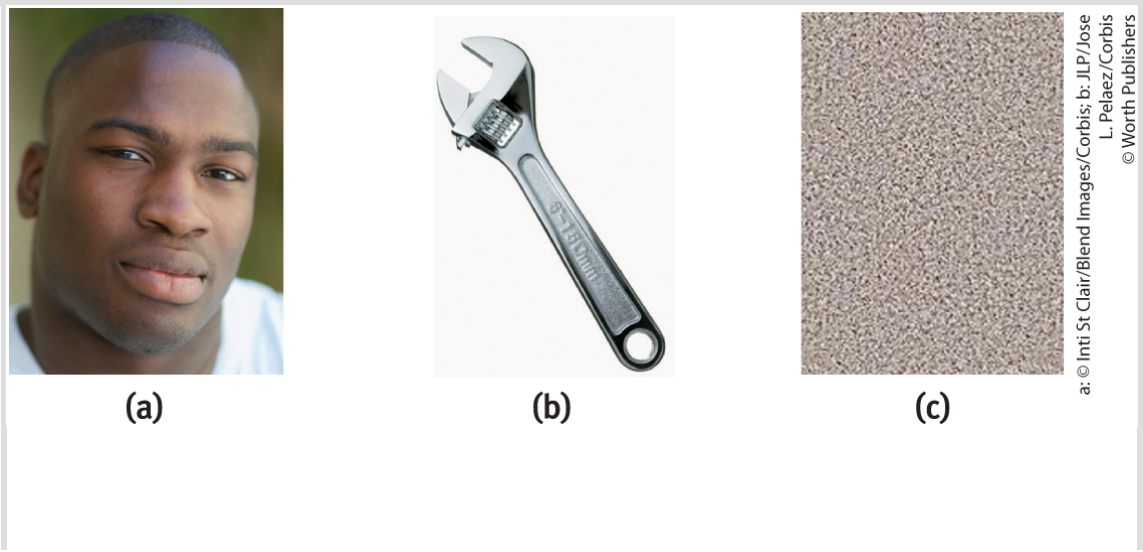


FIGURE 43.1 Race primes perceptions In experiments by Keith Payne (2006), people viewed (a) a White or Black face, immediately followed by (b) a flashed gun or hand tool, which was then followed by (c) a masking screen. Participants were more likely to misperceive a tool as a gun when it was preceded by a Black rather than a White face.

Gender Prejudice

In the early eighteenth century, Dr. James Barry became Britain's first female doctor. Because women were not allowed to attend university, Barry applied to the University of Edinburgh as a man, and went on to a storied career as a military surgeon. Barry's assigned sex was only revealed upon his death. Since then, and especially since 1950, expressed gender stereotypes and prejudice have decreased (Eagly et al., 2020). The one-third of Americans who in 1937 told Gallup pollsters that they would vote for a qualified woman whom their party nominated for president soared to 95 percent in 2012 (Jones, 2012; Newport, 1999). And 94 percent of people surveyed across 34 countries now agree "it is important for women to have the same rights as men" (Horowitz & Fetterolf, 2020).

Nevertheless, both implicit and explicit gender prejudice and discrimination persist. Consider:

- ***Work and pay.*** In Western countries, we pay more to those (usually men) who care for our streets than to those (usually women) who care for our children. Despite expressed support for women having the "same rights," 40 percent of the global survey respondents agreed that men have more right to a job when work

is scarce. (Agreement varied greatly by country, ranging from 7 percent in Sweden to about 80 percent in India and Tunisia.)

- ***Leadership.*** From 2007 through 2016, male directors of 1000 popular films (the top 100 for each year) outnumbered female directors by 24 to 1 (Smith et al., 2017). Implicit gender bias also contributes to females' not being selected for prestigious scientific research positions (Régner et al., 2019).
- ***Perceived intelligence and intellectual interests.*** Gender bias even applies to beliefs about intelligence: Despite equality between males and females in intelligence test scores, people have tended to perceive their fathers as more intelligent than their mothers and their sons as brighter than their daughters (Furnham, 2016). Children's books often plant the seeds of such gender stereotypes, with girls portrayed as emotional and good readers and boys depicted as interested in tools and excelling in math (Lewis et al., 2022).
- ***Masculine norms.*** Organizations often value and reward masculine ideas, values, and interaction styles (Cheryan & Markus, 2020). For example, people are encouraged to work independently, nominate themselves for awards and promotions, and use an assertive interaction style to influence others. These "masculine defaults" can reduce women's sense of belonging and increase their feelings of being an imposter (Vial et al., 2022).

"Until I was a man, I had no idea how good men had it at work.... The first time I spoke up in a meeting in my newly low, quiet voice and noticed that sudden,

> **focused attention, I was so uncomfortable that I found myself unable to finish my sentence."** — Thomas Page McBee, 2016, after transitioning from female to male

Unwanted female infants are no longer left on a hillside to die of exposure, as was the practice in ancient Greece. Yet the average male-to-female newborn ratio (105-to-100) doesn't explain the world's millions of "missing women." In many cultures, parents value sons more than daughters. In India, there have been 3.5 times more Google searches asking how to conceive a boy than how to conceive a girl (Stephens-Davidowitz, 2014). With scientific testing that enables sex-selective abortions, some countries are experiencing a shortfall in female births (**FIGURE 43.2**). India's newborn sex ratio was recently 111 boys for every 100 girls—though after a "Save the Girl Child" campaign has dropped to a still-high 108 (Tong, 2022). China's has been 111 to 100, despite China's declaring sex-selective abortions a criminal offense (CIA, 2014). In China and India, which together have 50 million more males than females under age 20, many men will be without mates (Denyer & Gowen, 2018; Gupta, 2017). When men outnumber women, there is often increased crime, violence, and trafficking of women (Brooks, 2012).

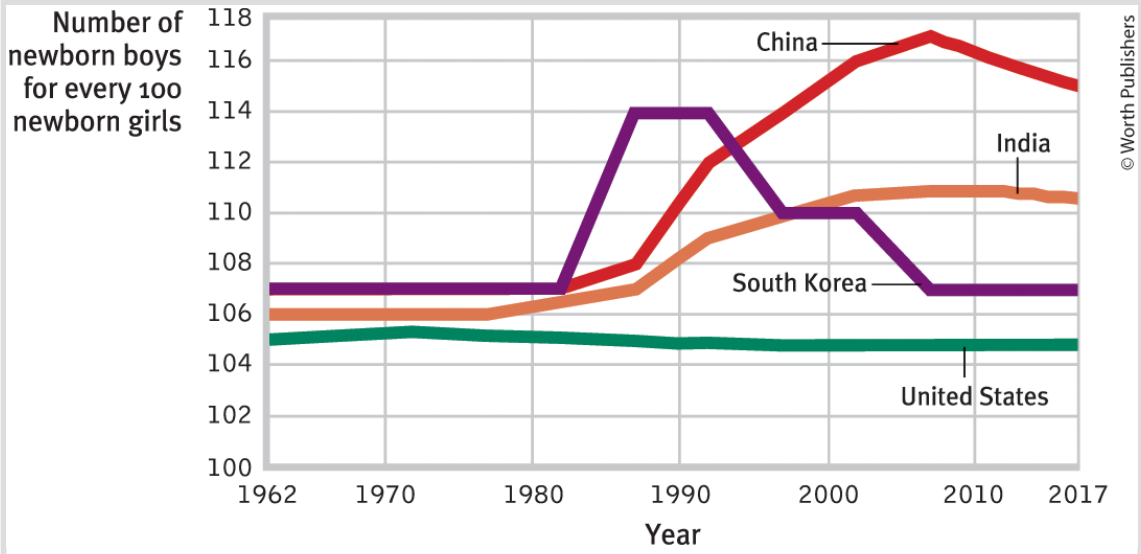


FIGURE43.2 Boy bias Biologically, the expected sex ratio would be 105 newborn boys for every 100 newborn girls. In reality, most countries show a significant boy bias. (Data from Our World in Data and World Bank/UN.)

LGBTQ Prejudice

In most of the world, gay, lesbian, and transgender people cannot openly and comfortably disclose who they are and whom they love. Although 32 countries allowed same-sex marriage by 2022, dozens more had laws criminalizing same-sex relationships. Cultural variation is enormous—ranging from 94 percent in Sweden who believe "homosexuality should be accepted" to 7 percent in Nigeria who agree with that statement (Pew, 2020). Worldwide, anti-gay attitudes have been most common among men, older adults, and those who are unhappy, unemployed, and less educated (Haney, 2016; Jäckle & Wenzelburger, 2015).

Explicit anti-LGBTQ prejudice persists, even in countries with legal protections in place. When U.S. and UK experimenters sent thousands of responses to employment ads, those whose resumes included "Treasurer, Progressive and Socialist Alliance" received more replies than did those whose resumes specified "Treasurer, Gay and Lesbian Alliance" (Agerström et al., 2012; Bertrand & Mullainathan, 2004; Drydakis, 2009, 2015).

Do attitudes and practices that label, disparage, and discriminate against gay, lesbian, and transgender people increase their risk of psychological disorder and ill health? *Yes.* In U.S. states without protections against LGBTQ hate crime and discrimination, gay and lesbian people experience substantially higher rates of depression and related disorders, even after controlling for income and education differences. In communities where anti-gay prejudice is high, so are gay and lesbian suicide and cardiovascular deaths. In 16 states that banned same-sex marriage between 2001 and 2005, gay and lesbian people (but not straight people) experienced a 37 percent increase in depressive disorder rates, a 42 percent increase in alcohol use disorder, and a 248 percent increase in generalized anxiety disorder. Meanwhile, gay and lesbian people in other states did not experience increased psychiatric disorders (Hatzenbuehler, 2014). So, do laws that promote acceptance of gay, lesbian, and transgender people *reduce* bias? Again, *Yes.* As happened after the passage of desegregation and civil rights laws, attitudes have followed the newly legislated behavior. In various U.S. states, people became more gay-supportive when and where same-sex marriages became legal (Ofuso et al., 2019).

Roots of Prejudice

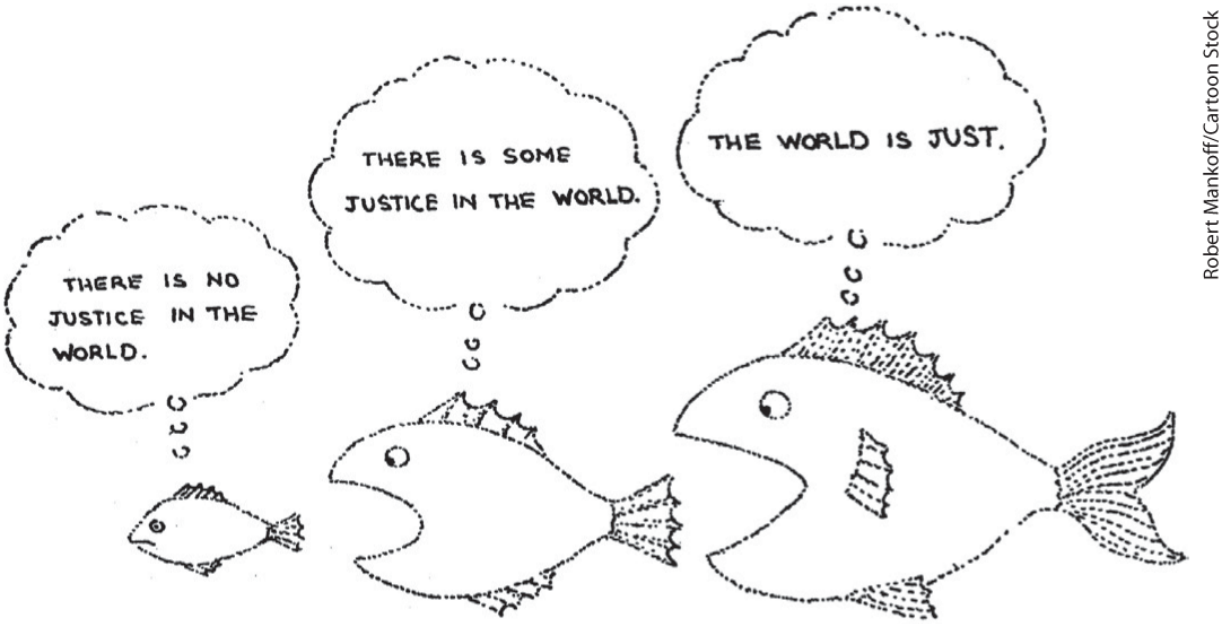
LOQ 43-3

What are some social, emotional, and cognitive roots of prejudice, and what are some ways to reduce prejudice?

Prejudice springs from a culture's divisions, the heart's passions, and the mind's natural workings.

Social Inequalities and Divisions

When some people have money, power, and prestige and others do not, the "haves" usually develop attitudes that justify things as they are. The **just-world phenomenon** reflects an idea we commonly teach our children—that good is rewarded and evil is punished. From this, it is but a short and sometimes automatic leap to assume that those who succeed must be good and those who suffer must be bad. Such reasoning enables wealthy people to see both their own riches and the misfortunes of those living in poverty as justly deserved. When slavery existed in the United States, slaveholders perceived enslaved people as innately lazy, ignorant, and irresponsible—as having the very traits that supposedly justified enslaving them. Stereotypes rationalize inequalities.



Robert Mankoff/Cartoon Stock

People who experience discrimination may react in ways that feed prejudice through the classic *blame-the-victim* dynamic (Allport, 1954). Do the circumstances of poverty breed a higher crime rate? If so, that higher crime rate can be used to justify discrimination against those who live in poverty.

Dividing the world into "us" and "them" can result in conflict, racism, and war, but it also provides the benefits of communal solidarity. Thus, we cheer for our groups, kill for them, die for them. Indeed, we define who we are—our *social identity*—partly in terms of our groups (Thomas et al., 2020; Whitehouse, 2018). When Margarita identifies herself as a woman, a Brit, a Liverpool native, and a Brexit supporter, she knows who she is, and so do we.

Mentally drawing a circle defines "us," the **ingroup.** But the social definition of who we are also states who we are not. People outside that circle are "them," the **outgroup.** An **ingroup bias** soon follows. In experiments, children and adults have favored their own group when dividing rewards—even a group that is created by a mere coin toss (Tajfel, 1982; Wynn et al., 2018). Across 17 countries, ingroup bias appears more as ingroup favoritism than as harm to the outgroup (Romano et al., 2017). Discrimination is triggered less by outgroup hostility than by ingroup networking and mutual support—such as hiring a friend's child at the expense of other candidates (Greenwald & Pettigrew, 2014).



Mike Hewitt/Getty Images

The ingroup Scotland's famed "Tartan Army" soccer fans, shown here during a match against archrival England, share a social identity that defines "us" (the Scottish ingroup) and "them" (the English outgroup).

We have inherited our Stone Age ancestors' need to belong, to live and love in groups. There was safety in solidarity: Whether hunting, defending, or attacking, 10 hands were better than 2. Evolution

prepared us, when encountering strangers, to make instant judgments: friend or foe? This urge to distinguish enemies from friends, and to dehumanize or "otherize" those not like us, predisposes prejudice against strangers (Kteily & Landry, 2022; Whitley, 1999). To Greeks of the classical era, all non-Greeks were "barbarians." In our own era, most children believe their school is better than all other schools in town. Many high school students form cliques—athletes, choir members, theater actors—and disparage those outside their own group. Even chimpanzees have been seen to wipe clean the spot where they were touched by a chimpanzee from another group (Goodall, 1986). They also display ingroup empathy by yawning more after seeing ingroup (rather than outgroup) members yawn (Campbell & de Waal, 2011). Although an ideal world might prioritize justice and love for all, in our real world, ingroup love often outranks universal justice.

Ask Yourself

What are some examples of ingroup bias in your own life, and in your community? How can you help break down barriers that you or others may face?

Negative Emotions

Negative emotions nourish prejudice. When facing death, fearing threats, or experiencing frustration, people cling more tightly to their ingroup. When frustrated by extreme inequality, people worldwide wish for a strong leader to restore order (Sprong et al., 2019). Fearing

terrorism increases patriotism, along with loathing and aggression toward those perceived as threats (Pyszczynski et al., 2002, 2008).

Scapegoat theory proposes that when things go wrong, finding someone to blame can provide a target for our negative emotions. From 2015 to 2020, as white nationalist political talk surged, FBI-reported U.S. hate crimes increased 38 percent (FBI, 2016, 2021). Social psychologists therefore wondered: Do political leaders' words merely voice common prejudices and grievances? Or do they also amplify them?

They do both. Leaders cater to their audiences. And when prominent leaders voice prejudices, it becomes more acceptable for their followers to do the same. Thus counties that hosted Trump rallies in 2016, where then-candidate Donald Trump had targeted Muslims and immigrants, reportedly experienced a doubled rate of hate crimes thereafter (Feinberg et al., 2019).

Researchers also have found that "frequent and repetitive exposure to hate speech leads to desensitization" to such speech and to "increasing outgroup prejudice" (Soral et al., 2018). Political leaders influence norms, and norms matter: "People express the prejudices that are socially acceptable and they hide the ones that are not" (Crandall & White, 2016).

Following the 2016 anti-immigrant Brexit referendum in England and Wales, hate crimes soared from 52,000 in 2015/2016 to 103,000 in

2018/2019 (Home Office, 2019). There, and in the United States, anti-Semitic crimes have also increased (ADL, 2022; Goodwin & Greene, 2022). During the Covid-19 pandemic, some government officials in White-majority countries referred to the virus as "Chinese" or "China virus." Associating the virus with a country fueled prejudice and discrimination, with 1 in 3 Asian Americans experiencing racial or ethnic slurs since the outbreak, and 1 in 4 fearing physical attack (Ruiz et al., 2020). U.S. psychologists have documented increased anti-Asian prejudice and called for greater advocacy to educate people about Covid-19 racial bias and build empathy toward Asian Americans (Cheng et al., 2021).

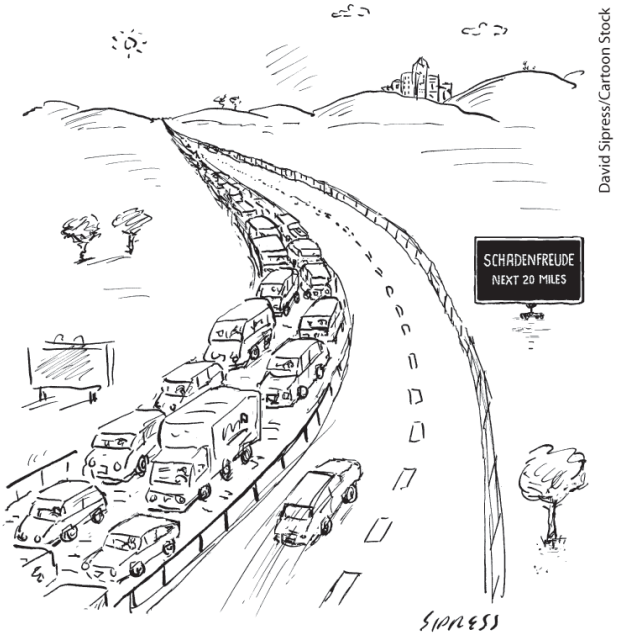


Ron Adar/Alamy Stock Photo

Fighting Covid-fueled prejudice U.S. demonstrators protest the rise of anti-Asian prejudice, which increased 339 percent between 2020 and 2021 (Yam, 2022).

Evidence for the scapegoat theory comes in two forms: (1) *Social trends*: Economically frustrated people often express heightened prejudice, and during economic downturns, racial prejudice intensifies (Bianchi et al., 2018); and (2) *Experiments*: Temporarily

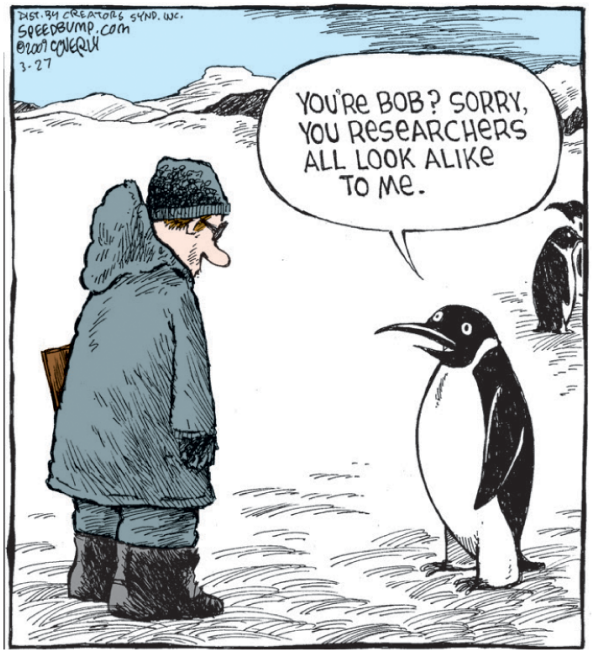
frustrating people intensifies their prejudice. Researchers have found that students who experience failure or are made to feel insecure often restore their self-esteem by disparaging a rival school or another person (Cialdini & Richardson, 1980; Crocker et al., 1987). Denigrating others may boost our own sense of status, which explains why a rival's misfortune sometimes provides a twinge of pleasure. (The German language has a word—*schadenfreude*—for this secret joy that we sometimes take in another's failure.) By contrast, those made to feel loved and supported become more open to and accepting of others who differ (Mikulincer & Shaver, 2001).



"The misfortunes of others are the taste of honey." — Japanese saying

Cognitive Shortcuts

Stereotyped beliefs are a by-product of how we cognitively simplify the world. To help understand the world around us, we frequently form categories. Chemists categorize molecules as organic and inorganic. Therapists categorize psychological disorders. We all categorize people by gender, ethnicity, race, age, and many other characteristics—including their warmth and their competence (Fiske, 2018). But when we categorize people into groups, we often stereotype. We recognize how greatly *we* differ from other individuals in *our* groups. But we overestimate the extent to which members of other groups are alike (Bothwell et al., 1989). We perceive *outgroup homogeneity*—uniformity of attitudes, personality, and appearance. Our greater recognition for individual own-race faces—called the **other-race effect** (or *cross-race effect* or *own-race bias*)—emerges during infancy, between 3 and 9 months of age, also a period when babies learn to distinguish the sounds of their language (Anzures et al., 2013; Telzer et al., 2013). Infant brains become attuned to small differences in familiar sounds and faces. (We also have an *own-age bias*—better recognition memory for faces of our own age group [Cronin et al., 2021; Rhodes & Anastasi, 2012]).



© Dave Coverly/speedbump.com

Sometimes, however, people don't fit easily into our racial categories. When that happens, we often assign them to their outgroup identity. Researchers believe this happens because, after learning the features of a familiar racial group, the observer's *selective attention* is drawn to the distinctive features of the less-familiar outgroup. One study illustrated this learned-association effect by showing research participants blended Chinese-White faces (Halberstadt et al., 2011). Compared with participants of Chinese descent, European-descent participants more readily classified ambiguous faces as Chinese (**FIGURE 43.3**). With effort and experience, people get better at recognizing individual faces from another group (Hugenberg et al., 2010; Young et al., 2012).



FIGURE 43.3 Categorizing mixed-race people When research participants quickly classified 104 photos by race, those of European descent more often than those of Chinese descent classified the ambiguous middle two as Chinese (Halberstadt et al., 2011). The actual digital morphing mix is shown beneath each photo.

Remembering Vivid Cases

We also simplify our world by employing *heuristics*—mental shortcuts that enable snap judgments. The *availability heuristic* is the tendency to estimate the frequency of an event by how readily it comes to mind. Vivid cases come to mind easily, so it's no surprise that they feed our stereotypes. In a classic experiment, researchers showed two groups of students lists containing information about 50 men (Rothbart et al., 1978). The first group's list included 10 men arrested for *nonviolent* crimes, such as forgery. The second group's list included 10 men arrested for *violent* crimes, such as assault. Later, both groups were asked how many men on their list had committed *any* sort of crime. The second group overestimated the number. Violent crimes form vivid memories (FIGURE 43.4).

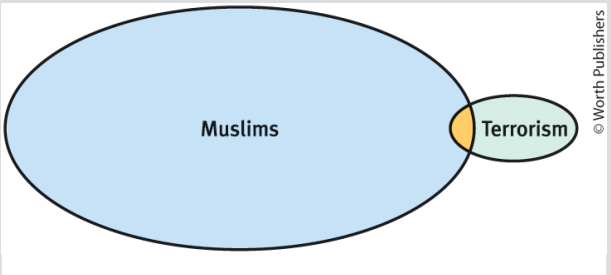


FIGURE 43.4 Vivid cases feed stereotypes
Memorable incidents of global terrorism have fed a stereotype of Muslims as terrorism-prone. Actually, reported a U.S. National Research Council panel on terrorism (which offered this inexact illustration), most terrorists are *not* Muslim.

Victim Blaming

As we noted earlier, people often justify their prejudices by blaming victims. If the world is just, they assume, people must get what they deserve, and believing this makes us feel better (Napier et al., 2020). As one German civilian is said to have remarked when visiting the Bergen-Belsen concentration camp shortly after World War II, "What terrible criminals these prisoners must have been to receive such treatment."

Hindsight bias amplifies victim blaming (Carli & Leonard, 1989). Have you ever heard people say that rape victims, abused spouses, or people with AIDS got what they deserved? In some countries, such as Pakistan, rape victims have been sentenced to severe punishment for violating adultery prohibitions (Mydans, 2002). In one experiment, two groups received a detailed account of a date (Janoff-Bulman et al.,

1985). The first group's account ended with the woman being raped. Members of that group perceived the woman's behavior as at least partly to blame, and in hindsight, they thought, "She should have known better." The second group, given the same account with the rape ending deleted, did not perceive the woman's behavior as inviting rape. In the first group, hindsight bias promoted a blame-the-victim mentality. Blaming the victim reassures people that it couldn't happen to them.

People also tend to justify their culture's social systems (Jost, 2020). We're inclined to see the way things are as the way they ought to be and deserve to be: If people are rich, they must be smart (Hussak & Cimpian, 2015). This natural resistance to change makes it difficult to legislate major social changes, such as health care improvements or climate change policies. Once policies are in place, "system justification" tends to preserve them.

***

If your own gut-check reveals you sometimes have feelings you would rather not have about other people, remember this: It is what we *do* with our feelings that matters. By monitoring our feelings and actions, by replacing old habits with new ones, and by seeking out new friendships, we can work to free ourselves from prejudice.

Retrieval Practice

RP-1 When prejudice causes us to blame an innocent person for a problem, we are using that person as a _____.

ANSWERS IN APPENDIX E

Aggression

LOQ 43-4

How does psychology's definition of *aggression* differ from everyday usage? What biological factors make us more prone to hurt one another?

In psychology, **aggression** is any physical or verbal behavior intended to harm someone, whether done out of hostility or as a calculated means to an end. The assertive, persistent salesperson is not aggressive. Nor is the dentist who makes you wince with pain. But the gossip who passes along a vicious rumor about you, the bully who torments you in person or online, and the attacker who robs you are aggressive. Remember, aggression is a behavior; you must *do* something to act aggressively. Feeling anger or thinking aggressive thoughts don't qualify as aggression.

Aggression emerges from the interaction of biology and experience. For a gun to fire, the trigger must be pulled; with some people, as with hair-trigger guns, it doesn't take much to trip an explosion. What do

you think: Do guns in the home save or take more lives? “Personal safety/protection” is the number one reason people in the United States have given for gun ownership (Swift, 2013). However, firearm ownership can backfire: Guns in the home are much more often used to kill family members or oneself than in self-defense (Kivisto et al., 2019; Stroebe et al., 2017). In 2020, 45,222 Americans died from firearms; nearly 6 in 10 were suicides (CDC, 2022). Over the last half-century more than 1.5 million Americans have suffered nonwar firearm deaths—more than all war deaths in U.S. history (Jacobson, 2015). Compared with people of the same sex, race, age, and neighborhood, those who keep a gun in their home have been twice as likely to be murdered and three times as likely to die by suicide (Anglemyer et al., 2014; Stroebe, 2013). U.S. states with high gun ownership rates also tend to have high gun homicide rates (correlation $r = .82$) (**FIGURE 43.5**). It takes Japan nearly a decade to accumulate as many violent gun deaths as occur in an average U.S. day. More guns → more deaths.

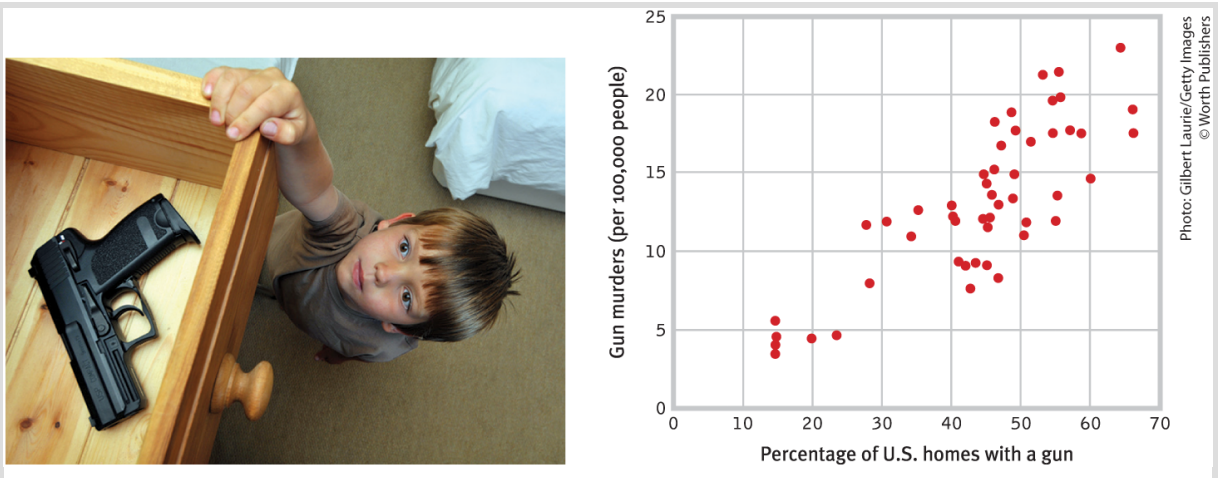


FIGURE 43.5 Gun ownership and murder rates across the 50 U.S. states

Information from CDC (2022) and Learish & Fieldstadt (2022).



In the discussions that follow, we will look first at some biological factors that influence our thresholds for aggressive behavior, then at the psychological factors that pull the trigger.

The Biology of Aggression

Aggression varies too widely from culture to culture, era to era, and person to person to be considered an unlearned instinct. But biology does *influence* aggression. We can look for biological influences at three levels—genetic, neural, and biochemical.

Genetic Influences

Genes influence aggression. Animals have been bred for aggressiveness—sometimes for sport, sometimes for research. The effect of genes also appears in human twin studies (Miles & Carey, 1997; Rowe et al., 1999). If one identical twin admits to "having a violent temper," the other twin will often independently admit the same. Fraternal twins are much less likely to respond similarly.

Researchers continue to search for genetic markers in those who commit violent acts. One is already well known and is carried by half the human race: the Y chromosome. Men are four times more likely than women to commit violent crime (FBI, 2022). Another such

marker is the *monoamine oxidase A (MAOA) gene,* sometimes called the "warrior gene," which is involved in breaking down neurotransmitters such as dopamine and serotonin. People who have low MAOA gene expression tend to behave aggressively when provoked. In one experiment, low (compared with high) MAOA gene carriers gave more unpleasant hot sauce to someone who provoked them (McDermott et al., 2009; Tiihonen et al., 2015).

Neural Influences

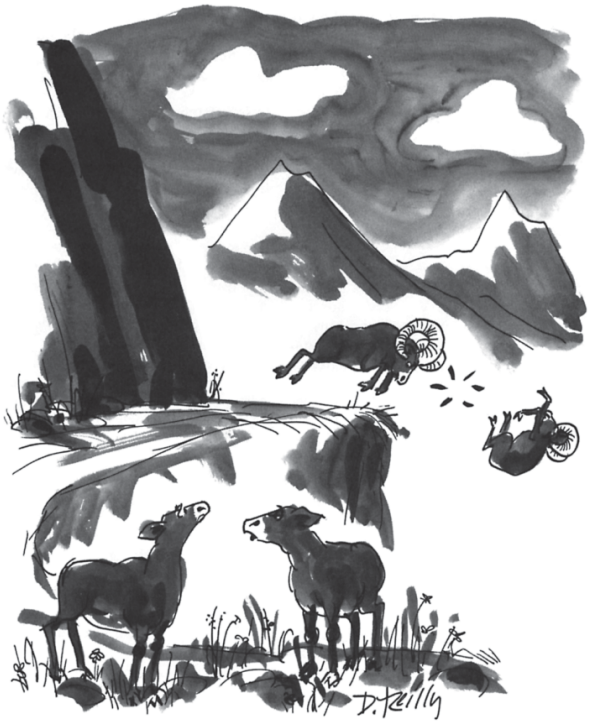
There is no one spot in the brain that controls aggression. Aggression is a complex behavior, and it occurs in particular contexts. But animal and human brains have neural systems that, given provocation, will either inhibit or facilitate aggression (Falkner et al., 2016; Fields, 2019). Consider:

- Researchers implanted a radio-controlled electrode in the brain of the domineering leader of a caged monkey colony. The electrode was in an area that, when stimulated, inhibited the leader's aggression. When researchers placed the control button for the electrode in the colony's cage, one small monkey learned to push it every time the boss became threatening.
- A neurosurgeon, seeking to diagnose a disorder, implanted an electrode in the amygdala of a mild-mannered woman. Because the brain has no sensory receptors, she was unable to feel the stimulation. But at the flick of a switch she snarled, "Take my blood pressure. Take it now," then stood up and began to strike the doctor (Moyer, 1983).

- If the frontal lobes are damaged, inactive, disconnected, or not yet fully mature, aggression may be more likely (Amen et al., 1996; Davidson et al., 2000; Raine, 2013). One study of 203 convicted murderers revealed reduced tissue in the frontal lobes (Sajous-Turner et al., 2020).

Biochemical Influences

Our genes engineer our individual nervous systems, which operate electrochemically. The hormone testosterone, for example, circulates in the bloodstream and influences the neural systems that influence aggression. A raging bull becomes a gentle giant when castration reduces its testosterone level. Conversely, when injected with testosterone, gentle, castrated mice become aggressive.



Donald Reilly/Cartoon Stock

"It's a guy thing."



Chris Courteau/AGE Fotostock

A lean, mean fighting machine—the testosterone-laden female hyena The hyena's unusual embryology pumps testosterone into female fetuses. The result is revved-up young female hyenas who seem born to fight.

Humans are less sensitive to hormonal changes. But as men's testosterone levels diminish with age, hormonally charged, aggressive 17-year-olds mature into quieter and gentler 50-year-olds. Drugs that sharply reduce testosterone levels subdue men's aggressive tendencies.

> **"We could avoid two-thirds of all crime simply by putting all able-bodied young men in cryogenic sleep from the age of 12 through 28."** — David T. Lykken, *The Antisocial Personalities,* 1995

Another drug that sometimes circulates in the bloodstream—alcohol—unleashes aggressive responses to frustration. Across police data, prison surveys, and experiments, aggression-prone people are more

likely to drink, and to become violent when intoxicated (White et al., 1993). Alcohol is a disinhibitor—it slows the brain activity that controls judgment and inhibitions. Under its influence, people may interpret ambiguous acts (such as being bumped in a crowd) as provocations and react aggressively (Bègue et al., 2010; Giancola & Corman, 2007). Alcohol consumption has been a factor in 1 in 3 U.S. homicides (Alpert et al., 2022). In countries that have restricted alcohol sales—by reducing alcohol's availability or increasing its price—homicides have dropped (Trangenstein et al., 2021).

Just *thinking* you've imbibed alcohol can increase aggression (Bègue et al., 2009). But so, too, does unknowingly ingesting alcohol slipped into a drink. Thus, alcohol affects aggression both biologically and psychologically (Bushman, 1993; Ito et al., 1996).

Psychological and Social-Cultural Factors in Aggression

LOQ 43-5

What psychological and social-cultural factors may trigger aggressive behavior?

Biological factors influence how easily aggression is triggered. But what psychological and social-cultural factors pull the trigger?

Aversive Events: Hurt People Hurt People

Suffering sometimes builds character. In both laboratory experiments and everyday life, however, those made miserable have often made others miserable (Berkowitz, 1983, 1989; O'Connor et al., 2021). Aversive stimuli—hot temperatures, physical pain, personal insults, foul odors, cigarette smoke, crowding, and a host of others—can evoke hostility. Even hunger can feed anger—making people "hangry" (Bushman et al., 2014). A prime example of this phenomenon is the **frustration-aggression principle**: Frustration creates anger, which can spark aggression.



Teresa Burns Parkhurst/Cartoon Stock

"I just stubbed my toe and need you to come in here so I can scream at you."

The frustration-aggression link was illustrated in an analysis of 27,667 hit-by-pitch Major League Baseball incidents between 1960 and 2004 (Timmerman, 2007). Pitchers were most likely to hit batters when the previous batter had hit a home run, the current batter had hit a home run the last time at bat, or a pitch had hit the pitcher's teammate in the previous half-inning. A separate study found a similar link

between rising temperatures and the number of hit batters (Reifman et al., 1991; see **FIGURE 43.6**). Overheated temperatures → overheated tempers.



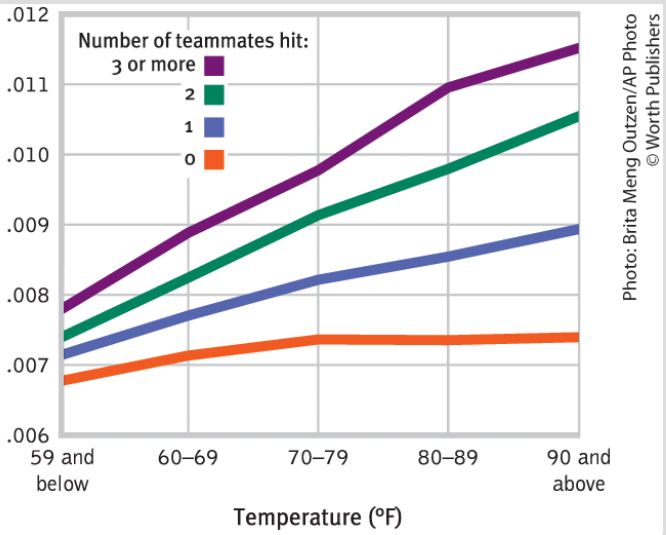


Photo: Brita Meng Outzen/AP Photo © Worth Publishers

FIGURE 43.6 Temperature, tempers, and retaliation Researchers looked for occurrences of batters hit by pitches during 4,566,468 pitcher-batter matchups across 57,293 Major League Baseball games between 1952 and 2009 (Larrick et al., 2011). The probability of a hit batter increased if one or more of the pitcher's teammates had been hit, and also with higher temperatures.

Worldwide, violent crime and spousal abuse rates have been higher during hotter years, seasons, months, and days (Anderson et al., 1997; Heilmann & Kahn, 2019). Studies from archaeology, economics, geography, political science, and psychology converge in finding that throughout human history, higher temperatures have predicted increased individual violence, wars, and revolutions (Hsiang et al., 2013). One projection from available data estimates that global warming of 4 degrees Fahrenheit (about 2 degrees Celsius) could

induce tens of thousands of additional assaults and murders (Miles-Novelo & Anderson, 2022). And that's before the added violence inducements from climate change–related drought, poverty, food insecurity, and migration.

Reinforcement and Modeling

Aggression may naturally follow aversive events, but learning can alter natural reactions. We learn when our behavior is reinforced, and we learn by watching others.

In situations where experience has taught us that aggression pays, we are likely to act aggressively again. Children whose aggression has successfully intimidated other children may become bullies. Animals that have successfully fought to get food or mates become increasingly ferocious. To foster a kinder, gentler world we had best model and reward sensitivity and cooperation from an early age, perhaps by training parents to discipline without modeling violence. Parent-training programs often advise parents to avoid screaming and hitting; instead, they can reward desirable behaviors and frame statements positively (Kazdin, 2018). Rather than say, "If you don't clean your room, you'll be in big trouble," Say "When you clean your room, you can go play."

Different cultures model, reinforce, and evoke different tendencies toward violence. Between 1882 and 1926, lynch mobs in the U.S. state of Georgia murdered 514 people. The best predictors of this collective violence were cultural norms that encouraged and supported

lynching (Ritchey & Rubak, 2018). But other factors also matter: Crime rates have been higher and average happiness lower in times and places marked by a great disparity between rich and poor (Messias et al., 2011; Oishi et al., 2011; Wilkinson & Pickett, 2009). And fathers matter (Triandis, 1994). Even after controlling for parental education, race, income, and teen motherhood, U.S. male youths from father-absent homes have been incarcerated at twice the rate of their peers (Harper & McLanahan, 2004).

Violence can vary by culture within a country. The U.S. South, for example, has long had a "culture of honor." Richard Nisbett and Dov Cohen (1996) analyzed violence among White Americans in southern towns settled by Scots-Irish herders whose tradition encouraged violent response to insult, the use of arms to protect one's flock, and slavery. Compared with their White counterparts in New England towns settled by the more traditionally peaceful Puritan, Quaker, and Dutch farmer-artisans, the cultural descendants of those herders had triple the homicide rates and were more supportive of physically punishing children, of wars, and of uncontrolled gun ownership. Today's culture of honor traditions remain influential, encouraging people to use weapons to defend their honor and to not "back down" (Gul et al., 2021; Lantz & Wenger, 2021).

Media Models for Violence

Television, films, video games, and the internet offer supersized portions of violence. An adolescent boy faced with a real-life challenge may "act like a man"—at least like an action-film man—by

intimidating or eliminating the threat. Media violence teaches us **social scripts**—culturally provided mental files for how to act in certain situations. As more than 100 studies confirm, we sometimes imitate what we've viewed. Watching media depictions of risk-glorifying behaviors (dangerous driving, extreme sports, unprotected sex) increases real-life risk-taking (Fischer et al., 2011). Watching violent behaviors (murder, robbery) can increase real-life aggressiveness (Anderson et al., 2017).

Music lyrics also teach us social scripts. In one study, German university men who listened to woman-hating lyrics poured the hottest chili sauce for a woman to consume. They also recalled more negative feelings and beliefs about women. Listening to man-hating lyrics similarly affected women (Fischer & Greitemeyer, 2006).

How does repeatedly watching pornographic films affect viewers? Just as repeated viewing of on-screen violence helps immunize us to aggression, repeated viewing of pornography—even nonviolent pornography—has made sexual aggression seem less serious (Harris, 1994). In one experiment, undergraduates viewed six brief films weekly for 6 weeks (Zillmann & Bryant, 1984). Some viewed sexually explicit films; others viewed films with no sexual content. Three weeks later, both groups, after reading a report about a man convicted of raping a female hitchhiker, suggested an appropriate prison term. Compared with sentences recommended by the control group, the sex film viewers recommended terms that were half as long. In other studies that explored pornography's effects on aggression toward

relationship partners, pornography consumption predicted both self-reported aggression and participants' willingness to administer laboratory noise blasts to their partner (Lambert et al., 2011; Peter & Valkenburg, 2016). Pornography acts mostly by adding fuel to a fire: It heightens the risk of sexual aggression primarily among aggression-prone men (Malamuth, 2018).

Researchers debate pornography's influence on healthy relationships and sexuality (Grubbs & Kraus, 2021; Zimbardo & Coulombe, 2021). Some experiments suggest that pornography with violent sexual content can increase men's readiness to behave aggressively toward women. As a long-ago statement by 21 social scientists noted, "Pornography that portrays sexual aggression as pleasurable for the victim increases the acceptance of the use of coercion in sexual relations" (Surgeon General, 1986). Analyzing 166 studies involving 125,000 participants, some of today's researchers reached a similar conclusion: "Exposure to sexualized media, especially in combination with violence, has negative effects on women, particularly on what people think about them and how aggressively they treat them" (Burnay et al., 2022).

Do Violent Video Games Teach Social Scripts for Violence?

Experiments worldwide indicate that playing positive games produces positive effects (Greitemeyer & Mügge, 2014; Prot et al., 2014). For example, playing the classic video game *Lemmings,* where a goal was to help others, increased real-life helping. So, might a similar effect

occur after playing games that enact violence? Violent video games became an issue for public debate after teenagers in more than a dozen places seemed to mimic the carnage in the first-person shooter games they had so often played (Anderson, 2004, 2013).

Such incidents of violent mimicry make us wonder: What *are* the effects of actively role-playing aggression? Does it cause people to become less sensitive to violence and more open to violent acts? Amid conflicting findings, nearly 400 studies of 130,000 people offer some answers (Calvert et al., 2017; Kim et al., 2021). Violent video game playing tends to make us less sensitive to cruelty (Arriaga et al., 2015). Video games can prime aggressive thoughts, decrease empathy, and induce us to respond aggressively when provoked. University men who spend the most hours playing violent video games have also tended to be the most physically aggressive (Anderson & Dill, 2000). For example, they more often acknowledged having hit or attacked someone else. More than two dozen longitudinal studies have found that violent video game playing predicts more bullying and physical violence (Prescott et al., 2018; Teng et al., 2022).



Cathal McNaughton/REUTERS/Alamy Stock Photo

Coincidence or cause? In 2011, a Norwegian terrorist killed eight people by bombing government buildings, and then shot and killed 69 people, mostly teens, at a youth camp. Describing his murderous actions, the shooter stirred debate when he commented that "I see MW2 *[Modern Warfare 2]* more as a part of my training-simulation than anything else." Did his violent game playing—and that of the 2022 mass murderer of Uvalde, Texas' elementary school children and teachers—contribute to the violence, or was it a merely coincidental association? Psychologists

explore such questions with experimental research.

In experiments, people who were randomly assigned to play a game involving bloody murders with groaning victims (rather than to play nonviolent games) became more hostile. On a follow-up task, they were more likely to blast intense noise at a fellow student. Studies of young adolescents revealed that those who played a lot of violent video games became more aggressive and saw the world as more hostile (Bushman, 2016; Exelmans et al., 2015; Gentile, 2009). Compared with nongaming kids, they got into more arguments and fights and earned poorer grades. In another experiment, children who played a video game with gun violence (rather than sword violence or no violence) later became more likely to touch, pick up, and pull the trigger on a real (but disabled) gun (Chang & Bushman, 2019).

Ah, but is this merely because naturally hostile kids are drawn to such games (Greitemeyer et al., 2019)? Apparently not. Comparisons of both gamers and nongamers who scored low on hostility measures revealed a difference in the number of fights they reported. Almost 4 in 10 violent-game players had been in fights, compared with only 4 in 100 of the nongaming kids (Anderson, 2004). Some researchers believe that, due partly to the more active participation and rewarded violence of game play, violent video games have even greater effects on aggressive behavior and cognition than do violent TV shows and movies (Anderson & Warburton, 2012).

> **"Research demonstrates a consistent relation between violent video game use and increases in aggressive behavior, aggressive cognitions and aggressive affect, and decreases in prosocial behavior, empathy and sensitivity to aggression."** — American Psychological Association Task Force on Violent Media, 2015

Other researchers are unimpressed by such findings (Ferguson et al., 2020; Markey & Ferguson, 2018). They note that although video game sales have increased, youth violence has declined. They argue that the best studies find minimal effects and that other factors—depression, family violence, peer influence, and a gun-toting culture—better predict aggression. Although some commentators have tried to blame modern mass shootings on violent video games, most researchers agree that they are, at worst, only one modest contributor to social violence (APA, 2019; Mathur & VanderWeele, 2019).

> **"Study finds exposure to violent children causes increased aggression in video game characters."** — *The* [satirical] *Onion,* March 6, 2017

***

To sum up, research reveals biological, psychological, and social-cultural influences on aggressive behavior. Complex behaviors, including violence, have many causes, making any single explanation an oversimplification. Asking what causes violence is therefore like

asking what causes cancer. Those who study the effects of asbestos exposure on cancer rates may remind us that asbestos is indeed a cancer cause, but it is only one among many. Like so much else, aggression is a biopsychosocial phenomenon (FIGURE 43.7).

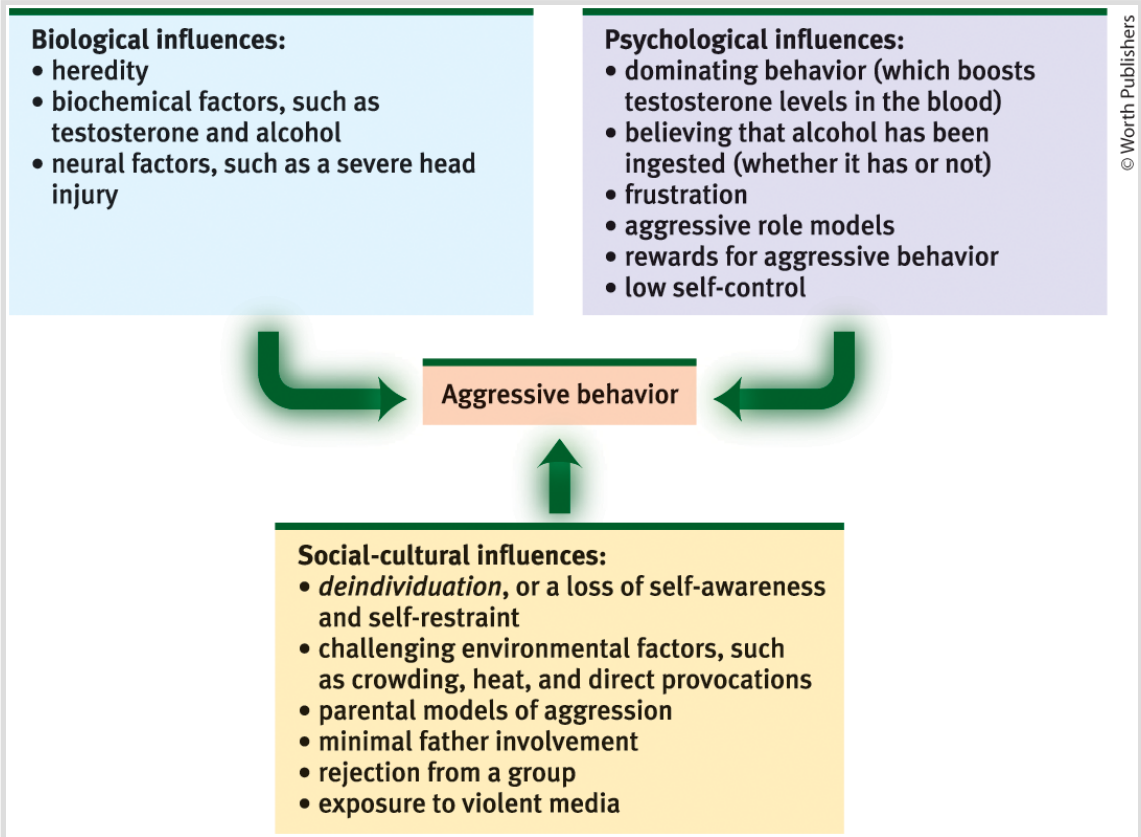


FIGURE 43.7 Biopsychosocial understanding of aggression Because many factors contribute to aggressive behavior, there are many ways to change such behavior, including learning anger management and communication skills, and avoiding violent media and video games.

A happy concluding note: Historical trends suggest that the world is becoming less violent over time (Pinker, 2011, 2018). That people vary across time and place reminds us that environments differ. Yesterday's

plundering Vikings have become today's peace-promoting Scandinavians. Like all behavior, aggression arises from the interaction of persons and situations.

Ask Yourself

In what ways have you been affected by social scripts for aggression? Have your viewing and gaming habits influenced these social scripts?

Retrieval Practice

RP-2 What biological, psychological, and social-cultural influences interact to produce aggressive behaviors?

ANSWERS IN APPENDIX E

REVIEW

Module 43: Antisocial Relations

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the

answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 43-1: What is *prejudice?* How do explicit and implicit prejudice differ?

LOQ 43-2: What groups tend to experience prejudice?

LOQ 43-3: What are some social, emotional, and cognitive roots of prejudice, and what are some ways to reduce prejudice?

LOQ 43-4: How does psychology's definition of *aggression* differ from everyday usage? What biological factors make us more prone to hurt one another?

LOQ 43-5: What psychological and social-cultural factors may trigger aggressive behavior?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

prejudice
stereotype
discrimination
implicit bias
just-world phenomenon

ingroup
outgroup
ingroup bias
scapegoat theory
other-race effect
aggression
frustration-aggression principle
social script

Module Test

TestYourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. Prejudice toward a group involves negative feelings, a tendency to discriminate, and overly generalized beliefs referred to as _____.

2. If several well-publicized murders are committed by members of a particular group, we may tend to react with fear and suspicion toward all members of that group. In other words, we
   a. blame the victim.
   b. overgeneralize from vivid, memorable cases.
   c. view the world as just.

d. rationalize inequality.

3. The other-race effect occurs when we assume that other groups are _____ (more/less) homogeneous than our own group.

4. Evidence of a biochemical influence on aggression is the finding that
   a. aggressive behavior varies widely from culture to culture.
   b. animals can be bred for aggressiveness.
   c. stimulation of an area of the brain produces aggressive behavior.
   d. a higher-than-average level of the hormone testosterone is associated with violent behavior in males.

5. When those who feel frustrated become angry and aggressive, this is referred to as the _____-_____ _____.

6. Studies show that delinquent young people tend to have parents who used physical force to enforce discipline. This suggests that aggression can be
   a. learned through direct rewards.
   b. triggered by exposure to violent media.
   c. learned through observation of aggressive models.
   d. caused by hormone changes at puberty.

7. A conference of social scientists studying the effects of pornography unanimously agreed that violent pornography

a. has little effect on most viewers.
b. is the primary cause of reported and unreported rapes.
c. leads viewers to be more accepting of coercion in sexual relations.
d. has no effect, other than short-term arousal and entertainment.

8. The aspect of heterosexual pornography that most directly influences men's aggression toward women seems to be the
a. time spent viewing
b. eroticism portrayed.
c. depictions of sexual violence.
d. attractiveness of the actors.

MODULE 44: Prosocial Relations

As social animals—as people who need people—we often approach others not with closed fists, but with open arms. Social psychologists focus not only on the dark side of social relationships, but also on this bright side, by studying *prosocial* behavior—behavior that intends to help or benefit someone. Our positive behaviors toward others are evident from explorations of attraction, altruism and compassion, and peacemaking.

> **"We humans are social beings. We come into the world as the result of others' actions. We survive here in dependence on others. Whether we like it or not, there is hardly a moment of our lives when we do not benefit from others' activities. For this reason, it is hardly surprising that most of our happiness arises in the context of our relationships with others."** — Dalai Lama XIV, *Ethics for the New Millennium,* 2019

Attraction

Pause a moment and think about your relationships. What led to you becoming close friends with someone, or stirred your romantic feelings for someone else? What psychological chemistry binds us together in friendship or love? Social psychology suggests some answers.

The Psychology of Attraction

LOQ 44-1

Why do we befriend or fall in love with some people but not others?

We spend a lot of time thinking about how we can win others' affection and what makes our own affections flourish or fade. Does familiarity breed contempt, or does it amplify affection? Do birds of a feather flock together, or do opposites attract? Is it what's inside that counts, or does physical attractiveness matter, too? To explore these questions, let's consider three ingredients of our liking for one another: proximity, attractiveness, and similarity.

Proximity

Before friendships become close, they must begin. *Proximity*—geographic nearness—is one of friendship's most powerful predictors (Eagle et al., 2009; Nahemow & Lawton, 1975). Proximity can provide opportunities for aggression. But much more often it breeds liking (and sometimes romance) among those who live in the same neighborhood, sit nearby in class, work in the same office, share the same parking lot, or eat in the same dining hall. Look around. Mating starts with meeting.

The power of proximity was illustrated at a "Seeds of Peace" Israeli summer camp (White et al., 2021). The camp sought to reduce

intergroup conflict among outgroup pairs (Jewish and Palestinian teens) with one of three strategies: Share a sleeping bunk, eat at the same table, or attend the same 110-minute dialogue group. Proximity mattered most. Outgroup pairs who shared a sleeping bunk, versus those who did not, were 11 times more likely to become friends. Keep your enemies close and they might become your friends.

Proximity breeds liking partly because of the **mere exposure effect**. Repeated exposure to novel visual stimuli increases our liking for them. By age 3 months, infants prefer photos of the race they most often see—usually their own race (Kelly et al., 2007). Familiarity with a face also makes it look happier (Carr et al., 2017). For our ancestors, this mere exposure effect likely had survival value. What was familiar was generally safe and approachable. What was unfamiliar was more often dangerous and threatening. Evolution may therefore have hard-wired into us the tendency to bond with those who look familiar and to be wary of those who look unfamiliar (Sofer et al., 2015; Zajonc, 1998).



Brendan Beirne/REX/Shutterstock

Familiarity breeds acceptance When this rare white penguin was born in the Sydney, Australia, zoo, his tuxedoed peers ostracized him. Zookeepers thought they would need to dye him black to gain acceptance. But after three weeks of contact, the other penguins came to accept him.

Mere exposure leads to familiarity and thus increases our liking not only for faces, but also for musical selections, geometric figures, Chinese characters (for Chinese language learners), and for the letters of our own name (Moreland & Zajonc, 1982; Nuttin, 1987; Reis et al., 2011; Zajonc, 2001). Mere exposure even increases *unconscious* liking of nonsense syllables—strings of letters presented so quickly our minds don't consciously process them (Van Dessel et al., 2019). So, up to a point (after which the effect wears off), familiarity feeds fondness (Bornstein, 1989, 1999; Montoya et al., 2017). This would come as no surprise to the young Taiwanese man who wrote more than 700 letters

to his girlfriend, urging her to marry him. She did marry—the mail carrier (Steinberg, 1993). No face is more familiar than your own. And that helps explain an interesting finding by Lisa DeBruine (2002, 2004): We like other people when their faces incorporate some morphed features of our own. When McMaster University students played an electronic game with a supposed other player, they were more trusting and cooperative when the other person's image had some of their own facial features morphed into it. In me I trust.



Anthony Behar/Sipa USA/Alamy Stock Photo

(a) (b)

Which is the real Simu Liu? The mere exposure effect applies even to ourselves. Because the human face is not perfectly symmetrical, the face we see in the mirror is not the same face our friends see. Most of us prefer the familiar mirror image, while our friends like the reverse (Mita et al., 1977). The person actor Simu Liu sees in the mirror each morning is

(b) and that's the photo he would probably prefer over the version that other people see in (a).

Modern Matchmaking

Those who have not found a romantic partner in their immediate proximity may cast a wider net. Millions search for love online. Despite some risks—which, for about half of young U.S. women using online dating sites and apps, include receiving unwanted sexual messages (Anderson et al., 2020; Brown, 2020)—an estimated 77 million people worldwide use online matchmaking services (Statista, 2022).

Online matchmaking expands the pool of potential mates, especially for same-sex couples (Finkel et al., 2012a,b; Rosenfeld et al., 2019). Among couples surveyed in 2017 that had met during the internet age, 39 percent of straight couples and 65 percent of same-sex couples met online (Rosenfeld et al., 2019; see **FIGURE 44.1**). Compared to couples meeting offline, those who meet online more often differ in race or ethnicity (Brown, 2019).

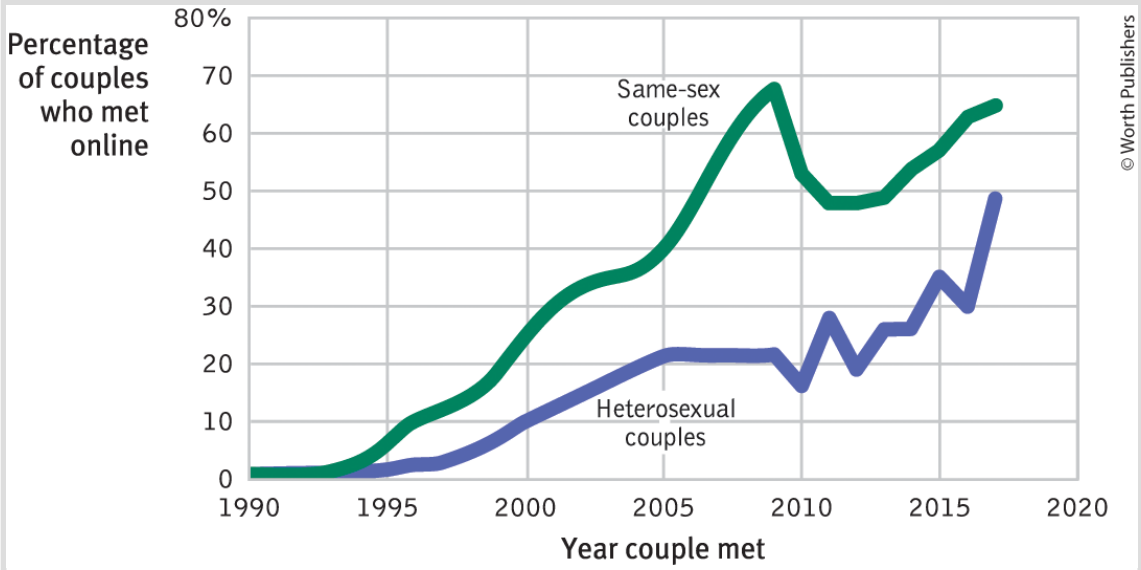


FIGURE 44.1 The changing way we meet our partners The internet's increasing role is clear in U.S. surveys of straight and same-sex couples. (Data from Rosenfeld, 2011; Rosenfeld et al., 2018, 2019)

How effective is the matchmaking? Compared with friendships and romances that began in person, internet-formed relationships are, on average, slightly more likely to last and be satisfying (Bargh & McKenna, 2004; Bargh et al., 2002; Cacioppo et al., 2013). In one study, people disclosed more, with less posturing, to those whom they met online (McKenna et al., 2002). When talking via text or chat with someone for 20 minutes, they felt more liking for that person than they did for someone they had met and talked with face-to-face. This was true even when (unknown to them) it was the same person!



Emily Flake/Cartoon Stock

". . . and if anyone here suspects that the algorithm that put these two together might be flawed, speak now . . ."

Speed dating pushes the search for romance into high gear. At these events, which were pioneered by a matchmaking Jewish rabbi, people meet a succession of prospective partners, either in person or via webcam (Bower, 2009). After a brief 3- to 8-minute conversation, people move on to the next prospect. Those who want to meet again can arrange for future contact. For many participants, a few minutes is enough time to form a feeling about a conversational partner and to register whether the partner likes them (Finkel & Eastwick, 2008).

For researchers, speed dating offers a unique opportunity for studying influences on our first impressions of potential romantic partners. Some findings:

- ***People who fear rejection often elicit rejection.*** After a 3-minute speed date, those who most feared rejection were least often

selected for a follow-up date (McClure & Lydon, 2014).

- ***Given more options, people make more superficial choices.*** When people meet lots of potential partners, they focus on more easily assessed characteristics, such as height and weight (Lenton & Francesconi, 2010).
- ***Similarity is in the eye of the beholder.*** After interacting with dating candidates for 4 minutes each, people's perceived—but not actual—similarity with each person predicted their romantic interest (Tidwell et al., 2013).

Physical Attractiveness

Once proximity affords us contact, what most affects our first impressions? The person's sincerity? Intelligence? Personality? Hundreds of experiments reveal that it is something more superficial: physical appearance. This finding is unnerving for those of us taught that "beauty is only skin deep" and "appearances can be deceiving."

In one early study, researchers randomly matched new students for heterosexual blind dates in a Welcome Week dance (Walster et al., 1966). Before the dance, the researchers gave each student a battery of personality and aptitude tests, and they rated each student's physical attractiveness. The couples danced and talked for more than 2 hours and then took a brief intermission to rate their dates. What predicted whether they liked each other? Only one thing: appearance. Both the men and the women liked good-looking dates best. Women are more likely than men to say that another's looks don't affect them (Lippa, 2007). But studies show that a man's looks do affect women's behavior

(Eastwick et al., 2014a,b). In speed-dating experiments, attractiveness influences first impressions and liking for men and women (Belot & Francesconi, 2006; Finkel & Eastwick, 2008).

Physical attractiveness also predicts how often people date and how popular they feel. And it affects initial impressions of people's personalities. We perceive attractive people as healthier, happier, more sensitive, more successful, and more socially skilled (Eagly et al., 1991; Fink & Penton-Voak, 2002). We dehumanize unattractive people, especially women (Alaei et al., 2022). This dehumanization can have deadly results: When asked whether they would be willing to kill one person to save five people, participants were more willing to sacrifice the life of an unattractive person.

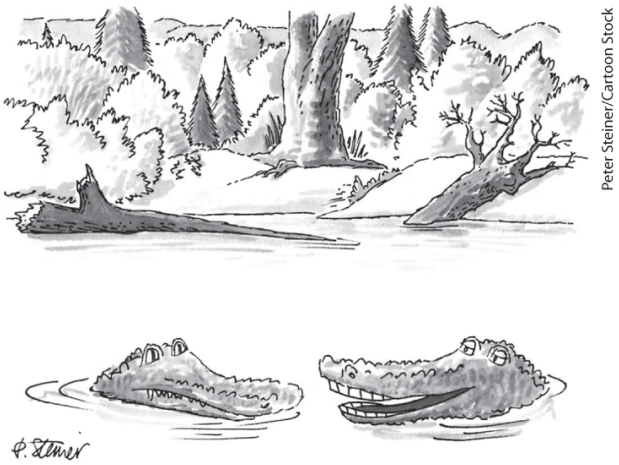
> **"Personal beauty is a greater recommendation than any letter of introduction."**
> — Aristotle, *Apothegems,* 330 B.C.E.

For those who find the importance of looks unfair, sexist, or unenlightened, three other findings offer some reassurance.

- People's attractiveness is unrelated to their self-esteem and happiness (Diener et al., 1995; Major et al., 1984). And unless we have just compared ourselves with extremely attractive people, few of us (thanks, perhaps, to the mere exposure effect) view ourselves as highly unattractive (Greitemeyer, 2020; Thornton & Moore, 1993).

- Very attractive people are sometimes suspicious that praise for their work may simply be a reaction to their looks. Less attractive people have been more likely to accept praise as sincere (Berscheid, 1981).
- For couples who were friends before lovers—who became romantically involved long after first meeting—looks matter less (Hunt et al., 2015). With slow-cooked love, shared values and interests matter more.

Beauty is also in the eye of the culture. People across the globe have modified their bodies in different ways, driven by cultural ideas of attractiveness. They have pierced and tattooed their bodies, lengthened their necks, bound their feet, artificially lightened or darkened their skin or hair, and bulked up their muscles. They have applied chemicals to rid themselves of unwanted hair or to regrow wanted hair, and used undergarments to change the proportions of waists, hips, and breasts. Cultural ideals also change over time and with context. For women in North America, for example, the ultrathin ideal of the Roaring Twenties gave way to the soft, voluptuous Marilyn Monroe ideal of the 1950s and then to today's more athletic ideal look.



"Cosmetic dentistry changed my life."

Some aspects of sexual attractiveness, however, do cross place and time (Cunningham et al., 2005; Langlois et al., 2000). By providing reproductive clues, bodies influence sexual attraction. As some evolutionary psychologists explain, straight men in cultures worldwide judge romantic partners as more attractive if they have a youthful, fertile appearance (Walter et al., 2020). Straight women feel attracted to men who are healthy- and fertile-looking, but are most attracted to men who seem mature, dominant, and affluent (Feingold, 1990; Gallup & Frederick, 2010; Gangestad et al., 2010). One review reported that straight men may place higher value on physical attractiveness than straight women (Feingold, 1990). Gay and bisexual women have reported a preference for larger body figures (Cohen & Tannenbaum, 2001).



Morsa Images/DigitalVision/Getty Images

What is "attractive"? The answer varies by culture and over time. Yet some adult physical features, such as a healthy appearance and a relatively symmetrical face, seem attractive everywhere. Some people use a photo filter that makes their face symmetrical (as has been applied to the face on the right, above) for social media presentation (Garelick, 2022).

People's attractiveness influences our first impressions: We tend to think that what is beautiful is also good. But we also perceive what is good as beautiful (He et al., 2022). Our feelings color our attractiveness judgments. Imagine two people: One is honest, humorous, and polite. The other is rude, unfair, and abusive. Which one is more attractive? Most people perceive the person with the appealing traits as more physically attractive (Lewandowski et al., 2007). Or imagine being paired with a stranger of the gender you find attractive—someone who listens intently to your self-disclosures. Might you feel a twinge of sexual attraction toward that empathic person? Student volunteers did, in several experiments (Birnbaum & Reis, 2012). People find smiling potential partners more attractive (Mehrabian & Blum, 2018). Those we like we find attractive.

Shakespeare said it in *A Midsummer Night's Dream:* "Love looks not with the eyes, but with the mind." As we see our loved ones

repeatedly, their physical imperfections grow less noticeable and their attractiveness grows more apparent (Beaman & Klentz, 1983; Gross & Crofton, 1977). Come to love someone and watch beauty grow. Love sees loveliness.

Similarity

So, proximity has brought you into contact with someone, and your appearance has made an acceptable first impression. What influences whether you will become friends? As you get to know each other, will the chemistry be better if you are opposites or if you are alike?

It makes a good story—extremely different types liking or loving each other: unlikely friends Frog and Toad in Arnold Lobel's books, unlikely couple Hermione and Ron in the Harry Potter series.

But in many real-life situations, opposites retract (Montoya & Horton, 2013; Oosterhoff et al., 2022; Rosenbaum, 1986). Tall people often find true love with other tall people; short people show a soft spot for other short people (Yengo et al., 2018). Compared with randomly paired people, friends and couples are far more likely to share—and to like those with whom they share—attitudes, beliefs, interests, and even personality traits (and, for that matter, age, religion, race, education, intelligence, smoking behavior, and economic status). Most people's immediate neighbors tend to be from the same political party (Brown & Enos, 2021). As C. S. Lewis (1960) observed, "What draws people to be friends is that they see the same truth."

While there is some evidence that among married, same-sex couples, similarity in personality may not predict long-term happiness (Shiota & Levinson, 2007), for most relationships, the more alike people are, the more their liking endures (Byrne, 1971; Hartl et al., 2015). One journalist was right to suppose that love lasts "when the lovers love many things together, and not merely each other" (Lippmann, 1929).



Similarity attracts; perceived dissimilarity does not.

Proximity, attractiveness, and similarity are not the only determinants of attraction. We also like those who like us. When we believe someone likes us, we feel good and respond to them warmly, which leads them to like us even more (Curtis & Miller, 1986). To be liked is powerfully rewarding. Moreover, there is a *liking gap*: After two

strangers interact, both tend to report liking the other person more than they presume the other liked them. This is good news to remember: Most people immediately like us more than we realize (Boothby et al., 2018; Wolf et al., 2021).

Indeed, all the findings we have considered so far can be explained by a simple *reward theory of attraction:* We will like those whose behavior is rewarding to us, including those who are both able and willing to help us achieve our goals (Montoya & Horton, 2014). When people live or work in close proximity to us, it requires less time and effort to develop the friendship and enjoy its benefits. When people are attractive, they are aesthetically pleasing, and associating with them can be socially rewarding. When people share our views, they reward us by validating our own beliefs.

Ask Yourself

To what extent have your closest relationships been affected by proximity, physical attractiveness, and similarity?

Retrieval Practice

RP-1 People tend to marry someone who lives or works nearby. This is an example of the _____ _____ _____ in action.

RP-2 How does being physically attractive influence others' perceptions?

ANSWERS IN APPENDIX E

Romantic Love

LOQ 44-2

How does romantic love typically change as time passes?

Sometimes people move from initial impressions to friendship to the more intense, complex, and mysterious state of new romantic love. If love endures, temporary *passionate love* will mellow into a lingering *companionate love* (Hatfield, 1988; Fehr et al., 2014).

Passionate Love

Passionate love mixes something new with something positive (Aron et al., 2000; Coulter & Malouff, 2013). We intensely desire to be with our partner, and seeing our partner stimulates blood flow to brain regions linked to craving and obsession (Acevedo et al., 2012; Hatfield et al., 2015).



MAURIX/Gamma-Rapho/Getty Images

Love is an ancient thing This 5000- to 6000-year-old "Romeo and Juliet" young couple was unearthed locked in embrace, near Rome.

The *two-factor theory of emotion* can help us understand the intense positive absorption of passionate love (Hatfield, 1988). It assumes that

- emotions have two ingredients—*physical arousal* plus *cognitive appraisal.*
- arousal from any source can enhance one emotion or another, depending on how we interpret and label the arousal.

In one classic experiment, researchers studied straight men crossing two bridges above British Columbia's rocky Capilano River (Dutton & Aron, 1974, 1989). One, a swaying footbridge, was 230 feet (70 meters) above the rocks; the other was low and solid. As the men came off

each bridge, an attractive young woman (working for the researchers) intercepted them and asked them to fill out a short questionnaire. She then offered her phone number in case they wanted to hear more about her project. Far more of the men who had just crossed the high bridge—which left their hearts pounding—accepted the number and later called the woman.

To be revved up and to associate some of that arousal with a desirable person is to feel the pull of passion. So, if you're looking for romance, perhaps take your date to a climbing gym. Adrenaline makes the heart grow fonder. Sexual desire + a growing attachment = passionate love (Berscheid, 2010).

Companionate Love

Although the desire and attachment of romantic love often endure, the intense absorption in the other, the thrill of the romance, the giddy "floating on a cloud" feelings typically fade. Does this mean the French are correct in saying that "love makes the time pass and time makes love pass"? Or can friendship and commitment keep a relationship going after the passion cools?

As love matures, it typically becomes a steadier **companionate love**—a deep, affectionate attachment (Hatfield, 1988). For people worldwide, as relationships mature they evolve: Passion subsides and commitment grows (Sorokowski et al., 2021). Like a passing storm, the flood of passion-facilitating hormones (testosterone, dopamine, adrenaline) subsides. But another hormone, *oxytocin,* remains,

supporting feelings of trust, calmness, and bonding with the mate. This shift from passion to attachment has adaptive value (Reis & Aron, 2008). Passionate love often produces children; companionate love aids children's survival as the parents lose their obsession with each other.



"I think I know where the passion in our marriage has gone."

In the most satisfying marriages, attraction and sexual desire endure, minus the obsession of early romance (Acevedo & Aron, 2009). Recognizing the short duration of obsessive passionate love, some societies deem such feelings an irrational reason for marrying. Better, they say, to seek (or have someone seek for you) a partner with a compatible background and interests. Cultures where people rate love as less important for marriage do have lower divorce rates (Levine et al., 1995).

One key to a gratifying and enduring relationship is **equity.** When equity exists—when both partners receive in proportion to what they give—the chances for sustained and satisfying companionate love are

good (Gray-Little & Burks, 1983; Van Yperen & Buunk, 1990). In one national survey, "sharing household chores" ranked third, after "having shared interests" and a "satisfying sexual relationship," on a list of seven things people associated with successful marriages (Geiger, 2016). As the saying goes, "I like hugs. I like kisses. But what I really love is help with the dishes."

Equity's importance extends beyond marriage. Mutually sharing one's self and possessions, making decisions together, giving and getting emotional support, promoting and caring about each other's welfare—all of these acts are at the core of every type of loving relationship (Sternberg & Grajek, 1984). It's true for lovers, for parent and child, and for close friends.

Sharing includes **self-disclosure**, revealing intimate details about ourselves—our likes and dislikes, our dreams and worries, our proud and shameful moments. "When I am with my friend," noted the Roman statesman Seneca, "methinks I am alone, and as much at liberty to speak anything as to think it." Self-disclosure breeds liking, and liking breeds self-disclosure (Collins & Miller, 1994). As one person reveals a little, the other reciprocates, the first then reveals more, and on and on, as lovers (and friends) move to deeper levels of intimacy (Baumeister & Bratslavsky, 1999).

One experiment marched some student pairs through 45 minutes of increasingly self-disclosing conversation—from "What is the greatest accomplishment of your life?" to "When did you last cry in front of

another person? By yourself?" Other pairs spent the time with small-talk questions, such as "What was your high school like?" (Aron et al., 1997). By the experiment's end, those experiencing the escalating intimacy felt much closer to their conversation partner than did the small-talkers. Likewise, after dating couples spent 45 minutes answering such questions, they felt increased love (Welker et al., 2014).

In addition to equity and self-disclosure, a third key to enduring love is *positive support.* For happy couples in enduring relationships, positive interactions (compliments, touches, laughing) outnumber negative interactions (sarcasm, disapproval, insults) by at least 5 to 1 (Gottman & Gottman, 2022). In the mathematics of love, self-disclosing intimacy + mutually supportive equity = enduring companionate love.

Relationship conflicts are inevitable, but hurtful communications are not. Do we more often express sarcasm or support, scorn or sympathy, sneers or smiles? In romance, a rejection hurts more and for longer than an acceptance pleases (Dobson et al., 2020). For unhappy couples, disagreements, criticisms, and put-downs are routine. It takes multiple compliments to equal the attention-getting and emotion-affecting power of one criticism.

Couples benefit from making space for positive communication. In one experiment, some couples were randomly assigned to once a week spend 15 minutes with their partner writing down "three *good*

things that happened to you as a couple during the week" and noting "why did this good thing happen?" After six weekly repetitions, these couples reported increased satisfaction and intimacy (Boiman-Meshita & Littman-Ovadia, 2021).

Retrieval Practice

RP-3 How does the two-factor theory of emotion help explain *passionate love?*

RP-4 Two vital components for maintaining *companionate love* are _____ and _____-_____.

ANSWERS IN APPENDIX E

Altruism

LOQ 44-3

What is *altruism?* When are people most—and least—likely to help?

"We are made for goodness," observed South African Archbishop Desmond Tutu (1931–2021). "Why else do we get so outraged by wrong?"

So it seemed during the first two weeks of March, 2021. Outraged by Russia's violence against Ukraine, people from 165 countries booked more than 430,000 nights at Ukrainian Airbnbs, most belonging to

people they did not know (Friedman, 2022). The purchasers had no intention of using the reservation; they simply wanted to donate money to people who were hurting. In the invasion's first two weeks, nearly $400 million in additional donations were made by people from around the world to support Ukrainians (Roohi, 2022).

Among those fleeing Ukraine were cousins Lesia Orshoko and Alona Chugai. On their arrival in Israel, they were welcomed by Sharon Bass, a Jew who owed her existence to the long-ago altruism of the cousins' "righteous Gentile" Ukrainian grandmother, Maria Blyshchik. For 2 years Blyshchik hid Bass's grandmother, Fania Rosenfeld, then a teen, sparing her from the Holocaust that killed her parents and five siblings.

After later relocating to Israel, Fania Rosenfeld Bass would tell the story "over and over to her children and grandchildren, letting them know about the good people who held on to their humanity and quietly rebelled against the horrors of the war" (Greenbaum, 2022). Eight decades later, as war ravaged Ukraine, Sharon Bass reciprocated that heroic goodness by enabling the cousins' escape to Israel and welcoming them into her home. For as long as they wish, she said, her house is their house.



Sharon Bass

Altruism across generations Israeli Sharon Bass (middle) is pictured here with Ukrainian refugees Lesia Orshoki (left) and Alona Chugai (right).

Such acts of **altruism** show that humans are capable of great evil, but also, as we shall see, of great goodness.

Altruism became a major concern of social psychologists after a widely publicized incident. On March 13, 1964, a stalker repeatedly stabbed Kitty Genovese, then raped her as she lay dying outside her Queens, New York, apartment at 3:30 A.M. "Oh, my God, he stabbed me!" Genovese screamed into the early morning stillness. "Please help me!" Windows opened and lights went on as some neighbors heard her screams. Her attacker fled and then returned to stab and rape her again. No one called the police or came to her aid until it was too late.

Bystander Intervention

Newspaper accounts of the murder, which misreported the number of witnesses and their responses to Genovese's cries, triggered public outrage over the bystanders' apparent "apathy" and "indifference." However, social psychologists John Darley and Bibb Latané (1968) attributed bystanders' inaction not to character flaws or moral choices, but to an important situational factor—the presence of others. Given certain circumstances, they suspected, most of us would behave similarly. To paraphrase the French writer Voltaire, we all are guilty of the good we did not do.

After staging emergencies under various conditions, Darley and Latané assembled their findings into a decision scheme: We will help only if the situation enables us first to *notice* the incident, then to *interpret* it as an emergency, and finally to *assume responsibility* for helping (FIGURE 44.2). At each step, the presence of others can turn us away from the path that leads to helping.

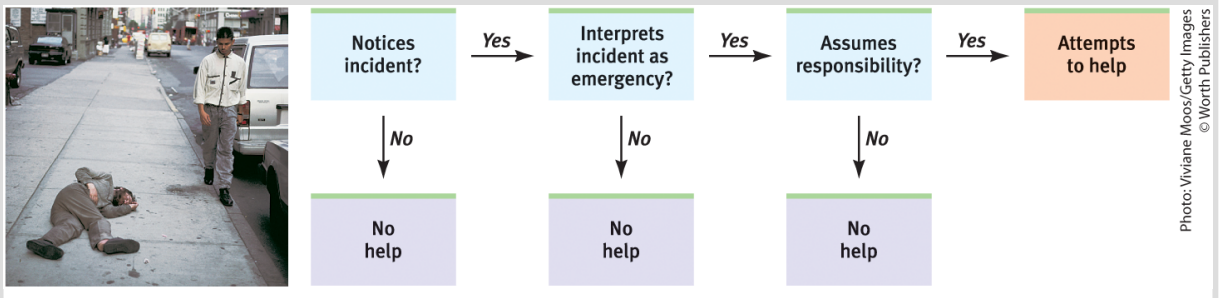


FIGURE 44.2 The decision-making process for bystander intervention (Data from Darley & Latané, 1968.)

One of Darley and Latané's experiments staged a fake emergency as students in separate laboratory rooms took turns talking over an intercom. Only the person whose microphone was switched on could be heard. When his turn came, one student (actually an accomplice) pretended to have an epileptic seizure, and he called for help (Darley & Latané, 1968).

How did the others react? As **FIGURE 44.3** shows, those who believed only they could hear the victim—and therefore thought they alone were responsible for helping him—usually went to his aid. Students who thought others could also hear the victim's cries were more likely to do nothing. When more people shared responsibility for helping—when there was a **diffusion of responsibility**—any single listener was less likely to help. Indeed, inattention and diffused responsibility contribute to "global bystander nonintervention" as millions of far-away people die of hunger, disease, and genocide (Pittinsky & Diamante, 2015).

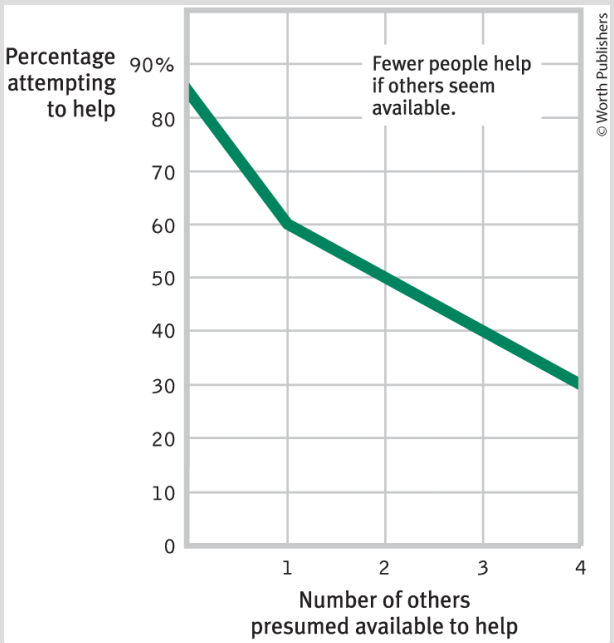


FIGURE 44.3 Responses to a simulated emergency When people thought they alone heard the calls for help from a person they believed to be having an epileptic seizure, they usually helped. But when they thought four others were also hearing the calls, fewer than one-third responded. (Data from Darley & Latané, 1968.)

Hundreds of additional experiments have confirmed this **bystander effect.** For example, researchers and their assistants took 1497 elevator rides in three cities and "accidentally" dropped coins or pencils in front of 4813 fellow passengers (Latané & Dabbs, 1975). When alone with the person in need, 40 percent helped; in the presence of 5 other bystanders, only 20 percent helped.

When reflecting on the bystander research—or on the conformity and obedience experiments in Module 42—it's tempting to think that, unlike many of the participants, we would have responded with moral courage. We may tell ourselves that, unlike so many others who lived before us, we would have taken steps to protect Jews from the Nazi genocide or intervened as George Floyd was slowly killed by a police officer. But research suggests we do not always act according to the better angels of our nature. In experiments, people greatly overestimate the odds of their protesting a sexist remark or a racial slur (Swim & Hyers, 1999).

Although the presence of other bystanders reduces the chance that an individual will offer help, often, people *do* help. In CCTV surveillance of arguments and fights caught on the streets of Amsterdam, Lancaster, and Cape Town, 9 times out of 10 at least one bystander and usually more did something to help (Philpot et al., 2019). Another research team planted 17,303 "lost" wallets in 40 countries, walking into public places such as hotels, post offices, and banks and explaining to a clerk: "I found this on the street around the corner. Someone must have lost it. I'm in a hurry and have to go. Can you please take care of it?" Forty percent of those given cashless wallets alerted the owner. Surprisingly to economists surveyed, those receiving wallets with cash were even *more* likely (51 percent) to help (Cohn et al., 2019).

Observations of behavior in thousands of these situations—relaying an emergency phone call, aiding a stranded motorist, donating blood,

picking up dropped books, contributing money, giving time—show that the odds of our helping someone depend on the characteristics of that person, the situation, and our own internal state. The odds of helping are highest when

- the person appears to need and deserve help.
- the person is in some way similar to us.
- the person is a woman.
- we have just observed someone else being helpful.
- we are not in a hurry.
- we are in a small town or rural area.
- we are feeling guilty.
- we are focused on others and not preoccupied.
- we are in a good mood.

The "good mood" result—that happy people are helpful people—is one of psychology's most consistent findings. As poet Robert Browning (1868) observed, "Oh, make us happy and you make us good!" It doesn't matter how we are cheered. Whether by being made to feel successful and intelligent, by thinking happy thoughts, by finding money, or even by receiving a posthypnotic suggestion, we become more generous and more eager to help (Aknin et al., 2019). Moreover, the world's happiest countries are also countries where people more often volunteer, give money, and even offer organ donations (Rhoads et al., 2021). And if our feeling of elevation follows witnessing or learning of someone else's self-giving deed, our helping will become even more pronounced (Schnall et al., 2010).

So, happiness begets helpfulness. But it's also true that helpfulness breeds happiness (Hui et al., 2020). Helping those in need activates brain areas associated with reward (Harbaugh et al., 2007; Kawamichi et al., 2015). That helps explain a curious finding: People who give money away are happier than those who spend it almost entirely on themselves. In one controlled experiment, researchers gave people money and instructed one group to spend it on themselves, and another group to spend it on others (Aknin et al., 2020). Which group was happiest afterward? It was, indeed, those assigned to the spend-it-on-others condition. Worldwide, people in both rich and developing countries were happier with their lives if they had donated to a charity in the last month (Dunn et al., 2008). You can likely recall a mood boost merely from giving directions to a stranger. *The lesson:* Doing good feels good.



Zinkevych/iStock/Getty Images

Happy to give a dog a bone In an experiment, pet owners who spent money on their pets felt happier than did pet owners who spent money on themselves (White et al., 2022).

Ask Yourself

Imagine being a newcomer needing directions at a busy bus station. What could you do to increase the odds that someone will assist you, and what sort of person would be most likely to help?

Retrieval Practice

RP-5 What social psychology principle did the Kitty Genovese incident illustrate?

ANSWERS IN APPENDIX E

Norms for Helping

LOQ 44-4

How do social exchange theory and social norms explain helping behavior?

Why do we help? One widely held view is that self-interest underlies all human interactions, that our constant goal is to maximize rewards and minimize costs. Accountants call it *cost-benefit analysis.* Philosophers call it *utilitarianism.* Social psychologists call it **social exchange theory.** For example, if you are considering donating blood, you may weigh the costs of doing so (time, discomfort, anxiety) against the benefits (reduced guilt, social approval, good feelings). If the rewards exceed the costs, you will donate blood.

Others believe we help because we have been socialized to do so, through norms that prescribe how we *ought* to behave (Everett et al., 2015). Two such norms are the *reciprocity norm* and the *social-responsibility norm.*

The **reciprocity norm** is the expectation that we should help, not harm, those who have helped us. Those for whom we do favors will often return favors. (Be kind to others and you may elicit future kindness from them.) With similar others, the reciprocity norm motivates us to give (in favors, gifts, or social invitations) about as much as we receive. Sometimes this means "paying it forward": In one experiment people who were treated generously became more likely to be generous to a stranger (Tsvetkova & Macy, 2014). Returning favors feels good, so we tend to find the reciprocity norm a pleasant way to help others (Hein et al., 2016).

The reciprocity norm kicked in after Dave Tally found $3300 in a backpack that an Arizona State University student had misplaced on his way to buy a used car (Lacey, 2010). Tally was homeless at the time, but instead of using the cash for much-needed bike repairs, food, and shelter, he turned the backpack in to the social service agency where he volunteered. To reciprocate Tally's help, the backpack's owner thanked him with a cash reward. Hearing about Tally's selfless deed, dozens of others also sent him money and job offers.

The **social-responsibility norm** is the expectation that we should help those who need our help—such as young children and newcomers—

even if the costs outweigh the benefits. Europeans are most responsive to help sought by the most vulnerable asylum seekers—those, for example, who have been tortured or have no surviving family (Bansak et al., 2016). During the Covid-19 pandemic, many people—despite the risk of infection—cared for the sick, shopped for older neighbors, and donated money to help those in need (Fridman et al., 2022). Many people also responded affirmatively to persuasion that defined mask-wearing as an act of kindness and concern for others (Van Bavel et al., 2020).



Invoking the social-responsibility norm

We're especially likely to respond to requests for help when asked face-to-face, rather than by phone or email (Roghanizad & Bohns, 2022). People often hesitate to ask others to, for example, take their photo at a picturesque place. But experiments show that they underestimate others' willingness to help and underestimate how positively helpers will feel (Zhao et al., 2022). So, when you could use a favor, just ask. More often than you suppose, people—even strangers—will gladly help and feel good about doing so.

Many world religions encourage their followers to practice the social-responsibility norm, and sometimes this leads to prosocial behavior (Henrich, 2020). Between 2006 and 2008, Gallup polls sampled more than 300,000 people across 140 countries, comparing the "highly religious" (who said religion was important to them and who had attended a religious service in the prior week) to those less religious. The highly religious, despite being poorer, were about 50 percent more likely to report having "donated money to a charity in the last month" and to have volunteered time to an organization (Pelham & Crabtree, 2008). New surveys of 8000 Australians and 32,000 New Zealanders replicated this association of religious engagement with volunteerism (Petrovic et al., 2021; Van Tongeren et al., 2021). In more than two dozen "God-priming" studies, merely reminding people of God led them to cheat less and help more (Henrich, 2020).



Denis Poroy/AP Photo

Heroic helping In 2019, when a gunman entered a California synagogue, 60-year-old Lori Gilbert-Kaye was murdered when she selflessly used her body to shield her rabbi. Social psychologists study what prompts people to help.

From Conflict to Peace

Positive social norms encourage generosity and enable group living. But conflicts often divide us. One response to recent conflict- and scarcity-driven migrations has been anti-immigrant nationalism and nativism (favoring native-born citizens over newcomers). Psychologists have wondered: What in the human mind causes destructive conflict? How might a spirit of cooperation replace the perceived threats of social diversity?

Elements of Conflict

LOQ 44-5

How do social traps and mirror-image perceptions fuel social conflict?

To a social psychologist, a **conflict** is a perceived incompatibility of actions, goals, or ideas. The elements of conflict are much the same, whether partners sparring, political groups feuding, or nations at war. In each situation, conflict may seed positive change, or it may be a destructive process that can produce unwanted results. Among the destructive processes are *social traps* and *distorted perceptions*.

Social Traps

In some situations, pursuing our personal interests also supports our collective well-being: A person may choose to get vaccinated for self-

protection from a contagious disease, but their decision means that they are also less likely to pass that disease on to others, and the whole community benefits from it. In other situations, we *harm* our collective well-being by pursuing our personal interests. Such situations are **social traps**.

Researchers have created mini social traps in laboratory games that require two participants to choose between pursuing their immediate self-interest, at others' expense, versus cooperating for mutual benefits. Many real-life situations similarly pit our individual interests against our communal well-being. Individual fish trawlers reasoned that the fish they took would not threaten the species and that if they didn't take them, others would anyway. The result: depleted fish stocks. Anticipating Covid-19-related shutdowns, people bought and hoarded toilet paper, leaving shelves empty for others. Individual car owners and homeowners reason, "Electric cars are more expensive. Besides, the fuel that I burn in my one car doesn't noticeably add to the greenhouse gases." When enough people reason similarly, the collective result threatens disaster—climate change, rising seas, and more extreme weather.



Jeff J Mitchell/Getty Images

Not in my ocean! Many people support alternative energy sources, including wind turbines. But proposals to construct wind farms in real-world places elicit less support. Wind turbines in the Highlands and off the coast of Scotland have produced heated debate over the benefits of clean energy versus the costs of altering treasured scenic views.

Social traps challenge us to reconcile our right to pursue our personal well-being with our responsibility for the well-being of all. Psychologists have therefore explored ways to convince people to cooperate for their mutual betterment—through agreed-upon *regulations,* through better *communication,* and through promoting *awareness* of our responsibilities toward community, nation, and the

whole of humanity (Dawes, 1980; Kraft-Todd et al., 2015; Linder, 1982; Sato, 1987). Given effective regulations, communication, and awareness, people more often cooperate, whether playing a laboratory game or the real game of life.

Enemy Perceptions

Psychologists have noted that those in conflict have a curious tendency to form diabolical images of one another. These distorted images are, ironically, so similar that we call them **mirror-image perceptions:** As we see "them"—as untrustworthy, with evil intentions—so "they" see us. Each demonizes the other: "My political party, unlike the other party, has the nation's best interests at heart" (Waytz et al., 2014).

Mirror-image perceptions can often feed a vicious cycle of hostility. If Juan believes Maria is annoyed with him, he may snub her, causing her to act in ways that justify his perception. As with individuals, so with countries. Perceptions can become **self-fulfilling prophecies**—beliefs that confirm themselves by influencing the other country to react in ways that seem to justify those beliefs. In the real world, we make what we believe.

Individuals and nations alike tend to see their own actions as responses to provocation, not as the causes of what happens next. Perceiving themselves as returning tit for tat, they often hit back harder, as University College London volunteers did in one experiment (Shergill et al., 2003). Their task: After feeling pressure on

their own finger, they used a mechanical device to press on another volunteer's finger. Although told to reciprocate with the same amount of pressure, they typically responded with about 40 percent more force than they had just experienced. Despite seeking only to respond in kind, their touches soon escalated to hard presses, much as when each child involved in a fight asserts "I just touched them, but they hit me!" Mirror-image perceptions feed similar cycles of hostility on the world stage. To most people, torture seems more justified when done by "us" rather than "them" (Tarrant et al., 2012).

The point is not that truth must lie midway between two such views (one may be more accurate). The point is that enemy perceptions often form mirror images.

Retrieval Practice

RP-6 How does group identity enable sports fans to feel a sense of satisfaction when their archrival team loses? Do such feelings, in other settings, make conflict resolution more challenging?

ANSWERS IN APPENDIX E

Promoting Peace

LOQ 44-6

What can we do to promote peace?

How can we make peace? Can contact, cooperation, communication, and conciliation transform the antagonisms fed by prejudice and conflicts into attitudes that promote peace? Research indicates that, in some cases, they can.

Contact

Does it help to put two conflicting parties into close contact? It depends. Negative contact increases disliking (Kotzur & Wagner, 2021). But positive contact—especially noncompetitive contact between parties of equal status, such as fellow store clerks—typically helps. Initially prejudiced co-workers of different races have, in such circumstances, usually come to accept one another. This finding is confirmed by studies of face-to-face contact between majority people and outgroups, such as ethnic minorities, older people, LGBTQ people, and people with disabilities. Among the quarter-million people studied across 38 nations, contact has correlated with (and in experiments has led to) more positive and empathic attitudes and reduced dehumanization (Bruneau et al., 2021; Pettigrew & Tropp, 2011; Tropp & Barlow, 2018). Some examples:

- Countries and U.S. states that have the most immigrants tend to be the most supportive of immigrants; outgroup prejudice is strongest in places with few immigrants (Myers, 2018; Shrira, 2020; Wagner et al., 2020).
- Straight, cisgender people's attitudes toward gay and transgender people are influenced not only by *what* they know but also by *whom* they know (Brown, 2017; DellaPosta, 2018). In surveys, the

reason people most often give for becoming more supportive of same-sex marriage is "having friends, family, or acquaintances who are gay or lesbian" (Pew, 2013). And in the United States, where 87 percent of people now say they know someone who is gay, attitudes toward same-sex marriage have become more accepting (McCarthy, 2019; Pew, 2016). Friendly contact—say, between Black and White students assigned to share a college dorm room—improves explicit and implicit attitudes toward others of the different race, and even toward other racial groups (Bruneau et al., 2021; Onyeador et al., 2020).

- More than 100 studies reveal that even "extended contact"—knowing that ingroup friends have outgroup friends—improves attitudes toward the outgroup (Zhou et al., 2019). Straight people often are more accepting of gay people if their straight friends have gay friends.

However, contact is not always enough. Despite laws that forbid school segregation, ethnic groups often resegregate themselves in lunchrooms, in classrooms, and elsewhere on school grounds (Alexander & Tredoux, 2010; Clack et al., 2005; Schofield, 1986). People in each group often think that they would welcome more contact with the other group, but they assume the other group does not reciprocate the wish (Richeson & Shelton, 2007). "I don't reach out to them because I don't want to be rebuffed; they don't reach out to me, because they're just not interested." When such mirror-image misperceptions are corrected, friendships may form and prejudices melt.

> **"Prejudice is learned behavior that can be unlearned."** — Desmond & Leah Tutu Legacy Foundation, 2019

Cooperation

To see if enemies could overcome their differences, researcher Muzafer Sherif (1966) set a conflict in motion. He randomly separated 22 Oklahoma City boys into two separate camp areas. Then he had the two groups compete for prizes in a series of activities. Before long, each group became intensely proud of itself and hostile to the other group's "sneaky," "smart-alecky stinkers." Food wars broke out. Cabins were ransacked. Fistfights had to be broken up by camp counselors. Brought together, the two groups avoided each other, except to taunt and threaten. Little did they know that within a few days, they would be friends.

> **"Me against my brother, my brothers and me against my cousins, then my cousins and me against strangers."** — Bedouin proverb

Sherif accomplished this by giving them **superordinate goals**—shared goals that could be achieved only through cooperation. When he arranged for the camp water supply to "fail," all 22 boys had to work together to restore the water. To rent a movie in those pre-streaming days, they all had to pool their resources. To move a stalled truck, everyone needed to combine their strength, pulling and pushing

together. Having used isolation and competition to make strangers into enemies, Sherif used shared predicaments and goals to turn enemies into friends. What reduced conflict was not mere contact, but *cooperative* contact. When diverse people team up as equals and collaborate toward a shared goal, animosities abate and friendships form.



Rosalind Beckton

Strangers coming together When a family got stuck in a Florida rip current, no less than 80 of their fellow beachgoers formed a human chain, rescuing them. One of the witnesses, Rosalind Beckton, wrote: “All races & ages join[ed] together to save lives” (AP, 2017).

Critics suggest that Sherif’s research team encouraged the conflict, hoping the study would illustrate their expectations about socially toxic competition and socially beneficial cooperation (Perry, 2018). Yet, shared predicaments or a common enemy do have powerfully unifying effects. Those facing rejection or discrimination have

developed strong ingroup identification (Bauer et al., 2014; Ramos et al., 2012). Youth exposed to war also typically bond with one another (Bauer et al., 2014). Israeli children growing up in conflict areas often develop conflict-supportive perceptions, beliefs, and emotions regarding their shared adversary (Nasie et al., 2016). Such interpretations build ingroup solidarity but also insensitivity to the pain experienced by those in the outgroup (Levy et al., 2016). In the aftermath of a divisive U.S. primary election, party members will usually reunify when facing their shared threat—the opposing party candidate. At such times, cooperation can lead people to define a new, inclusive group that dissolves their former subgroups (Dovidio & Gaertner, 1999). If serving as a peacemaker, you might seat members of two groups not on opposite sides, but alternately around a table. Give them a new, shared name. Have them work together. Enable them to see each other as part of one larger group. Then watch "us" and "them" become "we."

If cooperative contact between rival group members encourages positive attitudes, might this principle bring diverse students together? Could cooperative learning in classrooms create interracial friendships, while also enhancing student achievement? Experiments with adolescents from many countries confirm that the answer to both questions is *Yes* (Tropp et al., 2022). In the classroom as in the sports arena, members of multiethnic groups who work together on projects typically come to feel friendly toward one another. Knowing this, thousands of teachers have made multiethnic cooperative learning part of their classroom experience.



Rabie Zakaria

Superordinate goals override differences
Teaming up as equals and cooperating to achieve a shared goal is an optimal way to break down social barriers. When Iraqi Christians were assigned to play with Muslims on the same soccer team (as opposed to playing on all-Christian teams), they were later more likely to train with Muslims and register to play on a Christian-Muslim mixed soccer team (Mousa, 2020).

The power of cooperative activity to make friends of former enemies has led psychologists to urge increased international exchange and cooperation. Some experiments have found that just imagining the shared threat of global climate change reduces international hostilities (Pyszczynski et al., 2012). From adjacent Brazilian tribes to European countries, formerly conflicting groups have managed to build interconnections, interdependence, and a shared social identity as they seek common goals (Fry, 2012). As we engage in mutually beneficial trade, as we work to protect our common destiny on this fragile planet, and as we become more aware that our hopes and fears are shared, we can transform misperceptions that feed conflict into feelings of solidarity based on common interests.

"Most of us have overlapping identities which unite us with very different groups. We *can* love what we are, without hating what—and who—we are *not*. We can thrive in our own tradition, even as we learn from others." — UN Secretary-General Kofi Annan, Nobel Peace Prize lecture, 2001

Communication

When real-life conflicts become intense, a third-party mediator—a marriage counselor, labor mediator, diplomat, community volunteer—may facilitate much-needed communication (Rubin et al., 1994). Mediators help each party voice its viewpoint and understand the other's needs and goals. If successful, mediators can replace a competitive *win-lose* orientation with a cooperative *win-win* orientation that leads to a mutually beneficial resolution. A classic example: Two friends, after quarreling over an orange, agreed to split it. One squeezed his half for juice. The other used the peel from her half to flavor a cake. If only the two had communicated their motives to one another, they could have hit on the win-win solution of one having all the juice, the other all the peel.



Byron Buck

Finding common ground In local communities across the United States, mediators are helping "red" (conservative) and "blue" (liberal) citizens discover their common ground and form friendships (see BraverAngels.org). My Country Talks is an international platform with similar goals. They set up "one-on-one discussions between people with completely different views" to encourage civil political dialogue (MyCountryTalks.org, 2021).

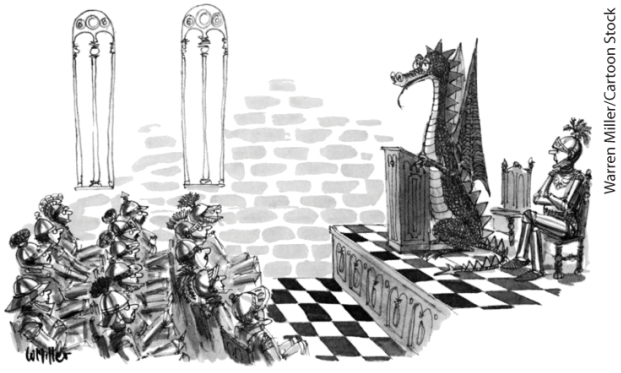
Conciliation

Understanding and cooperative resolution are most needed, yet least likely, in times of anger or crisis (Bodenhausen et al., 1994; Tetlock, 1988). When conflicts intensify, images become more stereotyped, judgments more rigid, and communication more difficult. Each party is likely to threaten, coerce, or retaliate. In the weeks before the 1990 Gulf War, U.S. President George H. W. Bush threatened, in the full glare of publicity, to "kick Saddam's ass." Iraqi president Saddam Hussein communicated in kind, threatening to make Americans "swim in their own blood."

Under such conditions, is there an alternative to war or surrender? Social psychologist Charles Osgood (1962, 1980) advocated a strategy of *Graduated and Reciprocated Initiatives in Tension-Reduction,* nicknamed **GRIT.** In applying GRIT, one side first announces its recognition of mutual interests and its intent to reduce tensions. It then initiates one or more small, conciliatory acts. Without weakening

one's retaliatory capability, this modest beginning opens the door for reciprocity by the other party. Should the enemy respond with hostility, one reciprocates in kind. But so, too, with any conciliatory response.

In laboratory experiments, small conciliatory gestures—a smile, a touch, a word of apology—have allowed both parties to begin edging down the tension ladder to a safer rung where communication and mutual understanding can begin (Lindskold, 1978; Lindskold & Han, 1988). In a real-world international conflict, U.S. President John F. Kennedy's gesture of stopping atmospheric nuclear tests began a series of reciprocated conciliatory acts that culminated in the 1963 atmospheric test-ban treaty between the United States and the Soviet Union.



Warren Miller/Cartoon Stock

"To begin with, I would like to express my sincere thanks and deep appreciation for the opportunity to meet with you. While there are still profound differences between us, I think the very fact of my presence here today is a major breakthrough."

As working toward shared goals reminds us, we are more alike than different. Civilization advances not by conflict and cultural isolation,

but by tapping the knowledge, the skills, and the arts that are each culture's legacy to the whole human race. Open societies are enriched by cultural sharing (Sowell, 1991). We have China to thank for paper and printing and for the magnetic compass that opened the great explorations. We have Egypt to thank for trigonometry. We have the Islamic world and India's Hindus to thank for our Arabic numerals. While celebrating and claiming these diverse cultural legacies, we can also welcome the continuing enrichment of today's cultural diversity. We can view ourselves as instruments in a human orchestra. And we can therefore each affirm our own culture's heritage while building bridges of communication, understanding, and cooperation across our cultural traditions.

"Peace is not just the absence of conflict; peace is the creation of an environment where all can flourish, regardless of race, color, creed, religion, gender, class, caste, or any other social markers of difference." — Former President of South Africa and anti-apartheid activist Nelson Mandela (2004).

Ask Yourself

Do you regret arguing with a friend or not getting along with a family member? How might you use these peace-promoting principles to resolve such conflicts, now or in the future?

Retrieval Practice

RP-7 What are some ways to reconcile conflicts and promote peace?

ANSWERS IN APPENDIX E

REVIEW

Module 44: Prosocial Relations

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 44-1: Why do we befriend or fall in love with some people but not others?

LOQ 44-2: How does romantic love typically change as time passes?

LOQ 44-3: What is *altruism?* When are people most—and least—likely to help?

LOQ 44-4: How do social exchange theory and social norms explain helping behavior?

LOQ 44-5: How do social traps and mirror-image perceptions fuel social conflict?

LOQ 44-6: What can we do to promote peace?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

mere exposure effect
passionate love
companionate love
equity
self-disclosure
altruism
diffusion of responsibility
bystander effect
social exchange theory
reciprocity norm
social-responsibility norm
conflict
social trap
mirror-image perceptions
self-fulfilling prophecy
superordinate goals
GRIT

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. The more familiar a stimulus becomes, the more we tend to like it. This exemplifies the _____ _____ effect.

2. A happy couple celebrating their fiftieth wedding anniversary is likely to experience deep _____ love, even though their _____ love has probably decreased over the years.

3. After vigorous exercise, you meet an attractive person, and you are suddenly seized by romantic feelings for that person. This response supports the two-factor theory of emotion, which assumes that emotions, such as passionate love, consist of physical arousal plus
   a. a reward.
   b. proximity.
   c. companionate love.
   d. our interpretation of that arousal.

4. The bystander effect states that a particular bystander is less likely to give aid if
   a. the victim is similar to the bystander in appearance.
   b. no one else is present.
   c. other people are present.
   d. the incident occurs in a deserted or rural area.

5. Our enemies often have many of the same negative impressions of us as we have of them. This exemplifies the concept of _____-_____ perceptions.

6. One way of resolving conflicts and fostering cooperation is by giving rival groups shared goals that help them override their differences. These are called _____ goals.

CHAPTER 14
Personality (Modules 45–47)



eyecrave productions/E+/Getty Images

MODULE 45 Introduction to Personality and Psychodynamic Theories

- What Is Personality?
- Psychodynamic Theories

MODULE 46 Humanistic Theories and Trait Theories

- Humanistic Theories

Trait Theories
THINKING CRITICALLY ABOUT: The Stigma of Introversion
MODULE 47 Social-Cognitive Theories and the Self
Social-Cognitive Theories
Exploring the Self

Lady Gaga dazzles millions with her unique musical arrangements, tantalizing outfits, and memorable performances. Her most predictable trait is her unpredictability. At an MTV Video Music Awards show, she stirred up debate by wearing a meat dress. A decade later, she performed the National Anthem at the most mainstream of events, the inauguration of U.S. President Joseph Biden.

Yet even unpredictable Lady Gaga exhibits distinctive and enduring ways of thinking, feeling, and behaving. Her fans and critics alike can depend on her openness to new experiences and the energy she gets from the spotlight. And they can also rely on her painstaking dedication to her performances. She describes her high school self as "very dedicated, very studious, and very disciplined." Now, in adulthood, she shows similar self-discipline: "I'm very detailed—every minute of the show has got to be perfect." Modules 45, 46, and 47 focus on our *personality*—our unique and persistent patterns of thinking, feeling, and behaving.

Much of this book deals with personality. Other modules consider biological influences on personality; personality development across the life span; how personality relates to learning, motivation, emotion, and health; social influences on personality; and disorders of personality.

These modules focus on personality itself—what it is and how researchers study it.

We begin with two important theories of personality that have become part of Western culture: *psychodynamic theories* and *humanistic theories* (Modules 45 and 46). These sweeping perspectives on human nature laid the foundation for later personality theories and for what Module 47 presents: newer scientific explorations of personality.

MODULE 45: Introduction to Personality and Psychodynamic Theories

Today's personality researchers study the basic dimensions of personality, and the interaction of persons and environments. They also study self-esteem, self-serving bias, and cultural influences on our concept of self—that sense of "Who I am." And they study the unconscious mind—with findings that probably would have surprised even Freud.

What Is Personality?

Learning Objective Question LOQ 45-1

What is *personality,* and what theories inform our understanding of personality?

Psychologists have varied ways to view and study **personality**—our characteristic pattern of thinking, feeling, and acting. Sigmund Freud's *psychoanalytic theory* proposed that childhood sexuality and unconscious motivations influence personality. The *humanistic theories* focused on our inner capacities for growth and self-fulfillment. Later theorists built upon these two broad perspectives. *Trait theories* examine characteristic patterns of behavior *(traits).*

Social-cognitive theories explore the interaction between people's traits (including their thinking) and their social context. Let's begin with Freud's work, and its modern-day descendant, *psychodynamic theories.*



Macmillan Learning

Sigmund Freud (1856–1939) "I was the only worker in a new field."

Psychodynamic Theories

Psychodynamic theories of personality view human behavior as a dynamic interaction between the conscious mind and unconscious mind, including associated motives and conflicts. These theories descended from Freud's **psychoanalysis**—his theory of personality and the associated treatment techniques. Freud was the first to focus clinical attention on our unconscious mind.

Freud's Psychoanalytic Perspective: Exploring the Unconscious

LOQ 45-2

How did Freud's treatment of psychological disorders lead to his view of the unconscious mind?

On the first day of class, when I [ND] ask students to name one psychologist, they always mention Freud. Although today's psychologists question many of his ideas, Freud remains psychology's best-known person (Diener et al., 2014). In the popular mind, he is to psychology what Louis Armstrong is to jazz music. Freud's influence lingers not only in psychiatry and clinical psychology, but also in literary and film interpretation. Almost 9 in 10 U.S. college courses that reference psychoanalysis have been outside of psychology departments (Cohen, 2007). Freud's early twentieth-century concepts penetrate our twenty-first-century language. Without realizing their source, we may speak of *ego, repression, projection, complex* (as in "inferiority complex"), *sibling rivalry, Freudian slips,* and *fixation.* So, who was Freud, and what did he teach?

Like all of us, Sigmund Freud was a product of his times. The late 1800s, the tail end of the Victorian era, was a time of tremendous discovery and scientific advancement, but also of sexual suppression and men's dominance. Gender roles were clearly defined, with men's superiority assumed. Only men's sexuality was generally

acknowledged (discreetly), whereas women's sexuality was dismissed or ignored. These assumptions influenced Freud's thinking about personality. He believed that psychological troubles resulted from men's and women's unresolved conflicts with their expected roles.

> **"The female … acknowledges the fact of her castration, and with it, too, the superiority of the male and her own inferiority; but she rebels against this unwelcome state of affairs."**
>
> — Sigmund Freud, *Female Sexuality,* 1931

Long before entering the University of Vienna in 1873, young Freud showed signs of independence and brilliance. He so loved reading plays, poetry, and philosophy that he once ran up a bookstore debt beyond his means. As a teen he often took his evening meal in his tiny bedroom in order to focus on his studies. After medical school he set up a private practice specializing in nervous disorders. Before long, however, he faced patients whose disorders made no neurological sense. A patient might have lost all feeling in a hand—yet there is no sensory nerve that, if damaged, would numb the entire hand and nothing else. Freud's search for a cause for such disorders set his mind running in a direction destined to change human self-understanding.

Do some neurological disorders have psychological causes? Observing patients led Freud to his "discovery" of the **unconscious.** He speculated that lost feeling in one's hand might be caused by a fear of touching one's genitals; that unexplained blindness or deafness might

be caused by not wanting to see or hear something that aroused intense anxiety. After some early unsuccessful trials with hypnosis, Freud turned to **free association**, in which he told the patient to relax and say whatever came to mind, no matter how embarrassing or trivial. He assumed that a line of mental dominoes had fallen from his patients' distant past to their troubled present. Free association, he believed, would allow him to retrace that line, following a chain of thought leading into the patient's unconscious. There, painful unconscious memories, often from childhood, could be retrieved, reviewed, and released.

Basic to Freud's theory was this belief that the mind is mostly hidden (**FIGURE 45.1**). Our *conscious* awareness is like the part of an iceberg that floats above the surface. Beneath this awareness is the larger *unconscious* mind, with its thoughts, wishes, feelings, and memories. We store some of these thoughts temporarily in a *preconscious* area, from which we can retrieve them into conscious awareness. Of greater interest to Freud was the mass of unacceptable passions and thoughts that he believed we *repress,* or forcibly block from our consciousness because they would be too unsettling to acknowledge. Freud believed that without our awareness, these troublesome feelings and ideas powerfully influence us, sometimes gaining expression in disguised forms—the work we choose, the beliefs we hold, our daily habits, our upsetting symptoms.

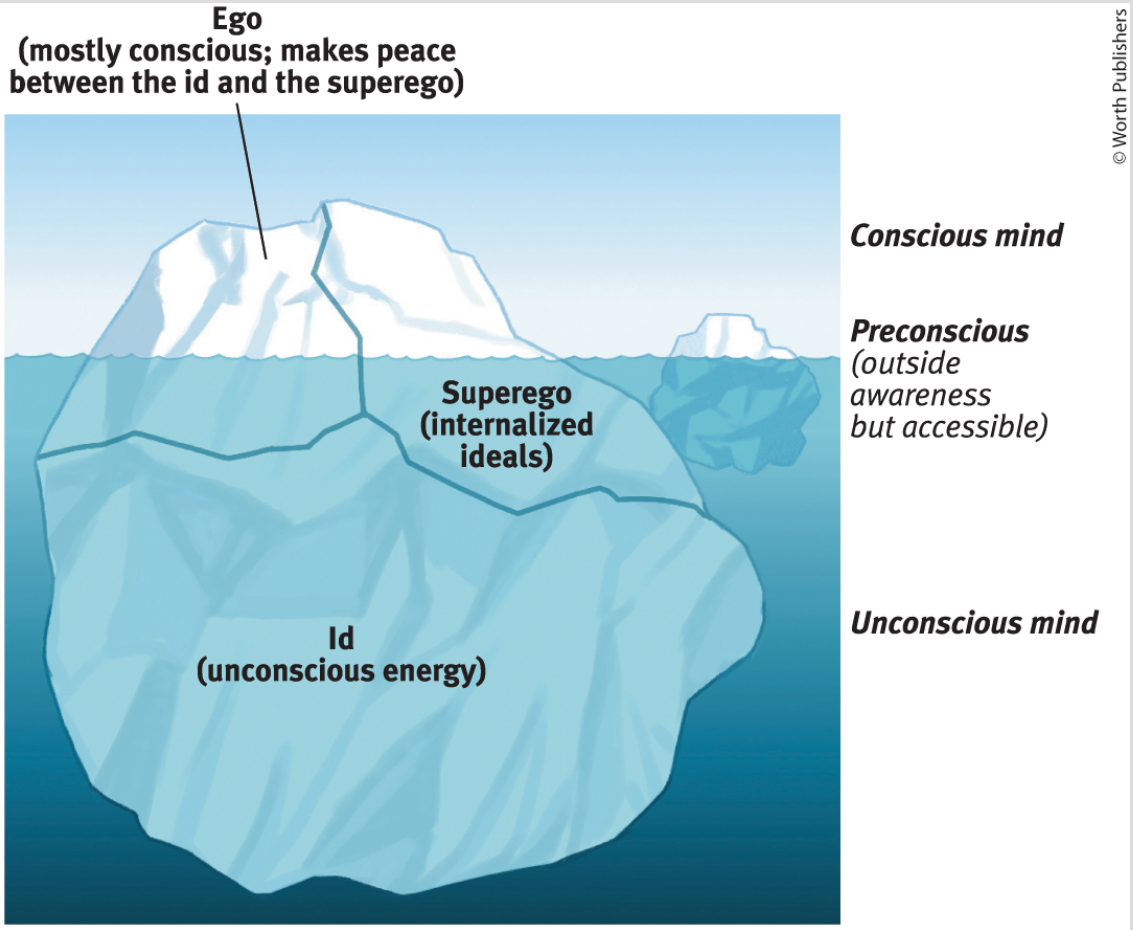


FIGURE 45.1 Freud's idea of the mind's structure Psychologists have used an iceberg image to illustrate Freud's idea that the mind is mostly hidden beneath the conscious surface.

Personality Structure

LOQ 45-3

What was Freud's view of personality?

Freud believed that human personality, including its emotions and strivings, arises from a conflict between impulse and restraint—between our aggressive, pleasure-seeking biological urges and our internalized social controls over these urges. Freud believed personality springs from our efforts to resolve this basic conflict—to express these impulses in ways that bring satisfaction without also bringing guilt or punishment. To understand the mind's dynamics during this conflict, Freud proposed three interacting systems: the *id, ego,* and *superego* (Figure 45.1).

The **id** stores unconscious energy, including our *libido*—a sexual energy force that fuels our pleasure-seeking. Freud argued that the id tries to satisfy our basic drives to survive, reproduce, and act aggressively. The id operates on the *pleasure principle:* It seeks immediate gratification. To understand the id's power, think of a newborn infant crying out for satisfaction, caring nothing for the outside world's conditions and demands. Or think of people who focus on the present more than the future—those who misuse tobacco, alcohol, or other drugs, and would sooner party now than sacrifice today's temporary pleasure for future success and happiness (Fernie et al., 2013; Friedel et al., 2014; Keough et al., 1999).

As the **ego** develops, a young child responds to the real world. The ego, operating on the *reality principle,* seeks to gratify the id's impulses in realistic ways to bring long-term pleasure. (Imagine what would happen if, lacking an ego, we acted on our unrestrained sexual or

aggressive impulses.) The ego contains our partly conscious perceptions, thoughts, judgments, and memories.

Around age 4 or 5, Freud theorized, a child's ego recognizes the demands of the newly emerging **superego**, the partly conscious voice of our moral compass (conscience) that forces the ego to consider not only the real but also the *ideal.* The superego focuses on how we *ought* to behave. It strives for perfection, judging actions and producing positive feelings of pride or negative feelings of guilt. Someone with an exceptionally strong superego may be virtuous yet guilt-ridden; another with a weak superego may be outrageously self-indulgent and remorseless.

Because the superego's demands often oppose the id's, the ego struggles to reconcile the two. The ego is the personality "executive," mediating among the impulsive demands of the id, the restraining demands of the superego, and the real-life demands of the external world. If virtuous Conner feels sexually attracted to Tatiana, he might make an ego-driven decision to satisfy both his id and superego by joining an organization where Tatiana volunteers regularly.

Personality Development

LOQ 45-4

What developmental stages did Freud propose?

Analysis of his patients' histories convinced Freud that personality forms during life's first few years. He concluded that children pass through a series of **psychosexual stages**, during which the id's pleasure-seeking energies focus on distinct pleasure-sensitive areas of the body called *erogenous zones* (TABLE 45.1). Each stage offers its own challenges, which Freud saw as conflicting tendencies.

TABLE 45.1 Freud's Psychosexual Stages

Stage	Focus
Oral (0–18 months)	Pleasure centers on the mouth—sucking, biting, chewing
Anal (18–36 months)	Pleasure focuses on bowel and bladder elimination; coping with demands for control
Phallic (3–6 years)	Pleasure zone is the genitals; coping with incestuous sexual feelings
Latency (6 years to puberty)	A phase of dormant sexual feelings
Genital (puberty on)	Maturation of sexual interests

Freud believed that during the *phallic stage,* for example, boys develop both unconscious sexual desires for their mother and jealousy and hatred for their father, whom they consider a rival. Such was Freud's (1897) own experience: "I have found, in my own case too, [the phenomenon of] being in love with my mother and jealous of my father, and I now consider it a universal event in early childhood." He believed these feelings cause boys to feel guilty and to fear punishment, perhaps by castration, from their father. He called this

collection of feelings the **Oedipus complex** after the Greek legend of Oedipus, whose failure to understand his unconscious desires led him to unknowingly kill his father and marry his mother. In Freud's era, some psychoanalysts believed that girls experience a parallel *Electra complex* (named after a mythological daughter who helped kill her mother to avenge her father's murder).

Children eventually cope with the threatening feelings, said Freud, by repressing them and by identifying with (trying to become like) the rival parent. It's as though something inside the child decides, "If you can't beat 'em [the same-sex parent], join 'em." Through this **identification** process, children's superegos gain strength as they incorporate many of their parents' values. Freud believed that identification with the same-sex parent provided what psychologists now understand more broadly as our *gender identity*—our sense of being male, female, neither, or some combination of male and female. Freud presumed that our early childhood relations—especially with our parents and other caregivers—influence our developing identity, personality, and frailties.



Sidney Harris/Cartoon Stock

"I heard that as soon as we become aware of our sexual impulses, whatever they are, we'll have to hide them."

In Freud's view, conflicts unresolved during earlier psychosexual stages could surface as maladaptive behavior in the adult years. At any point in the oral, anal, or phallic stages, strong conflict could lock, or **fixate**, the person's pleasure-seeking energies in that stage. A person who had been either orally overindulged or deprived (perhaps by abrupt, early weaning) might fixate at the oral stage. This orally fixated adult could exhibit either passive dependence (like that of a nursing infant) or an exaggerated denial of this dependence (by acting tough or uttering biting sarcasm). Or the person might continue to seek oral gratification by smoking or excessive eating. In such ways, Freud suggested, the twig of personality is bent at an early age.

Defense Mechanisms

LOQ 45-5

How did Freud think people defended themselves against anxiety?

Anxiety, said Freud, is the price we pay for civilization. As members of social groups, we must control our sexual and aggressive impulses, not act them out. But sometimes the ego fears losing control of this inner id-superego war. The presumed result is a dark cloud of unfocused anxiety that leaves us feeling unsettled but unsure why.

Freud proposed that the ego protects itself with **defense mechanisms**—tactics that reduce or redirect anxiety by distorting reality (**TABLE 45.2**). For Freud, *all defense mechanisms functioned indirectly and unconsciously.* Just as the body unconsciously defends itself against disease, the ego also unconsciously defends itself against anxiety. For example, **repression** banishes anxiety-arousing wishes and feelings from consciousness. According to Freud, *repression underlies all the other defense mechanisms.* However, because repression is often incomplete, repressed urges may appear as symbols in dreams or as slips of the tongue in conversation.

TABLE 45.2 Six Defense Mechanisms

Freud believed that *repression,* the basic mechanism that banishes anxiety-arousing impulses, enables other defense mechanisms, six of which are listed here.

Defense Mechanism	Unconscious Process Employed to Avoid Anxiety-Arousing Thoughts or Feelings	Example
Regression	Retreating to an earlier psychosexual stage, where some psychic energy remains fixated	A child reverts to the oral comfort of thumb sucking in the car on the way to their first day of school.
Reaction formation	Switching unacceptable impulses into their opposites	Repressing angry feelings, a person displays exaggerated friendliness.
Projection	Disguising one's own threatening impulses by attributing them to others	"The thief thinks everyone else is a thief" (an El Salvadoran saying).
Rationalization	Offering self-justifying explanations in place of the real, more threatening unconscious reasons for one's actions	A habitual drinker says they drink with their friends "just to be sociable."
Displacement	Shifting sexual or aggressive impulses toward a more acceptable or less threatening object or person	After being put in a time out, a child kicks the family dog.
Denial	Refusing to believe or even perceive painful realities	A partner denies evidence of their loved one's affair.



Regression

Freud believed he could glimpse the unconscious seeping through when a financially stressed patient, not wanting any large pills, said, "Please do not give me any bills, because I cannot swallow them." (Today we call these "Freudian slips.") Freud also viewed jokes as expressions of repressed sexual and aggressive tendencies, and dreams as the "royal road to the unconscious." The remembered content of dreams (their *manifest content*) he believed to be a censored expression of the dreamer's unconscious wishes (the dream's *latent content*). In his dream analyses, Freud searched for patients' inner conflicts.



"Good morning, beheaded—uh, I mean beloved."

"I remember your name perfectly but I just can't think of your face." — Oxford professor W. A. Spooner (1844–1930), famous for his linguistic flip-flops *(spoonerisms).* Spooner rebuked one student for "fighting a liar in the quadrangle" and another who "hissed my mystery lecture," adding, "You have tasted two worms."

Retrieval Practice

RP-1 According to Freud's ideas about the three-part personality structure, the _____ operates on the *reality principle* and tries to balance demands in a way that produces long-term pleasure rather than pain; the _____ operates on the *pleasure principle* and seeks immediate gratification; and the _____ represents the voice of our internalized ideals (our *conscience*).

RP-2 In the psychoanalytic view, conflicts unresolved during one of the psychosexual stages may lead to _____ at that stage.

RP-3 Freud believed that our defense mechanisms operate _____ (consciously/unconsciously) and defend us against _____.

ANSWERS IN APPENDIX E

The Neo-Freudian and Later Psychodynamic Theorists

LOQ 45-6

Which of Freud's ideas did his followers accept or reject?

In a historical period when people rarely talked about sex, and certainly not unconscious desires for sex with one's parent, Freud's writings sparked intense debate. "In the Middle Ages, they would have burned me," observed Freud to a friend. "Now they are content with burning my books" (Jones, 1957). Despite the controversy, Freud attracted followers. Several young, ambitious physicians formed an

inner circle around their strong-minded leader. These pioneering psychoanalysts, whom we often call *neo-Freudians,* adopted Freud's interviewing techniques and accepted his basic ideas: the personality structures of id, ego, and superego; the importance of the unconscious; the childhood roots of personality; and the dynamics of anxiety and the defense mechanisms. But they broke away from Freud in two important ways. First, they emphasized the conscious mind's role in interpreting experience and in coping with the environment. And second, they doubted that sex and aggression were all-consuming motivations. Instead, they tended to emphasize loftier motives and social interactions.

Alfred Adler and Karen Horney [HORN-eye], for example, agreed with Freud that childhood is important. But they believed that childhood *social,* not sexual, tensions are crucial for personality formation (Ferguson, 2003, 2020). Adler (who gave us the still popular *inferiority complex* idea) had struggled to overcome childhood illnesses and accidents. He believed that much of our behavior is driven by efforts to conquer childhood inferiority feelings that trigger our strivings for superiority and power. Horney said childhood anxiety triggers our desire for love and security. She also opposed Freud's assumptions that women have weak superegos and suffer "penis envy," and she attempted to balance his masculine bias.

Carl Jung [Yoong], Freud's disciple-turned-dissenter, placed less emphasis on social factors and agreed with Freud that the unconscious exerts a powerful influence. But to Jung, the unconscious

contains more than our repressed thoughts and feelings. He believed we also have a **collective unconscious**—shared memories and images that he called *archetypes*. Jung said that the collective unconscious explains why, for many people, spiritual concerns are deeply rooted and why people in different cultures share certain myths and images. Today's psychologists don't speak of a collective unconscious, but they do assume that our shared evolutionary history indeed shaped some universal dispositions, and that experience can leave *epigenetic* marks affecting gene expression.



Left to right: Macmillan Learning

Alfred Adler (1870–1937) "The individual feels at home in life and feels his existence to be worthwhile just so far as he is useful to others and is overcoming feelings of inferiority" (*Problems of Neurosis,* 1964).

Karen Horney (1885–1952) "The view that women are infantile and emotional creatures, and as such, incapable of responsibility and independence is the work of the masculine tendency to lower women's self-respect" (*Feminine Psychology,* 1932).

Carl Jung (1875–1961) "From the living fountain of instinct flows everything that is creative; hence the unconscious is the very source of the creative impulse" (*The Structure and Dynamics of the Psyche,* 1960).

Freud died in 1939. Since then, some of his ideas have been incorporated into the diverse perspectives that make up modern psychodynamic theory. "Most contemporary [psychodynamic]

theorists and therapists are not wedded to the idea that sex is the basis of personality," noted Drew Westen (1996). They "do not talk about ids and egos, and do not go around classifying their patients as oral, anal, or phallic characters." They assume, with Freud and with much support from today's psychological science, that much of our mental life is unconscious. With Freud, they also assume that we often struggle with inner conflicts among our wishes, fears, and values, and that childhood shapes our personality and ways of becoming attached to others.

Evaluating Freud's Psychoanalytic Perspective and Modern Views of the Unconscious

LOQ 45-7

How do contemporary psychologists view Freud's psychoanalysis?

Modern Research Contradicts Many of Freud's Ideas

We critique Freud from a twenty-first-century perspective. Freud did not have access to neurotransmitter or DNA studies, or to all that we have since learned about human development, thinking, and emotion. To criticize his theory by comparing it with today's thinking is like criticizing the Ford Model T by comparing it with a new Tesla

Model S. How tempting it is to judge the past from the perspective of our present.

> **"Many aspects of Freudian theory are indeed out of date, and they should be: Freud died in 1939, and he has been slow to undertake further revisions."** — Psychologist Drew Westen (1998)

Nevertheless, both Freud's devotees and his detractors agree that recent research contradicts many of his specific ideas. Today's developmental psychologists see our development as lifelong, not fixed in childhood. They doubt that infants' neural networks are mature enough to sustain as much emotional trauma as Freud assumed. Some think Freud overestimated parental influence and underestimated other factors, such as peer influence. These critics also doubt that conscience and gender identity form as the child resolves an Oedipus (or Electra) complex at age 5 or 6. We gain our gender identity earlier, and those who become strongly masculine or feminine do so even when they do not have a same-sex parent present. And they note that Freud's ideas about childhood sexuality arose from stories of childhood sexual abuse told by his female patients—stories that some scholars believe Freud doubted, and attributed to his patients' own childhood sexual wishes and conflicts (Esterson, 2001; Powell & Boer, 1994). Today, we know that *childhood sexual abuse happens,* and we also understand how Freud's questioning might have created false memories of abuse.

Modern dream research disputes Freud's belief that dreams disguise and fulfill wishes. And slips of the tongue can be explained as competition between similar verbal choices in our memory network. Someone who says, "I don't want to do that—it's a lot of brothel" may simply be blending *bother* and *trouble* (Foss & Hakes, 1978). Searching the more than 300,000 emails I [DM] have received since 2000, I see that friends have written me about their experience on "Wisconsin *Pubic* Radio" and about accessibility in "*pubic* venues." One analysis of 40,000 typing errors suggested that such mistakes are probably random typos (Stephens-Davidowitz, 2017).

History also has failed to support Freud's idea that suppressed sexuality causes psychological disorders. From Freud's time to ours, sexual inhibition has diminished; psychological disorders have not. Psychologists further criticize Freud's theory for its scientific shortcomings. It's important to remember that good scientific theories explain observations and offer testable hypotheses. Freud's theory rests on few objective observations, and parts of it offer few testable hypotheses. For Freud, his own recollections and interpretations of patients' free associations, dreams, and slips—sometimes selected to support his theory—were evidence enough.

What is the most serious problem with Freud's theory? It offers after-the-fact explanations of any characteristic (of one person's smoking, another's fear of horses, another's sexual orientation), yet fails to *predict* such behaviors and traits. If you feel angry at your mother's death, you illustrate Freud's theory because "your unresolved

childhood dependency needs are threatened." If you do not feel angry, you again illustrate his theory because "you are repressing your anger." That "is like betting on a horse after the race has been run" (Hall & Lindzey, 1978, p. 68). A good theory makes testable predictions.

So, should psychology post an "Allow Natural Death" order on this old theory? Freud's supporters object. To criticize Freudian theory for not making testable predictions is, they say, like criticizing baseball for not being an aerobic exercise—something it was never intended to be. Freud never claimed that psychoanalysis was predictive science. He merely claimed that, looking back, psychoanalysts could find meaning in our state of mind (Rieff, 1979).

Freud's supporters also note that some of his ideas *are* enduring. It was Freud who drew our attention to the unconscious and the irrational, at a time when such ideas were not popular. Many researchers have since studied our irrationality (Ariely, 2010; Thaler, 2015). Psychologist Daniel Kahneman (in 2002) and behavioral economist Richard Thaler (in 2017) each won Nobel Prizes for their studies of our faulty decision making. Freud also drew our attention to the importance of human sexuality, and to the tension between our biological impulses and our social well-being. It was Freud who challenged our self-righteousness, exposed our self-protective defenses, and reminded us of our potential for evil.

> **"Although [Freud] clearly made a number of mistakes in the formulation of his ideas, his understanding of unconscious mental processes was pretty much on target. In fact, it is very consistent with modern neuroscientists' belief that most mental processes are unconscious."** — Nobel Prize–winning neuroscientist Eric Kandel (2012)

Modern Research Challenges the Idea of Repression

Psychoanalytic theory hinges on the assumption that our mind often *represses* offending wishes, banishing them into the unconscious until they resurface, like a long-lost cat that finds its way home. Recover and resolve childhood's conflicted wishes, and emotional healing should follow. Repression became a widely accepted concept, used to explain hypnotic phenomena and psychological disorders. Some psychodynamic followers extended repression to explain apparently lost and recovered memories of childhood traumas (Boag, 2006; Cheit, 1998; Erdelyi, 2006). These psychodynamic beliefs have made their way into popular culture. In one survey, 88 percent of university students believed that painful experiences commonly get pushed out of awareness and into the unconscious (Garry et al., 1994).

Today's researchers agree that we sometimes preserve our self-esteem by neglecting threatening information (Green et al., 2008). Yet they also find that repression is rare, even in response to terrible trauma. Even those who have witnessed a parent's murder or survived Nazi

death camps have retained their unrepressed memories of the horror (Helmreich, 1992, 1994; Malmquist, 1986; Pennebaker, 1990).

Some researchers do believe that extreme, prolonged stress, such as the stress some severely abused children experience, might disrupt memory by damaging the hippocampus (Schacter, 1996). But the far more common reality is that high stress and associated stress hormones *enhance* memory. Indeed, rape, torture, and other traumatic events haunt survivors, who experience unwanted flashbacks. They are seared onto the soul. "You see the babies," said Holocaust survivor Sally H. (1979). "You see the screaming mothers. You see hanging people. You sit and you see that face there. It's something you don't forget."

> **"During the Holocaust, many children … were forced to endure the unendurable. For those who continue to suffer [the] pain is still present, many years later, as real as it was on the day it occurred."** — Eric Zillmer, Molly Harrower, Barry Ritzler, and Robert Archer, *The Quest for the Nazi Personality,* 1995

The Modern Unconscious Mind

LOQ 45-8

How has modern research developed our understanding of the unconscious?

Freud was right about a big idea that underlies today's psychodynamic thinking: We have limited access to all that goes on in our mind (Erdelyi, 1985, 1988; Norman, 2010). Our two-track mind has a vast unseen realm. Some researchers even argue that "most of a person's everyday life is determined by unconscious thought processes" (Bargh & Chartrand, 1999). (Perhaps, for example, you can recall being sad or angry without consciously knowing why.)

Many research psychologists now think of the unconscious not as seething passions and repressive censoring but as information processing that occurs without our awareness. To these researchers, the unconscious also involves

- the *schemas* that automatically control our perceptions and interpretations.
- the *priming* by stimuli to which we have not consciously attended.
- the right-hemisphere activity that enables the *split-brain* patient's left hand to carry out an instruction the patient cannot verbalize.
- the *implicit memories* of learned skills that operate without conscious recall, even in those with amnesia.
- the *emotions* that activate instantly, before conscious analysis.
- the *stereotypes* and *implicit prejudice* that automatically and unconsciously influence how we process information about others.

More than we realize, we fly on autopilot. Our lives are guided by off-screen, out-of-sight, unconscious information processing. The unconscious mind is vast. However, our current understanding of

unconscious information processing is more like the pre-Freudian view of an underground, unattended stream of thought from which spontaneous behavior and creative ideas surface (Bargh & Morsella, 2008).

Research also supports two of Freud's defense mechanisms. One study demonstrated *reaction formation* (trading unacceptable impulses for their opposite) in men who reported strong anti-gay attitudes. Compared with those who did not report such attitudes, these anti-gay men experienced greater physiological arousal (assessed with a device that measured blood flow to the penis) when watching videos of gay men having sex, even though they said the films did not make them sexually aroused (Adams et al., 1996). Likewise, some evidence suggests that people who have an unconscious same-sex sexual orientation—but who consciously identify as straight—report more negative attitudes toward gay men and lesbians (Weinstein et al., 2012).

Freud's *projection* (attributing our own threatening impulses to others) has also been confirmed. People do tend to see their traits, attitudes, and goals in others (Baumeister et al., 1998; Maner et al., 2005). Shown an ambiguous face, aggressive people often see anger (Brennan & Baskin-Sommers, 2020). Today's researchers call this the *false consensus effect*—the tendency to overestimate the extent to which others share our beliefs and behaviors. People who binge-drink or break speed limits tend to think many others do the same. Shortly before the 2020 U.S. presidential election, 83 percent of Democrats and 84 percent of

Republicans predicted that voters would elect *their* party's presidential candidate (ISR, 2020). As we are, so we see others.

Finally, research has supported Freud's idea that we unconsciously defend ourselves against anxiety. Researchers have proposed that one source of anxiety is "the terror resulting from our awareness of vulnerability and death" (Greenberg et al., 1997). Hundreds of experiments testing **terror-management theory** show that thinking about one's mortality—for example, by writing a short essay on dying and its associated emotions—provokes various terror-management defenses (Burke et al., 2010). For example, death anxiety increases aggression toward rivals and heightens esteem for oneself (Cohen & Solomon, 2011; Koole et al., 2006).



"It says, 'Someday you will die.'"

Faced with a threatening world, people act not only to enhance their self-esteem but also to adhere more strongly to worldviews that answer questions about life's meaning. The prospect of death promotes religious sentiments, and deep religious convictions enable

people to be less defensive—less likely to rise in defense of their worldview—when reminded of death (Jonas & Fischer, 2006; Norenzayan & Hansen, 2006). Moreover, when contemplating death, people prioritize their close relationships (Cox & Arndt, 2012; Mikulincer et al., 2003). The actual death of loved ones can provoke protective responses as well. For years, I [ND] have studied the way people respond to thoughts about death—but it took the shock of my own mother's unexpected death to motivate me to start running again, and to live a healthier lifestyle (Hayasaki, 2014; Kashdan et al., 2014). Facing death can inspire us to affirm life.

Ask Yourself

What understandings and impressions of Freud did you bring to this course? Are you surprised to find that some of his ideas have value, or that others have been called into question?

Retrieval Practice

RP-4 What big ideas have survived from Freud's psychoanalytic theory? In what ways has Freud's theory been criticized?

RP-5 Which elements of traditional psychoanalysis have modern-day *psychodynamic* theorists and therapists retained, and which elements have they mostly left behind?

ANSWERS IN APPENDIX E

Assessing Unconscious Processes

LOQ 45-9

What are *projective tests,* how are they used, and what are some criticisms of them?

Personality tests reflect the basic ideas of particular personality theories. So, what might be the assessment tool of choice for someone working in the Freudian tradition? It would need to provide some sort of road into the unconscious—to unearth the residue of early childhood experiences, move beneath surface thoughts, and reveal hidden conflicts and impulses. Objective assessment tools, such as agree-disagree or true-false questionnaires, would be inadequate because they would merely tap the conscious surface.

Henry Murray (1933) demonstrated a possible basis for such a test at a party hosted by his 11-year-old daughter. Murray engaged the children in a frightening game called "Murder." When shown some photographs after the game, the children perceived the photos as more malicious than they had before the game. These children, it seemed to Murray, had *projected* their inner feelings into the pictures.

A few years later, Murray introduced the **Thematic Apperception Test (TAT)**—a **projective test** in which people view ambiguous pictures and then make up stories about them. Shown a daydreaming boy, those who imagine he is fantasizing about an achievement are presumed to be projecting their own goals. "As a rule," said Murray, "the subject

leaves the test happily unaware that he has presented the psychologist with what amounts to an X-ray of his inner self" (quoted by Talbot, 1999).

Numerous studies suggest that Murray was right: The TAT provides a valid and reliable map of people's implicit motives (Jenkins, 2017). For example, such storytelling has been used to assess *achievement* and *affiliation motivation* (Drescher & Schultheiss, 2016; Schultheiss et al., 2014).

Swiss psychiatrist Hermann Rorschach [ROAR-shock; 1884–1922] created the most widely used projective test. He based his famous **Rorschach inkblot test** (**FIGURE 45.2**) on a childhood game. Unlike the TAT's natural life images, Rorschach and his friends would drip ink on a paper, fold it, and then say what they saw in the resulting inkblot (Sdorow, 2005). Do you see predatory animals or weapons? A Rorschach interpreter might speculate that you have aggressive tendencies. But is this a reasonable assumption, considering that inkblots don't have any real-life meaning? The answer varies.



Spencer Grant/Science Source

FIGURE 45.2 The Rorschach test In this projective test, people tell what they see in a series of symmetrical inkblots.

Some clinicians cherish the Rorschach test, convinced that it projects a client's inner motives to the outside world. Others view the test as a source of suggestive leads, an icebreaker, or a revealing interview technique.

But critics insist the Rorschach is no emotional MRI. They argue that only a few of the many Rorschach-derived scores, such as those for cognitive impairment and thought disorder, have demonstrated reliability and validity (Mihura et al., 2013, 2015; Wood et al., 2015). And inkblot assessments have inaccurately diagnosed many healthy adults as pathological (Wood, 2003; Wood et al., 2006).

"The Rorschach [inkblot test] has the dubious distinction of being, simultaneously, the most cherished and the most reviled of all psychological assessment tools." — John Hunsley and J. Michael Bailey (1999)

Retrieval Practice

RP-6 _____ tests ask test-takers to respond to an ambiguous image by describing it or telling a story about it.

ANSWERS IN APPENDIX E

REVIEW

Module 45: Introduction to Personality and Psychodynamic Theories

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 45-1: What is *personality,* and what theories inform our understanding of personality?

LOQ 45-2: How did Freud's treatment of psychological disorders lead to his view of the unconscious mind?

LOQ 45-3: What was Freud's view of personality?

LOQ 45-4: What developmental stages did Freud propose?

LOQ 45-5: How did Freud think people defended themselves against anxiety?

LOQ 45-6: Which of Freud's ideas did his followers accept or reject?

LOQ 45-7: How do contemporary psychologists view Freud's psychoanalysis?

LOQ 45-8: How has modern research developed our understanding of the unconscious?

LOQ 45-9: What are *projective tests,* how are they used, and what are some criticisms of them?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

personality
psychodynamic theories
psychoanalysis

unconscious
free association
id
ego
superego
psychosexual stages
Oedipus [ED-uh-puss] complex
identification
fixation
defense mechanisms
repression
collective unconscious
terror-management theory
Thematic Apperception Test (TAT)
projective test
Rorschach inkblot test

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. According to Freud's view of personality structure, the "executive" system, the _____, seeks to gratify the

impulses of the _____ in more acceptable ways.

a. id; ego
b. ego; superego
c. ego; id
d. id; superego

2. Freud proposed that the development of the "voice of our moral compass" is related to the _____, which internalizes ideals and provides standards for judgments.

3. According to the psychoanalytic view of development, we all pass through a series of psychosexual stages, including the oral, anal, and phallic stages. Conflicts unresolved at any of these stages may lead to

a. dormant sexual feelings.
b. fixation at that stage.
c. preconscious blocking of impulses.
d. a distorted gender identity.

4. Freud believed that defense mechanisms are unconscious attempts to distort or disguise reality, all in an effort to reduce our _____.

5. Freud believed that we may block painful or unacceptable thoughts, wishes, feelings, or memories from consciousness through an unconscious process called _____.

6. In general, neo-Freudians such as Adler and Horney accepted many of Freud's views but placed more emphasis

than he did on

a. development throughout the life span.
b. the collective unconscious.
c. the role of the id.
d. social interactions.

7. Modern-day psychodynamic theorists and therapists agree with Freud about

a. the existence of unconscious mental processes.
b. the Oedipus complex.
c. the predictive value of Freudian theory.
d. the superego's role as the executive part of personality.

8. Which of the following is NOT part of the contemporary view of the unconscious?

a. Repressed memories of anxiety-provoking events
b. Schemas that influence our perceptions and interpretations
c. Stereotypes that affect our information processing
d. Instantly activated emotions and implicit memories of learned skills

MODULE 46: Humanistic Theories and Trait Theories

By the 1960s, some personality psychologists had become discontented with the sometimes bleak focus on drives and conflicts in psychodynamic theory, and the mechanistic psychology of B. F. Skinner's *behaviorism*. Two pioneering theorists—Abraham Maslow and Carl Rogers—offered a *third-force perspective* that emphasized our potential for healthy personal growth.

Humanistic Theories

LOQ 46-1

How did humanistic psychologists view personality, and what was their goal in studying personality?

In contrast to Sigmund Freud's emphasis on disorders born out of dark conflicts, the **humanistic theorists** emphasized the ways people strive for self-determination and self-realization. In contrast to behaviorism's scientific objectivity, they studied people through self-reported experiences and feelings.

Abraham Maslow's Self-Actualizing Person

Maslow proposed that we are motivated by a **hierarchy of needs**. If our physiological needs are met, we become concerned with personal safety. If we achieve a sense of security, we then seek to love and to be loved. With our love needs satisfied, we seek self-esteem. Having achieved self-esteem, we ultimately seek **self-actualization** (the process of fulfilling our potential) and **self-transcendence** (meaning, purpose, and identity beyond the self).

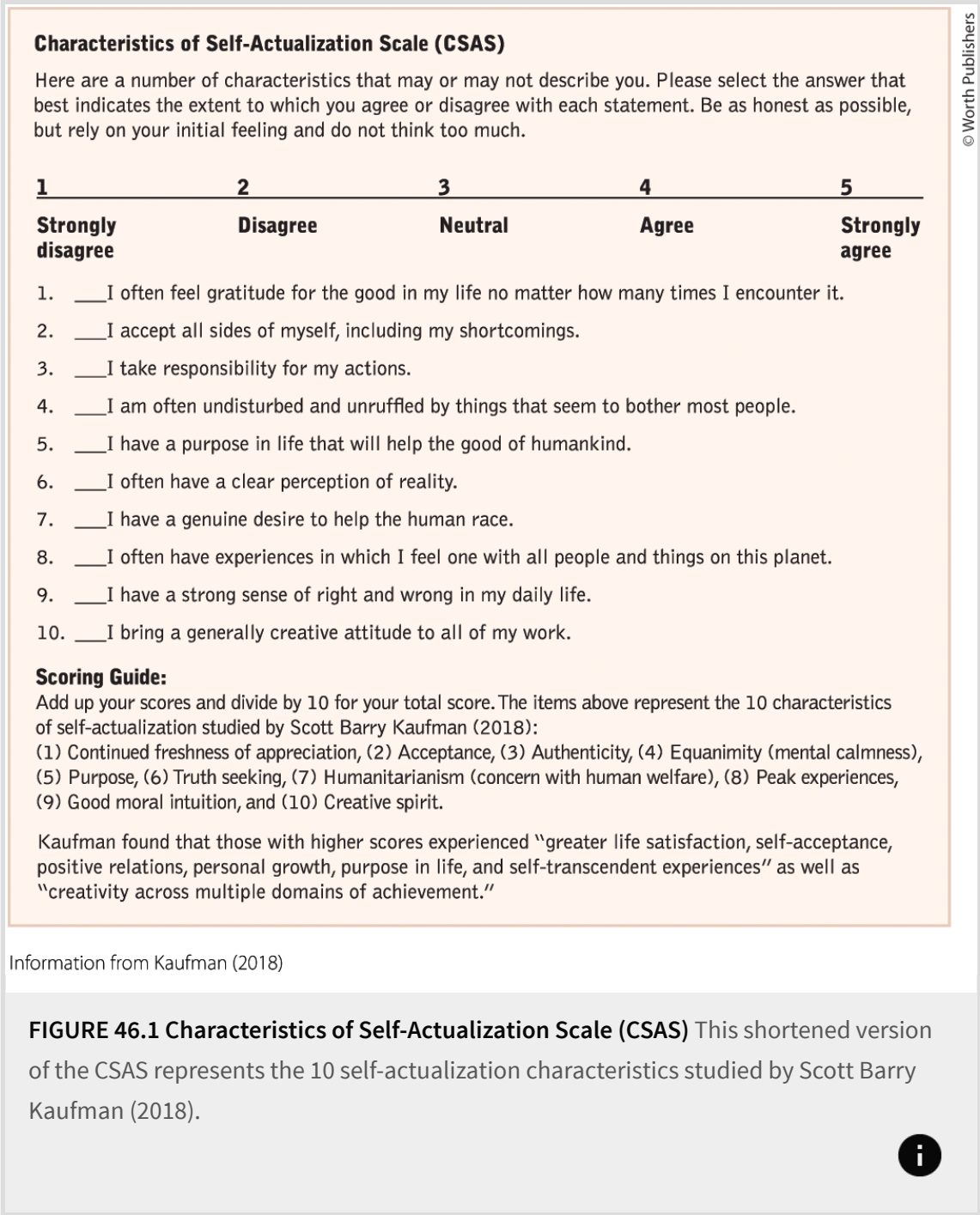


Macmillan Learning

Abraham Maslow (1908–1970) "Any theory of motivation that is worthy of attention must deal with the highest capacities of the healthy and strong person as well as with the defensive maneuvers of crippled spirits" (*Motivation and Personality,* 1970, p. 33).

Maslow (1970) developed his ideas by studying healthy, creative people rather than clinical cases of troubled people. His description of self-actualization grew out of his study of people, such as Abraham

Lincoln, who seemed notable for their meaningful and productive lives. Maslow reported that such people shared certain characteristics: They were self-aware and self-accepting, open and spontaneous, loving and caring, and not paralyzed by others' opinions (Kaufman, 2018). Secure in their sense of who they were, their interests were task-centered rather than self-centered. Curious about the world, they embraced uncertainties and stretched themselves to seek out new experiences (Compton, 2018; Kashdan, 2009). Once they focused their energies on a particular task, they often regarded it as their life mission, or "calling" (Hall & Chandler, 2005). Most enjoyed a few deep relationships rather than many superficial ones. Many had been moved by spiritual or personal *peak experiences* that surpassed ordinary consciousness. These, said Maslow (1970), are mature adult qualities found in those who have learned enough about life to be compassionate, to have outgrown their mixed feelings toward their parents, to have found their calling, to have "acquired enough courage to be unpopular, to be unashamed about being openly virtuous." (Test your own level of self-actualization in **FIGURE 46.1**.)



Characteristics of Self-Actualization Scale (CSAS)

Here are a number of characteristics that may or may not describe you. Please select the answer that best indicates the extent to which you agree or disagree with each statement. Be as honest as possible, but rely on your initial feeling and do not think too much.

1	2	3	4	5
Strongly disagree	**Disagree**	**Neutral**	**Agree**	**Strongly agree**

1. ___I often feel gratitude for the good in my life no matter how many times I encounter it.
2. ___I accept all sides of myself, including my shortcomings.
3. ___I take responsibility for my actions.
4. ___I am often undisturbed and unruffled by things that seem to bother most people.
5. ___I have a purpose in life that will help the good of humankind.
6. ___I often have a clear perception of reality.
7. ___I have a genuine desire to help the human race.
8. ___I often have experiences in which I feel one with all people and things on this planet.
9. ___I have a strong sense of right and wrong in my daily life.
10. ___I bring a generally creative attitude to all of my work.

Scoring Guide:
Add up your scores and divide by 10 for your total score. The items above represent the 10 characteristics of self-actualization studied by Scott Barry Kaufman (2018):
(1) Continued freshness of appreciation, (2) Acceptance, (3) Authenticity, (4) Equanimity (mental calmness), (5) Purpose, (6) Truth seeking, (7) Humanitarianism (concern with human welfare), (8) Peak experiences, (9) Good moral intuition, and (10) Creative spirit.

Kaufman found that those with higher scores experienced "greater life satisfaction, self-acceptance, positive relations, personal growth, purpose in life, and self-transcendent experiences" as well as "creativity across multiple domains of achievement."

Information from Kaufman (2018)

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FIGURE 46.1 Characteristics of Self-Actualization Scale (CSAS) This shortened version of the CSAS represents the 10 self-actualization characteristics studied by Scott Barry Kaufman (2018).

Carl Rogers' Person-Centered Perspective

Fellow humanistic psychologist Carl Rogers agreed with much of Maslow's thinking. Rogers' *person-centered perspective* held that people

are basically good and are endowed with self-actualizing tendencies. Unless thwarted by an environment that inhibits growth, each of us is like an acorn, primed for growth and fulfillment. Rogers (1980) believed that a growth-promoting social climate provides

- ***acceptance.*** When people are *accepting,* they offer **unconditional positive regard,** an attitude of grace that values us even knowing our failings. It is a profound relief to drop our pretenses, confess our worst feelings, and discover that we are still accepted. In a good marriage, a close family, or an intimate friendship, we are free to be spontaneous without fearing the loss of others' esteem.

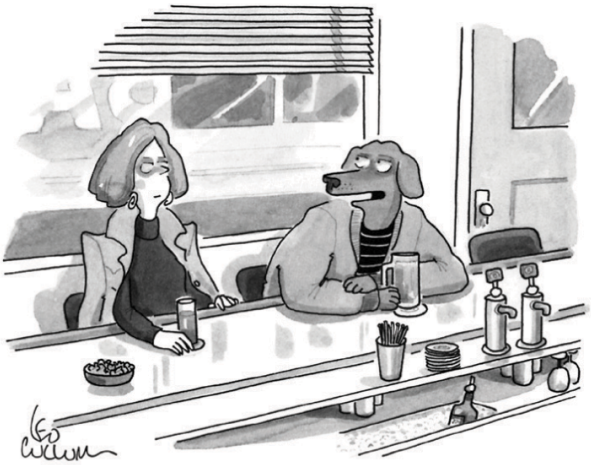
- ***genuineness.*** When people are *genuine,* they are open with their own feelings, drop their facades, and are transparent and self-disclosing.

- ***empathy.*** When people are *empathic,* they share and mirror others' feelings and reflect their meanings. "Rarely do we listen with real understanding, true empathy," said Rogers. "Yet listening, of this very special kind, is one of the most potent forces for change that I know."



Macmillan Learning

Carl Rogers (1902–1987) "The curious paradox is that when I accept myself just as I am, then I can change" (*On Becoming a Person,* 1961).



Leo Cullum/Cartoon Stock

"Yes, Doreen, I think I am capable of unconditional love."

Acceptance, genuineness, and empathy are, Rogers believed, the water, Sun, and nutrients that enable people to grow from acorns into vigorous oak trees. For "as persons are accepted and prized, they tend to develop a more caring attitude toward themselves" (Rogers, 1980, p.

116). When heard and accepted, people can listen to and accept their thoughts and feelings.



stefanamer/iStock/Getty Images

The picture of empathy Being open and sharing confidences is easier when the listener shows real understanding. Within such relationships we can relax and fully express our true selves.

The educator Alice Stewart Trillin discovered acceptance and genuineness at a camp for children with severe disorders. L., a "magical child," had genetic diseases that meant she had to be tube-fed and could walk only with difficulty. Trillin wondered "what this child's parents could have done … to make her the most optimistic, most enthusiastic, most hopeful human being I had ever encountered" (quoted in Trillin, 2006). One day Trillin spotted a note that L. received from her mom: "If God had given us all of the children in the world to choose from, L., we would only have chosen you." Inspired, Trillin approached a co-worker. "Quick. Read this," she whispered. "It's the secret of life."

Maslow and Rogers would have smiled knowingly. For them, a central feature of personality is one's **self-concept**—all the thoughts and feelings we have in response to the question, "Who am I?" If our self-concept is positive, we tend to act and perceive the world positively. If it is negative—if we fall far short of our *ideal self*—said Rogers, we feel dissatisfied and unhappy. A worthwhile goal for therapists, parents, teachers, and friends is therefore, he said, to help others know, accept, and be true to themselves.

Ask Yourself

Think back to a conversation you had when you knew someone was just waiting for their turn to speak instead of listening to you. Now consider the last time someone heard you with empathy. How did those two experiences differ?

Assessing the Self

LOQ 46-2

How did humanistic psychologists assess a person's sense of self?

Humanistic psychologists sometimes assessed personality by asking people to fill out questionnaires that would evaluate their self-concept. One questionnaire, inspired by Carl Rogers, asked people to describe themselves both as they would *ideally* like to be and as they *actually* are. When the ideal and the actual self are nearly alike, said

Rogers, the self-concept is positive. Assessing his clients' personal growth during therapy, he looked for successively closer ratings of actual and ideal selves.

Some humanistic psychologists believed that any standardized assessment of personality, even a questionnaire, is depersonalizing. Rather than forcing the person to respond to narrow categories, these humanistic psychologists presumed that interviews and intimate conversation would provide a better understanding of each person's unique experiences. Some researchers today believe our identity may be revealed using the *life story approach*—collecting a rich narrative detailing a person's unique life history (Adler et al., 2016; McAdams & Guo, 2015). A lifetime of stories can show more of a person's complete identity than can the responses to a few questions (Waters et al., 2019).

Evaluating Humanistic Theories

LOQ 46-3

How have humanistic theories influenced psychology? What criticisms have they faced?

One thing said of Freud can also be said of the humanistic psychologists: Their impact has been pervasive. Maslow's and Rogers' ideas have influenced counseling, education, child raising, and management. And they laid the groundwork for today's scientific *positive psychology* subfield.

These theorists have also influenced—sometimes in unintended ways—much of today's popular psychology. Is a positive self-concept the key to happiness and success? Do acceptance and empathy nurture positive feelings about ourselves? Are people basically good and capable of self-improvement? Many people answer *Yes, Yes,* and *Yes.* In 2006, U.S. high school students reported notably higher self-esteem and greater expectations of future career success than did students living in 1975, before humanistic psychology's feel-good philosophy infused U.S. culture (Twenge & Campbell, 2008). Given a choice, North American college students have said they'd rather get a self-esteem boost, such as a compliment or good grade on a paper, than enjoy a favorite food or sexual activity (Bushman et al., 2011). Humanistic psychology's message has been heard.

But the prominence of the humanistic perspective set off a backlash of criticism. First, said the critics, its concepts are vague and subjective. Consider Maslow's description of self-actualizing people as open, spontaneous, loving, self-accepting, and productive. Is this a scientific description? Or is it merely a description of the theorist's own values and ideals? Maslow, noted M. Brewster Smith (1978), offered impressions of his own personal heroes, such as Abraham Lincoln and Albert Einstein. Imagine another theorist who began with a different set of heroes—perhaps French military conqueror Napoleon and former U.S. President Donald Trump. This theorist might describe self-actualizing people as "undeterred by others' opinions," "motivated to achieve," and "comfortable with power."

Critics also objected to the idea that, as Rogers (1985) put it, "The only question which matters is, 'Am I living in a way which is deeply satisfying to me, and which truly expresses me?'" (quoted in Wallach & Wallach, 1985). This emphasis on *individualism*—trusting and acting on one's feelings, being true to oneself, fulfilling oneself—could lead to self-indulgence, selfishness, and an erosion of moral restraint (Campbell & Specht, 1985; Wallach & Wallach, 1983). Imagine working on a group project with people who refuse to complete any task that is not deeply satisfying or does not truly express their identity.

Humanistic psychologists have replied that a secure, nondefensive self-acceptance is actually the first step toward loving others. Indeed, people who feel intrinsically liked and accepted—for who they are, not just for their achievements—exhibit less defensive attitudes (Schimel et al., 2001). Those feeling liked and accepted by a romantic partner report being happier in their relationships and acting more kindly toward their partner (Gordon & Chen, 2010).

A final criticism leveled against humanistic psychology is that it is naive—that it fails to appreciate the reality of our human capacity for evil (May, 1982). Psychological science reminds us of this unfortunate capacity. Some situations can prompt us to believe lies or act cruelly (see the Social Psychology modules). *Deindividuation, groupthink,* and *group polarization* may accentuate our worst tendencies. And mere dislike can become prejudiced hatred. But as the humanistic psychologists remind us, there is another mountain of research that

testifies to our potential for goodness—for growth and gratitude, for humility and hope, for empathy and compassion.

Faced with a climate crisis, economic woes, and systemic racism, we may become apathetic from either of two rationalizations. One is a starry-eyed optimism that denies the threat ("People are basically good; everything will work out"). The other is a dark despair ("It's hopeless; why try?"). Action requires enough realism to fuel concern and enough optimism to provide hope. (Pessimism often fulfills its own predictions, by restraining our efforts at change.) Humanistic psychology, say the critics, encourages the needed hope but not the equally necessary realism about threats.



Igor Bobic/Huffington Post

Are we humans born to be bad or good? The lessons of psychological science mirror our cultural experience, where forces of good and bad sometimes collide, as Capitol Police Officer Eugene Goodman's bravery and quick-thinking protected lawmakers and staff from an invading mob that breached the U.S. Capitol in 2021.

Retrieval Practice

RP-1 How did the *humanistic theories* provide a fresh perspective?

RP-2 What does it mean to be *empathic?* How about *self-actualized?* Which humanistic psychologists used these terms?

ANSWERS IN APPENDIX E

Trait Theories

LOQ 46-4

How do psychologists use traits to describe personality?

Rather than focusing on unconscious forces and thwarted growth opportunities, some researchers attempt to define personality in terms of stable and enduring behavior patterns, such as Lady Gaga's self-discipline and openness to new experiences. This perspective can be traced in part to a remarkable meeting in 1919, when Gordon Allport, a curious 22-year-old psychology student, interviewed Sigmund Freud in Vienna. Allport soon discovered just how preoccupied the founder of psychoanalysis was with finding hidden motives, even in Allport's own behavior during the interview. That experience ultimately led Allport to do what Freud did not do: to describe personality in terms of fundamental **traits**, or people's characteristic behaviors and conscious motives (such as the curiosity

that actually motivated Allport to see Freud). Meeting Freud, said Allport, "taught me that [psychoanalysis], for all its merits, may plunge too deep, and that psychologists would do well to give full recognition to manifest motives before probing the unconscious." Allport came to define personality in terms of identifiable behavior patterns. He was concerned less with *explaining* individual traits than with *describing* them.

Like Allport, Isabel Briggs Myers (1987) and her mother, Katharine Briggs, wanted to describe important personality differences. They attempted to sort people according to Carl Jung's *personality types,* based on their responses to 126 questions. The *Myers-Briggs Type Indicator (MBTI),* available in 20+ languages, has been taken by millions of people, mostly for counseling, leadership training, and work-team development (CPP, 2017). It offers choices, such as "Do you usually value sentiment more than logic, or value logic more than sentiment?" Then it counts the test-taker's preferences, labels them as indicating, say, a "feeling type" or "thinking type," and feeds them back to the person in complimentary terms. Feeling types, for example, are told they are "sympathetic, appreciative, and tactful"; thinking types are told they are "good at analyzing." (Every type has its strengths, so everyone is affirmed.)

Most people agree with their announced MBTI profile, which mirrors their declared preferences. They may also accept their label as a basis for being matched with work or dating partners, and with tasks that supposedly suit their temperaments. But a National Research Council

report noted that despite the test's popularity in business and career counseling, its use has outrun research on its validity as a job performance predictor: "The popularity of this instrument in the absence of proven scientific worth is troublesome" (Druckman & Bjork, 1991, p. 101; see also Pittenger, 1993). Although research on the MBTI has been accumulating since those cautionary words were expressed, the test remains mostly a counseling and coaching tool, not a research instrument. Fortunately, newer research offers reliable and valid tools to explore traits.

Exploring Traits

We are each a unique complex of multiple traits. So how can we describe our personalities in a way that captures our individuality? We might describe an apple by placing it along several trait dimensions—relatively large or small, red or green, sweet or tart. By placing people on several trait dimensions simultaneously, psychologists can describe countless individual personality variations.

What trait dimensions describe personality? If you were looking at profiles on a dating app, what personality traits would give you the most useful information about each person? Allport and his associate H. S. Odbert (1936) counted all the words in an unabridged dictionary that could be used to describe people. There were almost 18,000! How, then, could psychologists condense the list to a manageable number of basic traits?



James Stevenson/Cartoon Stock

"Hello. This is Dial-a-Grump. What the hell do you want?"

Factor Analysis

One technique is *factor analysis,* a statistical procedure that identifies clusters (factors) of test items that tap basic components of a trait (McCabe & Fleeson, 2016). Imagine that people who describe themselves as outgoing also tend to say that they like excitement and practical jokes and dislike quiet reading. Such a statistically correlated cluster of behaviors reflects a basic factor, or trait—in this case, *extraversion.*

British psychologists Hans Eysenck and Sybil Eysenck [EYE-zink] believed that we can reduce many of our individual variations to two

dimensions: *extraversion–introversion* and *emotional stability–instability* (FIGURE 46.2).[1] People in 35 countries worldwide took the *Eysenck Personality Questionnaire*. When their answers were analyzed, the extraversion and emotionality (later called *neuroticism*) factors inevitably emerged as basic personality dimensions (Eysenck, 1990, 1992). The Eysencks believed, and research confirms, that these factors are genetically influenced.

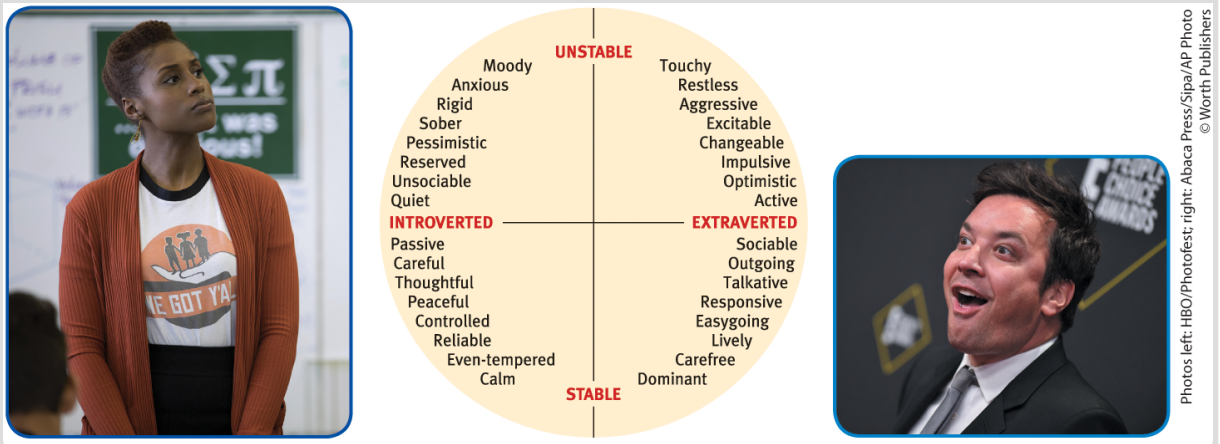


FIGURE 46.2 Two personality dimensions Mapmakers can tell us a lot by using two axes (north–south and east–west). Two primary personality factors (extraversion–introversion and stability–instability) are similarly useful as axes for describing personality variation. Varying combinations define other, more specific traits (Eysenck & Eysenck, 1963). Although many actors are extraverted, some, such as Issa Rae, are introverts—particularly capable of solitary study to become each character they portray. Professional comedians, such as Jimmy Fallon, are often natural extraverts (Irwing et al., 2020).

Biology and Personality

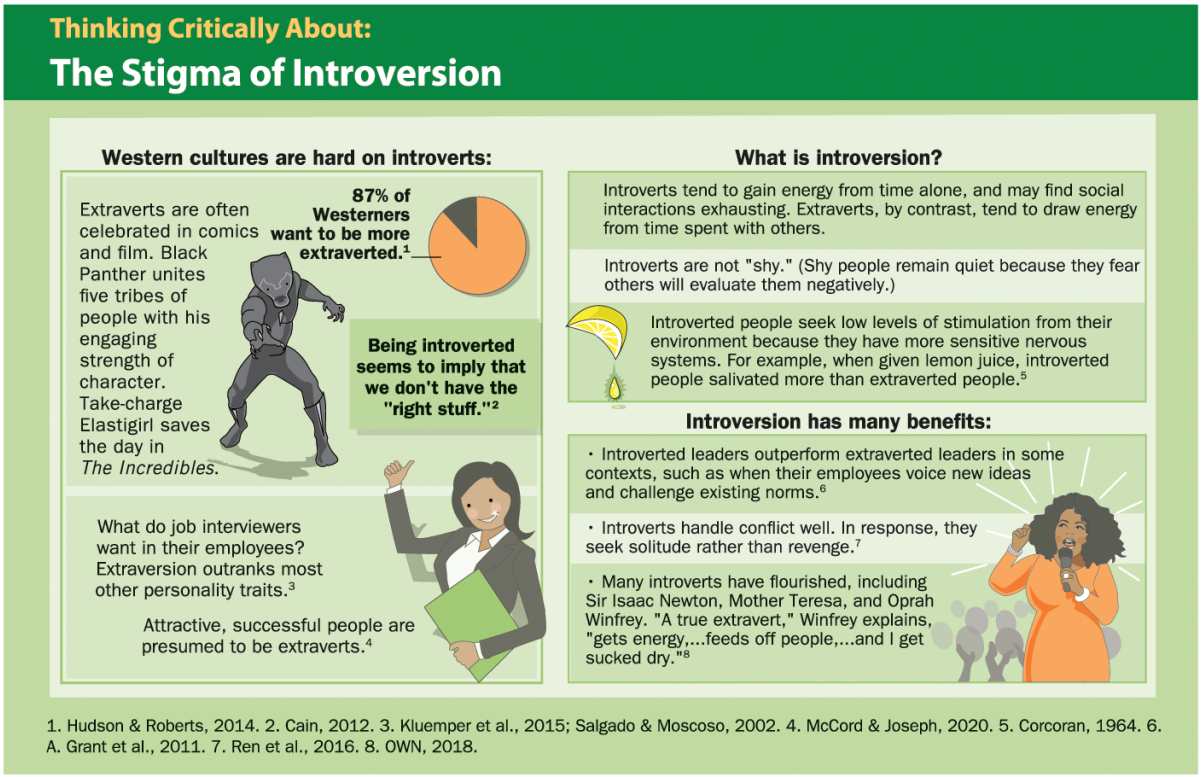
Brain-activity scans of extraverts add to the growing list of traits and mental states now being explored. Such studies indicate that

extraverts seek stimulation because their normal brain arousal is relatively low. For example, PET scans have shown that a frontal lobe area involved in behavior inhibition is less active in extraverts than in introverts (Johnson et al., 1999).

Our biology influences our personality. As we know from twin and adoption studies, compared with fraternal twins, identical twin personalities are much more similar (Loehlin & Martin, 2018; Mõttus et al., 2019). What's true of so much of human nature is also true of personality and life outcomes, which are influenced by many genes having small effects (Smith-Wooley et al., 2019; van den Berg et al., 2016). Our genes also influence the *temperament* and behavioral style that shape our personality. Jerome Kagan (2010), for example, has attributed differences in children's shyness and inhibition to their autonomic nervous system reactivity. Those with a reactive autonomic nervous system respond to stress with greater anxiety and inhibition. The fearless, curious child may become the extreme skier or mountain biker with a GoPro. (See Thinking Critically About: The Stigma of Introversion.)

LOQ 46-5

What are some common misunderstandings about introversion?



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Personality differences among dogs (in energy, affection, reactivity, and curious intelligence) are as evident, and as consistently judged, as personality differences among humans (Gosling et al., 2003; Jones & Gosling, 2005). Monkeys, bonobos, chimpanzees, orangutans, dolphins, orcas, sea lions, and even birds and fish also have distinct and stable personalities (Altschul et al., 2018; Morton et al., 2021; Úbeda et al., 2018; Weiss et al., 2017). Even conscientiousness varies among individual animals, from chimps to bees (Delgado & Sulloway, 2017). Through selective breeding, researchers can produce bold or shy birds. Both personality types have their place in natural history: In lean years, bold birds are more likely to find food; in abundant years, shy birds feed with less risk.



Macmillan Learning

Octopus personality The real-life Otto the octopus seems to love getting attention from visitors. But when his German aquarium closes during the winter, Otto acts like a bored prankster. He has juggled hermit crabs, squirted water at staff members, and broken his light by spraying it with water.

"I come from many tribes—immigrant, introvert, working class, Korean.... Talking is painful because we expose our ideas for evaluation; however, ... talking is powerful because our ideas ... have value and require expression." —Writer and lecturer Min Jin Lee (2019)

Retrieval Practice

RP-3 Which two primary dimensions did Hans Eysenck and Sybil Eysenck propose for describing personality variation?

ANSWERS IN APPENDIX E

Assessing Traits

LOQ 46-6

What are *personality inventories,* and what are their strengths and weaknesses as trait-assessment tools?

If stable and enduring traits guide our actions, can we devise valid and reliable tests of them? Several trait-assessment techniques exist—some more valid than others. Some provide quick assessments of a single trait, such as extraversion, anxiety, or self-esteem. **Personality inventories**—longer **self-report** questionnaires covering a wide range of feelings and behaviors—assess several traits at once.

The classic personality inventory is the **Minnesota Multiphasic Personality Inventory (MMPI).** Although the MMPI was originally developed to identify emotional disorders (still considered its most appropriate use), it also assesses people's personality traits. One of its creators, Starke Hathaway (1960), compared his effort with that of Alfred Binet. Binet, the founder of modern intelligence testing,

developed the first intelligence test by selecting items that identified children who would likely struggle to progress in French schools. Like Binet's items, the MMPI items were **empirically derived**: From a large pool of items, Hathaway and his colleagues selected those on which particular diagnostic groups differed. "My hands and feet are usually warm enough" may seem superficial, but it just so happened that anxious people were more likely to answer *False*. The researchers grouped the questions into 10 clinical scales, including scales that assess depressive tendencies, masculinity–femininity, and introversion–extraversion. Today's MMPI-2 has additional scales that assess work attitudes, family problems, and anger.

Whereas most projective tests (such as the Rorschach) are scored subjectively, personality inventories are scored objectively. Objectivity does not, however, guarantee validity. For example, individuals taking the MMPI for employment purposes can give socially desirable answers to create a good impression. But in so doing they may also score high on a *lie scale* that assesses faking (as when people respond *False* to a universally true statement such as "I get angry sometimes"). In other cases, the MMPI can be used to identify people pretending to have a disorder in order to avoid their responsibilities (Chmielewski et al., 2017). The MMPI's objectivity has contributed to its popularity and its translation into more than 100 languages.

> People have had fun spoofing the MMPI with their own mock items: "Weeping brings tears to my eyes," "Frantic screams make me nervous," and "I stay in the bathtub until I look like a raisin" (Frankel et al., 1983).

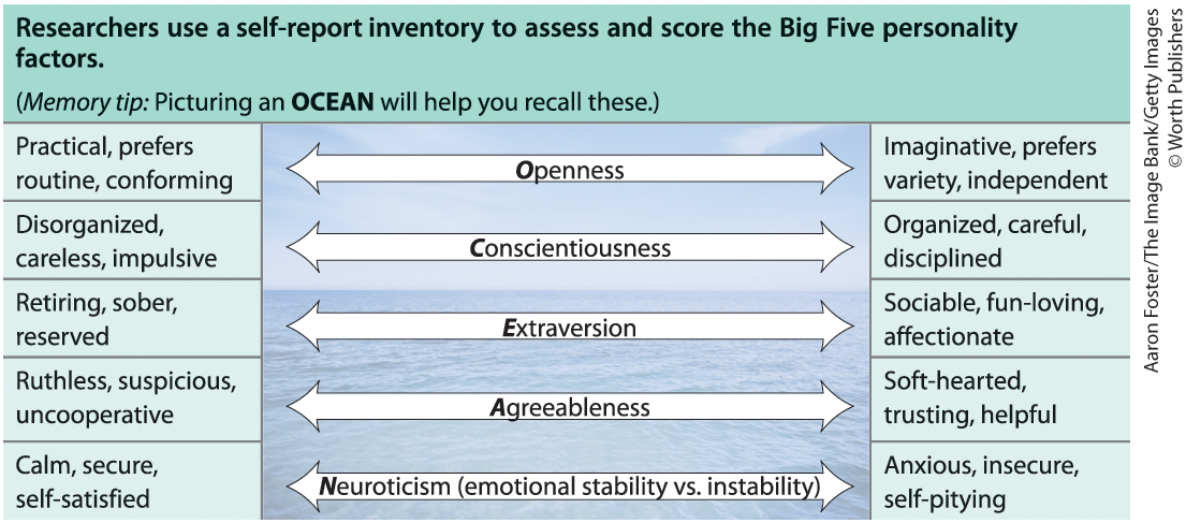
The Big Five Factors

LOQ 46-7

Which traits seem to provide the most useful information about personality variation?

Today's trait researchers believe that simple trait factors, such as the Eysencks' introversion–extraversion and stability–instability dimensions, are important, but they do not tell the whole story. A slightly expanded set of factors—dubbed the **Big Five factors** (also called the *five-factor model*)—does a better job (Costa & McCrae, 2011; Soto & John, 2017). If a test specifies where you are on the five dimensions (*openness, conscientiousness, extraversion, agreeableness,* and *neuroticism;* see **TABLE 46.1**), it has said much of what there is to say about your personality. The Big Five factors can also be used to understand both psychological flourishing and dysfunction (Bleidorn et al., 2020; Oltmanns et al., 2018; Wimmelmann et al., 2020).

TABLE 46.1 The "Big Five" Personality Factors



Information from McCrae & Costa (1986, 2008).

Around the world—across 56 nations and 29 languages in one study (Schmitt et al., 2007)—people describe others in terms roughly consistent with this list. The Big Five—today's "common currency for personality psychology" (Funder, 2001)—has been the most active personality research topic since the early 1990s and is currently our best approximation of the basic trait dimensions.

Big Five research has explored various questions:

- ***How stable are these traits?*** Research teams have analyzed the traits of Americans, Australians, Icelanders, and Germans in adolescence and again 20 to 30 years later (Damian et al., 2019; Hoff et al., 2020; Wagner et al., 2019). The participants' personalities remained generally stable, but most people

exhibited a *maturity principle:* From adolescence onward, they became more conscientious and agreeable, and less neurotic (emotionally unstable) (Allemand et al., 2019; Atherton et al., 2021). People in Japan, who more often adapt their personality to their social environment, show somewhat more Big Five trait variation (Haas & vanDellen, 2020).

- ***Do self-ratings on these traits match others' ratings?*** The ratings of family and friends of our Big Five trait levels do resemble the ratings we give ourselves (Finnigan & Vazire, 2018; Luan et al., 2019).

- ***Do these traits reflect differing brain structure?*** The size and thickness of brain tissue correlates with several Big Five traits (DeYoung & Allen, 2019; Li et al., 2017; Riccelli et al., 2017). For example, those who score high on conscientiousness tend to have a larger frontal lobe area that aids in planning and controlling behavior. Brain connections also influence the Big Five traits (Toschi et al., 2018). People high in neuroticism have brains that are wired to experience stress intensely (Shackman et al., 2016; Xu & Potenza, 2012).

- ***Do these traits reflect birth order?*** After controlling for other variables such as family size, are first-born children, for example, more conscientious and agreeable? Contrary to popular opinion, several massive studies failed to find any association between birth order and personality (Damian & Roberts, 2015; Harris, 2009; Rohrer et al., 2015).

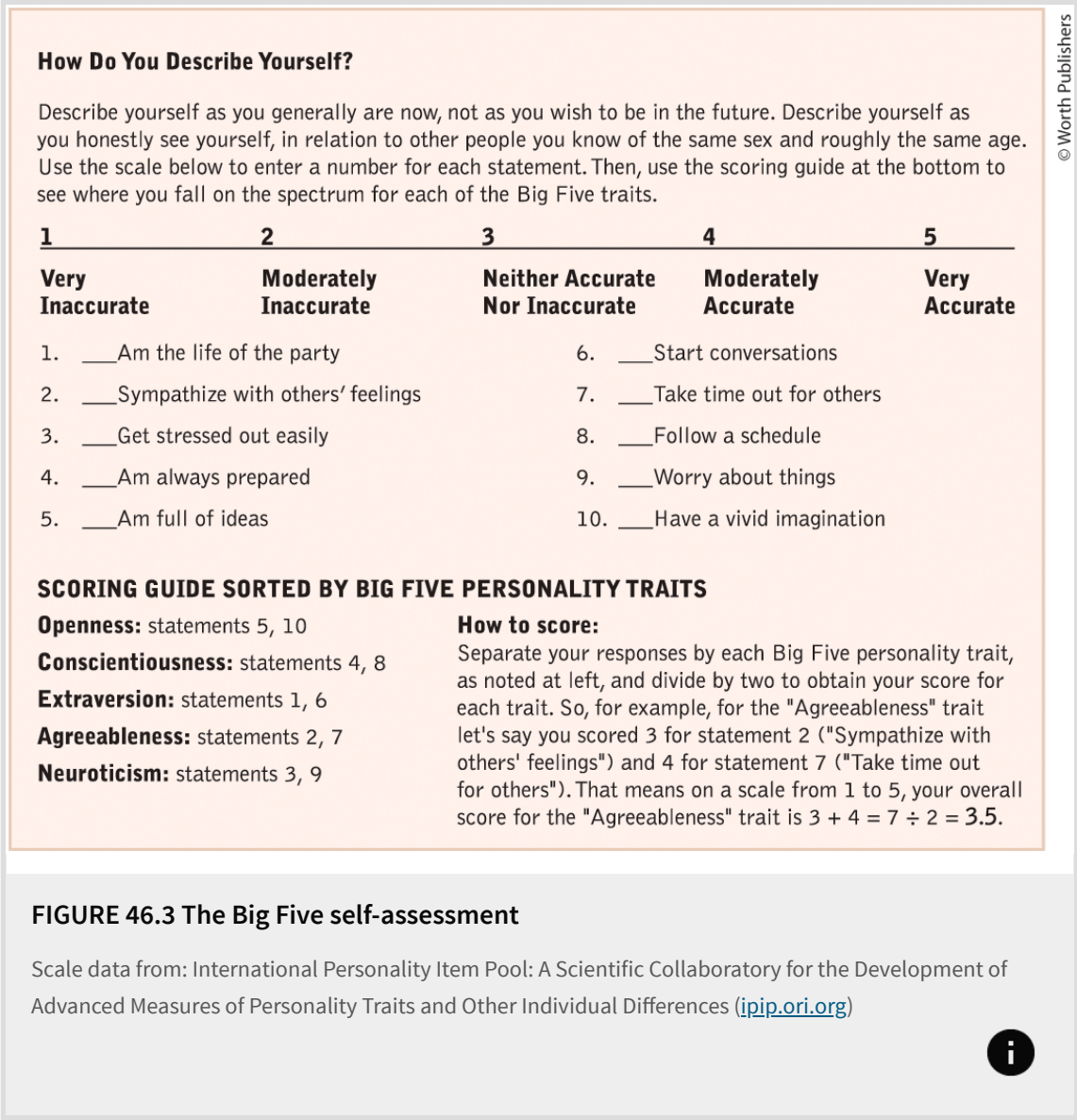
- ***How well do these traits apply to various cultures?*** The Big Five dimensions describe personality in various cultures reasonably well (H. Kim et al., 2018; Minkov et al., 2019; Schmitt et al., 2007). From herders in Kenya and Tanzania to gardeners in Mali, these traits help us understand basic features of personality (Thalmayer et al., 2020). After studying people from 50 cultures, Robert McCrae and 79 co-researchers concluded that Big Five traits "are common to all human groups" (2005).

- ***Do the Big Five traits predict our everyday behaviors?*** *Yes,* Big Five traits reliably predict important life outcomes (Soto, 2021). Conscientiousness predicts better school performance and workplace success (Mammadov, 2022; Nickel et al., 2019). (Maybe nice people finish first?) Agreeable people are caring and law-abiding, and were more likely to follow mobility restrictions to minimize Covid-19 spread (Chan et al., 2021; Zajenkowski et al., 2020). Extraverts post more on social media, more often become leaders, and spend less time at home (true even during the Covid pandemic) (Bowden-Green, 2020; Götz et al., 2021; Matz & Harari, 2021; Scott & Medeiros, 2020). People high in neuroticism were more stressed during the pandemic (Kroenke et al., 2020).



How do you shop and vote? Let me count the likes Researchers can use Facebook likes to predict individuals' Big Five traits, opinions, and political attitudes (Youyou et al., 2015). Companies sell "big data" for advertisers (who then personalize the ads you see) and to political campaigns, which can then target certain users with persuasive messages (Matz et al., 2017).

By exploring such questions, Big Five research has sustained trait psychology and has renewed appreciation for the importance of personality. (To describe your personality, try the brief self-assessment in **FIGURE 46.3**.) Traits matter.



How Do You Describe Yourself?

Describe yourself as you generally are now, not as you wish to be in the future. Describe yourself as you honestly see yourself, in relation to other people you know of the same sex and roughly the same age. Use the scale below to enter a number for each statement. Then, use the scoring guide at the bottom to see where you fall on the spectrum for each of the Big Five traits.

1	2	3	4	5
Very Inaccurate	**Moderately Inaccurate**	**Neither Accurate Nor Inaccurate**	**Moderately Accurate**	**Very Accurate**

1. ___Am the life of the party
2. ___Sympathize with others' feelings
3. ___Get stressed out easily
4. ___Am always prepared
5. ___Am full of ideas
6. ___Start conversations
7. ___Take time out for others
8. ___Follow a schedule
9. ___Worry about things
10. ___Have a vivid imagination

SCORING GUIDE SORTED BY BIG FIVE PERSONALITY TRAITS

Openness: statements 5, 10

Conscientiousness: statements 4, 8

Extraversion: statements 1, 6

Agreeableness: statements 2, 7

Neuroticism: statements 3, 9

How to score:
Separate your responses by each Big Five personality trait, as noted at left, and divide by two to obtain your score for each trait. So, for example, for the "Agreeableness" trait let's say you scored 3 for statement 2 ("Sympathize with others' feelings") and 4 for statement 7 ("Take time out for others"). That means on a scale from 1 to 5, your overall score for the "Agreeableness" trait is 3 + 4 = 7 ÷ 2 = 3.5.

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FIGURE 46.3 The Big Five self-assessment

Scale data from: International Personality Item Pool: A Scientific Collaboratory for the Development of Advanced Measures of Personality Traits and Other Individual Differences (ipip.ori.org)

Ask Yourself

Before trying the self-assessment in Figure 46.3, where would you have placed yourself on the Big Five personality dimensions? Where might your family and friends place you? Did the actual results surprise you, and do you think these results would surprise them?

Retrieval Practice

RP-4 What are the *Big Five* personality factors, and why are they scientifically useful?

ANSWERS IN APPENDIX E

Evaluating Trait Theories

LOQ 46-8

Does research support the consistency of personality traits over time and across situations?

Are our personality traits stable and enduring? Or does our behavior depend on where and with whom we find ourselves? Cheerful, friendly children do tend to become cheerful, friendly adults. At a college reunion, I [DM] was amazed to find that my jovial former classmates were still jovial, the shy ones still shy, the happy-seeming people still smiling and laughing *50 years later.* But it's also true that a fun-loving jokester can suddenly turn serious and respectful at a job interview. New situations and major life events can shift the personality traits we express. Transitioning from high school to university or the workforce, we often become more agreeable, conscientious, and open-minded, and less neurotic (Bleidorn et al., 2018). Losing our job may make us less agreeable and open-minded (Boyce et al., 2015). But when we retire—losing our job *by choice*—we

often become more agreeable and open-minded (Schwaba & Bleidorn, 2019).

> **"There is as much difference between us and ourselves, as between us and others."** — Michel de Montaigne, *Essays,* 1588

The Person-Situation Controversy

Our behavior is influenced by the interaction of our inner disposition with our environment. Still, the question lingers: Which is more important? When we explore this *person-situation controversy,* we look for genuine personality traits that persist over time and across situations. Are some people dependably conscientious and others unreliable, some cheerful and others dour, some outgoing and others quiet? If we are to consider friendliness a trait, friendly people must act friendly at different times and places. Do they?

Longitudinal research follows lives through time. Some scholars (especially those who study infants) are impressed with personality change; others are struck by personality stability during adulthood. As **FIGURE 46.4** illustrates, data from 152 longitudinal studies reveal that personality trait scores are positively correlated with scores obtained an average of 7 years later, and that as people grow older, their personality stabilizes. Interests may change—the avid tropical-fish collector may become an avid gardener. Careers may change—the determined salesperson may become a determined social worker.

Relationships may change—the hostile son may become a hostile husband. But most people come to recognize and accept who they are. As researchers Robert McCrae and Paul Costa (1994) observed, our recognizing the inevitability of our personality is "the culminating wisdom of a lifetime."

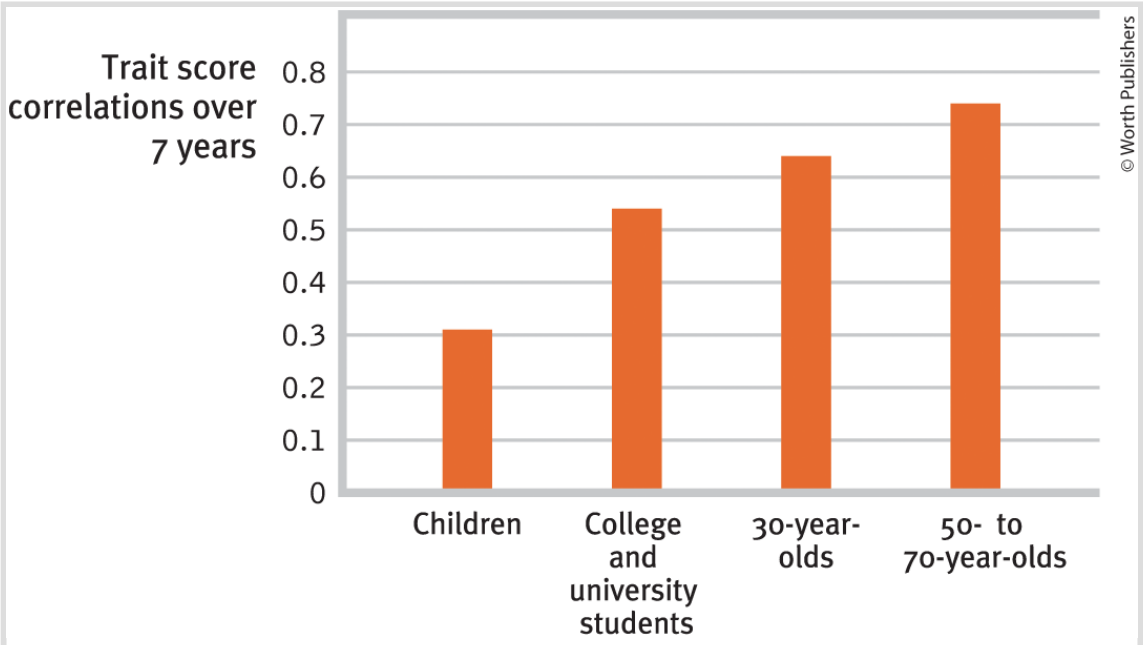

FIGURE 46.4 Personality stability With age, personality traits become more stable, as reflected in the stronger correlation of trait scores with follow-up scores 7 years later. (Data from Roberts & DelVecchio, 2000.)

So most people—including most psychologists—would probably presume the stability of personality traits. Moreover, our traits are socially significant. They influence our health, our thinking, and our job choices and performance (Hogan, 1998; Jackson et al., 2012; Mueller et al., 2018). Studies that follow thousands of lives through time show that personality traits rival socioeconomic status and

cognitive ability as predictors of mortality, divorce, and occupational attainment (Graham et al., 2017; Roberts et al., 2007).

Although our personality *traits* may be both stable and potent, the consistency of our specific *behaviors* from one situation to the next is another matter. What relationship would you expect to find between being conscientious in one situation (say, showing up for class on time) and being conscientious in another (say, avoiding unhealthy foods)? If you've noticed how outgoing you are in some situations and how reserved you are in others, perhaps you said, "Very little." That's what researchers have found—only a small correlation (Mischel, 1968; Sherman et al., 2015). This inconsistency in behaviors also makes personality test scores weak predictors of behaviors. People's scores on an extraversion test, for example, do not neatly predict how sociable they will be on any given occasion.

If we remember such results, we will be more cautious about labeling and pigeonholing individuals (Mischel, 1968). Years in advance, science can tell us the phase of the Moon for any date. A day in advance, meteorologists can predict the weather. But we are much further from being able to predict how *you* will feel and act tomorrow.

However, people's *average* outgoingness, happiness, or carelessness over many situations is predictable (Epstein, 1983a,b). This tendency toward trait-consistent actions occurs worldwide, from the United States to Venezuela to Japan (Locke et al., 2017). By tracking their daily phone activity, researchers confirmed that extraverts really do talk

and text more (Harari et al., 2020). I [DM] kept vowing to cut back on my jabbering and joking during my noontime pickup basketball games. Alas, moments later, the irrepressible chatterbox would inevitably reoccupy my body. Likewise, when buying groceries, I [ND] always end up chatting with the cashier! As our best friends can verify, we do have persistent (genetically influenced) personality traits. And our personality traits get expressed in our

- ***music preferences.*** Your playlist reveals something of your personality. Folk, classical, and ambient music lovers tend to be open to experience and verbally intelligent. Agreeable people tend to like jazz and avoid punk rock music. Blues, classic country, and soul music lovers tend to be emotionally stable. Extraverts like country music, R&B, and funk—and enjoy listening to their friends' playlists (Anderson et al., 2021). People also gravitate toward musicians who share their personality traits (Greenberg et al., 2021). Extraverts prefer extraverted Lil Wayne and Jay Z; agreeable people prefer the agreeable Norah Jones and Carrie Underwood.

- ***written communications.*** If you have ever felt you could detect someone's personality from their writing voice, you are right!! What a cool finding!!! 😊 People's writings—even their brief tweets and Facebook posts—often express their extraversion, self-esteem, and agreeableness (Bowden-Green et al., 2020; Park et al., 2015; Pennebaker, 2011). "Off to meet a friend. Woohoo!!!" posted one Facebook user who had scored high on extraversion (Kern et al., 2014). Extraverts also use more adjectives.

- ***online and personal spaces.*** Are online profiles, websites, and avatars a canvas for self-expression? Or are they an opportunity for people to present themselves in false or misleading ways? It's more the former (Akhtar et al., 2018; Hinds & Joinson, 2019). People who seemed most likable on Facebook or Twitter also seemed most likable in person (Qiu et al., 2012; Weisbuch et al., 2009). Photos show people's clothes, expressions, and postures, and can therefore give clues to personality and how people act in person (Gunyadin et al., 2017; Naumann et al., 2009). Our living and working spaces also help us express our identity, offering clues to our extraversion, agreeableness, conscientiousness, and openness (Back et al., 2010; Fong & Mar, 2015; Gosling, 2008).



"You tend to overuse the exclamation point."

In unfamiliar, formal situations (perhaps as a guest in the home of a person from another culture) our traits remain hidden as we carefully attend to social cues. In familiar, informal situations (just hanging out with friends), we feel less constrained, allowing our traits to emerge (Buss, 1989). In these informal situations, our expressive styles—our animation, manner of speaking, and gestures—are impressively consistent. Viewing "thin slices" of someone's behavior, such as seeing

a photo for a mere fraction of a second, or seeing several 2-second clips of a teacher in action, can tell us a lot about the person's basic personality traits (Ambady, 2010; Tackett et al., 2016).

Some people are naturally expressive (and therefore talented at pantomime and charades); others are less expressive (and therefore better poker players). To evaluate people's voluntary control over their expressiveness, Bella DePaulo and her colleagues (1992) asked people to *act* as expressive or inhibited as possible while stating opinions. Their remarkable findings: Inexpressive people, even when feigning expressiveness, were less expressive than expressive people acting naturally. Similarly, expressive people, even when trying to seem inhibited, were less inhibited than inexpressive people acting naturally. It's hard to be someone you're not, or not to be who you are.



James Woodson/Getty Images

Room with a cue Even at "zero acquaintance," people can catch a glimpse of others' personality from looking at their online and personal spaces. So, what's your read on the occupants of these two rooms?

To sum up, we can say that at any moment the immediate situation powerfully influences a person's behavior. Social psychologists have learned that this is especially so when a "strong situation" makes clear demands (Cooper & Withey, 2009). We can better predict drivers' behavior at traffic lights from knowing the color of the lights than from knowing the drivers' personalities. Thus, professors may perceive certain students as subdued (based on their classroom behavior), but friends may perceive them as pretty wild (based on their party behavior). Averaging our behavior across many occasions

does, however, reveal distinct personality traits. Traits exist. We differ. And our differences matter.

Ask Yourself

How do you think your own personality traits shine through in your music preferences, communication style, and online and personal spaces?

Retrieval Practice

RP-5 How well do personality test scores predict our behavior? Explain.

ANSWERS IN APPENDIX E

REVIEW

Module 46: Humanistic Theories and Trait Theories

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 46-1: How did humanistic psychologists view personality, and what was their goal in studying personality?

LOQ 46-2: How did humanistic psychologists assess a person's sense of self?

LOQ 46-3: How have humanistic theories influenced psychology? What criticisms have they faced?

LOQ 46-4: How do psychologists use traits to describe personality?

LOQ 46-5: What are some common misunderstandings about introversion?

LOQ 46-6: What are *personality inventories,* and what are their strengths and weaknesses as trait-assessment tools?

LOQ 46-7: Which traits seem to provide the most useful information about personality variation?

LOQ 46-8: Does research support the consistency of personality traits over time and across situations?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

humanistic theories

hierarchy of needs
self-actualization
self-transcendence
unconditional positive regard
self-concept
trait
personality inventory
self-report
Minnesota Multiphasic Personality Inventory (MMPI)
empirically derived test
Big Five factors

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. Maslow's hierarchy of needs proposes that we must satisfy basic physiological and safety needs before we seek ultimate psychological needs, such as self-actualization. Maslow based his ideas on
   a. Freudian theory.
   b. his experiences with patients.
   c. a series of laboratory experiments.

d. his study of healthy, creative people.

2. How might Rogers explain how environment influences the development of a criminal?

3. The total acceptance Rogers advocated as part of a growth-promoting environment is called _____ _____ _____.

4. _____ theories of personality focus on describing characteristic behavior patterns, such as agreeableness or extraversion.

5. The most widely used personality inventory is the
   a. Extraversion–Introversion Scale.
   b. Person-Situation Inventory.
   c. MMPI.
   d. Big Five.

6. Which of the following is NOT one of the Big Five personality factors?
   a. Conscientiousness
   b. Anxiety
   c. Extraversion
   d. Agreeableness

7. Our scores on personality tests best predict
   a. our behavior on a specific occasion.
   b. our average behavior across many situations.

MODULE 47: Social-Cognitive Theories and the Self

Roughly speaking, the outside influences on behavior are the focus of *social psychology* (see the Social Psychology modules), and the inner influences are the focus of *personality psychology.* But behavior always depends on the interaction of persons with situations.

Social-Cognitive Theories

LOQ 47-1

How do social-cognitive theorists view personality development, and how do they explore behavior?

The **social-cognitive perspective** on personality, proposed by Albert Bandura (1986, 2006, 2008), emphasizes the interaction of our traits with our social situations.

Social-cognitive theorists believe we learn many of our behaviors either through conditioning or by observing and imitating others. (That's the "social" part.) They also emphasize the importance of mental processes: What we *think* about a situation affects our resulting behavior. (That's the "cognitive" part.) Instead of focusing

solely on how our environment *controls* us (behaviorism), social-cognitive theorists focus on how we and our environment *interact:* How do we interpret and respond to external events? How do our schemas, our memories, and our expectations influence our behavior patterns?

Reciprocal Influences

Bandura (1986, 2006) views the person-environment interaction as **reciprocal determinism**. "Behavior, internal personal factors, and environmental influences," he said, "all operate as interlocking determinants of each other" (FIGURE 47.1). We can see this interaction as people's relationships affect their self-esteem, and as their self-esteem also affects their relationships (de Moor et al., 2021; Harris & Orth, 2020). For example, Rosa's past romantic experiences (her behaviors) influence her romantic attitudes (internal factor), which affect how she now responds to Ryan (environmental factor).

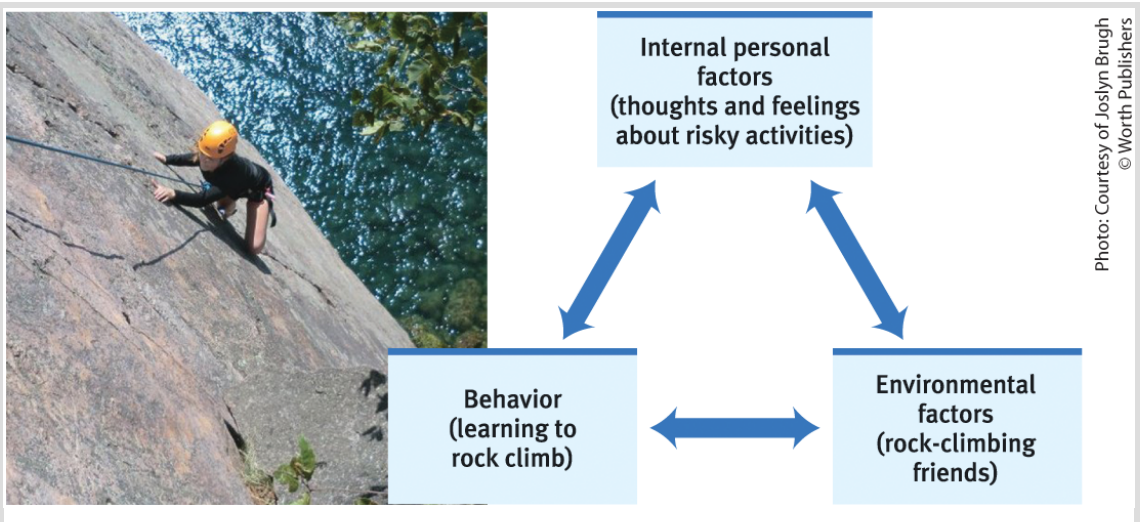

FIGURE 47.1 Reciprocal determinism

Consider three specific ways in which individuals and environments interact:

1. ***Different people choose different environments.*** The reading we do, the social media we use, the careers we pursue, the music we listen to, the friends we associate with—all are part of the environment we have chosen, based partly on our disposition (Denissen et al., 2018; Funder, 2009). And the environments we choose then shape us. People with inflated self-esteem may post frequent selfies, which may lead to public attention and praise, and to even greater self-love (Halpern et al., 2016).

2. ***Our personalities shape how we interpret and react to events.*** If we perceive the world as threatening, we will watch for threats and be prepared to defend ourselves. Anxious people often attend to and react strongly to relationship threats, such as when they feel ignored or excluded (Campbell & Marshall, 2011).

3. ***Our personalities help create situations to which we react.*** How we view and treat people influences how they then treat us. If we expect that others will not like us, our efforts to win their approval (such as bragging) might actually cause them to reject us (Scopelliti et al., 2015).

In addition to the interaction of internal personal factors, the environment, and our behaviors, we also experience *gene–environment*

interaction. Our genetically influenced traits evoke certain responses from others, which may nudge us in one direction or another. In one well-replicated finding, those with the interacting factors of (1) having a specific gene associated with aggression and (2) being raised in a difficult environment were most likely to demonstrate adult antisocial behavior (Byrd & Manuck, 2014; Caspi et al., 2002).

In such ways, we are both the products and the architects of our environments: *Behavior emerges from the interplay of external and internal influences.* Boiling water turns an egg hard and a potato soft. A threatening environment turns one person into a hero, another into a scoundrel. Extraverts experience focused concentration—what psychologists call *flow*—in social situations; introverts more often experience flow when alone (Liu & Csikszentmihalyi, 2020). *At every moment,* our behavior is influenced by our biology, our social and cultural experiences, and our cognition and dispositions (**FIGURE 47.2**).

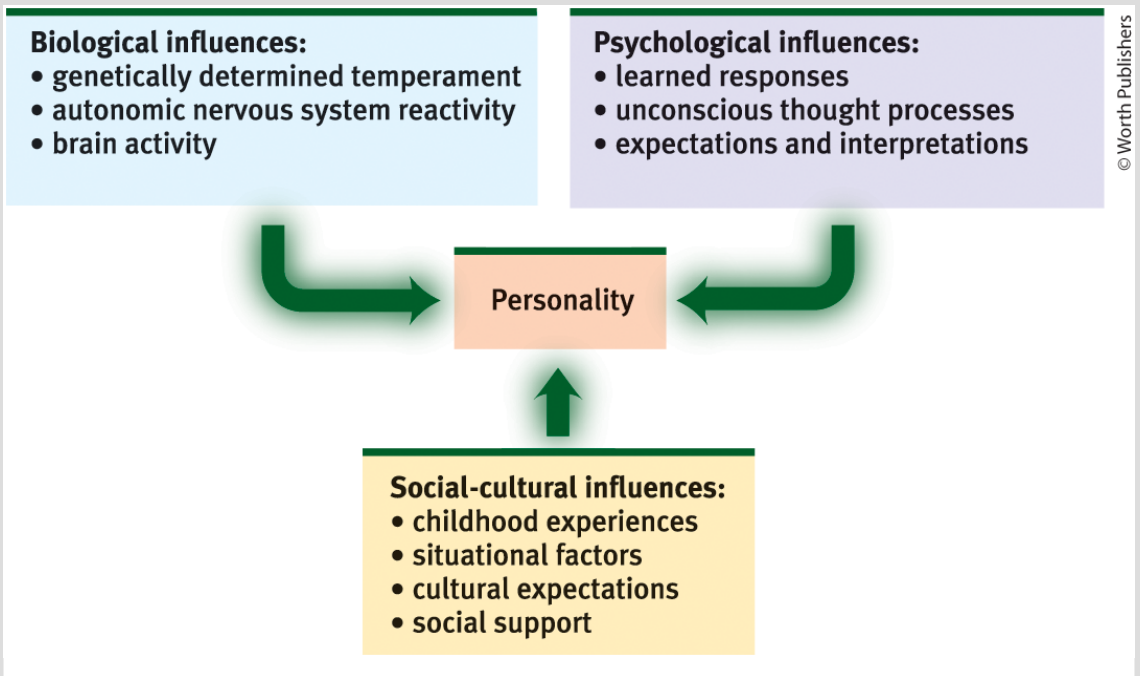

FIGURE 47.2 The biopsychosocial approach to the study of personality As with other psychological phenomena, personality is fruitfully studied at multiple levels.

Ask Yourself

How have your experiences shaped your personality? How has your personality helped shape your environment?

Retrieval Practice

RP-1 Albert Bandura proposed the _____-_____ perspective on personality, which emphasizes the interaction of people with their environment. To describe the interacting influences of behavior, thoughts, and environment, he used the term _____ _____.

ANSWERS IN APPENDIX E

Assessing Behavior in Situations

To predict behavior, social-cognitive psychologists often observe behavior in realistic situations. One ambitious example was the U.S. Army's World War II strategy for assessing candidates for spy missions. Rather than using paper-and-pencil tests, Army psychologists subjected the candidates to simulated undercover conditions. They tested their ability to handle stress, solve problems, maintain leadership, and withstand intense interrogation without blowing their cover. Although time-consuming and expensive, this assessment of behavior in a realistic situation helped predict later success on actual spy missions (OSS Assessment Staff, 1948).

Military and educational organizations and many Fortune 500 companies have adopted similar strategies, known as the *assessment center* approach (Bray & Byham, 1991, 1997; Eurich et al., 2009). The U.S. telecommunications giant AT&T has observed prospective managers doing simulated managerial work. Some European universities give student applicants material to study, and then test their learning—thus mimicking the educational program (Niessen & Meijer, 2017). Many colleges assess nursing students' potential by observing their clinical work. And they assess potential faculty members' teaching abilities by observing them teach.



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Teaching success Many education programs require students to complete a supervised instructional experience. The student teaching program presumes a valid point: People's behavior in job-relevant situations helps predict their job performance.

The assessment center approach exploits the principle that the best means of predicting behavior is neither a personality test nor an interviewer's intuition. Rather, *the best predictor of future behavior is the person's past behavior patterns in similar situations* (Lyons et al., 2011; Mischel, 1981; Schmidt & Hunter, 1998). As long as the situation and the person remain much the same, the best predictor of future job performance is past job performance; the best predictor of future grades is past grades; the best predictor of future aggressiveness is past aggressiveness. People who have used marital infidelity websites at home will also be more likely to behave immorally at work (Griffin et al., 2019). If you can't check the person's past behavior, the next best thing is to create an assessment situation that simulates the task so you can see how the person handles it (Lievens et al., 2009; Meriac et al., 2008).

"What's past is prologue." — William Shakespeare, *The Tempest,* 1611

Evaluating Social-Cognitive Theories

LOQ 47-2

What criticisms have social-cognitive theories faced?

Social-cognitive theories of personality sensitize researchers to how situations affect, and are affected by, individuals. More than other personality theories (see TABLE 47.1), they build from psychological research on learning and cognition.

TABLE 47.1 Comparing the Major Personality Theories

Personality Theory	Key Proponents	Assumptions	View of Personality	Personality Assessment Methods
Psychoanalytic	Freud	Emotional disorders spring from unconscious dynamics, such as unresolved sexual and other childhood conflicts, and fixation at various	Personality consists of pleasure-seeking impulses (the id), a reality-oriented executive (the ego), and an internalized set of ideals (the superego).	Free association, projective tests, dream analysis

		developmental stages. Defense mechanisms fend off anxiety.		
Psychodynamic	Adler, Horney, Jung	The unconscious and conscious minds interact. Childhood experiences and defense mechanisms are important.	The dynamic interplay of conscious and unconscious motives and conflicts shapes our personality.	Projective tests, therapy sessions
Humanistic	Maslow, Rogers	Rather than focusing on disorders born of dark conflicts, it's better to emphasize how healthy people may strive for self-realization.	If our basic human needs are met, we will strive toward self-actualization. In a climate of unconditional positive regard, we can develop self-awareness and a more realistic and positive self-concept.	Questionnaires, therapy sessions, life story approach
Trait	Allport; Costa; H. Eysenck; S. Eysenck; McCrae	We have certain stable and enduring characteristics, influenced by genetic predispositions.	Scientific study of traits has isolated important dimensions of personality, such as the Big Five traits (openness, conscientiousness, extraversion,	Personality inventories

			agreeableness, and neuroticism).	
Social-cognitive	Bandura	Our traits interact with the social context to produce our behaviors.	Conditioning and observational learning interact with cognition to create behavior patterns. Our behavior in one situation is best predicted by considering our past behavior in similar situations.	Observing behavior in realistic situations

Critics charge that social-cognitive theories focus so much on the situation that they fail to appreciate the person's inner traits. Where is the person in this view of personality, ask the dissenters, and where are human emotions? True, the situation does guide our behavior. But in many instances our unconscious motives, our emotions, and our pervasive traits shine through. Personality traits predict behavior at work, in love, and at play. Our biologically influenced traits really do matter. Consider Percy Ray Pridgen and Charles Gill. Each faced the same situation: They had jointly won a $90 million lottery jackpot (Harriston, 1993). When Pridgen learned of the winning numbers, he began trembling uncontrollably, huddled with a friend behind a bathroom door while confirming the win, and then sobbed. When Gill heard the news, he told his wife and then went to sleep.

Retrieval Practice

RP-2 What is the best way to predict a person's future behavior?

ANSWERS IN APPENDIX E

Exploring the Self

LOQ 47-3

Why has psychology generated so much research on the self?

Our personality feeds our sense of self. Asked to consider "Who I am," people draw on their distinctive and enduring ways of thinking, feeling, and acting. Psychology's concern with our sense of self dates back at least to William James, who devoted more than 100 pages of his 1890 *Principles of Psychology* to the topic. By 1943, Gordon Allport lamented that the self had become "lost to view." Although humanistic psychology's later emphasis on the self did not instigate much scientific research, it did help renew the concept of self and keep it alive. Now, more than a century after James, the self is one of Western psychology's most vigorously researched topics. Every year, new studies galore appear on self-esteem, self-disclosure, self-awareness, self-schemas, self-monitoring, and more. Even neuroscientists have searched for the self, by identifying a central frontal lobe region that activates when people respond to self-reflective questions about their

traits and dispositions (Damasio, 2010; Mitchell, 2009; Pauly et al., 2013). The **self**, as organizer of our thoughts, feelings, and actions, occupies the center of personality.

Consider the concept of *possible selves* (Markus & Nurius, 1986; Rathbone et al., 2016). Your possible selves include your visions of the self you dream of becoming (the rich self, the successful self, the loved and admired self), and also the self you fear becoming (the unemployed self, the academically failed self, the lonely and unpopular self). Possible selves motivate us to lay out specific goals that direct our energy effectively and efficiently (Landau et al., 2014). Eighth- and ninth-grade students whose families struggle financially are more likely to earn high grades if they have a clear vision of themselves succeeding in school (Duckworth et al., 2013). Dreams do often give birth to achievements.

Our self-focused perspective may motivate us, but it can also lead us to presume too readily that others are noticing and evaluating us, a phenomenon called the **spotlight effect**. In one experiment, university students who were asked to put on an embarrassing T-shirt before meeting other students guessed that nearly half their peers would notice the shirt. But only 23 percent did (Gilovich, 1996). To turn down the spotlight's brightness, we can use two strategies. The first is simply to know and remember the spotlight effect. Public speakers perform better if they understand that their natural nervousness is hardly noticeable (Savitsky & Gilovich, 2003). The second is to take the audience's perspective. When we imagine

audience members empathizing with our situation, we usually expect to be judged less harshly (Epley et al., 2002). The point to remember: *We stand out less than we imagine,* even with dorky clothes and bad hair, and even after a blunder like setting off a library alarm (Gilovich & Savitsky, 1999; Savitsky et al., 2001).

Ask Yourself

What possible selves do you dream of—or fear—becoming? To what extent do these imagined selves motivate you now?

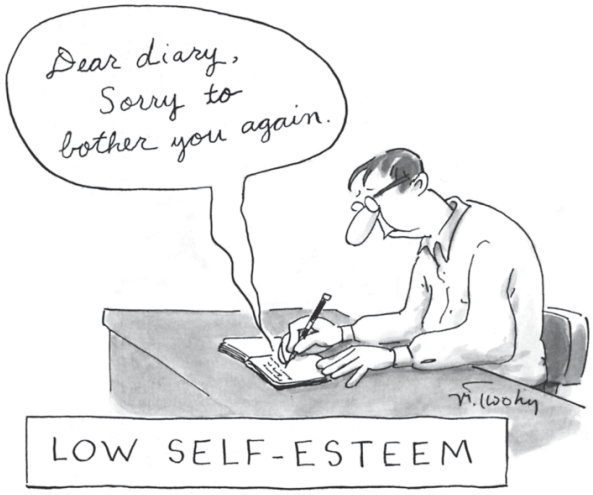
The Benefits of Self-Esteem

LOQ 47-4

How important is self-esteem to our well-being?

Self-esteem—our feelings of high or low self-worth—matters. So does **self-efficacy**, our sense of competence on a task (Bandura, 1977, 2018). (A student might feel high self-efficacy in a math course yet low overall self-esteem.) People who feel good about themselves (who strongly agree with self-affirming questionnaire statements, such as "I am fun to be with") have fewer sleepless nights. They tend to be outgoing, responsible, and open to new experiences (Fetvadjiev & He, 2019). Online and in person, they communicate positively, causing others to like and include them more (Cameron & Granger, 2019;

Mahadevan et al., 2019). They feel less shy, anxious, and lonely, and are just plain happier (Greenberg, 2008; Orth & Robins, 2014; Swann et al., 2007). Our self-esteem grows from venturesome experiences and achievement, and therefore changes as we age (Hutteman et al., 2015). Self-esteem often increases dramatically from adolescence to middle adulthood, continuing to climb until peaking between ages 50 and 60 (Bleidorn et al., 2016; Orth et al., 2018; von Soest et al., 2018).



Mike Twohy/Cartoon Stock

But most psychologists doubt that high self-esteem is "the armor that protects kids" from life's problems (Baumeister & Vohs, 2018; McKay, 2000; Seligman, 2002). Children's academic self-efficacy—their confidence that they can do well in a subject—predicts school achievement. But general self-image does not (Marsh & Craven, 2006; Swann et al., 2007; Trautwein et al., 2006). Maybe self-esteem is a side effect of meeting challenges and surmounting difficulties, or a gauge that reports the state of our relationships with others (Bleidorn et al., 2021; Reitz et al., 2016). If so, isn't pushing the gauge artificially higher

with empty compliments much like forcing a car's low fuel gauge to display "full"?

> **"When kids increase in self-control, their grades go up later. But when kids increase their self-esteem, there is no effect on their grades."** — Angela Duckworth, *In Character* interview, 2009

If feeling good *follows* doing well, then giving praise in the absence of good performance may actually harm people. After receiving weekly self-esteem-boosting messages, struggling students earned *lower*-than-expected grades (Forsyth et al., 2007). Other research showed that giving people random rewards hurt their productivity. Martin Seligman (2012) reported that "when good things occurred that weren't earned, like nickels coming out of slot machines, it did not increase people's well-being. It produced helplessness. People gave up and became passive."

> **"The enthusiastic claims of the self-esteem movement mostly range from fantasy to hogwash. The effects of self-esteem are small, limited, and not all good."** — Roy Baumeister (1996)

There are, however, important effects when self-esteem is threatened. When researchers temporarily deflated people's self-image (by telling them they did poorly on an aptitude test or by disparaging their personality), those participants became more likely to disparage

others or to express heightened racial prejudice (vanDellen et al., 2011; van Dijk et al., 2011; Ybarra, 1999). Self-image threat even increases *unconscious* racial bias (Allen & Sherman, 2011). Those who are negative about themselves have also tended to be oversensitive and judgmental (Baumgardner et al., 1989; Pelham, 1993). Such findings are consistent with humanistic psychology's ideas about the benefits of a healthy self-image. Accept yourself and you'll find it easier to accept others. Disparage yourself and you will be prone to the floccinaucinihilipilification[2] of others. People who are down on themselves tend to be down on others.

The Costs of Self-Esteem

LOQ 47-5

How do excessive optimism, blindness to one's own incompetence, and self-serving bias reveal the costs of self-esteem, and how do defensive and secure self-esteem differ?

Excessive Optimism

Positive thinking in the face of adversity can pay dividends, but so, too, can a dash of realism (Schneider, 2001). Realistic anxiety over possible future failures can fuel energetic efforts to avoid the dreaded fate (Goodhart, 1986; Norem, 2001; Showers, 1992). Concerned about failing an upcoming exam, students may study thoroughly and outperform their equally able but more confident peers. Asian American students have expressed somewhat greater pessimism than

their European American counterparts, which may help explain their often impressive academic achievements (Chang, 2001). Success requires enough optimism to provide hope and enough pessimism to prevent complacency. We want our airline pilots to be mindful of worst-possible outcomes.

Excessive optimism can blind us to real risks (Tenney et al., 2015). More than 1000 studies have shown how our natural positive thinking bias can promote "unrealistic optimism" (Shepperd et al., 2015; Weinstein, 1980). When 56 percent of twelfth graders believed they would earn a graduate degree—though only 9 percent were likely to do so—that was unrealistic optimism (Reynolds et al., 2006). When most people of opposing political views optimistically believed that *their* views would become more widely held, many were in error (Rogers et al., 2017). When students believed they were more likely than their classmates to get a high-paying job and own a nice home, and less likely to have a heart attack or get cancer, that, too, was unrealistic optimism (Waters et al., 2011). If overconfident of our ability to control an impulse such as the urge to smoke, we are more likely to expose ourselves to temptations—and to fail (Nordgren et al., 2009). Blind optimism can be self-defeating, as we can see in those who optimistically deny the addictive toxicity of smoking, venture into ill-fated relationships, and invest money in risky schemes.

Our natural positive thinking bias does seem to vanish, however, when we are awaiting feedback, such as exam results (Carroll et al., 2006). Across many studies in both the real world (awaiting bar exam

scores) and laboratory (awaiting intelligence test results), people "brace for the worst" (Sweeny & Falkenstein, 2017). (Perhaps you, too, can recall shifting toward pessimism as a moment of truth approaches?) Positive illusions also vanish after a traumatic personal experience—as they did for victims of a catastrophic California earthquake, who had to give up their illusions of being less vulnerable than others to earthquakes (Helweg-Larsen, 1999).

Blindness to One's Own Incompetence

Ironically, people often are most overconfident when most incompetent. They are often "unskilled and unaware of it," observed Justin Kruger and David Dunning (1999), after finding that most students scoring at the low end of grammar and logic tests *believed* they had scored in the top half. This "ignorance of one's own incompetence," now famously called the *Dunning-Kruger effect,* can produce overconfidence among political leaders. It also has a parallel among those of us with hearing loss, as I [DM] can confirm. Because we are unaware of what we don't hear, we may overestimate our hearing. If I fail to hear my friend calling my name, the friend notices my inattention. But for me it's a nonevent. I hear what I hear—which, to me, seems pretty normal. As comedian Trevor Noah (2020) quipped, "This is the problem when the dumbest person in the room thinks they're the smartest."

"What I'd dearly love would be to be able to see [myself] having a Dunning-Kruger moment. But according to my own theory, I'll never have it." —

> Psychologist David Dunning, NPR, 2016

Because it takes competence to recognize competence, "Our ignorance is invisible to us," summarizes Dunning (2019). "The first rule of the Dunning-Kruger club," he says, "is you don't know you're a member of the Dunning-Kruger club." Thus, to judge our competence and predict our future performance, it pays to invite others' assessments (Dunning, 2006; Grossmann & Kross, 2014).

Based on studies in which both individuals and their acquaintances predict their future, we can hazard some advice: Ask your peers for their candid prediction. If you're in love and want to predict whether it will last, don't listen to your heart—ask your roommate.

Self-Serving Bias

Imagine dashing to class, hoping not to miss the first few minutes. But you arrive 5 minutes late, huffing and puffing. As you sink into your seat, what sorts of thoughts go through your mind? Do you go through a negative door, thinking "I'm such a loser"? Or do you go through a positive door, telling yourself, "At least I made it to class"?

Personality psychologists have found that most people choose the second door because it leads to positive self-thoughts. We have a good reputation with ourselves. We show a **self-serving bias**—a readiness to perceive ourselves favorably (Myers, 2010). Consider:

People accept more responsibility for good deeds than for bad, and for successes than for failures. Athletes often privately credit their victories to their own prowess, and their losses to bad breaks, lousy officiating, or the other team's exceptional performance (Allen et al., 2020). Most students who receive poor exam grades criticize the exam or the instructor, not themselves. Drivers filling out insurance claims have explained their accidents in such words as "A pedestrian hit me and went under my car." The question "What have I done to deserve this?" is one we usually ask of our troubles, not our successes. Although a self-serving bias can lead us to avoid uncomfortable truths, it can also motivate us to approach difficult tasks with confidence instead of despair (Tomaka et al., 1992; von Hippel & Trivers, 2011). Indeed, across many studies, self-enhancement predicts emotional well-being (Dufner et al., 2019).



Sophia Warren/Cartoon Stock

"That's strange. I remember it differently, in a way that aligns with my world view and casts me in a positive light."

Most people see themselves as better than average. Compared with most other people, how intelligent are you? How friendly? On each question, where would you rank yourself, from the 1st to the 99th percentile? Most people put themselves well above the 50th

percentile. This better-than-average effect appears for nearly any subjectively assessed and socially desirable trait or behavior. Most people rate themselves as having above average intelligence, kindness, humor, and ethics (Zell et al., 2020). Nine in ten drivers rate themselves as more skilled than the average driver (Koppel et al., 2021). Most people in the United Kingdom, the United States, and Germany believed that, compared with other same-aged citizens, they had a better-than-average chance of not catching Covid-19 (Kuper-Smith et al., 2020). The average person thinks they're better than average. Self-serving bias is weaker in Asia, where social practices emphasize modesty (Church et al., 2014; Falk et al., 2009). Yet in every one of 53 countries surveyed, people expressed self-esteem above the midpoint of the most widely used scale (Schmitt & Allik, 2005).



"Fun fact: The average man [thinks] he would be better than 63 percent of other men if he had to survive a zombie apocalypse." — Mathematician Spencer Greenberg and economist Seth Stephens-Davidowitz, 2019

Self-serving bias often underlies conflicts, such as blaming a partner for relationship problems or a colleague for work problems. All of us also tend to see our own *groups*—our school, organization, region, or country—as superior. Although there are 50 U.S. states, Americans on average estimate that their home state made 18 percent of the contributions to U.S. history (Putnam et al., 2018). Likewise, people from 35 countries rate their own country as making outsized contributions to world history (Zaromb et al., 2018). Such *group-serving bias*—my group is better—fueled the trans-Atlantic slave trade, Nazi horrors, and Rwandan genocide. No wonder literature and religion so often warn against the perils of self-love and pride. Ingroup love often feeds outgroup hate (Golec de Zavala & Lantos, 2020).

Finding their self-esteem threatened, some people with inflated egos may react violently. Researchers Brad Bushman and Roy Baumeister (1998; Bushman et al., 2009) had undergraduate volunteers write a brief essay, in response to which another supposed student gave them either praise ("Great essay!") or stinging criticism ("One of the worst essays I have read!"). The essay writers were then allowed to lash out at their evaluators by blasting them with unpleasant noise. Can you anticipate the result? After criticism, those with inflated self-esteem were "exceptionally aggressive." They delivered three times the auditory torture than did those with average self-esteem. Over 80 studies have replicated the dangerous effect of **narcissism** (excessive self-love and self-focus) on aggression (Rasmussen, 2016). Researchers have concluded that "conceited, self-important individuals turn nasty

toward those who puncture their bubbles of self-love" (Baumeister, 2001).

After tracking self-importance across several decades, psychologist Jean Twenge (2006; Twenge & Foster, 2010) reported that what she called *Generation Me*—born in the 1980s and early 1990s—expressed more narcissism (by agreeing more often with statements such as, "If I ruled the world, it would be a better place," or "I think I am a special person"). Why does a rise in narcissism matter? Narcissists tend to be materialistic, desire fame, have inflated expectations, hook up more often without commitment, and gamble and cheat more—all of which have been increasing as narcissism has increased. Humility, by contrast, is the attitude that, no matter your accomplishments, you are not entitled to special treatment (Banker & Leary, 2020).

Narcissistic people (who are more often men) tend to be unforgiving, take a game-playing, sexually forceful approach to romantic relationships, and are more likely to become divorced (Johnson, 2020; Lamarche & Seery, 2019; Wetzel et al., 2020). They're often charismatic and ambitious, making them popular until others tire of their cold-hearted arrogance (Leckelt et al., 2020; Poorthuis et al., 2019). From moment to moment, they crave status and adulation and often become defensive or enraged when criticized (Grapsas et al., 2020; Sedikides, 2021). Many had parents who told them they were superior to others (Brummelman et al., 2015). Reality TV stars are often especially narcissistic (Rubinstein, 2016; Young & Pinsky, 2006).

> **"The [self-]portraits that we actually believe, when we are given freedom to voice them, are dramatically more positive than reality can sustain."** — Shelley Taylor, *Positive Illusions,* 1989

Despite the demonstrated perils of pride, many people object that the idea of self-serving bias overlooks those who feel worthless and unlovable. If self-serving bias prevails, why do so many people disparage themselves? For five reasons:

1. Sometimes self-directed put-downs are *subtly strategic*—they elicit reassuring strokes. Saying "No one likes me" may at least elicit "But not everyone has met you!"
2. Other times, such as before a game or an exam, self-disparaging comments *prepare us for possible failure.* The coach who extols the superior strength of the upcoming opponent makes a loss understandable, a victory noteworthy.
3. A self-disparaging "How could I have been so stupid!" also helps us *learn from our mistakes.*
4. Sometimes false humility is actually a *humblebrag:* "I barely studied, so I'm amazed I got an A" (Sezer et al., 2018).
5. Self-disparagement frequently *pertains to one's old self.* Asked to remember their really bad behaviors, people recall things from long ago; good behaviors more easily come to mind from their recent past (Escobedo & Adolphs, 2010). Even when they have not changed, people are much more critical of their distant past selves than of their current selves (Wilson & Ross, 2001). Chumps

yesterday, champs today: “At 18, I was a jerk; today I’m more sensitive.”

Even so, all of us some of the time (and some of us much of the time) do feel inferior. This is especially true when we compare ourselves with those who are a step or two higher on the ladder of status, looks, income, or ability. The more frequently we feel comparatively inferior, the more unhappy or even depressed we become. But for most people, thinking has a naturally positive bias.

> **“If you compare yourself with others, you may become vain and bitter; for always there will be greater and lesser persons than yourself.”** — Max Ehrmann, “Desiderata,” 1927

Some researchers identify two types of self-esteem—defensive and secure (Kernis, 2003; Lambird & Mann, 2006; Ryan & Deci, 2004). *Defensive self-esteem* is fragile. It focuses on sustaining itself, which makes failure and criticism feel threatening. Defensive people may respond to such perceived threats with anger or aggression (Crocker & Park, 2004; Donnellan et al., 2005).

Secure self-esteem is less fragile, because it is less contingent on external evaluations. To feel accepted for who we are, and not for our looks, wealth, or acclaim, relieves pressures to succeed and enables us to focus beyond ourselves. Those who accept their own flaws also more compassionately accept others’ flaws (Zhang et al., 2020).

By losing ourselves in relationships and purposes larger than ourselves, we may achieve a more secure self-esteem, satisfying relationships, and greater quality of life (Crocker & Park, 2004). Authentic pride, rooted in actual achievement, supports self-confidence and leadership (Tracy et al., 2009; Weidman et al., 2016; Williams & DeSteno, 2009).

"True humility is not thinking less of yourself; it is thinking of yourself less." — C. S. Lewis, *Mere Christianity,* 1952

Retrieval Practice

RP-3 What are the positive and negative effects of high self-esteem?

RP-4 The tendency to accept responsibility for success and blame circumstances or bad luck for failure is called _____-_____ _____.

RP-5 _____ (Secure/Defensive) self-esteem is linked to angry and aggressive behavior. _____ (Secure/Defensive) self-esteem is a healthier self-image that allows us to focus beyond ourselves and enjoy a higher quality of life.

ANSWERS IN APPENDIX E

REVIEW

Module 47: Social-Cognitive Theories and the Self

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 47-1: How do social-cognitive theorists view personality development, and how do they explore behavior?

LOQ 47-2: What criticisms have social-cognitive theories faced?

LOQ 47-3: Why has psychology generated so much research on the self?

LOQ 47-4: How important is self-esteem to our well-being?

LOQ 47-5: How do excessive optimism, blindness to one's own incompetence, and self-serving bias reveal the costs of self-esteem, and how do defensive and secure self-esteem differ?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

social-cognitive perspective
reciprocal determinism
self
spotlight effect
self-esteem
self-efficacy
self-serving bias
narcissism

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. The social-cognitive perspective proposes our personality is shaped by a process called *reciprocal determinism,* as personal factors, environmental factors, and behaviors interact. An example of an environmental factor is
   a. the presence of books in a home.

b. a preference for outdoor play.
c. the ability to read at a fourth-grade level.
d. the fear of violent action on television.

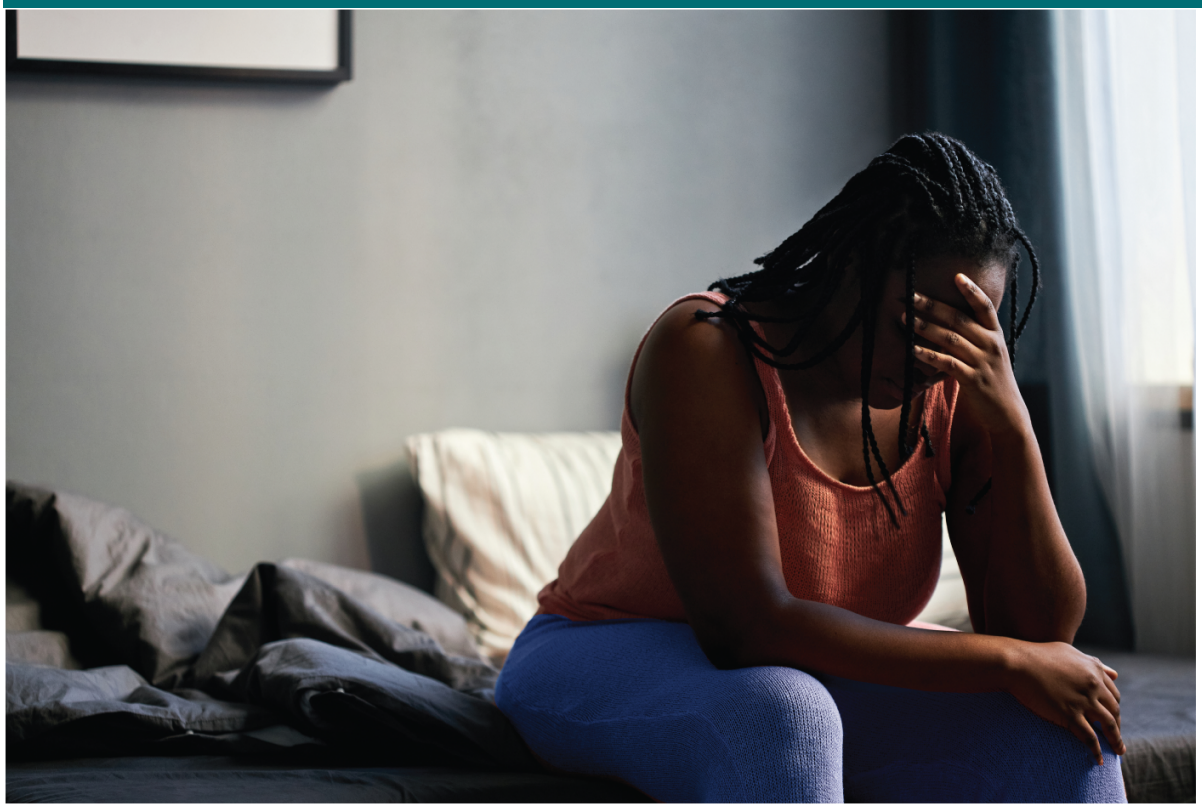
2. Critics say that _____-_____ personality theories are very sensitive to an individual's interactions with particular situations, but that they give too little attention to the person's enduring traits.

3. The tendency to overestimate others' attention to and evaluation of our appearance, performance, and blunders is called the _____ _____.

4. Researchers have found that low self-esteem tends to be linked with life problems. How should this link be interpreted?
   a. Life problems cause low self-esteem.
   b. The answer isn't clear because the link is correlational and does not indicate cause and effect.
   c. Low self-esteem leads to life problems.
   d. Because of the self-serving bias, we must assume that external factors cause low self-esteem.

5. A fortune cookie advises, "Love yourself and happiness will follow." Is this good advice?

CHAPTER 15
Psychological Disorders (Modules 48–53)



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MODULE 48 Introduction to Psychological Disorders

Defining Psychological Disorders

Understanding Psychological Disorders

Classifying Disorders—and Labeling People

Risk of Harm to Self and Others
Rates of Psychological Disorders
MODULE 49 Anxiety Disorders, Obsessive-Compulsive and Related Disorders, Trauma- and Stressor-Related Disorders, and Somatic Symptom and Related Disorders
Anxiety Disorders
Obsessive-Compulsive and Related Disorders
Trauma- and Stressor-Related Disorders
Somatic Symptom and Related Disorders
Understanding Anxiety Disorders, Obsessive-Compulsive and Related Disorders, Trauma- and Stressor-Related Disorders, and Somatic Symptom and Related Disorders
MODULE 50 Depressive Disorders and Bipolar Disorders
Depressive Disorders
Bipolar Disorders
Understanding Depressive Disorders and Bipolar Disorders
MODULE 51 Schizophrenia
Symptoms of Schizophrenia
Onset and Development of Schizophrenia
Understanding Schizophrenia
MODULE 52 Dissociative, Personality, and Eating Disorders
Dissociative Disorders
Personality Disorders
Eating Disorders
MODULE 53 Neurodevelopmental Disorders
Intellectual Developmental Disorder

Autism Spectrum Disorder
Attention-Deficit/Hyperactivity Disorder
THINKING CRITICALLY ABOUT: ADHD—Natural High Energy or Disordered Behavior?

> You lose entire blocks of your day to obsessive thoughts or actions. I spend so much time finishing songs in my car before I can get out or redoing my entire shower routine because I lost count of how many times I scrubbed my left arm.
>
> *Kelly, diagnosed with obsessive-compulsive disorder (from Schuster, 2015)*

> Whenever I get depressed it's because I've lost a sense of self. I can't find reasons to like myself. I think I'm ugly. I think no one likes me.
>
> *Greta, diagnosed with depression (from Thorne, 1993, p. 21)*

> Voices, like the roar of a crowd, came. I felt like Jesus; I was being crucified.
>
> *Stuart, diagnosed with schizophrenia (from Emmons et al., 1997)*

Now and then, we all feel, think, or act in ways that resemble a psychological disorder. We feel anxious, depressed, withdrawn, or suspicious. So it's no wonder we are drawn to try to understand disordered psychological states—we sometimes see ourselves in the mental illnesses we study.

Worldwide, nearly a billion people live with mental or behavioral disorders (GBD, 2022). Many of us will know—or love someone who knows—the bewilderment and pain of unexplained physical symptoms,

irrational fears, or a feeling that life is not worth living. In a survey of first-year university students in eight countries, 1 in 3 reported a mental health problem during the prior year (Auerbach et al., 2018).

Each year, mental or behavioral disorders contribute to an estimated 8 million deaths (Walker et al., 2015). Although their rates and symptoms vary by culture, no known society is free of two serious disorders—*major depressive disorder* and *schizophrenia* (Baumeister & Härter, 2007; Jablensky, 1999; Susser & Martínez-Alés, 2018). These modules examine mental disorders; the Therapy modules consider scientifically-studied treatments for them.

MODULE 48: Introduction to Psychological Disorders

Most people would agree that someone who is depressed and stays mostly in bed for 3 months has a psychological disorder. But what about a grieving father who, 3 months after his child has died, can't resume his usual social activities? Where should we draw the line between understandable grief and clinical depression? Between a fear and a phobia? Between typical distractedness and attention-deficit/hyperactivity disorder?

> **"Who in the rainbow can draw the line where the violet tint ends and the orange tint begins? Distinctly we see the difference of the colors, but where exactly does the one first blendingly enter into the other? So with sanity and insanity."** — Herman Melville, *Billy Budd, Sailor,* 1924

And how do race and socioeconomic status influence mental illness diagnoses and treatment? For example, why are incarcerated people in the United States more likely to receive a mental health diagnosis if they are White, whereas those who are Black are more likely to be labeled merely as criminals (Bronson & Berzofsky, 2017; Prins et al., 2012)? Why are White defendants more often offered substance use disorder treatment as an alternative to prosecution, while Black defendants in similar circumstances more often receive a felony

conviction (Schlesinger, 2013)? And why do people in poverty have an increased risk for depression and anxiety—and often struggle for equitable access to high-quality mental health care (Hodgkinson et al., 2017; Ridley et al., 2020)? Scientists and clinicians are asking these and other questions:

- How should we *define* psychological disorders?
- How should we *understand* what causes disorders? How do underlying biological factors contribute? How do troubling environments influence our well-being? And how do these effects of nature and nurture interact?
- How should we *classify* psychological disorders? And can we do so in a way that allows us to help people without stigmatizing or labeling them?
- Are those with psychological disorders at risk of harming themselves or others?
- What do we know about rates of psychological disorders? How many people have them? Who is vulnerable, and when are they most likely to develop a new disorder?

Defining Psychological Disorders

Learning Objective Question LOQ 48-1

How should we draw the line between typical behavior and a disorder?

A **psychological disorder** is a syndrome (a collection of symptoms) marked by a "clinically significant disturbance in an individual's cognition, emotion regulation, or behavior" (American Psychiatric Association, 2013). Thoughts, emotions, or behaviors are described as *dysfunctional* or *maladaptive* when they interfere with day-to-day quality of life. Believing your home must be thoroughly cleaned every weekend is not a disorder; but if compulsive daily cleaning rituals interfere with work and leisure, they may indicate a disorder. Occasional sadness is to be expected; sadness that persists for weeks and becomes disabling likewise signals a psychological disorder. Feeling energized is common; feeling so hyped or excited that you sleep too little, drive dangerously, or spend money recklessly—perhaps worrying your loved ones—can be a sign of a disorder.

Distress often accompanies such dysfunction. Kelly, Greta, and Stuart were all distressed by their thoughts, emotions, or behaviors.

Over time, definitions of what constitutes a "significant disturbance" have varied. In 1973, the American Psychiatric Association voted that "homosexuality" should no longer be classified as a psychological disorder. The organization made this change because more and more of its members viewed same-sex attraction as a natural biological predisposition that did not cause people distress or impair their daily lives. Such is the power of shifting societal beliefs. Despite cultural progress toward reducing stigma and prejudice toward various groups, U.S. children and adolescents who identify as transgender or gender nonconforming have been seven times more likely than their

peers to be diagnosed with a psychological disorder (Becerra-Culqui et al., 2018). This is due largely to the continued stigma and stress they often experience (Hatzenbuehler et al., 2009; Meyer, 2003). In the twenty-first century, controversies swirl over other new or altered diagnoses in the most recent edition of psychiatry's manual for describing disorders (Conway et al., 2019; Widiger et al., 2019).

Retrieval Practice

RP-1 Anika, a lawyer, is distressed by feeling the need to wash her hands 100 times a day. She has little time to meet with clients, and her colleagues are wondering about her competence. Her behavior would probably be labeled disordered, because it is _____—that is, it interferes with her quality of life.

ANSWERS IN APPENDIX E

Understanding Psychological Disorders

LOQ 48-2

How do the medical model and the biopsychosocial approach influence our understanding of psychological disorders?

The way we view a problem influences how we try to solve it. In earlier times, people often viewed strange behaviors as evidence of strange forces at work—the movements of the stars, godlike powers, or evil spirits. Had you lived during the Middle Ages, you might have

said, “The devil made me do it.” Believing that, you might have approved of a harsh cure that would drive out the evil demon. Thus, people experiencing “madness” (as mental illness was then known) have been caged or given “therapies” such as genital mutilation, beatings, removal of teeth or lengths of intestines, or transfusions of animal blood (Farina, 1982).



John W. Verano

Yesterday’s “therapy”? Through the ages, people with psychological disorders have endured brutal treatments, including the trephination evident in this Stone Age patient’s skull. Drilling skull holes like these may have been an attempt to release evil spirits and cure those with psychological disorders. Do you think a patient would have

survived this kind of "cure"?

Reformers, such as Philippe Pinel (1745–1826) in France, opposed such brutal treatments. Madness is not demonic possession, Pinel insisted, but a sickness of the mind caused by severe stress and inhumane conditions. He argued that curing the illness requires *moral treatment,* including boosting patients' spirits by unchaining them and talking with them. He and others worked to replace brutality with gentleness, isolation with activity, and filth with clean air and sunshine.

In some places, cruel treatments for mental illness—including chaining people to beds or confining them in spaces with wild animals—linger even today. The World Health Organization has launched a reform that aims to transform hospitals "into patient-friendly and humane places with minimum restraints" (WHO, 2014).

The Medical Model

A medical breakthrough around the year 1900 prompted further reforms. Researchers discovered that syphilis, a sexually transmitted infection, invades the brain and distorts the mind. This discovery triggered an eager search for physical causes and effective treatments of other mental disorders. Hospitals replaced asylums, and the **medical model** of mental disorders was born. A mental *illness* (also called a psycho*pathology*) needs to be *diagnosed* based on its *symptoms.*

It needs to be *treated* through *therapy,* which may include time in a psychiatric *hospital.* Recent discoveries have energized the medical model, demonstrating that many genes together influence the brain and that biochemical abnormalities contribute to all major disorders (Smoller, 2019). A growing number of clinical psychologists work in medical hospitals, where they collaborate with physicians.

The Biopsychosocial Approach

To call psychological disorders "sicknesses" tilts research toward the influence of biology. But as in so many other areas, biological, psychological, and social-cultural influences together weave the fabric of our human experience. As individuals, we differ in how much stress we experience and how we cope with stressors. Cultures also differ in their sources of stress and in their ways of coping. We are physically embodied and socially embedded.

Two disorders—major depressive disorder and schizophrenia—occur worldwide. Other disorders tend to be associated with specific cultures. In Latin America, some experience *susto*—severe anxiety or panic in response to emotional trauma or fear of black magic. In Japanese culture, people may experience *taijin kyofusho*—social anxiety about physical appearance, a readiness to blush, and a fear of eye contact. The eating disorders *anorexia nervosa* and *bulimia nervosa* occur mostly in food-abundant Western cultures. These varied disorders may share an underlying dynamic (such as anxiety) while

differing in the symptoms (an eating problem or a specific fear) manifested in a particular culture.

The biopsychosocial approach emphasizes that mind and body are inseparable (FIGURE 48.1). Negative emotions can trigger physical problems and vice versa. The biopsychosocial approach gave rise to the *vulnerability-stress model,*[1] which assumes that individual dispositions combine with environmental stressors to influence psychological disorder (Monroe & Simons, 1991; Zuckerman, 1999). Research on **epigenetics** supports the vulnerability-stress model by showing how environment interacts with our DNA. A gene may be *expressed* in one environment, but not in another. For some, that will be the difference between developing a disorder or not.

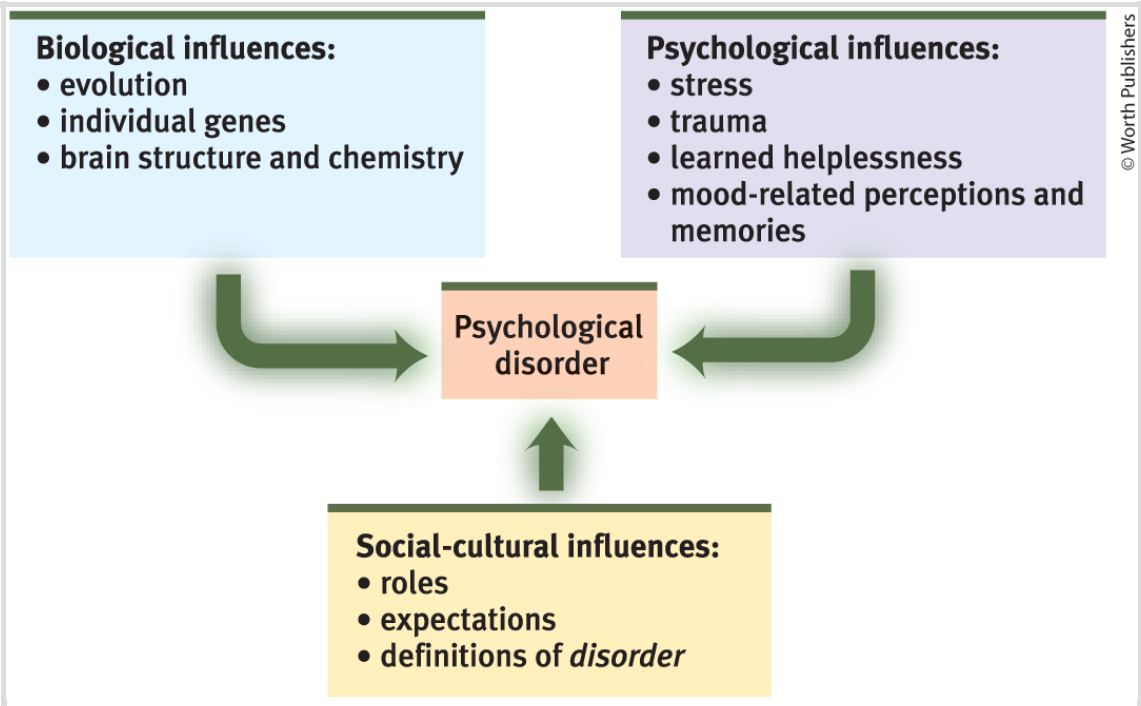


FIGURE 48.1 The biopsychosocial approach to psychological disorders Today's psychology studies how biological, psychological, and social-cultural factors interact to

produce specific psychological disorders.

Disorders often accompany one another (Jacobson & Newman, 2017; Plana-Ripoll et al., 2019). People diagnosed with one disorder, such as major depressive disorder, are at higher risk for being diagnosed with another, such as an anxiety disorder. Such *comorbidity* results from several factors, such as having overlapping genes that predispose different disorders (Brainstorm Consortium, 2018; Tylee et al., 2022). In one U.S. national sample, 51 percent of people with one disorder were also diagnosed with at least one other disorder (Barr et al., 2022). Comorbidity is common.



Emma McIntyre/Getty Images

Making a scene Actor Constance Wu has achieved acclaim for her roles in the television sitcom *Fresh Off the Boat* and the movies *Crazy Rich Asians* and *Hustlers*. She has also experienced mental health problems, which led her to attempt suicide. “Asian Americans don’t talk about mental health enough,” she said. “While we’re quick to celebrate representation wins, there’s a lot of

avoidance around the more uncomfortable issues within our community" (Kim, 2022). In her memoir *Making a Scene,* she portrays how sexism and racism in Hollywood harm Asian American women's mental health (Wu, 2019).

Retrieval Practice

RP-2 Are psychological disorders universal or culture-specific? Explain with examples.

RP-3 What is the biopsychosocial approach, and why is it important in our understanding of psychological disorders?

ANSWERS IN APPENDIX E

Classifying Disorders—and Labeling People

LOQ 48-3

How and why do clinicians classify psychological disorders, and why do some psychologists criticize diagnostic labels?

In biology, classification creates order. To classify an animal as a "mammal" says a great deal—that it is likely warm-blooded, has hair or fur, and produces milk to nourish its young. In psychiatry and psychology, too, classification aims to order and describe symptoms.

To classify a person's disorder as "schizophrenia" suggests that the person talks incoherently, has irrational beliefs, shows either little emotion or inappropriate emotion, or is completely withdrawn. "Schizophrenia" is a quick way to describe a complex disorder.

Moreover, diagnostic classification gives more than a thumbnail sketch of a disorder. In psychiatry and psychology, classification also aims to *predict* a disorder's future course, *suggest* appropriate treatment, and *guide* research into its causes. To study a disorder, we must first name and describe it.



"I'm always like this, and my family was wondering if you could prescribe a mild depressant."

In many countries, the most common tool for describing disorders is the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders,* released in 2022 as an updated Text Revision of the fifth edition (**DSM-5-TR**).[2] Physicians and mental health workers use the detailed DSM-5-TR to guide diagnoses and treatment. The DSM-5-TR represents a *categorical* approach (symptoms are present or absent). For example, someone who meets

all of the criteria in TABLE 48.1 may be diagnosed with *insomnia disorder.* Other disorders, such as *posttraumatic stress disorder* and major depressive disorder require people to meet only a certain number of criteria to be diagnosed. The DSM-5-TR includes diagnostic codes from the World Health Organization's *International Classification of Diseases* (ICD), which makes it easy to track worldwide trends in psychological disorders.

TABLE 48.1 Insomnia Disorder

• Feeling unsatisfied with amount or quality of sleep (trouble falling asleep, staying asleep, or returning to sleep)
• Sleep disruption causes distress or diminished everyday functioning
• Happens three or more nights each week
• Occurs during at least three consecutive months
• Happens even with sufficient sleep opportunities
• Independent from other sleep disorders (such as narcolepsy)
• Independent from substance use or abuse
• Independent from other mental disorders or medical conditions
Information from: American Psychiatric Association (2022).

In real-world tests *(field trials)* assessing the DSM-5 categories' reliability, some diagnoses fared well and others fared poorly (Freedman et al., 2013). Clinician agreement on adult posttraumatic

stress disorder and childhood *autism spectrum disorder,* for example, was near 70 percent. (If one psychiatrist or psychologist diagnosed someone with one of these disorders, there was a 70 percent chance that another mental health worker would independently give the same diagnosis.) But for *antisocial personality disorder* and *generalized anxiety disorder,* agreement was closer to 20 percent.

Critics have long faulted the DSM for casting too wide a net and bringing "almost any kind of behavior within the compass of psychiatry" (Eysenck et al., 1983). Some worried that the DSM-5's (2013) even wider net would extend the pathologizing of everyday behavior. For example, the DSM-5 classified severe grief following the death of a loved one as a possible *depressive disorder.* Critics wondered whether such grief—which one grieving person described as "not a problem to be solved, but a process to be lived through"—might instead be considered a common human reaction to tragic life events (Perry, 2022). The DSM-5-TR (2022) responded to this concern with the newly classified *prolonged grief disorder,* diagnosed only when bereavement-related grief lasts more than a year (or 6 months for children and adolescents) and disrupts daily life. Yet grief varies in duration—for some 3 months, for some a year, and for some, a lifetime. "There is no uniform expiration date on normal grief," argue Joanne Cacciatore and Allen Francis (2022). "Pathologizing grief is an insult to the dignity of loving relationships."

A newer *dimensional* approach to classification (in which symptoms are present along a continuum) that builds on the DSM is the U.S.

National Institute of Mental Health's Research Domain Criteria (RDoC) project (Cuthbert, 2022; NIMH, 2022). This dimensional approach argues that mental health problems are a common part of day-to-day life and that people who have one symptom of a disorder are just as worthy of receiving treatment as those who have all of a disorder's symptoms. The RDoC framework fosters "new research approaches that will lead to better diagnosis, prevention, intervention, and cures" (NIMH, 2022). Clinical psychologists, for example, may explore how neural, genetic, and childhood trauma factors influence the development of mental disorders (Damme et al., 2022; Li et al., 2022; Tiecher et al., 2022). Other dimensional approaches, such as the Hierarchical Taxonomy of Psychopathology (HiTOP), recognize different numbers of symptoms and the connections between disorders (Kotov et al., 2017).

Other critics of classification register a more basic complaint—that diagnostic labels, whether categorical or dimensional, can be subjective or even value judgments masquerading as science. Once we label a person, we view that person differently. Labels can change reality by putting us on alert for evidence that confirms our view. If we hear that a new co-worker is mean-spirited, we may treat them suspiciously. They may, in turn, react to us as a mean-spirited person would. Ditto if we're led to believe that someone is smart. Teachers who were told certain students were "gifted" then acted in ways that elicited the behaviors they expected (Snyder, 1984). Labels can be self-fulfilling, and if negative, they convey a stigma.

In one study, therapists watched recorded interviews. If told the interviewees were job applicants, the therapists perceived the interviewees as typical people (Langer & Abelson, 1974; Langer & Imber, 1980). Other therapists who were told they were watching cancer or psychiatric patients perceived the same interviewees as "different from most people." Therapists who thought they were watching an interview of a psychiatric patient perceived him as "frightened of his own aggressive impulses," a "passive, dependent type," and so forth. People, especially in high-income countries, tend to stigmatize those with psychological disorders (Wüsten & Lincoln, 2022). Increasing mental health education, and promoting contact between those who have psychological disorders and those who do not, can reduce this stigma (Corrigan et al., 2012, 2014).

> **"Portray [people with mental illness] sympathetically, and portray them in all the richness and depth of their experience as people, and not as diagnoses."** — American legal scholar and professor Elyn Saks, diagnosed with schizophrenia (TED talk, A Tale of Mental Illness, 2012)

Labels also have power outside the laboratory. Getting a job or finding a place to rent can be a challenge for people recently released from a psychiatric hospital. Label someone as "mentally ill" and people may fear them as potentially violent. That reaction is fading as people increase their understanding of psychological disorders. Public figures have helped foster this understanding by speaking openly about their own struggles with disorders such as anxiety, depression,

and substance abuse—and about how beneficial it was to seek help, receive a diagnosis, and get better through treatment.

So, labels matter. Despite their risks, diagnostic labels have benefits. They help mental health professionals communicate about their cases and study the causes and treatments of disorders. Clients are often relieved to learn that their challenges have a name, and that they are not alone in experiencing their symptoms.



Kevin Mazur/Getty Images

The struggle is real Actor Dwayne "The Rock" Johnson has been vocal about his struggle with depression. "Struggle and pain is real," he said. "I was devastated and depressed" (Parker, 2018). He also "found that, with depression, one of the most important things

you could realize is that you're not alone" (Mosbergen, 2015).

Ask Yourself

Have you or someone you know been diagnosed with a psychological disorder? How do you think a diagnostic label has helped or hurt?

Retrieval Practice

RP-4 What is the value, and what are the dangers, of labeling people with disorders?

ANSWERS IN APPENDIX E

Risk of Harm to Self and Others

People with psychological disorders are more likely to harm themselves than are people without such disorders. Are they also more likely to harm others?

Understanding Suicide

LOQ 48-4

What factors increase the risk of suicide, and what do we know about nonsuicidal self-injury?

Each year some 160,000 Americans are among the drug, alcohol, or suicide "deaths of despair" (Case & Deaton, 2020). Have you ever, in a moment of despair, considered suicide? If so, you have much company. Among the many who entertain the thought, each year some 703,000 despairing people worldwide will complete the act, electing a permanent solution to what might have been a temporary problem (WHO, 2022a). Someone will likely die by suicide in the 40 or so seconds it takes you to read this paragraph.

For those who have been anxious, the risk of suicide is tripled, and for those who have been depressed, the risk is quintupled (Bostwick & Pankratz, 2000; Kanwar et al., 2013). Yet people seldom elect suicide while in the depths of depression, when energy and initiative are lacking. The risk increases when they begin to rebound and become capable of following through (Chu et al., 2016).

> **"But life, being weary of these worldly bars,**
> **Never lacks power to dismiss itself."**
>
> — William Shakespeare, *Julius Caesar,* 1599

Comparing the suicide rates of different groups, researchers have found

- ***national differences:*** Guyana has more than double the suicide rate of the United States, which has double that of Spain (WHO,

2022b). Within Europe, Lithuanians have been five times more likely to die by suicide than Greeks.

- ***racial differences:*** Within the United States, White and Native American people die by suicide roughly twice as often as Black, Hispanic, and Asian people (Curtin & Hedegaard, 2019). The rate among Indigenous Canadians is triple that of other Canadians (Kumar & Tjepkema, 2019).
- ***gender differences:*** Women are much more likely than men to consider or attempt suicide. But worldwide, men are twice as likely to actually die by suicide (ONS, 2019; Ritchie et al., 2019; WHO, 2022b). The methods men use, such as firing a bullet into the head, are more lethal. In the United States, for example, only 13 percent of all suicide attempts end in death—but for those using firearms, that number mushrooms to 90 percent (Juskalian, 2019).
- ***trait differences:*** Suicidal thoughts increase when perfectionists feel driven to reach a goal or standard—to become thin or straight or rich—and find it unattainable (Chatard & Selimbegović, 2011; Smith et al., 2018).
- ***age differences:*** In late adulthood, rates increase worldwide, with the highest rate among those over age 70 (Ritchie et al., 2019).
- ***other group differences:*** Suicide rates have been much higher among the high-income, the nonreligious, and the unmarried (Chen et al., 2020; Norko et al., 2017; VanderWeele et al., 2016, 2017). Gay, transgender, and gender-nonconforming youth who face an unsupportive environment, including family or peer rejection, are also at increased risk of attempting suicide

(Goldfried, 2001; Haas et al., 2011; Hatzenbuehler, 2011; Testa et al., 2017). One in two transgender adults has contemplated suicide, and one in four has attempted suicide (Adams & Vincent, 2019; Yockey et al., 2022).

- ***seasonal differences:*** Suicide rates are highest in April and May, and not (as commonly believed) over the winter holidays (Nock, 2016).
- ***year-by-year differences:*** In most countries, suicide deaths have been decreasing. But in the United States and Canada, suicide deaths have trended upward (FIGURE 48.2). For example, between 2009 and 2019, U.S. high school students' suicide rate increased by 62 percent (CDC, 2019; SAMHSA, 2019). (See the What Drives Us modules for a discussion of social media and teen mental health.)

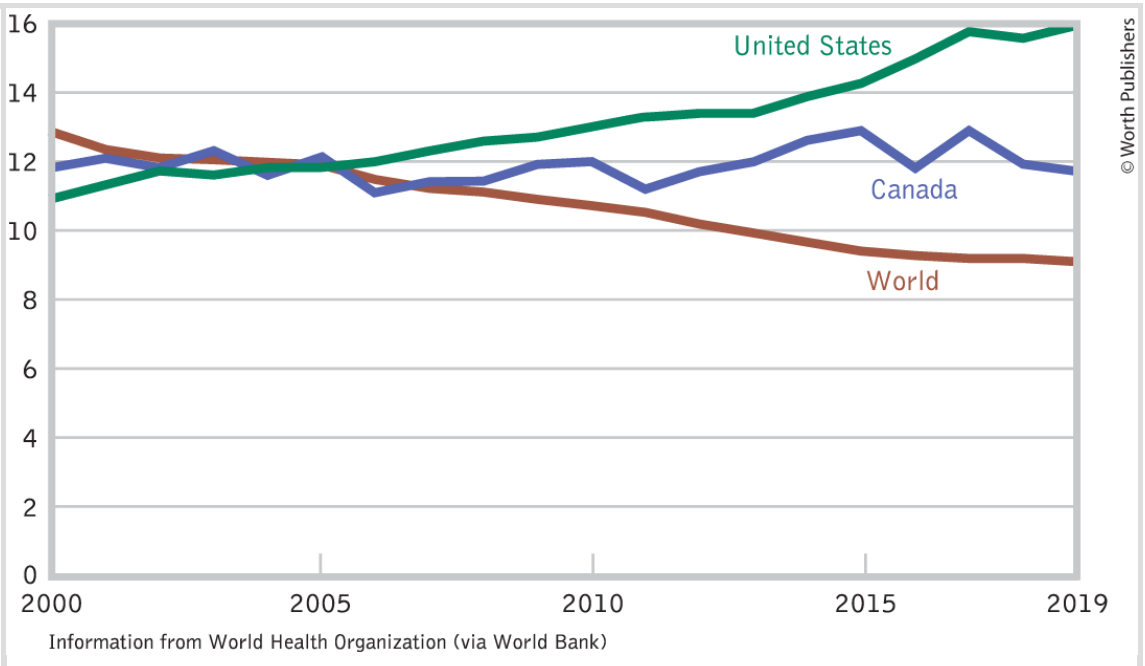


FIGURE 48.2 Suicide death rates, 2000 to 2019 The annual number of suicide deaths per 100,000 people has trended downward worldwide, but upward in the United States

(Ritchie et al., 2022).

Social suggestion may trigger suicidal thinking and behavior. One analysis of 17 million Twitter users' data showed that sharing suicidal thoughts had a ripple effect, spreading suicidal thinking through one's social network (Cero & Witte, 2020). Following highly publicized suicides and TV programs featuring suicide, rates of suicide sometimes increase (Niederkrotenthaler et al., 2019). Sometimes, suicide reverberates throughout a family tree. One 36-year Danish study tracked suicides among 4.4 million people between 1980 and 2016 (Ranning et al., 2022). People were 3.2 times more likely to die by suicide if exposed to a parent's suicide.

Suicide is rarely an act of hostility or revenge. People—especially older adults—may choose death as an alternative to current or future suffering, a way to switch off unendurable pain or relieve a perceived burden on family members. Suicidal urges typically arise when people feel like they don't belong or are a burden to others, when they feel demoralized, or when they are unable to experience joy (Chu et al., 2018; Costanza et al., 2022). Three examples of difficult life circumstances increasing suicide risk:

- The Covid-19 pandemic brought widespread unemployment and social isolation, and a tripling of suicidal thinking (CDC, 2020).
- Following the January 6, 2021, attack on the U.S. Capitol, four of its police officers died by suicide.

- In Britain, 35 percent of women attempting suicide had experienced intimate partner violence in the past year (McManus et al., 2022).

> **"People desire death when two fundamental needs are frustrated to the point of extinction: The need to belong with or connect to others, and the need to feel effective with or to influence others."** — Thomas Joiner (2006, p. 47)

In hindsight, families and friends may recall signs they believe should have forewarned them—verbal hints, giving possessions away, a sudden mood change, or withdrawal and preoccupation with death (Bagge et al., 2017). To judge from surveys of 84,850 people across 17 nations, about 9 percent of people at some point in their lives contemplate suicide. About 3 in 10 of those who think about it will actually attempt suicide; of those, fewer than 1 in 20 will die by suicide (Han et al., 2016; Nock et al., 2008; WHO, 2020).



MARIO ANZUONI/REUTERS/Alamy Stock Photo

Suicide prevention Rapper Lil Nas X was the Trevor Project's 2021 Suicide Prevention Advocate of the Year. The Trevor Project,

which works to prevent suicide and crisis among LGBTQ young people, cited Lil Nas X's mental health advocacy and openness about his sexual orientation and suicidal ideation.

Suicide is difficult to predict. Over the past 50 years, researchers have conducted hundreds of studies examining suicide risk factors, which have yielded little conclusive evidence on whether a person will die by suicide (Knipe et al., 2022). Today's researchers continue to try to solve the suicide puzzle with newer methods and technologies. Using an app that harvests phone data, investigative teams have gained clues to suicide risk by studying teen volunteers' tone of voice, language, photos, music choice, sleep disturbances, and angry words in text messages (Glenn et al., 2020; Servick, 2019). Other researchers are seeking to identify *epigenetic* marks that predict suicide death (Punzi et al., 2022). And still other research teams are developing suicide-predicting AI (artificial intelligence) algorithms using psychological assessments, health records, or social media posts (Ribeiro et al., 2019; Simon et al., 2018; Walsh et al., 2017).

About 46,000 Americans a year die by suicide, half using guns (CDC, 2022). (Poison and drug overdoses account for about 80 percent of suicide *attempts,* but only 14 percent of suicide fatalities.) U.S. states with high gun ownership are states with high suicide rates, even after controlling for poverty and urbanization (Siegel & Rothman, 2016). After Missouri repealed its tough handgun law, its suicide rate went up 15 percent; when Connecticut enacted such a law, its suicide rate dropped 16 percent (Crifasi et al., 2015). Thus, although U.S. gun

owners often keep a gun to feel safer, having a gun in the home makes one less safe, because it substantially *increases* the odds of a family member dying by suicide or homicide (Miller et al., 2022; VPC, 2015; Vyse, 2016).

How can we be helpful to someone who is talking about suicide—who says, for example, "I wish I could just end it all" or "I hate my life; I can't go on"? If people write such things online, you can anonymously contact various social media safety teams (including on Facebook, Twitter, Instagram, YouTube, and Snapchat). If a classmate, friend, or family member talks about suicide, you can

1. ***listen,*** empathize, and offer hope;
2. ***connect*** the person with their campus counseling center; with (in the United States) the 988 Suicide & Crisis Lifeline (by dialing 988) or Crisis Text Line (by texting HOME to 741741); or with support services in other countries (such as CrisisServicesCanada.ca); and
3. ***protect*** someone who appears at immediate risk by seeking help from your campus health or counseling service, a doctor, the nearest hospital emergency room, or 911. Better to disclose a secret than to attend a funeral. Remain connected—online or in person—until the person gets the help they need.

By synthesizing the available evidence, experts have outlined a variety of strategies for community-based suicide prevention (**TABLE 48.2**). Developing and implementing policies and programs based on these strategies—involving the cooperation of educators, health care providers, government officials, and community activists—aims to

enhance individual and community resilience, reducing suicide risk for all.

TABLE 48.2 Community-Based Suicide Prevention Strategies

Strategy	Example
Build economic security	Make sure people have enough money to meet their basic needs (food, shelter), such as by offering job skills training or public housing.
Ensure access to mental health care providers	Lobby health insurance companies to cover mental health conditions. Create programs in communities to ensure enough money to hire mental health care providers.
Create safe environments	Reduce access to firearms among people at risk of suicide. Create community policies to reduce excessive alcohol use.
Promote social connections	Promote programs that bring people together and foster a connection to the local community.
Teach coping and problem-solving skills	Offer free programs teaching parenting skills and relationship strategies.
Identify and support people at risk	Train people to identify warning signs of suicide risk in others and get them the help they need.
Prevent future risk	Encourage those at risk to regularly check in with mental health care providers.

Information from: Stone et al., 2017

Nonsuicidal Self-Injury

Self-harm takes many forms. Some people—mostly adolescents and females—engage in *nonsuicidal self-injury (NSSI)* (Mercado et al., 2017) (FIGURE 48.3). They may, for example, cut or burn their skin, hit themselves, or insert objects under their nails or skin.

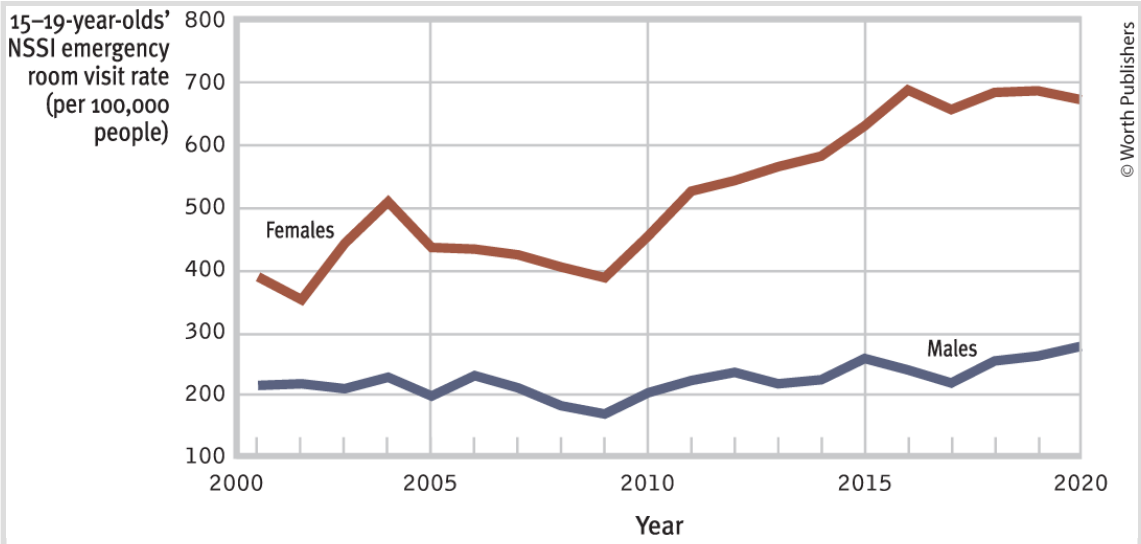


FIGURE48.3 Rates of U.S. nonsuicidal self-injury emergency room visits Self-injury rates peak higher for 15- to 19-year-old females than for same-age males (Mercado et al., 2017). Other countries, including Canada and England, have simultaneously experienced the same gender difference and upward trend (Ritchie et al., 2022).

Those who engage in NSSI often have experienced harassment, stress, or bullying (either as the target of bullies, or as bullies themselves) (Miller et al., 2019; Nesi et al., 2021). They are generally less able to tolerate and regulate emotional distress (Hamza et al., 2015). They are

often both self-critical and impulsive (Beachaine et al., 2019; Cassels et al., 2020).

NSSI is often self-reinforcing (Cummings et al., 2021). People who engage in NSSI may

- find relief from intense negative thoughts through the distraction of pain.
- attract attention and possibly get help.
- relieve guilt by punishing themselves.
- get others to change their negative behavior (bullying, criticism).
- fit in with a peer group.

Does NSSI lead to suicide? Usually not. Those who engage in NSSI are typically suicide gesturers, not suicide attempters (Liu et al., 2022; Nock & Kessler, 2006). Nevertheless, NSSI is a risk factor for suicidal thoughts and future suicide attempts, especially when co-existing with a bipolar disorder (Geulayov et al., 2019). If people do not find help, their nonsuicidal behavior may escalate to suicidal thoughts and, finally, to suicide attempts. Thankfully, various forms of psychotherapy can benefit people who engage in NSSI (Prada et al., 2018; Turner et al., 2014).

Does Disorder Equal Danger?

LOQ 48-5

Do psychological disorders predict violent behavior?

September 16, 2013, started like any other Monday at the Navy Yard in Washington, DC, with people arriving early to begin work. Then government contractor Aaron Alexis entered the building and began shooting. An hour later, 13 people were dead—including Alexis, who had a history of mental illness and had earlier written that an "ultra low frequency attack is what I've been subject to for the last three months. And to be perfectly honest, that is what has driven me to this."

This mass shooting, like many others since, reinforced public perceptions that people with psychological disorders pose a threat (Barry et al., 2013; Jorm et al., 2012). "People with mental illness are getting guns and committing these mass shootings," said U.S. Speaker of the House Paul Ryan (2015). In one survey, 84 percent of Americans agreed that "increased government spending on mental health screening and treatment" would be a "somewhat" or "very" effective "approach to preventing mass shootings at schools" (Newport, 2012). "Anybody who shoots somebody else has a mental health challenge," said Texas Governor Greg Abbott in the aftermath of the 2022 Uvalde, Texas, school massacre (Hixenbaugh & Siemaszko, 2022).

Can clinicians indeed foretell who is likely to do harm? *No.* Most violent criminals and mass murderers are not mentally ill, and most mentally ill people are not violent (Brucato et al., 2021; Whiting et al., 2021). Moreover, clinical prediction of violence is unreliable. The few people with disorders who commit violent acts tend to be either those, like the Navy Yard shooter, who experience threatening delusions and

hallucinated voices that command them to act, or those who abuse substances (Douglas et al., 2009; Elbogen et al., 2016; Fazel et al., 2009, 2010).



Top: Eric Gay/AP Photo; bottom: Marco Bello/REUTERS/Alamy Stock Photo

Mental health and mass shootings Following mass shootings such as the 2022 Uvalde, Texas, slaughter of 19 schoolchildren and 2 adults, people wondered: Could mental health workers identify people who are violence-prone and remove their right to gun ownership? Not likely. Most homicide "is committed by healthy people in the grip of everyday emotions using guns" (Friedman, 2017).

People with disorders are more likely to be *victims* than perpetrators of violence (Buchanan et al., 2019). According to the U.S. Surgeon General's Office (1999, p. 7), "there is very little risk of violence or harm to a stranger from casual contact with an individual who has a mental disorder." Better predictors of violence are alcohol or drug use, previous violence, gun availability, and—as in the case of the repeatedly head-injured and ultimately homicidal National Football League player Aaron Hernandez—brain damage (Belson, 2017). Mass-killing shooters have one more thing in common: They are mostly young males.

Ask Yourself

Why do you think people often believe those with psychological disorders are dangerous?

Retrieval Practice

RP-5 The presence of a gun in a home makes it less likely that a family member will die. True or false?

RP-6 Those with psychological disorders are more likely to be victims of violence rather than perpetrators of violence. True or false?

ANSWERS IN APPENDIX E

Rates of Psychological Disorders

LOQ 48-6

How many people have, or have had, a psychological disorder? What are some of the risk factors?

Who is most vulnerable to psychological disorders? At what times of life? To answer such questions, many countries have conducted lengthy structured interviews with their citizens. After asking hundreds of questions that probed for symptoms (for example, "Has there ever been a period of two weeks or more when you felt like you wanted to die?"), researchers have estimated the current, prior-year, and lifetime prevalence of various disorders. (See **TABLE 48.3**.)

TABLE 48.3 Percentage in the U.S. Reporting Selected Psychological Disorders "in the Past Year"

Psychological Disorder	Percentage
Phobia of specific object or situation	9.1
Major depressive disorder	7.8
Social anxiety disorder	7.1
Attention-deficit/hyperactivity disorder (ADHD)	4.4
Posttraumatic stress disorder (PTSD)	3.6
Bipolar disorders	2.8

Generalized anxiety disorder	2.7
Obsessive-compulsive disorder (OCD)	1.2
Schizophrenia	< 0.5
Data from: National Institute of Mental Health (2018).	

Do rates of psychological disorder vary by place? The Global Burden of Disease Study estimated the prevalence of mental disorders in 204 countries and territories (GBD, 2022; **FIGURE 48.4**). Cultures vary. For example, the highest rates of eating disorders are in high-income Monaco and Australia, and the lowest rates in low-income Somalia.

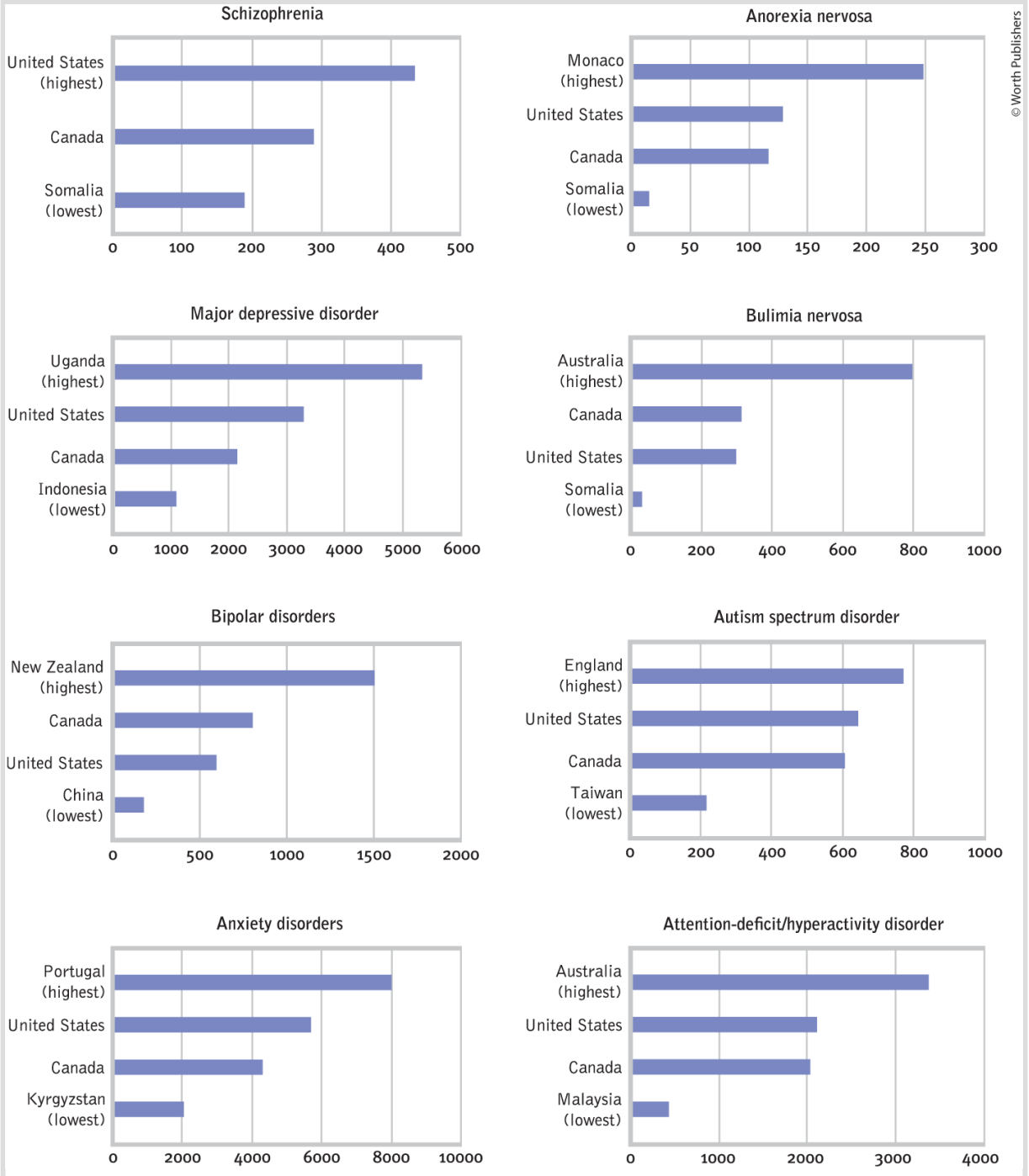


FIGURE 48.4 Highest and lowest rates of selected disorders worldwide These data, from an investigation of 204 countries and territories, show the number of cases per 100,000 people (controlling for age). The United States and Canada are shown for comparison. (Data from GBD, 2022.)

Moreover, immigrants to the United States from Mexico, Africa, and Asia averaged better mental health than their U.S.-born counterparts with the same ethnic heritage (Breslau et al., 2007; Maldonado-Molina et al., 2011). For example, compared with Mexican Americans born in the United States, Mexican Americans who have recently immigrated are less at risk for mental disorders—a phenomenon known as the *immigrant paradox* (Salas-Wright et al., 2018).

What increases vulnerability to mental disorders? As **TABLE 48.4** indicates, there are various risk and protective factors for mental disorders. One predictor—poverty—crosses ethnic and gender lines. The incidence of serious psychological disorders is 2.5 times higher among those below the poverty line (CDC, 2014). This poverty-disorder correlation raises further questions: Does poverty cause disorders? Or do disorders cause poverty? The answer varies with the disorder. Schizophrenia understandably leads to poverty. Yet poverty can cause distress that increases the risk of certain disorders. A recession-related financial, job, or housing loss may produce lingering depression and anxiety (Forbes & Krueger, 2019).

TABLE 48.4 Risk and Protective Factors for Mental Disorders

Level	Risk factors	Protective factors
Individual attributes	Low self-esteem	Self-esteem, confidence
	Cognitive/emotional immaturity	Ability to solve problems and manage stress or adversity

	Difficulties in communicating	Communication skills
	Medical illness, substance use	Physical health, fitness
Social circumstances	Loneliness, bereavement	Social support of family and friends
	Neglect, family conflict	Good parenting/positive family interaction
	Exposure to violence/abuse	Physical security and safety
	Low income and poverty	Economic security
	Difficulties or failure at school	Scholastic achievement
	Work stress, unemployment	Satisfaction and success at work
Environmental factors	Poor access to basic services	Equality of access to basic services
	Injustice and discrimination	Social justice, tolerance, integration
	Social and gender inequalities	Social and gender equality
	Exposure to war or disaster	Physical security and safety
Information from WHO, 2012.		

As economic development enabled a dramatic poverty-rate reduction for the North Carolina Eastern Band of Cherokee Indians, researchers saw the opportunity for a natural experiment that could investigate the poverty-pathology link. They tracked the community's rates of children's behavior problems over time. When the study began, children of poverty exhibited more deviant and aggressive behaviors. After 4 years, children whose families had moved above the poverty line exhibited a 40 percent decrease in behavior problems. But children whose families remained in poverty or were never in poverty exhibited no change (Costello et al., 2003).

At what times of life do disorders strike? About half of people with a disorder experience their first symptoms by the mid-teens, and three-quarters do so by the mid-twenties (Kessler et al., 2007; Robins & Regier, 1991). Among the earliest to appear are the symptoms of antisocial personality disorder (median age 8) and of phobias (median age 10). Alcohol use disorder, obsessive-compulsive disorder, bipolar disorders, and schizophrenia symptoms appear at a median age near 20. Major depressive disorder often hits somewhat later, at a median age of 25.

Retrieval Practice

RP-7 What is the relationship between poverty and psychological disorders?

ANSWERS IN APPENDIX E

REVIEW

Module 48: Introduction to Psychological Disorders

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 48-1: How should we draw the line between typical behavior and a disorder?

LOQ 48-2: How do the medical model and the biopsychosocial approach influence our understanding of psychological disorders?

LOQ 48-3: How and why do clinicians classify psychological disorders, and why do some psychologists criticize diagnostic labels?

LOQ 48-4: What factors increase the risk of suicide, and what do we know about nonsuicidal self-injury?

LOQ 48-5: Do psychological disorders predict violent behavior?

LOQ 48-6: How many people have, or have had, a psychological disorder? What are some of the risk factors?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

psychological disorder
medical model
epigenetics
DSM-5-TR

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. Two major disorders that are found worldwide are schizophrenia and _____ _____ _____.

2. Robert is embarrassed that it takes him several minutes to parallel park his car. He usually gets out of the car once or twice to inspect his distance, both from the curb and from

the nearby cars. Should he worry about having a psychological disorder?

3. A therapist says that psychological disorders are illnesses, and people with these disorders should be treated as patients in a hospital. This therapist's belief reflects the _____ model.

4. What is an example of a culturally related psychological disorder?

5. Many psychologists reject the disorder-as-illness view and instead contend that other factors may also be involved—for example, the person's level of stress and ways of coping. This view represents the _____ approach.
   a. medical
   b. epigenetics
   c. biopsychosocial
   d. diagnostic

6. Why is the DSM, and the DSM-5 in particular, considered controversial?

7. _____ (Women/Men) are more likely than _____ (women/men) to die by suicide.

8. The symptoms of _____ appear around age 10; _____ tend[s] to appear later, around age 25.
   a. schizophrenia; bipolar disorders

b. bipolar disorders; schizophrenia
c. major depressive disorder; phobias
d. phobias; major depressive disorder

MODULE 49: Anxiety Disorders, Obsessive-Compulsive and Related Disorders, Trauma- and Stressor-Related Disorders, and Somatic Symptom and Related Disorders

Anxiety is part of life. Speaking in front of a class, peering down from a ladder, or waiting to learn the results of a final exam can make any of us feel anxious.

Anxiety can both help us and hurt us. Anxiety, it has been said, keeps us alive while also diminishing our living. A little anxiety prompts action and keeps us safe, but persistent anxiety can overwhelm and paralyze us. It may cause us to avoid talking or making eye contact —"shyness," we call it. Fortunately for most people, this uneasiness is neither intense nor persistent.

Some people, however, are especially prone to fearing the unknown and noticing and remembering perceived threats—as if living while horror-movie background music plays (Gorka et al., 2017; Mitte, 2008). When the brain's danger-detection system becomes hyperactive—with fearsome pop-up thoughts—we are at greater risk for an *anxiety disorder* and three other disorders involving anxiety: *obsessive-*

compulsive disorder (OCD), posttraumatic stress disorder (PTSD), and the *somatic symptom disorders.*

Anxiety Disorders

LOQ 49-1

How do generalized anxiety disorder, panic disorder, and specific phobias differ?

The **anxiety disorders** are marked by distressing, persistent anxiety or by dysfunctional anxiety-reducing behaviors. For example, people with **social anxiety disorder** become extremely anxious in social settings where others might judge them, such as parties, class presentations, or even eating in public. People with social anxiety may experience palpitations, tremors, blushing, and sweating when giving a presentation, taking an exam, or meeting an authority figure, fearing embarrassment or rejection. By avoiding eye contact or staying home, they can temporarily avoid anxious feelings. But in the long run, such strategies are maladaptive: Avoiding others prevents them from learning to cope and leaves them feeling lonely (Günther et al., 2021; Oren-Yagoda et al., 2022; Rapee et al., 2022).

Let's take a closer look at three other anxiety disorders:

- ***generalized anxiety disorder,*** in which a person, for no apparent reason, worries about many different things they cannot control and is continually tense and uneasy;

- ***panic disorder,*** in which a person experiences one or more *panic attacks*—sudden episodes of intense dread and "fight or flight" arousal—and fears a future panic attack; and
- ***specific phobias,*** in which a person is intensely and excessively afraid of a specific object, activity, or place.

Generalized Anxiety Disorder

For two years, Tom, a 27-year-old electrician, was bothered by dizziness, sweating palms, and heart palpitations. He felt on edge and sometimes found himself shaking. Tom mostly hid his symptoms from his family and co-workers. But he allowed himself few other social contacts, and occasionally he felt so anxious he would leave work. Neither his family doctor nor a neurologist could find any physical problem.

Tom's experiences suggest **generalized anxiety disorder**, which is marked by excessive and uncontrollable worry that persists for 6 months or more. People with this condition (two-thirds are women) worry continually, and they are often jittery, agitated, and sleep-deprived (McLean & Anderson, 2009). Their *autonomic nervous system* arousal may leak out through furrowed brows, twitching eyelids, trembling, perspiration, or fidgeting. Concentration suffers, as everyday worries demand continual attention. Emotions can feel overwhelming, confusing, and hard to manage (Mennin et al., 2005).

Those affected usually cannot identify, relieve, or avoid their anxiety. To use Sigmund Freud's term, the anxiety is *free-floating* (not linked to a specific stressor or threat). Generalized anxiety disorder often co-occurs with a depressed mood. But even without depression, generalized anxiety disorder tends to be disabling. Moreover, it may lead to physical problems, such as high blood pressure. As time passes, however, emotions tend to mellow, and by age 50, generalized anxiety disorder becomes relatively rare (Rubio & López-Ibor, 2007).

Panic Disorder

Some people experience intense anxiety that escalates into a terrifying panic attack—a several-minutes-long episode of intense fear that something horrible is about to happen. The body's fight-or-flight system goes into overdrive: Irregular heartbeat, chest pains, shortness of breath, choking, trembling, or dizziness may accompany the panic. One woman recalled suddenly feeling

> hot and as though I couldn't breathe. My heart was racing and I started to sweat and tremble and I was sure I was going to faint. Then my fingers started to feel numb and tingly and things seemed unreal. It was so bad I wondered if I was dying and asked my husband to take me to the emergency room. By the time we got there (about 10 minutes) the worst of the attack was over and I just felt washed out (Greist et al., 1986).



© Walt Disney Pictures/Entertainment Pictures/Alamy Stock Photo

Understanding panic At age 7, actor Emma Stone started having panic attacks. While playing at a friend's house, she became convinced that the house was on fire. "There was nothing in me that didn't think we were going to die," she said (Gonzalez, 2018). Therapy and meditation have helped Stone cope with her anxiety. Today, she says, publicly discussing her anxiety helps her "own it and realize that this is something that is part of me but it's not who I am."

For the 3 percent of people with **panic disorder**, panic attacks recur. These anxiety tornados strike suddenly, wreak havoc, and disappear, but are not forgotten. Ironically, worries about anxiety—perhaps fearing another panic attack, or fearing anxiety-related symptoms in public—can amplify anxiety symptoms (Olatunji & Wolitzky-Taylor, 2009). After several panic attacks, people may avoid situations where panic might strike (**FIGURE 49.1**). People with panic disorder are two to three times more likely than the general population to think about or attempt suicide (Zhang et al., 2022).

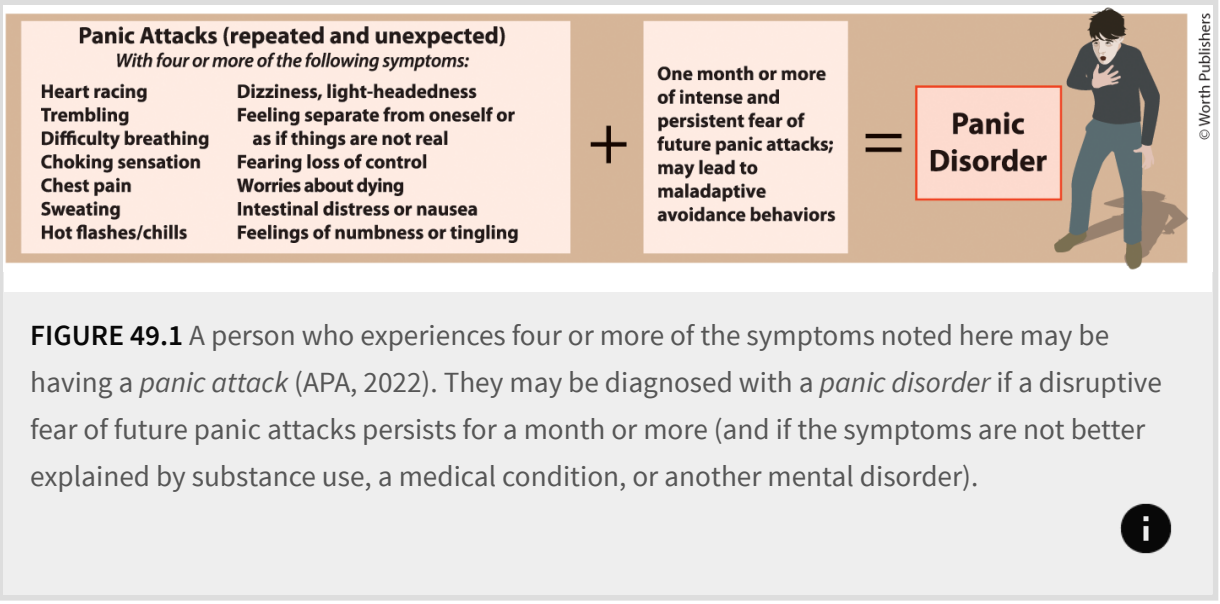


FIGURE 49.1 A person who experiences four or more of the symptoms noted here may be having a *panic attack* (APA, 2022). They may be diagnosed with a *panic disorder* if a disruptive fear of future panic attacks persists for a month or more (and if the symptoms are not better explained by substance use, a medical condition, or another mental disorder).

If their fear is intense enough, people with panic disorder may also develop *agoraphobia*—fear or avoidance of public situations from which escape might be difficult. People with agoraphobia may avoid being outside the home, in a crowd, or at a coffee shop or grocery store. Smokers have at least a doubled risk of panic disorder and greater symptoms when they do have an attack (Knuts et al., 2010; Zvolensky & Bernstein, 2005). Because nicotine is a stimulant, lighting up doesn't lighten us up.

Charles Darwin began experiencing panic disorder at age 28, after spending 5 years sailing the world. He moved to the country, avoided social gatherings, and traveled only in his wife's company. But the relative seclusion did free him to elaborate his evolutionary theory. "Even ill health," he reflected, "has saved me from the distraction of society and its amusements" (quoted in Ma, 1997).

Specific Phobias

We all live with some fears. But people with **specific phobias** are consumed by a persistent, excessive fear and avoidance of some object, activity, or place—for example, animals, insects, heights, blood, or enclosed spaces (FIGURE 49.2). Many people avoid the triggers (such as high places) that arouse their fear, and they manage to live with their phobia. Others are incapacitated. Marilyn, an otherwise healthy and happy 28-year-old, feared thunderstorms so much that she felt anxious as soon as a weather forecaster mentioned possible storms later in the week. If her husband was away when a storm was forecast, she often stayed with a close relative. During a storm, she hid from windows and buried her head to avoid seeing the lightning.

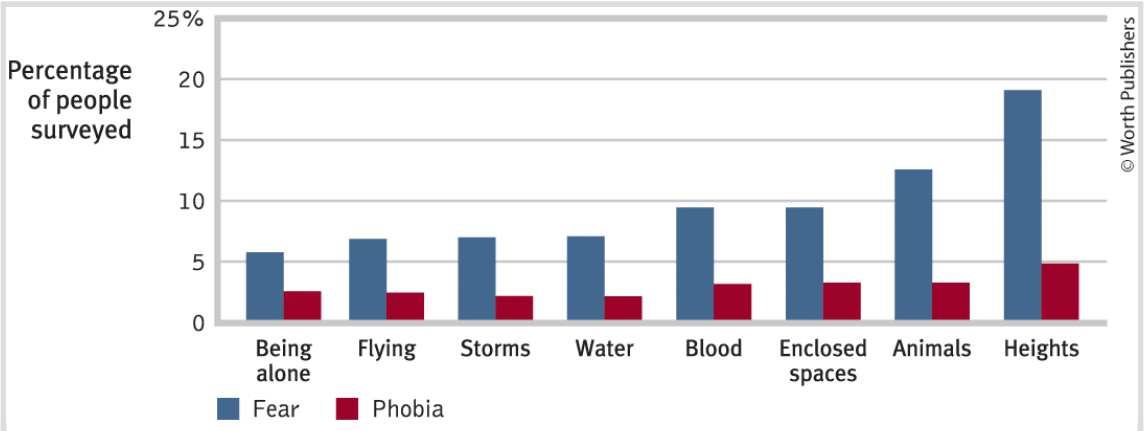


FIGURE 49.2 Some common specific fears Researchers surveyed Dutch people to identify the most common events or objects they feared. An intense fear becomes a specific phobia if it provokes a compelling, irrational desire to avoid the dreaded object or situation. (Data from Depla et al., 2008.)

Retrieval Practice

RP-1 Unfocused tension, apprehension, and arousal are symptoms of _____ _____ disorder.

RP-2 Those who experience unpredictable periods of terror and intense dread, accompanied by frightening physical sensations, may be diagnosed with _____ disorder.

RP-3 If a person is focusing anxiety on specific feared objects, activities, or situations, that person may have a _____ _____.

ANSWERS IN APPENDIX E

Obsessive-Compulsive and Related Disorders

LOQ 49-2

What is *OCD?*

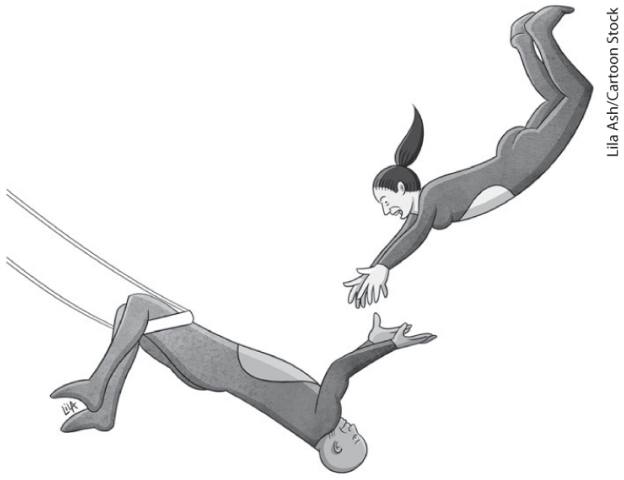
Obsessive-compulsive and related disorders are characterized by the presence of obsessions and compulsions. *Obsessive thoughts* are unwanted, intrusive, and persistent. *Compulsive behaviors* are responses to those thoughts. As with the anxiety disorders, we can see aspects of **obsessive-compulsive disorder (OCD)** in our everyday behavior.

We are all at times obsessed with thoughts, and we may behave compulsively. Have you ever felt a bit anxious about how your living space will appear to others and found yourself checking and cleaning one last time before your guests arrived? Or, perhaps worried about an upcoming exam, you caught yourself lining up your study materials "just so" before studying? Our everyday lives are full of little rehearsals and fussy behaviors. They cross the fine line between "typical" and "disordered" only when they *persistently interfere* with everyday living and cause distress. Checking that you locked the door is typical; checking 10 times is not. (TABLE 49.1 offers more examples.) At some time during their lives, often during their late teens or early adulthood, about 2 percent of people cross that line from typical preoccupations and fussiness to debilitating disorder (Kessler et al., 2012). Although people know their anxiety-fueled obsessive thoughts are irrational, the thoughts can become so haunting, and the compulsive rituals so intensely time-consuming, that effective functioning—including healthy sleep and school success—becomes nearly impossible (Pérez-Vigil et al., 2018; Segal & Carmona, 2022).

TABLE 49.1 Common Obsessions and Compulsions Among Children and Adolescents With Obsessive-Compulsive Disorder

	Thought or Behavior	Percentage Reporting Symptom

Obsessions (repetitive *thoughts*)	Concern with dirt, germs, or toxins	40
	Something terrible happening (fire, death, illness)	24
	Symmetry, order, or exactness	17
Compulsions (repetitive *behaviors*)	Excessive hand washing, bathing, toothbrushing, or grooming	85
	Repeating rituals (in/out of a door, up/down from a chair)	51
	Checking doors, locks, appliances, car brakes, homework	46
Data from: Rapoport, 1989.		



"Wait—did you wash your hands?"

OCD is more common among teens and young adults than among older people (Samuels & Nestadt, 1997). A 40-year follow-up study of 144 Swedes diagnosed with the disorder found that, for most, the

obsessions and compulsions had gradually lessened, though only 1 in 5 had completely recovered (Skoog & Skoog, 1999).



Kelly Sullivan/Getty Images

Writing with OCD Author John Green's personal experience with obsessive-compulsive disorder informed his novel, *Turtles All the Way Down* (Flood, 2017). Green explained: "It's like there is an invasive weed that just spreads out of control. It starts out with one little thought and then slowly that becomes the only thought that you're able to have, the thought that you're … trying desperately to distract yourself from" (Gross, 2018).

Some people experience other OCD-related disorders, such as *hoarding disorder* (cluttering their space with acquired possessions they can't part with), *body dysmorphic disorder* (preoccupation with perceived body defects; repeatedly checking their appearance in the

mirror), *trichotillomania* (hair-pulling disorder), or *excoriation* (skin-picking) *disorder.* Many people have some clutter in their living space or feel sensitive about their appearance. But for these common behaviors and feelings to be considered an OCD-related disorder, they must occur frequently and disrupt people's lives—their social life, work, or daily functioning.

Trauma- and Stressor-Related Disorders

LOQ 49-3

What is *PTSD?*

While serving overseas, one soldier, Jesse, saw the killing "of children and women. It was just horrible for anyone to experience." Back home, he experienced "real bad flashbacks" (Welch, 2005). Jesse is not alone. In one study of 104,000 veterans returning from Iraq and Afghanistan, 25 percent were diagnosed with a psychological disorder (Seal et al., 2007). The most frequent diagnosis was **posttraumatic stress disorder (PTSD)**, one of the **trauma- and stressor-related disorders**. Survivors of terror, torture, sexual assault, earthquakes, and refugee displacement have also exhibited PTSD (Charlson et al., 2016; Nichter et al., 2022). The hallmark symptoms are recurring vivid, distressing memories and nightmares. PTSD also often entails laser-focused attention on possible threats, social withdrawal, and

jumpy anxiety (Clauss et al., 2022; Fried et al., 2018). To cope with PTSD symptoms, people sometimes engage in harmful alcohol use (Luciano et al., 2022).

Many of us will experience a traumatic event at some point in our lives. Yet most people, after traumatic experiences, display *resiliency* by returning to their baseline of healthy functioning (Galatzer-Levy et al., 2018). During the early months of the Covid pandemic, people's self-reported anxiety and depression rose sharply, and then—displaying human resilience—subsided (Banks et al., 2021; Fancourt et al., 2021).

Although philosopher Friedrich Nietzsche's (1889/1990) idea that "what does not kill me makes me stronger" is not true for all, about half of trauma survivors report *posttraumatic growth*—marked by a greater appreciation for life and its close relationships, more compassion, or increased spirituality and life purpose (X. Wu et al., 2019). The trauma remains a negative, but it can change one's perspective for the better. Sometimes, tears enable triumphs.



Chip Somodevilla/Getty Images

PTSD in Parkland In the 2018 Parkland, Florida, school shooting, Samantha Fuentes (at right) witnessed friends dying, and shrapnel struck her face and legs. She later reported PTSD symptoms, including a fear of returning to the school, and jumping at the sound of a slammed door. Two other student survivors died by suicide in 2019, including one diagnosed with PTSD (Mazzei, 2019).

Why do some 5 to 10 percent of people develop PTSD after a traumatic event while others do not (Bonanno et al., 2011)? Multiple factors, including personality and social support, matter. One important influence is the amount of emotional distress: The higher the distress (such as the level of physical torture suffered by prisoners of war), the greater the risk for posttraumatic symptoms (King et al., 2015; Ozer et al., 2003). In a study of child survivors of the 2020 Beirut port explosion—which killed 200 people and injured 7,000—children who were near the blast (compared to children who were in the region, but far from the site of the catastrophe) had quadruple the risk of a subsequent PTSD diagnosis (Maalouf et al., 2022).



Fadel Itani/NurPhoto/Alamy Stock Photo

Closeness to terror In the 2020 Beirut port explosion (pictured here), the 2001 terrorist attack in New York, and the 2011 massacre at a Norwegian summer camp, the closer survivors were to the heart of the terror, the more likely PTSD became (Bonanno et al., 2006; Glad et al., 2020).

What else influences PTSD development? Individual differences in memory processing matter. In memory testing of people affected by a Paris terror attack, those who experienced PTSD exhibited more difficulty inhibiting unwanted memories than did those not experiencing PTSD (Mary et al., 2020).

Exposure to violence also increases the risk of experiencing PTSD. African American and Puerto Rican people who experienced repeated violent crime, such as being threatened with a weapon or assaulted, also faced a higher-than-average risk of experiencing PTSD (Pahl et al., 2020). Other studies show that 1 in 4 U.S. college women experience sexual assault, and those who were assaulted had a higher-than-average risk of PTSD (AAU, 2020; Dworkin et al., 2017).

Some people may have a more sensitive emotion-processing limbic system that floods their bodies with stress hormones (Duncan et al., 2017; Kosslyn, 2005). Genes and gender also matter. Twins, compared with nontwin siblings, more commonly share PTSD risk factors (Gilbertson et al., 2006). And after a traumatic event, women

experience PTSD more often than do men (Olff et al., 2007; Ozer & Weiss, 2004).

Some psychologists believe that PTSD has been overdiagnosed (Dobbs, 2009; McNally, 2003). Too often, say critics, PTSD gets stretched to include typical stress-related bad memories and dreams. And some well-intentioned procedures—such as "debriefing" people by asking them to revisit the experience and vent their emotions immediately after the traumatic event—may worsen stress reactions (Bonanno et al., 2010; Wakefield & Spitzer, 2002).

Retrieval Practice

RP-4 Those who experience unwanted repetitive thoughts or actions may have _____-_____ disorder.

RP-5 Those with symptoms of recurring memories and nightmares, social withdrawal, jumpy anxiety, numbness of feeling, and/or insomnia for weeks after a traumatic event may be diagnosed with _____ _____ disorder.

ANSWERS IN APPENDIX E

Somatic Symptom and Related

Disorders

LOQ 49-4

What is a *somatic symptom disorder?*

Among the common problems bringing people into doctors' offices are "medically unexplained illnesses" (Johnson, 2008). Earl becomes dizzy and nauseated shortly before he expects his wife home. Neither his primary care physician nor a neurologist can identify a physical cause. They suspect his symptoms have an unconscious psychological origin, possibly triggered by his feelings about his wife. Earl has a **somatic symptom disorder** (formerly known as *somatoform disorder*).

We have all experienced inexplicable physical symptoms under stress. Being told the problem is "all in your head" gives no comfort. Although the symptoms may be psychological in origin, they are genuinely felt. One person may have a variety of complaints—vomiting, dizziness, blurred vision, difficulty swallowing. Another may experience severe and prolonged pain. Such symptoms become a disorder when they are associated with significant distress and impaired functioning.

Cultural context greatly affects people's physical complaints and how they explain them (Kirmayer & Sartorius, 2007). In China, anxiety disorders are the most common psychological disorder (Huang et al., 2019). Yet psychological explanations of anxiety and depression are

socially less acceptable there than in many Western countries, so people less often express the emotional aspects of distress. The Chinese appear more sensitive to—and more willing to report—the physical symptoms of their distress (Ryder et al., 2008).

Somatic symptom and related disorders send people not to a psychologist or psychiatrist but to a physician. This is especially true of those who experience **illness anxiety disorder** (previously called *hypochondriasis*). People with this relatively common disorder interpret normal sensations (a stomach cramp today, a headache tomorrow) as symptoms of a dreaded disease. No amount of reassurance by any physician convinces the patient that the trivial symptoms do not reflect a serious illness. So, the patient moves on to another physician—seeking and receiving more medical attention, but failing to confront the disorder's psychological roots. Other patients with illness anxiety disorder cope with their fears by avoiding medical care.

Ask Yourself

Can you recall (as most people can) times when you have fretted needlessly over a normal bodily sensation?

Retrieval Practice

RP-6 What does *somatic* mean, and how does it apply to a *somatic symptom disorder?*

ANSWERS IN APPENDIX E

Understanding Anxiety Disorders, Obsessive-Compulsive and Related Disorders, Trauma- and Stressor-Related Disorders, and Somatic Symptom and Related Disorders

LOQ 49-5

How do learning, cognition, and biology contribute to the feelings and thoughts that mark anxiety disorders, OCD, PTSD, and somatic symptom disorders?

Anxiety is a feeling. It is also a cognition—a doubt-laden self-evaluation. How do these anxious feelings and thoughts arise? Most psychologists attribute them to learning, cognition, and biology.

Learning

Through *classical conditioning* (see Learning modules), our fear responses can become linked with formerly neutral objects and events. To understand the link between learning and anxiety, researchers have given lab rats unpredictable electric shocks (Schwartz, 1984). The rats were like assault survivors who report

feeling anxious when returning to the scene of the crime: They learned to become uneasy in their lab environment.

Likewise, anxious or traumatized people learn to associate their anxiety with certain cues (Christian & Levinson, 2022). In one survey, 58 percent of those with social anxiety disorder experienced their disorder after a traumatic event (Öst & Hugdahl, 1981). Anxiety or an anxiety-related disorder is more likely to develop when bad events happen unpredictably and uncontrollably (Field, 2006; Mineka & Oehlberg, 2008). Black people residing in the United States and Canada who experience frequent racial discrimination—a type of bad event that is both unpredictable and out of their control—are at greater risk of anxiety (Paradies et al., 2015; Kogan et al., 2022). Even a single painful and frightening event may trigger a full-blown phobia, thanks to classical conditioning's *stimulus generalization* and operant conditioning's *reinforcement.*

Stimulus generalization occurs when a person experiences a fear-provoking event and later develops a fear of similar events. My [DM's] car was once struck by a driver who missed a stop sign. For months afterward, I felt a twinge of unease when any car approached from a side street. Combat veterans exposed to frequent explosions may experience panic attacks and flashbacks at the sound of fireworks.

Reinforcement helps maintain learned fears and anxieties. Anything that enables us to avoid or escape a feared situation can reinforce maladaptive behaviors. Fearing a panic attack, we may decide not to

leave the house. Reinforced by feeling calmer, we are likely to repeat that behavior (Antony et al., 1992). So, too, with compulsive behaviors. If washing our hands relieves our feelings of anxiety, we may rewash our hands when those feelings return.

Cognition

Conditioning influences our feelings of anxiety, but so do our thoughts, memories, interpretations, and expectations. By observing others, we can learn to fear what they fear. Nearly all monkeys raised in the wild fear snakes, but lab-raised monkeys do not. Surely, most wild monkeys do not actually suffer snake bites. Do they learn their fear through observation?

To find out, Susan Mineka (1985, 2002) experimented with six monkeys raised in the wild (all strongly fearful of snakes) and their lab-raised offspring (virtually none of which feared snakes). After repeatedly observing the wild-raised monkeys refuse to reach for food in the presence of a snake, the lab-raised monkeys developed a similar strong fear of snakes that persisted when retested 3 months later. We humans similarly learn fears by observing others (Helsen et al., 2011; Olsson et al., 2007).

Although it pays to be alert to dangers, anxiety is often a response to the “fake news” we produce ourselves. One study that followed people with anxiety disorders found that more than 9 in 10 of their worries proved groundless (LaFreniere & Newman, 2020). Such people tend to

be *hypervigilant*. They more often *interpret* stimuli as threatening (Everaert et al., 2018). A pounding heart signals a heart attack; a lone spider indicates an infestation; an everyday disagreement with a friend spells a doomed relationship. And they more often *remember* threatening events (Van Bockstaele et al., 2014). Anxiety is especially common when people cannot switch off such intrusive thoughts and feel helpless (Franklin & Foa, 2011).

Ask Yourself

What is a fear that you have learned? How were conditioning or cognition involved?

Biology

Conditioning and cognition can't explain all aspects of anxiety disorders, OCD, or trauma-related disorders like PTSD. Our biology also plays a role. Physically stronger people, for example, tend to be less anxious (Kerry & Murray, 2021). And men, who are often physically stronger than women, also tend to live with less self-protective anxiety (Benenson et al., 2021; Courtright et al., 2013).

Genes

Among monkeys, fearfulness runs in families. A monkey reacts more strongly to stress if its close biological relatives are anxiously reactive (Suomi, 1986). So, too, with people. Although twins, in general, are not at higher risk for disorders, if one identical twin has an anxiety

disorder, the other is also at risk (Polderman et al., 2015). Even when raised separately, identical twins may develop similar specific phobias (Carey, 1990; Eckert et al., 1981). One pair of separated identical twins independently became so afraid of water that each would wade into the ocean backward and only up to her knees. Another pair of twins with OCD rarely left their house, took hours-long showers, used five bottles of disinfecting rubbing alcohol daily, and, tragically, died together in an apparent suicide pact (Schmidt, 2018).

Given the genetic contribution to anxiety disorders, researchers are sleuthing the culprit genes. Researchers have identified gene variations associated with typical anxiety disorder symptoms (Purves et al., 2020). Other teams have found genes associated specifically with OCD or PTSD (Girgenti et al., 2021; Lin et al., 2022). But remember that behavior is typically influenced by *many genes each having small effects.* Thus, large-scale research further explores how the whole of our genome predicts anxiety (Smoller, 2020).

Some genes may influence anxiety disorders by regulating brain levels of neurotransmitters. These neurotransmitters include

- *serotonin,* which influences sleep, mood, and attending to threats;
- *glutamate,* which heightens activity in the brain's alarm centers; and
- *GABA,* which inhibits neural activity to produce a calming effect (Pergamin-Hight et al., 2012; Ross et al., 2021; Welch et al., 2007).

So genes matter. Some people have genes that make them like orchids—fragile, yet capable of beauty under favorable circumstances. Others are like dandelions—hardy, and able to thrive in varied circumstances (Ellis & Boyce, 2008; Pluess & Belsky, 2013).

But experience affects gene expression. A history of wartime trauma or child abuse can leave long-term *epigenetic marks.* These molecular tags attach to our chromosomes and turn certain genes on or off. Thus, traumatic experiences can increase the likelihood that a genetic vulnerability to a disorder such as PTSD will be expressed (Wang et al., 2022; Zannas et al., 2015).

The Brain

Our experiences change our brain, paving new pathways. Traumatic fear-learning experiences can leave tracks in the brain, altering fear circuits within the amygdala (Couette et al., 2022; Kredlow et al., 2022). These fear pathways create easy inroads for more fear experiences (Armony et al., 1998).

Social anxiety disorder, generalized anxiety disorder, panic attacks, specific phobias, OCD, and PTSD express themselves biologically as overarousal of brain areas involved in impulse control and habitual behaviors. These disorders reflect the brain's danger-detection system gone hyperactive—producing anxiety when little danger exists. In OCD, for example, when the brain detects that something is amiss, it seems to generate a mental hiccup of repeating thoughts (obsessions) or actions (compulsions) (Gehring et al., 2000). Brain scans of people

with OCD reveal elevated activity in specific brain areas during behaviors such as compulsive hand washing, checking, organizing, or hoarding (Insel, 2010; Mataix-Cols et al., 2004, 2005). The *anterior cingulate cortex,* a brain region that monitors our actions and checks for errors, is often especially hyperactive (Chavanne & Robinson, 2021) (**FIGURE 49.3**).

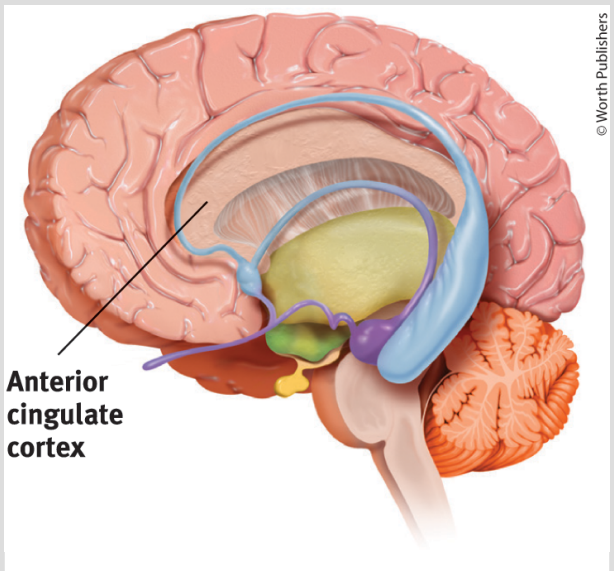


FIGURE 49.3 An obsessive-compulsive brain
When people engaged in a challenging cognitive task, those with OCD showed the most activity in the anterior cingulate cortex in the brain's frontal lobe (Maltby et al., 2005).

Some antidepressant drugs dampen this fear circuit activity and its associated obsessive-compulsive behavior. Fears can also be blunted by giving people drugs as they recall and then rerecord ("reconsolidate") a traumatic experience (Kindt et al., 2009; Norberg et

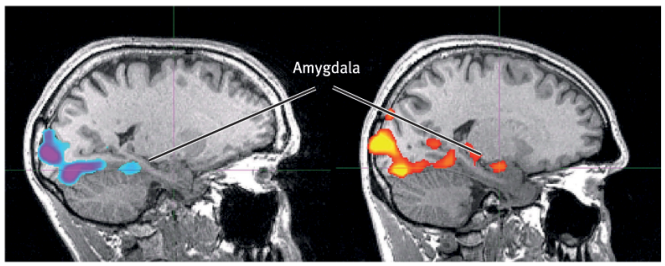
al., 2008). Although they don't forget the experience, the associated emotion is largely erased.

Natural Selection

We seem biologically prepared to fear threats faced by our ancestors. Our specific phobias focus on particular fears such as spiders, snakes, and other animals; enclosed spaces and heights; storms and darkness. Those fearless about these occasional threats were less likely to survive and leave descendants. Nine-month-old infants attend more to sounds signaling ancient threats (hisses, thunder) than they do to sounds representing modern threats (a bomb exploding, breaking glass) (Erlich et al., 2013). It is easy to condition and hard to extinguish fears of such "evolutionarily relevant" stimuli (Coelho & Purkis, 2009; Davey, 1995; Öhman, 2009). Some of our modern fears (such as of flying) can also have an evolutionary explanation (a biological predisposition to fear confinement and heights).

Just as our specific phobias sometimes focus on dangers faced by our ancestors, so our compulsive acts typically exaggerate behaviors that contributed to our species' survival. Grooming had survival value. Gone wild, it becomes compulsive hair pulling. Washing up becomes relentless hand washing. And securing territorial boundaries becomes checking and rechecking already locked doors (Rapoport, 1989).





Alex Honnold Control subject

Left: Peter Bohler/Redux Pictures; right: Jane E. Joseph

Fearless The biological perspective helps us understand why most people fear heights more than Alex Honnold does. In 2017, he became the first person to free solo (climb without safety ropes) Yosemite National Park's massive El Capitan granite wall. (*Free Solo,* a documentary about this feat, won a 2019 Oscar.) When psychologist Jane Joseph showed Honnold fear-inducing images in the lab, an fMRI scan found his fear-processing amygdala minimally responsive (Donovan, 2019). (The red and yellow indicate increased amygdala activation in the control subject—also a rock climber—while Honnold's brain shows less activation in that region.)

Retrieval Practice

RP-7 In addition to conditioning and cognition, what *biological* factors contribute to anxiety disorders, OCD, PTSD, and somatic symptom disorders?

ANSWERS IN APPENDIX E

REVIEW

Module 49: Anxiety Disorders, Obsessive-Compulsive and Related Disorders, Trauma- and Stressor-Related Disorders,

and Somatic Symptom and Related Disorders

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 49-1: How do generalized anxiety disorder, panic disorder, and specific phobias differ?

LOQ 49-2: What is *OCD?*

LOQ 49-3: What is *PTSD?*

LOQ 49-4: What is a *somatic symptom disorder?*

LOQ 49-5: How do learning, cognition, and biology contribute to the feelings and thoughts that mark anxiety disorders, OCD, PTSD, and somatic symptom disorders?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

anxiety disorders
social anxiety disorder
generalized anxiety disorder
panic disorder
specific phobia
obsessive-compulsive disorder (OCD)
posttraumatic stress disorder (PTSD)
trauma- and stressor-related disorders
somatic symptom disorder
illness anxiety disorder

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. An episode of intense dread that can be accompanied by chest pains, choking, or other frightening sensations is called
   a. an obsession.
   b. a compulsion.
   c. a panic attack.
   d. a specific phobia.

2. Anxiety that takes the form of an irrational and maladaptive fear of a specific object, activity, or situation is called a _____ _____.

3. Marino became consumed with the need to clean the entire house and refused to participate in any other activities. His family consulted a therapist, who diagnosed him as having _____ - _____ disorder.

4. When a person with an anxiety disorder eases anxiety by avoiding or escaping a situation that inspires fear, this is called
   a. free-floating anxiety.
   b. reinforcement.
   c. an epigenetic mark.
   d. hypervigilance.

5. The learning perspective proposes that specific phobias are
   a. the result of individual genetic makeup.
   b. a way of repressing unacceptable impulses.
   c. conditioned fears.
   d. a symptom of having been abused as a child.

MODULE 50: Depressive Disorders and Bipolar Disorders

LOQ 50-1

How do depressive disorders and bipolar disorders differ?

What separates depression from sadness? We feel sad when bad things happen—a poor exam grade, a breakup, a job loss. But when feelings of despair or emptiness last for weeks (or even months), psychologists consider this more than just ordinary sadness—it may be depression.

> **"The first thing that goes is happiness. You cannot gain pleasure from anything."**
> — Andrew Solomon, *The Noonday Demon: An Atlas of Depression,* 2001

Have you ever been diagnosed with depression? If so, you are not alone. In one national survey, 27 percent of U.S. college students answered *Yes* (ACHA, 2022). If depressed, you might feel deeply discouraged about the future, dissatisfied with your life, or socially isolated. You may lack the energy to get things done, to see people, or even to force yourself out of bed. You may be unable to concentrate or eat. You may struggle to fall or stay asleep (Pan et al., 2022).

Occasionally, you may think about death and even wonder if you would be better off gone (Li et al., 2022). Perhaps academic success came easily to you before, but now you find that disappointing grades jeopardize your perfectionist goals (Levine et al., 2020). Maybe loneliness or a romantic breakup has plunged you into despair. And perhaps low self-esteem increases your brooding, worsening your self-torment (Orth et al., 2016). Comparing yourself to seemingly happy, successful others on social media, you may think it's just you feeling this way (Jordan et al., 2011). Most of us will have some direct or indirect experience with depression: Misery has more company than we think.

As anxiety can be a response to the threat of future loss, depression is often a response to past and current stress, such as family traumas or repeatedly experienced racism (Chen et al., 2022; Hankerson et al., 2022; Macjejewski et al., 2021). To feel bad in reaction to profoundly sad events, such as the loss of a friend or family member, is to be in touch with reality. In such times, depression is like a car's low-fuel light—a signal to stop and take appropriate measures. As one book title reminds us, there are "good reasons for bad feelings."

People with *major depressive disorder,* however, experience hopelessness and lethargy that doesn't always match the situation, and that lasts several weeks or months (Rottenberg & Hindash, 2015). *Persistent depressive disorder* (also called *dysthymia*) is similar, but with milder depressive symptoms that last 2 years or more. Those with

bipolar disorders (formerly called *manic-depressive disorder*) alternate between depression and overexcited hyperactivity.

> **"My life had come to a sudden stop. I was able to breathe, to eat, to drink, to sleep. I could not, indeed, help doing so; but there was no real life in me."** — Leo Tolstoy, *My Confession,* 1887

Biologically speaking, life's purpose is not constant happiness but survival and reproduction. Coughing, vomiting, and pain protect the body from dangerous toxins and stimuli. Similarly, depression compels us to slow us down and conserve energy (Beck & Bredemeier, 2016; Gershon et al., 2016). When we grind temporarily to a halt and reassess our life, as depressed people do, we can consider how to redirect our energy in ways that may reduce our depression (Watkins, 2008). There can be sense to some suffering.

> **"If someone offers you a pill that would make you happy 100 percent of the time, you should run fast in the other direction.... What good is a compass if it's always stuck on north?"** — Daniel Gilbert (Lambert, 2007)

Even temporary sadness helps people process and recall faces more accurately (Hills et al., 2017). Sadness can also help us be more cooperative, compassionate, and attuned to others (Gruber et al., 2011; Ong et al., 2017). It can enhance our critical thinking (and lessen our chances of being fooled) by increasing our attention to details

(Forgas, 2009, 2013, 2017). Bad moods sometimes serve good purposes. But sometimes depression becomes seriously maladaptive. How do we recognize the fine line between a blue mood and a depressive disorder?

Ask Yourself

Has student life ever made you feel down or depressed? What advice would you have for new students (perhaps advice you wish someone had given to you)?

Depressive Disorders

Joy, contentment, sadness, and despair are different points on a continuum—points at which any of us may be found at any given moment. The difference between a blue mood after bad news and **major depressive disorder**—the most common of the **depressive disorders**—is like the difference between breathlessness after climbing a few flights of stairs and chronic breathing problems (**TABLE 50.1**).

TABLE 50.1 Diagnosing Major Depressive Disorder

The DSM-5-TR classifies major depressive disorder as the presence of at least five of the following symptoms over 2 weeks (must include depressed mood or reduced interest) (American Psychiatric Association, 2022).
• Depressed mood most of the time
• Dramatically reduced interest or enjoyment in most activities most of the time

- Significant challenges regulating appetite and weight
- Significant challenges regulating sleep
- Physical agitation or lethargy
- Feeling listless or with much less energy
- Feeling worthless, or feeling unwarranted guilt
- Problems in thinking, concentrating, or making decisions
- Thinking repetitively of death and suicide



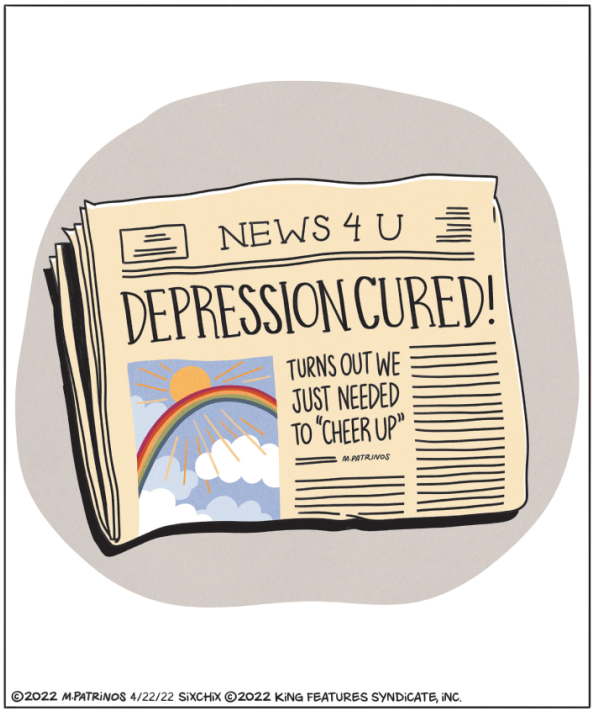
Depression involves multiple symptoms.

Depression varies. You can be depressed in different ways and for different amounts of time. You can be depressed for 2 weeks or more, in the case of major depressive disorder, or for a much longer time

(but with milder symptoms) in the case of persistent depressive disorder. You might feel unusually depressed a week before your menses *(premenstrual dysphoric disorder),* experience parts of depression and anxiety at the same time *(mixed anxiety-depressive disorder),* or feel depressed alongside severe irritability that starts at a young age *(disruptive mood dysregulation disorder)* (American Psychiatric Association, 2022).

> **"Depression is a silent, slow motion tsunami of dark breaking over me."** — Effy Redman, "Waiting for Depression to Lift," 2017

Depression—the number-one reason people seek mental health services—is "a global health crisis," according to a World Psychiatric Association commission (Herrman et al., 2022). In surveys conducted in 15 countries, 5 percent of people reported experiencing a major depressive episode during the prior year (Vigo et al., 2022). U.S. rates were even higher, with 17 percent of adolescents and 8 percent of adults experiencing such an episode (SAMHSA, 2021). Worldwide, depression levels rose dramatically during the Covid-19 pandemic (Zhang & Chen, 2021). Younger adults, women, medical workers, people of color, and those who were unemployed were hardest hit (Fitzpatrick et al., 2020; Gruber et al., 2021; Rossi et al., 2020; Twenge & Joiner, 2020). Michelle Obama (2020) spoke for many: "There have been periods throughout this quarantine where I just have felt too low.... I am dealing with some form of low-grade depression."



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If only it were so easy.

Bipolar Disorders

People with **bipolar disorders** have periods of extremely excited mood and increased energy that can last several days or more. Like depressive disorders, bipolar disorders take different forms depending on how severe the symptoms are and how long they last (see **FIGURE 50.1**). People with *bipolar I disorder,* the most severe form, experience a euphoric, talkative, highly energetic and overly ambitious state called **mania** that lasts a week or longer. Psychiatrist Kay Redfield Jamison described her mania: "When you're high it's tremendous. The ideas and feelings are fast and frequent like shooting stars, and you follow them until you find better and brighter ones" (Jamison, 1996).

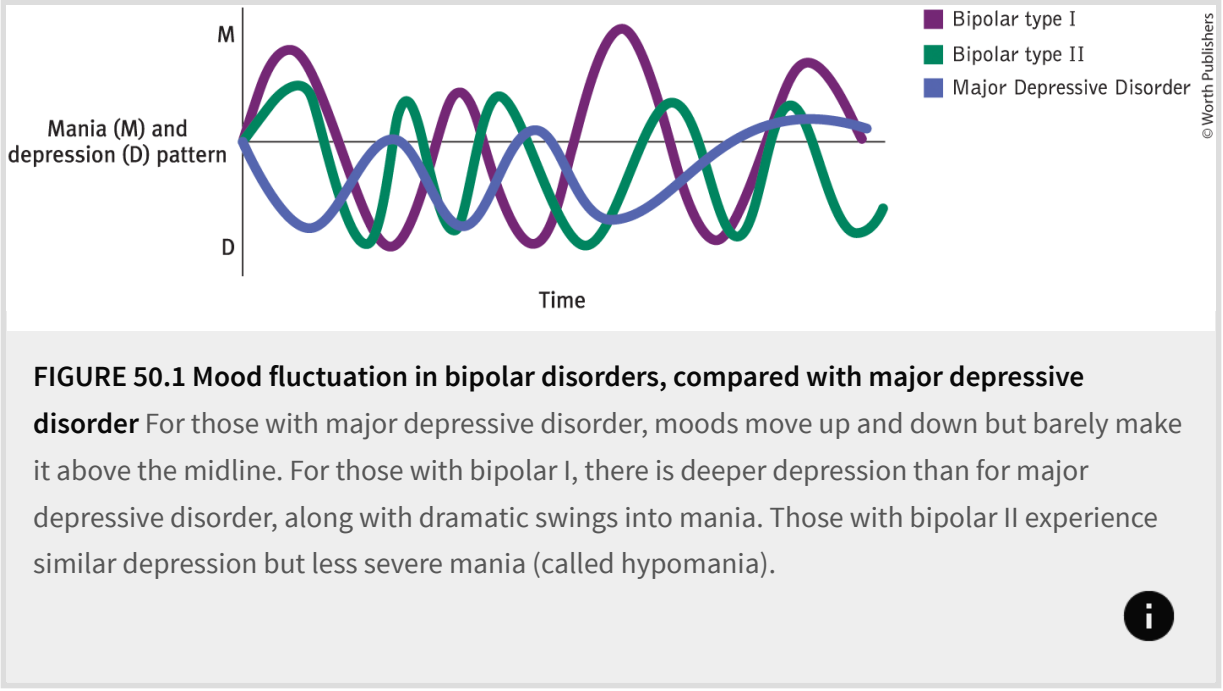


FIGURE 50.1 Mood fluctuation in bipolar disorders, compared with major depressive disorder For those with major depressive disorder, moods move up and down but barely make it above the midline. For those with bipolar I, there is deeper depression than for major depressive disorder, along with dramatic swings into mania. Those with bipolar II experience similar depression but less severe mania (called hypomania).

But before long, many people with bipolar I disorder can plunge into depression. Sometimes they go back and forth, experiencing *rapid cycling* between the highs and lows. Those with *bipolar II disorder* move between depression and a milder *hypomania*.



Life as a Two-Headed Beast: Bipolar, Abigail Southworth

Bipolar disorders Artist Abigail Southworth illustrated her experience of a bipolar disorder.

If depression is living in slow motion, mania is fast forward. Thinking fast feels good, but it also increases risk-taking (Chandler & Pronin, 2012; Pronin, 2013). During the manic phase, people with a bipolar disorder typically have less need for sleep. They show fewer sexual inhibitions. They set overly ambitious goals—like becoming famous or winning the Nobel Prize—and rarely follow through with them (Johnson, 2005). They may be excited and highly positive, no matter what the circumstances (Gruber, 2011). They have trouble regulating their emotions, which can lead to inappropriately persistent positive emotions (Gruber et al., 2019; Miola et al., 2022). Their speech is rapid, flighty, and hard to interrupt. They may ignore advice. Yet they might need assistance to prevent them from engaging in harmful behaviors, such as out-of-control spending, too-fast driving, or unsafe sex.

Mania's energy and flood of ideas can fuel creativity. Genes associated with high creativity increase the likelihood of a bipolar disorder, and risk factors for developing a bipolar disorder predict greater creativity (Taylor, 2017). George Frideric Handel (1685–1759), who may have experienced a bipolar disorder, composed his nearly 3-hour-long *Messiah* (1742) during 3 weeks of intense, creative energy (Keynes, 1980). Robert Schumann composed 51 musical works during 2 years of mania (1840 and 1849) but none during 1844, when he experienced severe depression (Slater & Meyer, 1959). Composers, artists, poets,

novelists, and entertainers seem especially prone to bipolar disorders (Jamison, 1993, 1996; Kaufman & Baer, 2002; Ludwig, 1995). Indeed, one analysis of over a million people showed that the only psychiatric condition linked to working in a creative profession was a bipolar disorder (Kyaga et al., 2013).



Axelle/Bauer-Griffin/Getty Images

Creativity and bipolar disorders There have been many creative artists, composers, writers, and musical performers with a bipolar disorder. Some struggle secretly, as did Mariah Carey for 17 years.

People in the United States are more likely than people in other countries to have been diagnosed with a bipolar disorder, especially among adolescents (GBD, 2022; Merikangas et al., 2011). From 2000 to

2010, U.S. children and adolescents were an astonishing 72 times more likely than English adolescents to receive a bipolar disorder diagnosis (James et al., 2014). The DSM-5-TR (2022) classifications became stricter, resulting in a reduced number of child and adolescent bipolar diagnoses.

Understanding Depressive Disorders and Bipolar Disorders

LOQ 50-2

How can the biological and social-cognitive perspectives help us understand depressive disorders and bipolar disorders?

Today's psychologists continue to investigate why people have depressive disorders and bipolar disorders, and to design more effective treatments and prevention strategies. Here, we focus on major depressive disorder. One research group summarized the facts that any theory of depression must explain (Lewinsohn et al., 1985, 1998, 2003):

- ***Behaviors and thoughts change with depression.*** People in a depressed mood become inactive and feel alone, empty, and without a meaningful future. They have more negative thoughts about themselves *(I am a failure),* the world *(everything is worthless),* and the future *(the future is hopeless).* Depression may be triggered by a sad or stressful event (LeMoult, 2020). Yet even

when nothing bad happens, people with major depressive disorder often feel a heavy sadness. They also recall and expect negative happenings (my team will lose, my grades will fall, my love will fail) (Zetsche et al., 2019).

- ***Depression is widespread, with women everywhere at greater risk.*** Worldwide, 280 million people have depressive disorders and 40 million people have a bipolar disorder (WHO, 2022). There is, however, a considerable depression *gender gap*. Globally, women's risk for major depressive disorder is roughly double men's (GBD, 2022). The gap is especially pronounced among adolescent girls (Kuehner, 2017; see also **FIGURE 50.2**). In general, women are more vulnerable to disorders involving internal states, such as depression, anxiety, and inhibited sexual desire. Women also experience more situations that increase their risk for depression, such as receiving less pay for equal work, experiencing sexual harassment and assault, juggling multiple roles, and more often caring for children and older family members (Freeman & Freeman, 2013). Men's disorders tend to be more external—alcohol use disorder, and disorders related to antisocial conduct and lack of impulse control. Women often get sadder than men do; men often get madder than women do.
- ***Depression sometimes returns.*** For many people, depression comes and, after sustained struggle, it often goes. But for about half of these people, the depression returns (Curry et al., 2011; Klein & Kotov, 2016). For about 20 percent, the condition will be chronic (Klein, 2010).

- ***Stress and negative events often precede depression.*** About 1 person in 4 diagnosed with depression has experienced significant loss or trauma, such as a loved one's death, a ruptured marriage, a physical assault, or a lost job (LeMoult, 2020). Moving to a new culture also increases risk for depression, especially among younger people who have not yet formed their identities (Zhang et al., 2013). And childhood maltreatment and emotional abuse doubles a person's risk of later adult depression (Nelson et al., 2017).
- ***Compared with generations past, depression strikes earlier and more often, with the highest rates among older teens and young adults*** (Cross-National Collaborative Group, 1992; Kessler et al., 2010; Olfson et al., 2015). From 2010 to 2020, depression rates doubled among U.S. 12- to 17-year-olds (SAMHSA, 2021).
- ***Most people with depression can recover on their own and thrive.*** Therapy often speeds recovery. But even without professional help, many people recover amazingly well, do not experience future depression, and achieve "optimal well-being" (Rottenberg & Kashdan, 2022). An enduring recovery is more likely if: The first episode strikes later in life, there were no previous episodes, the person experiences minimal physical or psychological stress, and there is ample social support (Fuller-Thomson et al., 2016).

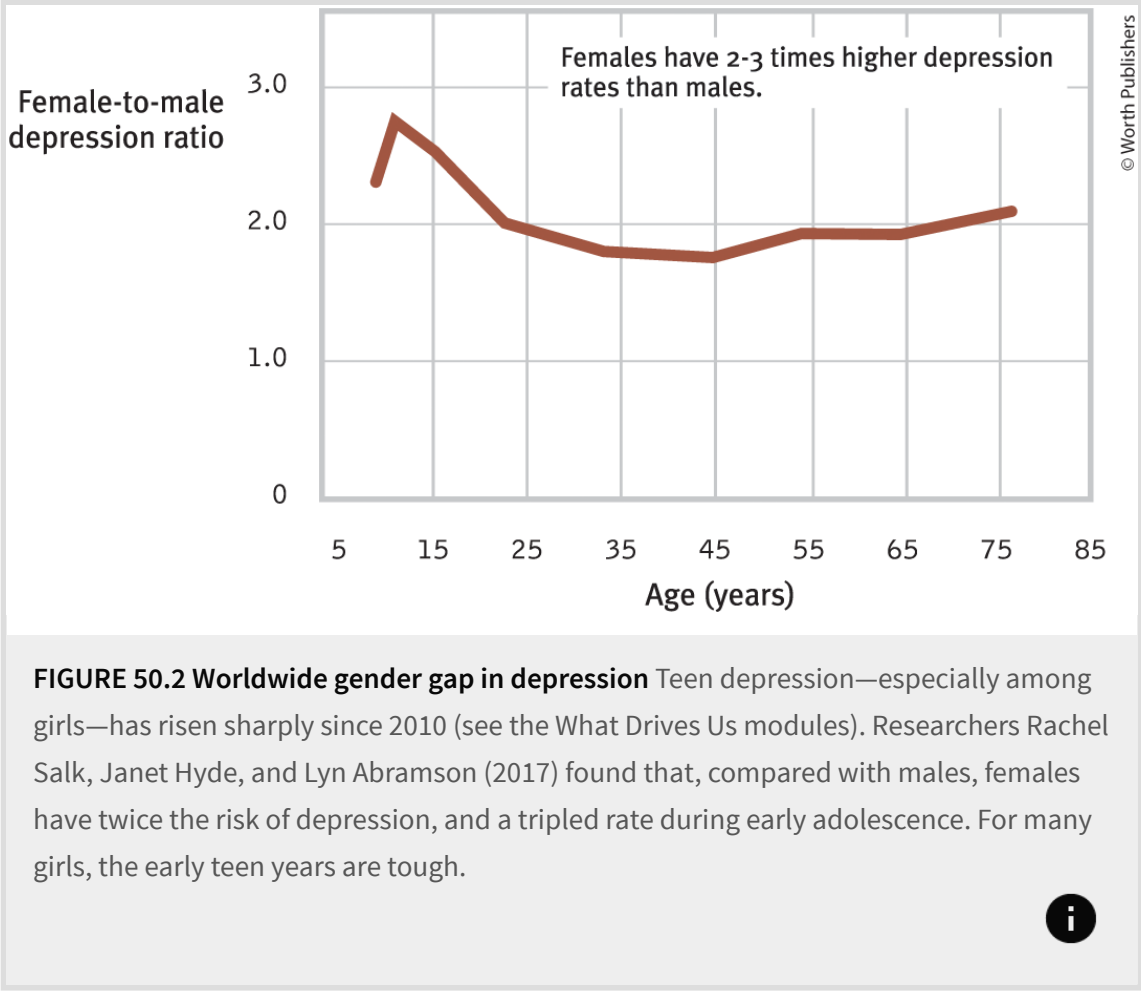


FIGURE 50.2 Worldwide gender gap in depression Teen depression—especially among girls—has risen sharply since 2010 (see the What Drives Us modules). Researchers Rachel Salk, Janet Hyde, and Lyn Abramson (2017) found that, compared with males, females have twice the risk of depression, and a tripled rate during early adolescence. For many girls, the early teen years are tough.

The Biological Perspective

Depression is a whole-body disorder. It involves genetic predispositions and biochemical imbalances, as well as negative thoughts and a gloomy mood.

Genetic Influences

Major depressive disorder and bipolar disorders run in families. As one researcher noted, emotions are "postcards from our genes" (Plotkin, 1994). The risk of being diagnosed with one of these

disorders increases if your parent or sibling has the disorder (Sullivan et al., 2000; Weissman et al., 2016). If one identical twin is diagnosed with major depressive disorder, the chances are about 1 in 2 that at some time the other twin will be, too. If one identical twin has a bipolar disorder, the chances of a similar diagnosis for the co-twin are even higher—7 in 10—even for twins raised apart (DiLalla et al., 1996).

Summarizing the major twin studies, two research teams independently estimated the *heritability*—the extent to which individual differences are attributable to genes—of major depressive disorder at nearly 40 percent (Kendler et al., 2018; Polderman et al., 2015; see also **FIGURE 50.3**). But nurture matters, too. A Swedish national study examined children who had a biological parent with depression. In families where at least one child was raised by the parent with depression and another child was adopted into a different family, those raised in the adoptive homes "had a significantly reduced risk for major depression" (Kendler et al., 2020).

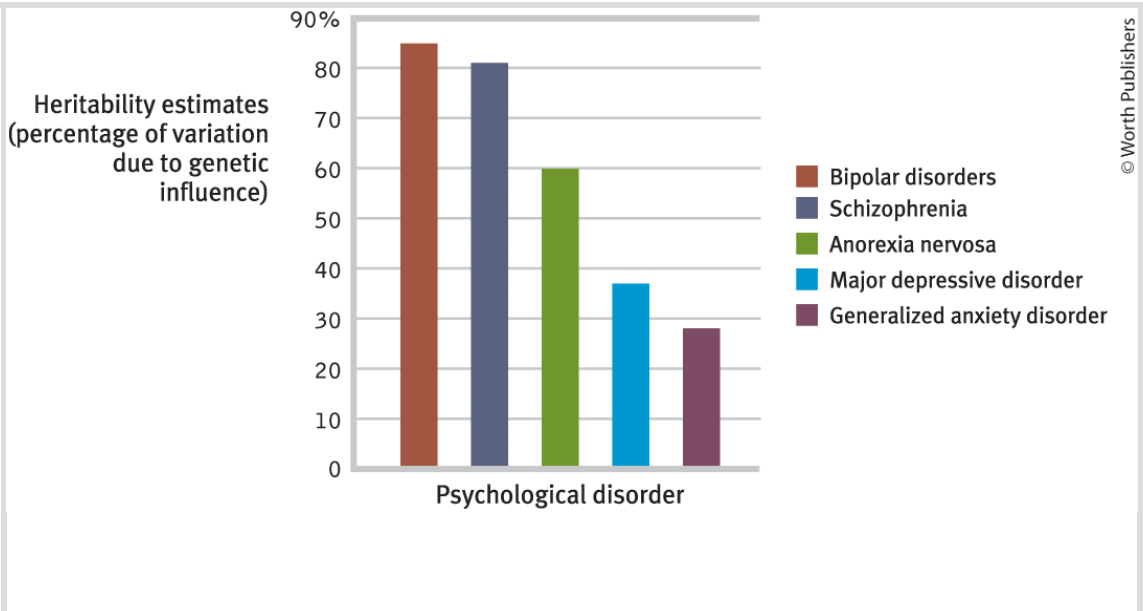


FIGURE 50.3 The heritability of various psychological disorders Using aggregated data from studies of identical and fraternal twins, researchers estimated the heritability of bipolar disorders, schizophrenia, anorexia nervosa, major depressive disorder, and generalized anxiety disorder (Bienvenu et al., 2011). (Heritability was calculated by a formula that compares the extent of similarity among identical versus fraternal twins.)



To tease out the genes that put people at risk for depression, researchers may use *linkage analysis.* First, geneticists find families in which the disorder appears across several generations. Next, the researchers look for differences in DNA from affected and unaffected family members. Linkage analysis points them to a chromosome neighborhood; "A house-to-house search is then needed to find the culprit gene" (Plomin & McGuffin, 2003). But depression is a complex condition. *Many genes* work together, each producing small effects that interact with other factors to increase depression risk. Today's researchers are analyzing the entire human genome to identify genetic variations in depressive and bipolar disorders that may open the door to more personalized and effective drug therapy (Howard et al., 2019; Palmer et al., 2022; Peterson, 2021).

Brain Structure and Activity

Nearly 150 studies have identified unique brain circuitry linked with depression (Zhukovsky et al., 2021). Neuroscientists have also discovered altered brain structures in people with a bipolar disorder, including thin frontal lobes and enlarged fluid-filled ventricles (Angelescu et al., 2021; Zhu et al., 2022).

Scanning devices offer a window into the brain's activity during depressed and manic states. One study gave 13 elite Canadian swimmers the wrenching experience of watching a video of the swim in which they failed to make the Olympic team or failed at the Olympic games (Davis et al., 2008). Functional MRI scans showed the disappointed swimmers experiencing brain activity patterns similar to those of people with depressed moods.

Many studies have found diminished brain activity during slowed-down depressive states, and more activity during periods of mania (**FIGURE 50.4**). Depression can cause the brain's reward centers to become less active, whereas bipolar mania can increase activity in these centers (Dutra et al., 2015; Nusslock et al., 2012).

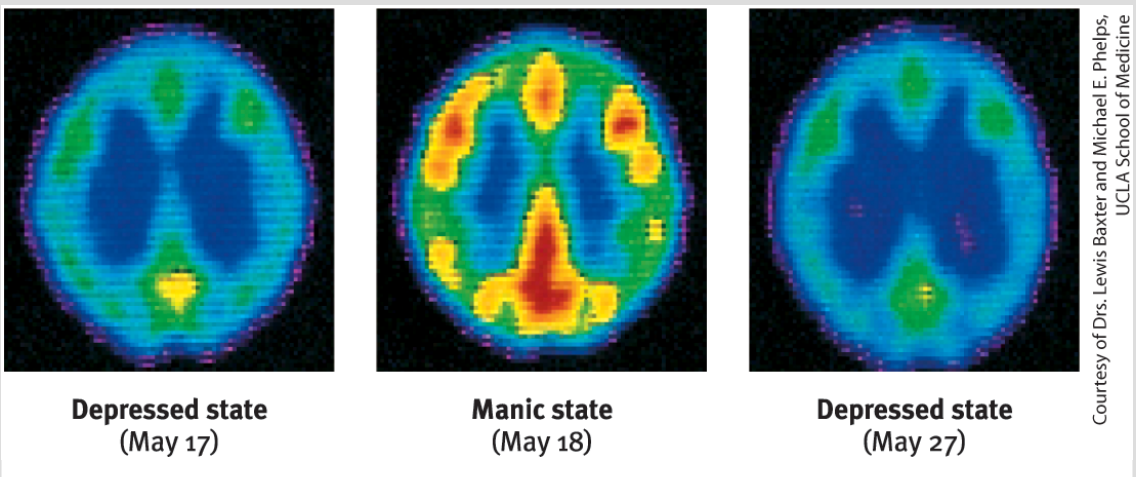


FIGURE 50.4 The ups and downs of a bipolar disorder These top-facing PET scans show that brain energy consumption rises and falls with the patient's emotional changes. Red areas are where the brain rapidly consumes *glucose,* an important energy source.

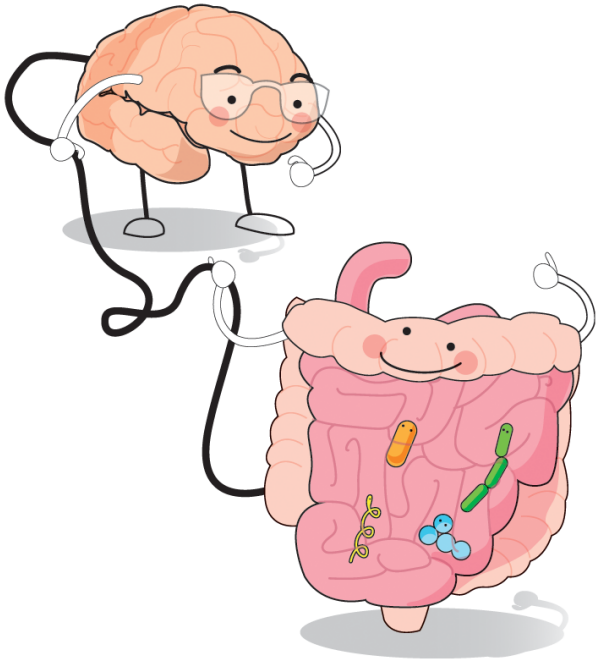
At least two neurotransmitter systems are at work during the periods of altered brain activity that accompany major depressive disorder and bipolar disorders. *Norepinephrine,* which increases arousal and boosts mood, is scarce during depression and overabundant during mania. Drugs that decrease mania reduce norepinephrine. *Serotonin* is also often scarce or inactive during depression, increasing when depression fades (Carver et al., 2008; Svensson et al., 2021). The story of neurotransmitters is still being written, as other researchers have begun to question the reliability of associations between neurotransmitter levels and depression (Moncrieff et al., 2022).

Drugs that relieve depression tend to increase norepinephrine or serotonin supplies by blocking either their reuptake (as Prozac, Zoloft, and Paxil do with serotonin) or their chemical breakdown. Repetitive physical exercise, such as jogging, reduces depression in part because it increases serotonin, which affects mood and arousal (Morres et al., 2019; Wipfli et al., 2011). To run away from a bad mood, some people use their own two feet.

Nutritional Effects

Certain foods, such as refined sugar and red meat, have been linked to *inflammation* (a persistent immune response that can affect many body systems). Inflammation and depression often go hand in hand (Mousten et al., 2022; Osimo et al., 2019). Conversely, what's good for the body is also good for the brain and mind. People who eat a healthy "Mediterranean diet" (heavy on vegetables, fish, whole grains, and

olive oil) reduce inflammation levels, thereby diminishing their risk of depression (Kaplan et al., 2015; Psaltopoulou et al., 2013; Rechenberg, 2016). Excessive alcohol use also correlates with depression, partly because depression can increase alcohol use but mostly because alcohol misuse *leads* to depression (Fergusson et al., 2009).



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Minding the gut Does food modify mood? Digestive system bacteria produce serotonin and other neurotransmitters that influence emotions. Although some researchers think the happy gut/happy brain relationship is overhyped, healthy, diverse gut microbes predict less risk of anxiety, depression, and bipolar disorders (Nikolova et al., 2021). There is, it seems, a biochemistry behind "gut feelings."

The Social-Cognitive Perspective

Biological influences contribute to depression, but in the nature–nurture dance, our life experiences also play a part. Diet, drugs, stress, and other environmental influences lay down epigenetic marks, those molecular genetic tags that can turn certain genes on or off. Animal studies suggest long-lasting epigenetic influences on depression (Nestler, 2011).

Thinking matters, too. The *social-cognitive perspective* explores how people's assumptions and expectations influence what they perceive. Many depressed people have intensely negative views of themselves, their situation, and their future (Nieto et al., 2020). Norman, a Canadian university professor, recalled his depression this way:

> I [despaired] of ever being human again. I honestly felt subhuman, lower than the lowest vermin. Furthermore, I was self-deprecatory and could not understand why anyone would want to associate with me, let alone love me.... I was positive that I was a fraud and a phony and that I didn't deserve my Ph.D.... I didn't deserve the research grants I had been awarded; I couldn't understand how I had written books and journal articles.... I must have conned a lot of people. (Endler, 1982, pp. 45–49)

Expecting the worst, depressed people magnify bad experiences and minimize good ones (Wenze et al., 2012). Their *self-defeating beliefs* and their *negative explanatory style* feed their depression.

Negative Thoughts and Negative Moods

Do you agree or disagree with this statement: "I feel frequently overwhelmed by all I have to do"? In a national survey, 55 percent of women and 28 percent of men entering U.S. colleges and universities agreed (Stolzenberg et al., 2020). Relationship stresses also affect teen girls more than boys (Hamilton et al., 2015). Why are women nearly twice as vulnerable as men to depression, and twice as likely to take antidepressant drugs (Pratt et al., 2017)?

This higher risk may relate to women's tendency to *ruminate*—to overthink, fret, or brood (Nolen-Hoeksema, 2003; Spinoven et al., 2018). Staying focused on a problem—thanks to the continuous activation of an attention-sustaining frontal lobe area—can be adaptive (Altamirano et al., 2010; Andrews & Thomson, 2009a,b). But relentless, self-focused **rumination** can distract us, intensify negative emotion, and increase depression symptoms (Johnson et al., 2016; Stefanovic et al., 2022; Yang et al., 2017). We can even ruminate about our excessive rumination—by thinking too much about how we're thinking about something too much.

Comparisons can also feed rumination. Lonely Lori scrolls through her social media feed and sees Maria having a blast at a party, Angelique enjoying a family vacation, and Amira looking super in a swimsuit. In response, Lori broods: "My life is terrible" and "Why can't I look like her?" (See the What Drives Us modules for the debate over whether social media-enabled comparisons have fueled the rise in teen girls' depression.)



Rumination runs wild We all think about our flaws. But dwelling constantly on negative thoughts—particularly negative thoughts about ourselves—makes it difficult to feel confident and self-assured. People sometimes seek therapy to reduce their rumination.

But why do life's unavoidable failures lead only some people to become depressed? The answer lies partly in their *explanatory style*—who or what they blame for their failures. Think of how you might feel if you failed a test. If you externalize the blame ("What an unfair test!"), you are more likely to feel angry. If you blame yourself, you probably will feel stupid and depressed ("I can't do anything right!").

Depression-prone people respond to bad events in an especially self-focused, self-blaming way (LeMoult & Gotlib, 2019). As **FIGURE 50.5**

illustrates, they explain bad events in terms that are *stable, global,* and *internal.*

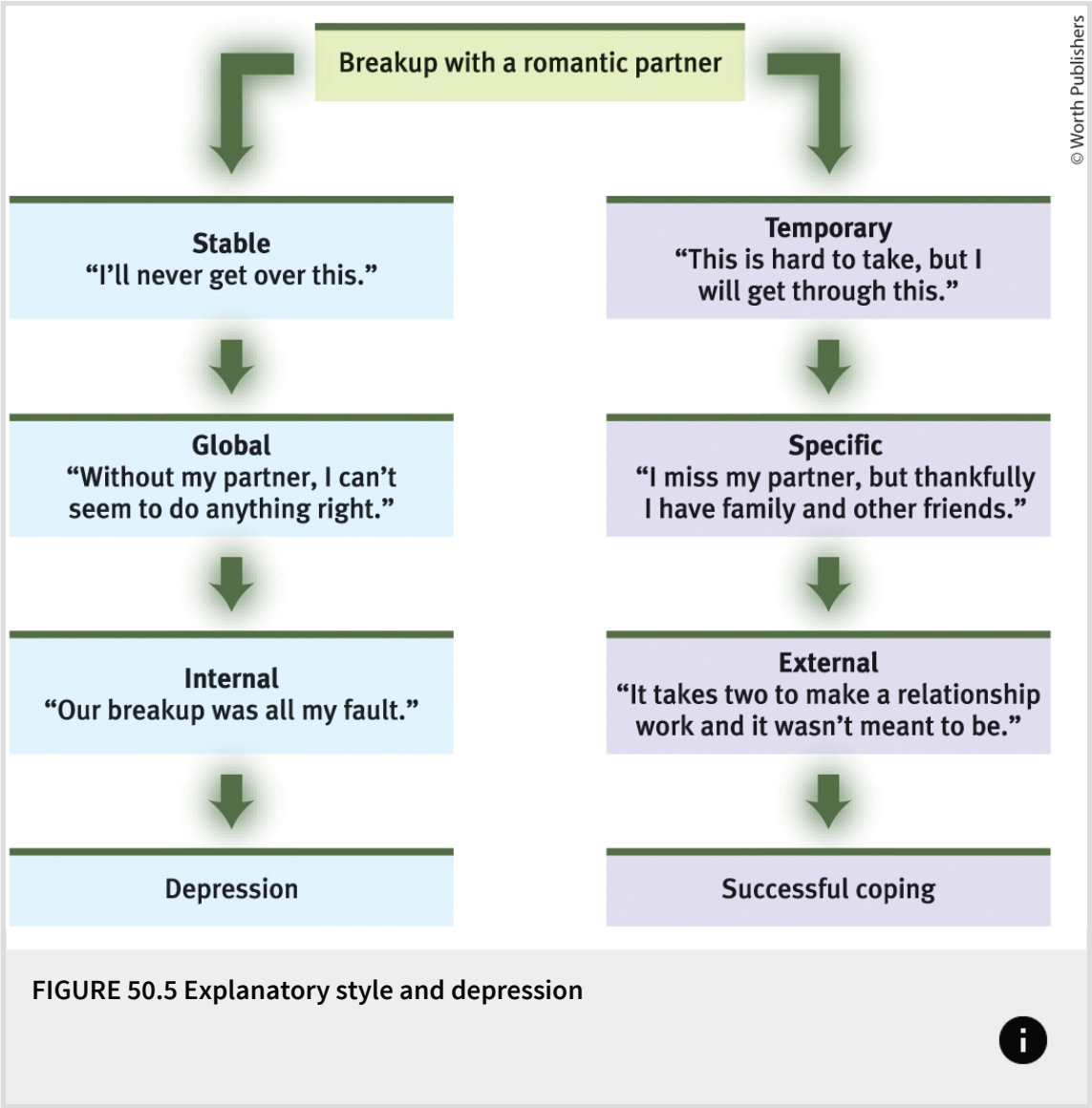


FIGURE 50.5 Explanatory style and depression

Self-defeating beliefs may arise from *learned helplessness,* the hopelessness and passive resignation that humans and other animals learn when they experience uncontrollable painful events (Maier & Seligman, 2016). Pessimistic, overgeneralized, self-blaming attributions may create a depressing sense of hopelessness

(Abramson et al., 1989; Groß et al., 2017). As researcher Martin Seligman has noted, “A recipe for severe depression is preexisting pessimism encountering failure” (1991, p. 78).

What, then, might we expect of new college students who exhibit a pessimistic explanatory style? Lauren Alloy and her colleagues (1999) monitored several hundred students every 6 weeks for 2.5 years. Among those identified as having a pessimistic thinking style, 17 percent had a first episode of major depression, as did only 1 percent of those who began college with an optimistic thinking style. This massive difference was no fluke: A large follow-up study showed that extreme feelings of hopelessness increased the odds of major depression tenfold (Liu et al., 2021).

Why is depression so common among young Westerners? Seligman (1991, 1995) has pointed to the rise of individualism and the decline of commitment to religion and family. In non-Western cultures, where close-knit relationships and cooperation are the norm, major depressive disorder is less common and less tied to self-blame for failure (De Vaus et al., 2018; Ferrari et al., 2013). In Japan, for example, depressed people instead tend to report feeling shame over letting others down (Draguns, 1990).

Critics note a chicken-and-egg problem nesting in the social-cognitive explanation of depression. Which comes first? The pessimistic explanatory style, or the depressed mood? The negative explanations *coincide* with a depressed mood, and they are *indicators* of depression.

But do they *cause* depression? Experiments reveal that a depressed mood triggers pessimism. Temporarily putting people in a bad or sad mood makes their memories, judgments, and expectations more pessimistic. Memory researchers call this tendency to recall experiences that fit our current good or bad mood *state-dependent memory*.

Depression's Vicious Cycle

Depression is both a cause and an effect of stressful experiences that disrupt our sense of who we are and why we matter. Such disruptions can lead to brooding, which amplifies negative feelings. Being withdrawn, self-focused, and complaining can, in turn, elicit rejection (Furr & Funder, 1998; Gotlib & Hammen, 1992). Indeed, people in the throes of depression are at high risk for divorce, job loss, and other stressful life events. Weary of the person's fatigue, hopeless attitude, and negativity, a spouse may threaten to leave, or a boss may begin to question the person's competence. (This provides another example of gene–environment interaction: People genetically predisposed to depression more often experience depressing events.) Rejection and depression feed each other. Misery may love another's company, but company does not love another's misery.

We can now assemble the pieces of the depression puzzle (**FIGURE 50.6**): (1) Stressful experiences interpreted through (2) a ruminating, pessimistic explanatory style create (3) a hopeless, depressed state that (4) hampers the way the person thinks and acts. This, in turn,

fuels (1) further stressful experiences such as rejection. Depressed people “are prone to behaviors that reinforce their depressive symptoms” (Hart et al., 2021). Depression is a snake that bites its own tail.

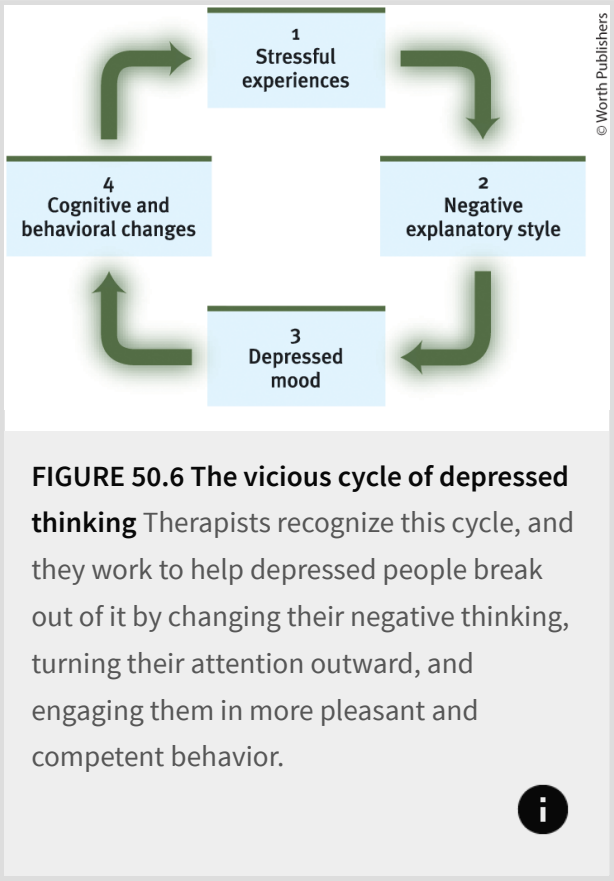


FIGURE 50.6 The vicious cycle of depressed thinking Therapists recognize this cycle, and they work to help depressed people break out of it by changing their negative thinking, turning their attention outward, and engaging them in more pleasant and competent behavior.

It is a cycle we can all recognize. Bad moods feed on themselves: When we feel down, we think negatively and remember bad experiences. Britain’s Prime Minister Winston Churchill called depression a “black dog” that periodically hounded him. U.S. President Abraham Lincoln was so withdrawn and brooding as a young man that his friends feared he might take his own life (Kline, 1974). Poet Emily Dickinson was so afraid of bursting into tears in

public that she spent much of her adult life in seclusion (Patterson, 1951). As their lives remind us, "depression" can be an anagram for "I pressed on." Many people struggle through depression and regain their capacity to love, to work, and to succeed.

Retrieval Practice

RP-1 What does it mean to say that "depression is a whole-body disorder"?

ANSWERS IN APPENDIX E

REVIEW

Module 50: Depressive Disorders and Bipolar Disorders

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 50-1: How do depressive disorders and bipolar disorders differ?

LOQ 50-2: How can the biological and social-cognitive perspectives help us understand depressive disorders and bipolar disorders?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

major depressive disorder
depressive disorders
bipolar disorders
mania
rumination

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. The gender gap in depression refers to the finding that _____ (men's/women's) risk of depression is roughly double that of _____ (men's/women's).

2. U.S. rates of bipolar disorders _____ between 1990 and 2019.
   a. increased.
   b. decreased.
   c. were consistent.

3. Treatment for depression often includes drugs that increase supplies of the neurotransmitters _____ and _____.

4. Psychologists who emphasize how negative perceptions, beliefs, and thoughts enable depression are working within the _____-_____ perspective.

MODULE 51: Schizophrenia

During their most severe periods, people with **schizophrenia** live in a private inner world, preoccupied with the strange ideas and images that haunt them. The word itself means "split" *(schizo)* "mind" *(phrenia).* It refers *not* to a multiple identity split but rather to the mind's split from reality. People with schizophrenia have disturbed perceptions and beliefs, disorganized speech, and diminished, inappropriate emotions and actions. Schizophrenia is the chief example of a **psychotic disorder**.

Symptoms of Schizophrenia

LOQ 51-1

What patterns of perceiving, thinking, and feeling characterize schizophrenia?

Schizophrenia comes in varied forms. People with schizophrenia display symptoms that are *positive* (*inappropriate* behaviors are *present*) or *negative* (*appropriate* behaviors are *absent*). Those with positive symptoms may experience disturbed perceptions, talk in disorganized and deluded ways, or exhibit inappropriate laughter, tears, or rage. Those with negative symptoms may exhibit an absence of emotion in their voices, expressionless faces, or mute and rigid bodies.

Disturbed Perceptions and Beliefs

People with schizophrenia sometimes *hallucinate*—they see, hear, feel, taste, or smell things that exist only in their minds. Most often, the hallucinations are voices, which sometimes make insulting remarks or give orders. The voices may tell the person that they are bad or that they must hurt themselves. Imagine your own reaction if a dream broke into your waking consciousness, making it hard to separate your experience from your imagination. When the unreal seems real, the resulting perceptions are at best bizarre, at worst terrifying.



Art by someone with schizophrenia After his schizophrenia diagnosis, Michigan artist Craig Geiser said he "started drawing as a way to relax and escape the real world" (Geiser, 2021). Medication and therapy have helped

quiet Geiser's hallucinations and delusions, enabling him to lead a meaningful life (Geiser, 2019).

Hallucinations are false *perceptions.* People with schizophrenia also have disorganized, fragmented thinking, often distorted by false *beliefs* called **delusions**. If they have *paranoid* delusions, they may interpret events in ways that make them feel threatened or pursued (Trotta et al., 2021).

One cause of disorganized thinking may be a breakdown in *selective attention.* Normally, we have a remarkable capacity to give our undivided attention to one set of sensory stimuli while filtering out others. People with schizophrenia are easily distracted by tiny unrelated stimuli, such as the grooves on a brick or tones in a voice. As Elyn Saks (2007) described it, "every sight, every sound, every smell coming at you carries equal weight; every thought, feeling, memory, and idea presents itself to you with an equally strong and demanding intensity." This selective-attention difficulty is but one of dozens of cognitive differences associated with schizophrenia (Reichenberg & Harvey, 2007).

Disorganized Speech

Maxine, a young woman with schizophrenia, believed she was Mary Poppins. Communicating with Maxine was difficult because her thoughts spilled out in no logical order. Her biographer, Susan

Sheehan (1982, p. 25), observed her saying aloud to no one in particular, “This morning, when I was at Hillside [Hospital], I was making a movie. I was surrounded by movie stars.... Is this room painted blue to get me upset? My grandmother died four weeks after my eighteenth birthday.”

Jumbled ideas may make no sense even within sentences, forming what is known as *word salad.* One young man begged for “a little more allegro in the treatment,” and suggested that “liberationary movement with a view to the widening of the horizon” will “ergo extort some wit in lectures.”

Diminished or Inappropriate Emotions

The expressed emotions of schizophrenia are often utterly inappropriate, split off from reality (Kring & Caponigro, 2010). Maxine laughed after recalling her grandmother’s death. On other occasions, she cried when others laughed, or became angry for no apparent reason. Others with schizophrenia lapse into an emotionless *flat affect* state of no apparent feeling.

Most also have an *impaired theory of mind*—they have difficulty reading other peoples’ facial expressions and states of mind (Bora & Pantelis, 2016). Unable to understand others’ mental states, those with schizophrenia struggle to feel sympathy and compassion (Bonfils et al., 2016). These emotional deficiencies occur early in the illness and have a genetic basis (Bora & Pantelis, 2013). *Motor behavior* may also

be inappropriate and disruptive. Those with schizophrenia may experience *catatonia,* characterized by motor behaviors ranging from a physical stupor (remaining motionless for hours), to senseless, compulsive actions (such as continually rocking or rubbing an arm), to severe and dangerous agitation.

As you can imagine, such disturbed perceptions and beliefs, disorganized speech, and out of place emotions profoundly disrupt social and work relationships. During their most severe periods, people with schizophrenia live in a private inner world, preoccupied with illogical ideas and unreal images. As with other disorders, many have sleep problems, which can increase night eating and obesity (Baglioni et al., 2016; Palmese et al., 2011). Given a supportive environment and medication, over 40 percent of people with schizophrenia will have periods of a year or more of normal life experience (Jobe & Harrow, 2010). But only 1 in 7 will have a full and enduring recovery (Jääskeläinen et al., 2013).

Onset and Development of Schizophrenia

LOQ 51-2

How do *chronic schizophrenia* and *acute schizophrenia* differ?

An estimated 20 million people worldwide—about 1 in 270—have schizophrenia (WHO, 2019). This disorder knows no national boundaries and it typically strikes as young people are maturing into adulthood (TABLE 51.1). Men tend to be diagnosed more often than women, and to be struck earlier and with more severity (Aleman et al., 2003; Eranti et al., 2013; Picchioni & Murray, 2007).

TABLE 51.1 Onset of Psychological Disorders

A digest of nearly 200 studies of more than 700,000 people reveals the *median* age (midpoint of the recorded ages) at which various disorders are first diagnosed (Solmi et al., 2022). In each case the most frequent *(modal)* age of onset is somewhat younger than the median age shown below.

Disorder	Median Age of Onset
Neurodevelopmental disorders	12
Anxiety disorders	17
Eating disorders	18
Obsessive-compulsive disorder	19
Substance use disorders	25
Schizophrenia	25
Personality disorders	25
Depressive disorders	30

When schizophrenia is a slow-developing process, called **chronic schizophrenia**, recovery is doubtful (Harrison et al., 2001; Jääskeläinen et al., 2013). This was the case with Maxine, whose schizophrenia took a slow course, emerging after a long history of social difficulties and poor school performance (MacCabe et al., 2008). Although people with both chronic and *acute schizophrenia* can exhibit positive or negative symptoms, social withdrawal—a negative symptom—is often found among those with chronic schizophrenia (Kirkpatrick et al., 2006). Men more often exhibit negative symptoms and chronic schizophrenia (Räsänen et al., 2000).

When previously well-adjusted people develop schizophrenia rapidly following particular life stresses, this is called **acute schizophrenia**, and recovery is much more likely. They more often have positive symptoms that respond to drug therapy (Fenton & McGlashan, 1991, 1994; Fowles, 1992).

Understanding Schizophrenia

Schizophrenia is one of the most heavily researched psychological disorders. Studies now link it with abnormal brain tissue and genetic predispositions. Schizophrenia is a disease of the brain manifested in symptoms of the mind.

Brain Abnormalities

LOQ 51-3

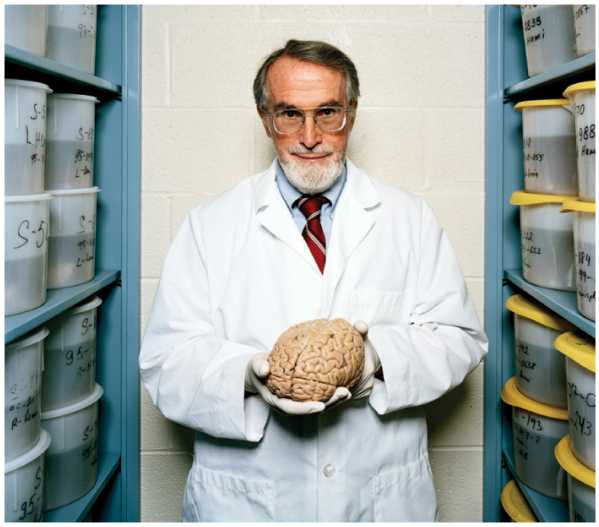
What brain abnormalities are associated with schizophrenia?

Might chemical imbalances in the brain underlie schizophrenia? Scientists have long known that strange behavior can have strange chemical causes. The saying "as mad as a hatter" is often thought to refer to the psychological deterioration of British hatmakers whose brains, it was later discovered, were slowly poisoned by the mercury-laden felt material (Smith, 1983). Could schizophrenia symptoms have a similar biochemical key? Scientists are searching for blood proteins that might predict schizophrenia onset (Chan et al., 2015). And they are tracking the mechanisms by which chemicals produce hallucinations and other symptoms.

Dopamine Overactivity

One possible answer emerged when researchers examined schizophrenia patients' brains after death. They found an excess number of *dopamine* receptors, including a sixfold excess for the dopamine receptor D4 (Seeman et al., 1993; Wong et al., 1986). Such a hyper-responsive dopamine system may intensify brain signals in schizophrenia, creating positive symptoms such as hallucinations and paranoia (Maia & Frank, 2017). Drugs that block dopamine receptors often lessen these symptoms. Drugs that increase dopamine levels,

such as nicotine, amphetamines, and cocaine, sometimes intensify them (Basu & Basu, 2015; Farnia et al., 2014).



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Storing and studying brains Psychiatrist E. Fuller Torrey has collected the brains of hundreds of people with disorders such as schizophrenia and bipolar disorders who died as young adults.

Abnormal Brain Activity and Anatomy

Abnormal brain activity and brain structures accompany schizophrenia. Some people diagnosed with schizophrenia have abnormally low brain activity in the frontal lobes, areas that help us reason, plan, and solve problems (Morey et al., 2005; Pettegrew et al., 1993; Resnick, 1992). Brain scans also show a noticeable decline in the brain waves that reflect synchronized neural firing in the frontal lobes (Spencer et al., 2004; Symond et al., 2005).

One study took PET scans of brain activity while people with schizophrenia were hallucinating (Silbersweig et al., 1995). When participants heard a voice or saw something, their brain became vigorously active in several core regions. One was the thalamus, the structure that filters incoming sensory signals and transmits them to the brain's cortex. Another PET scan study of people with paranoia found increased activity in the amygdala, a fear-processing center (Epstein et al., 1998).

In schizophrenia, fluid-filled brain cavities called *ventricles* become enlarged; cerebral tissue also shrinks (Goldman et al., 2009; van Haren et al., 2016). People often inherit these brain differences. If one affected identical twin shows brain abnormalities, the odds are at least 1 in 2 that the other twin's brain will have them (van Haren et al., 2012). Some studies have even found these abnormalities in people who *later* developed the disorder (Karlsgodt et al., 2010). The greater the brain shrinkage, the more severe the thought disorder (Collinson et al., 2003; Nelson et al., 1998; Shenton, 1992).

Smaller-than-normal areas may include the cortex, the hippocampus, and the corpus callosum connecting the brain's two hemispheres (Arnone et al., 2008; Bois et al., 2016). Often, the thalamus is also smaller than normal, which may explain why people with schizophrenia have difficulty filtering sensory input and focusing attention (Andreasen et al., 1994; Ellison-Wright et al., 2008). Schizophrenia also tends to involve a loss of neural connections across the brain network (Bohlken et al., 2016; Kambeitz et al., 2016).

The bottom line: Schizophrenia involves not one isolated brain abnormality but problems with several brain regions and their interconnections (Andreasen, 1997, 2001; Arnedo et al., 2015).

Prenatal Environment and Risk

LOQ 51-4

What prenatal events are associated with increased risk of developing schizophrenia?

What causes these brain abnormalities in people with schizophrenia? Some scientists point to prenatal development or delivery (Fatemi & Folsom, 2009; Walker et al., 2010). Risk factors include low birth weight, maternal diabetes, older paternal age, and oxygen deprivation during delivery (King et al., 2010). Famine may also increase risks. People conceived during the peak of World War II's Dutch famine and during the famine of 1959 to 1961 in eastern China later developed schizophrenia at twice the normal rate (St. Clair et al., 2005; Susser et al., 1996). And extreme maternal stress may be a culprit: A large Israeli study showed that maternal exposure to terror attacks during pregnancy doubled children's risk of schizophrenia (Weinstein et al., 2018).

Let's consider another possible culprit. Might a midpregnancy viral infection impair fetal brain development (Brown & Patterson, 2011)? Can you imagine some ways to test this fetal-virus idea? Scientists have asked the following:

- ***Are people at increased risk of schizophrenia if their country experienced a flu epidemic during the middle of their fetal development?*** The repeated answer has been *Yes* (Mednick et al., 1994; Murray et al., 1992; Wright et al., 1995).
- ***Are people born in densely populated areas, where viral diseases spread more readily, at greater risk for schizophrenia?*** The answer, confirmed in a study of 1.75 million Danes, has again been *Yes* (Jablensky, 1999; Mortensen, 1999).
- ***Are those born during the winter and spring months—those who were in utero during the fall-winter flu season—also at increased risk?*** The answer is again *Yes* (Fox, 2010; Schwartz, 2011; Torrey & Miller, 2002; Torrey et al., 1997).
- ***In the Southern Hemisphere, where the seasons are the reverse of the Northern Hemisphere, are the months of above-average pre-schizophrenia births similarly reversed?*** Again, the answer has been *Yes*. In Australia, people born between August and October are at greater risk. But people born in the Northern Hemisphere who later moved to Australia still have a greater risk if they were born between January and March (McGrath et al., 1995; McGrath & Welham, 1999).
- ***Are those who report being sick with influenza during pregnancy more likely to bear children who develop schizophrenia?*** In one study of nearly 8000 women, the answer was *Yes.* The schizophrenia risk increased from the customary 1 percent to about 2 percent—but only when infections occurred during the second trimester (Brown et al., 2000). Maternal influenza

infection during pregnancy affects brain development in monkeys as well (Short et al., 2010).

- ***Do blood samples collected from pregnant participants whose offspring develop schizophrenia show higher-than-normal levels of antibodies that suggest a viral infection?*** In several studies—including one that collected blood samples from some 20,000 pregnant participants—the answer has again been *Yes* (Brown et al., 2004; Buka et al., 2001; Canetta et al., 2014).

These converging lines of evidence suggest that fetal-virus infections contribute to the development of schizophrenia. They also strengthen the World Health Organization's (2017) recommendation that those who are pregnant be given high priority for the seasonal flu vaccine.

Genetic Factors

LOQ 51-5

How do genes influence schizophrenia? What factors may be early warning signs of schizophrenia in children?

Fetal-virus infections may increase the odds that a child will develop schizophrenia. But many women get the flu during their second trimester of pregnancy, and only 2 percent of them bear children who develop schizophrenia. Why are only some children at risk? Might some people be more genetically vulnerable to schizophrenia? *Yes.* The roughly 1-in-270 lifetime odds of any person being diagnosed with

schizophrenia become about 1 in 10 among those who have a sibling or parent with the disorder. If the affected sibling is an identical twin, the odds increase to nearly 1 in 2 (FIGURE 51.1). Those odds remain the same even when the twins are raised apart (Plomin et al., 1997). (Only about a dozen such cases are on record.)

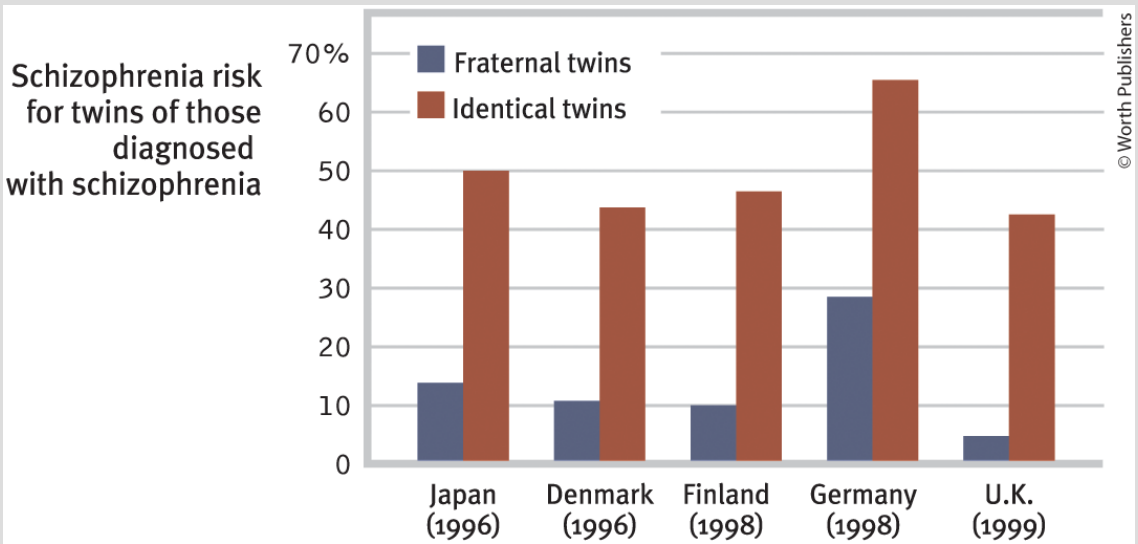


FIGURE 51.1 Risk of developing schizophrenia The lifetime risk of developing schizophrenia varies with a person's genetic relatedness to someone who has this disorder. Worldwide, barely more than 1 in 10 fraternal twins, but some 5 in 10 identical twins, share a schizophrenia diagnosis. (Data from Gottesman, 2001; Hilker et al., 2018.)

Remember, though, that identical twins share more than their genes. They also share a prenatal environment. About two-thirds share a placenta and the blood it supplies; the other third have separate placentas. Shared placentas matter. If the co-twin of an identical twin with schizophrenia shared the placenta, the chances of developing the disorder are 6 in 10. If the identical twins had separate placentas, the

co-twin's chances of developing schizophrenia drop to 1 in 10 (Davis et al., 1995; Davis & Phelps, 1995; Phelps et al., 1997). Twins who share a placenta are more likely to share the same prenatal viruses. So perhaps shared germs as well as shared genes produce identical twin schizophrenia similarities (FIGURE 51.2).

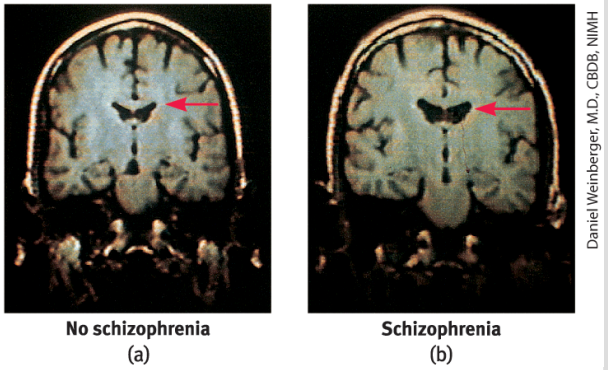


FIGURE 51.2 Schizophrenia in only one identical twin When identical twins differ, only the brain of the twin with schizophrenia typically has enlarged, fluid-filled cranial cavities (b) (Suddath et al., 1990). The difference between the twins implies some nongenetic factor, such as a virus, is also at work.

Adoption studies help untangle genetic and environmental influences. Children adopted by someone who develops schizophrenia do not "catch" the disorder. Rather, adopted children have an elevated risk if a *biological* parent has schizophrenia (Gottesman, 1991). Genes indeed matter.

Although genes matter, the genetic formula is not straightforward as with inheritance of eye color. Schizophrenia is influenced by (no surprise by now) many genes, each with small effects (Binder, 2019; Weinberger, 2019). The search is on for specific genes that, in some combination, predispose schizophrenia-inducing brain abnormalities. In the largest genetic studies of schizophrenia, scientists analyze worldwide data from the genomes of tens of thousands of people with and without schizophrenia (Lam et al., 2019; Pardiñas et al., 2018). One analysis found 176 genome locations linked with this disorder, some affecting dopamine and other neurotransmitters. Another study of more than 100,000 people—nearly half with schizophrenia and the rest without—identified 413 schizophrenia-associated genes (Huckins et al., 2019).

Moreover, as we see in so many different contexts, nature and nurture interact. *Epigenetic* factors influence whether genes will be expressed. Like hot water activating a tea bag, environmental factors such as viral infections, nutritional deprivation, and maternal or severe life stress can "turn on" the genes that put some of us at higher risk for schizophrenia. Identical twins' differing histories in the womb and beyond explain why they may show differing gene expressions (Dempster et al., 2013; Walker et al., 2010). Our heredity and our life experiences work together. Neither hand claps alone.

Thanks to our expanding understanding of genetic and brain influences on disorders such as schizophrenia, the general public increasingly recognizes the potency of biological factors in psychiatric

disorders (Pescosolido et al., 2010). So, will future scientists develop genetic tests that reveal who is at risk—for schizophrenia, or for other psychological disorders? If so, will people undergo testing for themselves, their embryos, or their children to determine risk? And how will they use that information? In this twenty-first-century world, such questions await answers.

Environmental Triggers for Schizophrenia

If prenatal viruses and genetic predispositions do not, by themselves, cause schizophrenia, neither do family or social factors alone. It remains true, as Susan Nicol and Irving Gottesman (1983) noted over three decades ago, that "no environmental causes have been discovered that will invariably, or even with moderate probability, produce schizophrenia in persons who are not related to" a person with schizophrenia.

Hoping to identify environmental triggers of schizophrenia, researchers have compared the experiences of high-risk children (for example, those with relatives with schizophrenia) and low-risk children. In one 2.5-year study that followed 163 teens and early-twenties adults who had two relatives with schizophrenia, the 20 percent of participants who developed schizophrenia showed social withdrawal or other abnormal behavior before the onset of the disorder (Johnstone et al., 2005). Researchers identified other possible early warning signs, including a mother whose schizophrenia was severe and long-lasting; birth complications (often involving oxygen

deprivation and low birth weight); frequent childhood hospitalizations for viral and other infections; separation from parents; short attention span and poor muscle coordination; disruptive or withdrawn behavior; emotional unpredictability; poor peer relations and solo play; and childhood physical, sexual, or emotional abuse (Abel et al., 2010; Debost et al., 2019; Freedman et al., 1998; Schiffman et al., 2001; Susser, 1999; Welham et al., 2009).

***

Few of us can relate to the strange thoughts, perceptions, and behaviors of schizophrenia. Sometimes our thoughts jump around, but we rarely talk nonsensically. Occasionally we feel unjustly suspicious of someone, but we do not fear that the world is plotting against us. Often our perceptions err, but rarely do we see or hear things that are not there. We feel regret after laughing at someone's misfortune, but we rarely giggle in response to our own bad news. At times we just want to be alone, but we do not retreat into fantasy worlds. However, millions of people worldwide do talk strangely, experience delusions, hear nonexistent voices, see things that are not there, laugh or cry at inappropriate times, or withdraw into private imaginary worlds. The quest to solve the cruel puzzle of schizophrenia therefore continues, more vigorously than ever.

Ask Yourself

Can you recall a time when you heard something or someone casually (and inaccurately) described as "schizophrenic"? Now that you know more about this disorder, how might you correct such descriptions?

Retrieval Practice

RP-1 A person with schizophrenia who has _____ (positive/negative) symptoms may have an expressionless face and toneless voice. Those with _____ (positive/negative) symptoms are likely to experience delusions.

RP-2 What factors contribute to the onset and development of schizophrenia?

ANSWERS IN APPENDIX E

REVIEW

Module 51: Schizophrenia

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 51-1: What patterns of perceiving, thinking, and feeling characterize schizophrenia?

LOQ 51-2: How do *chronic schizophrenia* and *acute schizophrenia* differ?

LOQ 51-3: What brain abnormalities are associated with schizophrenia?

LOQ 51-4: What prenatal events are associated with increased risk of developing schizophrenia?

LOQ 51-5: How do genes influence schizophrenia? What factors may be early warning signs of schizophrenia in children?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

schizophrenia
psychotic disorders
delusion
chronic schizophrenia
acute schizophrenia

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. Valencia exclaims, "The weather has been so schizophrenic lately; it's hot one day and freezing the next!" In addition to being insensitive, this comparison is inaccurate. Why?

2. A person with positive symptoms of schizophrenia is most likely to experience
   a. catatonia.
   b. delusions.
   c. withdrawal.
   d. flat emotion.

3. People with schizophrenia may hear voices urging self-destruction, an example of a(n) _____.

4. Chances for recovery from schizophrenia are best when
   a. onset is sudden, in response to stress.
   b. deterioration occurs gradually, during childhood.
   c. no environmental causes can be identified.
   d. there is a detectable brain abnormality.

MODULE 52: Dissociative, Personality, and Eating Disorders

Next we will consider the dissociative, personality, and eating disorders.

Dissociative Disorders

LOQ 52-1

What are *dissociative disorders,* and why are they controversial?

Among the most bewildering disorders are the rare **dissociative disorders**, in which a person's conscious awareness *dissociates* (separates) from painful memories, thoughts, and feelings. The result may be a *dissociative fugue state,* a sudden loss of memory or change in identity, often in response to an overwhelmingly stressful situation (Harrison et al., 2017). Such was the case for one Vietnam War veteran who was haunted by his comrades' deaths, and who had left his World Trade Center office shortly before the 9/11 terrorist attack. Later, he disappeared. Six months later, when he was discovered in a Chicago homeless shelter, he reported no memory of his identity or family (Stone, 2006).

Dissociative Identity Disorder

Dissociation itself is not so rare. Any one of us may have a fleeting sense of being unreal, of being separated from our body, of watching ourselves as if in a movie. A massive dissociation of self from ordinary consciousness occurs in **dissociative identity disorder (DID)**, in which two or more distinct identities—each with its own voice and mannerisms—seem to control a person's behavior. Thus, the person may be prim and proper one moment, loud and flirtatious the next. Typically, the original identity denies any awareness of the other(s).



Collection Christophel/Alamy Stock Photo

Multiple identities in the movies Chris Sizemore's story, told in the 1957 book and movie *The Three Faces of Eve,* gave early visibility to what is now called dissociative identity disorder. This controversial disorder continues to influence modern media, as in the 2019 movie *Glass,* where James McAvoy's character (pictured here) displays 24 different identities.

Understanding Dissociative Identity Disorder

Skeptics question DID. Are clinicians who discover multiple identities merely triggering role-playing by fantasy-prone people in a particular social context (Giesbrecht et al., 2008, 2010; Lynn et al., 2014; Merskey, 1992)? After all, clients do not enter therapy saying "Allow me to introduce myselves." Instead, charge the critics, some therapists go fishing for multiple identities: "Have you ever felt like another part of you does things you can't control?" "Does this part of you have a name? Can I talk to the angry part of you?" Once clients permit a therapist to talk, by name, "to the part of you that says those angry things," they begin acting out the fantasy. Like actors who lose themselves in their roles, vulnerable patients may "become" the parts they are acting out. The result may be the experience of another self. Or perhaps dissociative identities are simply a more extreme version of the varied "selves" we sometimes present—a goofy self around our friends, a subdued self around our employer.

Skeptics also find it suspicious that the disorder has such a short and localized history. Between 1930 and 1960, the number of North American DID diagnoses averaged 2 per decade. By the 1980s, when the *Diagnostic and Statistical Manual of Mental Disorders* (DSM) contained the first formal code for this disorder, the number had exploded to more than 20,000 (McHugh, 1995). The average number of displayed identities also mushroomed—from 3 to 12 per patient (Goff & Simms, 1993). And although diagnoses have been increasing in countries where DID has been publicized, the disorder is much less

prevalent outside North America (Lilienfeld, 2017). As skeptics note, once a disorder is made "official," reported cases of it tend to soar.



MBR/KRT/Newscom

Widespread dissociation Shirley Mason was a psychiatric patient diagnosed with dissociative identity disorder. Her life formed the basis of the bestselling book, *Sybil* (Schreiber, 1973), and of two movies. The book and movies' popularity contributed to increased DID diagnoses. Audio recordings later revealed that Mason's psychiatrist manipulated her and that she did not actually have the disorder (Nathan, 2011).

Despite some hoaxes, other researchers and clinicians believe DID is a real disorder. They cite findings of distinct body and brain states associated with differing identities (Putnam, 1991). Abnormal brain anatomy and activity can also accompany DID. Brain scans show shrinkage in areas that aid memory and detection of threat (Vermetten et al., 2006). Heightened activity appears in brain areas associated with the control and inhibition of traumatic memories (Elzinga et al., 2007).

Both the psychodynamic and learning perspectives have interpreted DID symptoms as ways of coping with anxiety. Some psychodynamic theorists see them as defenses against the anxiety caused by the eruption of unacceptable impulses. In this view, a second identity enables the discharge of forbidden impulses. Learning theorists see dissociative disorders as behaviors reinforced by anxiety reduction.

Some clinicians include dissociative disorders under the umbrella of posttraumatic stress disorder as a natural, protective response to traumatic experiences during childhood (Brand et al., 2016; Spiegel, 2008). Many people being treated for DID recall being physically, sexually, or emotionally abused as children (Gleaves, 1996; Lilienfeld et al., 1999). Critics wonder, however, whether such recollections are false memories (Kihlstrom, 2005; McNally, 2007). So the scientific debate continues.

> **"Though this be madness, yet there is method in 't."** — William Shakespeare, *Hamlet,* 1600

Ask Yourself

Do you ever flip between displays of different aspects of your identity depending on the situation? How is your experience similar to and different from the described symptoms of dissociative identity disorder?

Retrieval Practice

RP-1 The psychodynamic and learning perspectives agree that dissociative identity disorder symptoms are ways of dealing with anxiety. How do their explanations differ?

ANSWERS IN APPENDIX E

Personality Disorders

LOQ 52-2

What are the three clusters of personality disorders? What behaviors and brain activity characterize antisocial personality disorder?

The inflexible and enduring behavior patterns of **personality disorders** interfere with social functioning. These 10 disorders in the DSM-5-TR tend to form three clusters (**TABLE 52.1**):

- In Cluster A, people appear ***eccentric or odd,*** as in the suspiciousness of *paranoid personality disorder*; the social detachment of *schizoid personality disorder*; or the magical thinking of *schizotypal personality disorder*.
- In Cluster B, people appear ***dramatic, emotional, or erratic,*** as in the unstable, attention-getting *borderline personality disorder;* the self-focused and self-inflating *narcissistic personality disorder;* the excessively emotional *histrionic personality disorder;* and—what we next discuss as an in-depth example—the callous, and often dangerous, *antisocial personality disorder.*
- In Cluster C, people appear ***anxious or fearful,*** as in the fearful sensitivity to rejection that predisposes the withdrawn *avoidant personality disorder;* the clinging behavior of *dependent personality disorder;* and the preoccupation with orderliness, perfectionism, and control that characterizes *obsessive-compulsive personality disorder.*

TABLE 52.1 Personality Disorders

The DSM-5-TR identifies 10 personality disorders (APA, 2022).
Cluster A • **Paranoid personality disorder:** suspiciousness; distrust of others • **Schizoid personality disorder:** social detachment; limited emotional expression • **Schizotypal personality disorder:** intense social discomfort; distorted cognitions or perceptions; behavioral eccentricity
Cluster B • **Borderline personality disorder:** impulsivity; unstable relationships and self-image

- **Narcissistic personality disorder:** grandiosity; admiration-seeking behavior; deficient empathy
- **Histrionic personality disorder:** extreme emotional expression; a need for attention
- **Antisocial personality disorder:** indifference to (and willingness to violate) others' rights; impulsiveness; criminal behavior

Cluster C

- **Avoidant personality disorder:** social inhibition; feeling inadequate; sensitivity to criticism
- **Dependent personality disorder:** submissive behavior; emotional neediness
- **Obsessive-compulsive personality disorder:** a fixation on orderliness; the need for perfection and control

Antisocial Personality Disorder

People with **antisocial personality disorder**, usually male, can display symptoms by age 8. Their lack of conscience becomes plain before age 15, as they begin to lie, steal, fight, or display unrestrained sexual behavior (Cale & Lilienfeld, 2002). Not all children with these traits become antisocial adults, and for many males, antisocial behavior often subsides after adolescence (Moffitt, 2018). (Note that *antisocial* means socially harmful and remorseless, not merely unsociable.) Those who do develop the disorder—about half—will generally act in violent or otherwise criminal ways, be unable to keep a job, and behave irresponsibly toward family members (Farrington, 1991).

But criminality is not an essential component of antisocial behavior (Skeem & Cooke, 2010). And many criminals do not exhibit antisocial personality disorder; rather, they show responsible concern for their friends and family members. In contrast with most criminals, people with antisocial personality disorder (sometimes called *sociopaths* or

psychopaths) are more socially deficient. They often exhibit less *emotional intelligence*—the ability to understand, manage, and perceive emotions (Ermer et al., 2012; Gillespie et al., 2019).



Leo Cullum/Cartoon Stock

"Thursday is out. I have jury duty."

Many criminals, like this one, display a sense of conscience and responsibility in other areas of their life, and thus do not exhibit antisocial personality disorder.

Antisocial personalities behave impulsively, and then feel and fear little (Fowles & Dindo, 2009). Their impulsivity can have horrific consequences, including homicide (Camp et al., 2013; Fox & DeLisi, 2019). Consider the case of Tommy Lynn Sells. He said he killed his first victim when he was 15. He felt little regret then or later. During his years of crime, he brutally murdered at least 17 adults and children. "I am hatred," Sells told one interviewer while on death row (ABC, 2014). "When you look at me, you look at hate."



John Mantha/Reuters/Newscom

No remorse Bruce McArthur, a 66-year-old landscaper shown here in a courtroom sketch, was convicted in 2019 of killing eight people over 8 years. He often targeted men who were gay, immigrants, or experiencing homelessness, storing their remains in boxes at his job sites. McArthur exhibited the extreme lack of remorse that marks antisocial personality disorder.

Understanding Antisocial Personality Disorder

Antisocial personality disorder is woven of both biological and psychological strands. Twin and adoption studies reveal that biological relatives of people with antisocial and unemotional tendencies are at increased risk for antisocial behavior (Frisell et al., 2012; Kendler et al., 2015). People with antisocial personalities sometimes spread their genes to future generations by marrying others who have antisocial personalities (B. Weiss et al., 2017). No single gene codes for a complex behavior such as crime. But genes that predispose lower mental ability and self-control predict a higher crime risk (Wertz et al., 2018). As with other disorders, geneticists have also identified specific genes that are more common in those

with antisocial personality disorder (Gunter et al., 2010; Tielbeek et al., 2017). The genes that put people at risk for antisocial behavior also put people at risk for substance use disorders (Dick, 2007).

The genetic vulnerability of people with antisocial tendencies appears as low arousal in response to threats. Awaiting aversive events, such as electric shocks or loud noises, they show little autonomic nervous system arousal (Hare, 1975; Ling et al., 2019). Long-term studies show that their stress hormone levels were lower than average as teenagers, before they had ever committed a crime (FIGURE 52.1). And those who were slow to develop conditioned fears at age 3 were also more likely to commit a crime later in life (Gao et al., 2010). Likewise, preschool boys who later become aggressive or antisocial adolescents tend to be impulsive, uninhibited, unconcerned with social rewards, and low in anxiety (Caspi et al., 1996; Tremblay et al., 1994).

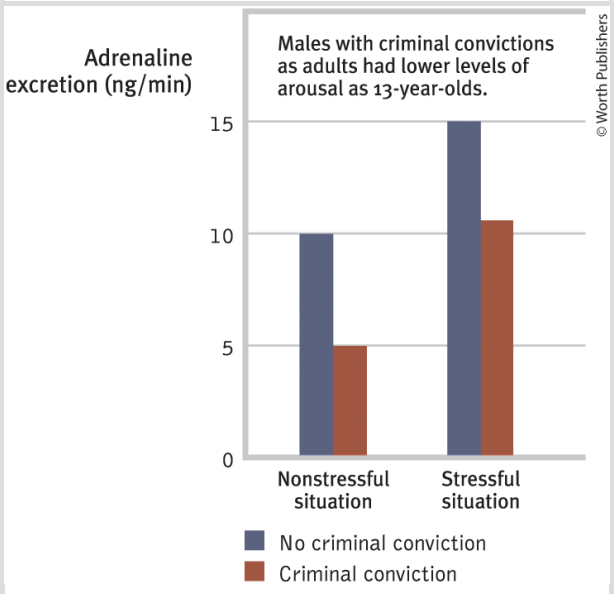


FIGURE 52.1 Cold-blooded arousability and risk of crime Researchers measured levels of

the stress hormone adrenaline in two groups of 13-year-old Swedish boys, and followed up on them as young adults. Those who would later be convicted of a crime as 18- to 26-year-olds showed relatively low arousal when they were younger, in both stressful and nonstressful situations. (Data from Magnusson, 1990.)

Traits such as fearlessness and dominance can be adaptive. If channeled in more productive directions, fearlessness may lead to athletic stardom, adventurism, or courageous heroism (Costello et al., 2018; Patton et al., 2018). Indeed, 42 U.S. presidents exhibited higher than usual fearlessness and dominance (Lilienfeld et al., 2012, 2016). Patient S. M., a 49-year-old woman with amygdala damage, showed fearlessness and impulsivity but also heroism: She gave a man in need her only coat and scarf, and donated her hair to the Locks of Love charity after befriending a child with cancer (Lilienfeld et al., 2017). Lacking a sense of social responsibility, however, the same disposition may produce a cool con artist or killer (Lykken, 1995).

Brain structure matters, too: People with antisocial criminal tendencies have a smaller-than-usual amygdala, which controls emotions, and a smaller and thinner brain cortex (Carlisi et al., 2020; Pardini et al., 2014). The frontal lobes are also less active, as shown by PET scans of 41 murderers' brains compared with those from people of similar age and sex (Raine, 1999, 2005; **FIGURE 52.2**). The frontal lobes help control impulses. The reduced activation was especially

apparent in those who murdered impulsively. In a follow-up study, Adrian Raine and his team (2000) found that violent repeat offenders had 11 percent less frontal lobe tissue than is typical. This helps explain why people with antisocial personality disorder exhibit marked deficits in frontal lobe cognitive functions, such as planning, organization, and inhibition (Morgan & Lilienfeld, 2000). Compared with people who feel and display empathy, their brains also respond less to facial displays of others' distress, which may contribute to their lower emotional intelligence (Deeley et al., 2006).

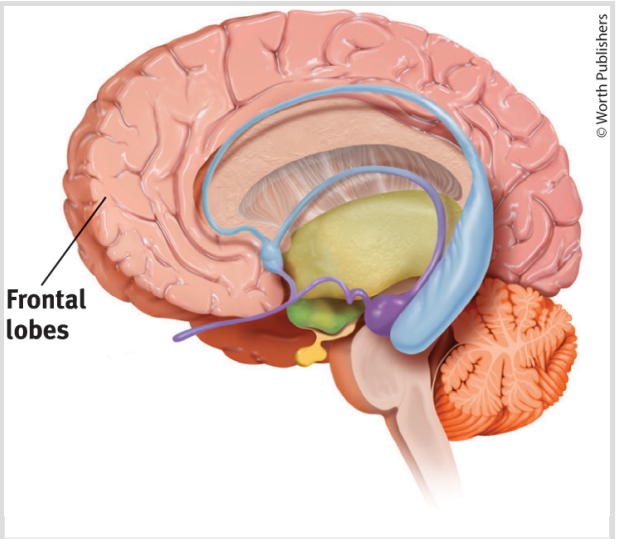


FIGURE 52.2 Murderous minds Researchers have found reduced activation in a murderer's frontal lobes. This brain area (shown in a left-facing brain) helps curb impulsive, aggressive behavior (Raine, 1999).

Genetic influences often combine with negative environmental factors —such as childhood abuse, family instability, or poverty—to wire the brain (Dodge, 2009). This gene–environment combination also occurs

in chimpanzees, which, like humans, vary in antisocial (mean/bold/disinhibited) tendencies (Latzman et al., 2017). In another Raine-led study (1996), researchers checked criminal records on nearly 400 Danish men at ages 20 to 22. All these men either had biological risk factors at birth (such as premature birth) or came from family backgrounds marked by poverty and family instability. The researchers then compared each of these two groups with a third *biosocial* group (people whose lives were marked by *both* those biological and social risk factors). The biosocial group had double the risk of committing a crime. Similar findings emerged from a famous study that followed 1037 children for a quarter-century: Two combined factors—childhood maltreatment and a gene that altered neurotransmitter balance—predicted antisocial problems (Caspi et al., 2002). Neither "bad" genes alone nor a "bad" environment alone predisposed later antisocial behavior. Rather, genes predisposed some children to be more sensitive to maltreatment. Within "genetically vulnerable segments of the population," environmental influences matter—for better or for worse (Belsky & Pluess, 2009; Moffitt, 2005).

With antisocial behavior—as with so much else—nature and nurture interact. Once again, the biopsychosocial perspective helps us understand the whole story. To further investigate the neural basis of antisocial personality disorder, neuroscientists are exploring the antisocial brain (Brazil & Buades-Rotger, 2020). Shown emotionally evocative photographs, such as a man holding a knife to a woman's throat, criminals with antisocial personality disorder display blunted heart rate and perspiration responses, and less activity in brain areas

that typically respond to emotional stimuli (Harenski et al., 2010; Kiehl & Buckholtz, 2010). They also have a larger and hyperreactive dopamine reward system, which predisposes their impulsive drive to do something rewarding despite the consequences (Buckholtz et al., 2010; Glenn et al., 2010). Such data provide another reminder: Everything psychological is also biological.

Retrieval Practice

RP-2 How do biological and psychological factors contribute to antisocial personality disorder?

ANSWERS IN APPENDIX E

Eating Disorders

LOQ 52-3

What are the three main eating disorders, and how do biological, psychological, and social-cultural influences make some people more vulnerable to them?

Our bodies are naturally disposed to maintain a steady weight, including storing energy for times when food becomes unavailable. But sometimes psychological influences overwhelm biological wisdom. This becomes painfully clear in three eating disorders.

- In **anorexia nervosa,** people—most often adolescent girls, but some women, men, and boys as well—starve themselves. Anorexia often begins as an attempt to lose weight, but the dieting becomes a habit (Steinglass et al., 2018). Regardless of their actual weight, a person with anorexia feels fat, fears being fat, and focuses obsessively on losing weight, sometimes exercising excessively.
- In **bulimia nervosa,** a cycle of repeated episodes of binge eating alternates with behaviors to compensate, such as vomiting, laxative use, fasting, or excessive exercise (Wonderlich et al., 2007). Unlike anorexia, bulimia is marked by weight fluctuations within or above typical ranges, making the disorder easier to hide.
- Those with **binge-eating disorder**—the world's most common eating disorder—are preoccupied with food and engage in significant bouts of bingeing, followed by remorse. But they do not purge, fast, or exercise excessively (Santomauro et al., 2021).



A distorted body image underlies anorexia.

At some point during their lifetime, about 2.6 million Americans (0.8 percent) have met the DSM-5-TR-defined criteria for anorexia, 2.6 million for bulimia, and 2.7 million for binge-eating disorder (Udo & Grilo, 2019). All three disorders can be deadly. They harm the body and mind, resulting in shorter life expectancy and greater risk of suicide and nonsuicidal self-injury (Cucchi et al., 2016; Fichter & Quadflieg, 2016; Mandelli et al., 2019).

Understanding Eating Disorders

Eating disorders are *not* (as some have speculated) a telltale sign of childhood sexual abuse (Smolak & Murnen, 2002; Stice, 2002). The

family environment may influence eating disorders in other ways, however. For example, the families of those with anorexia tend to be competitive, high-achieving, and protective (Ahrén et al., 2013; Berg et al., 2014; Yates, 1989, 1990).

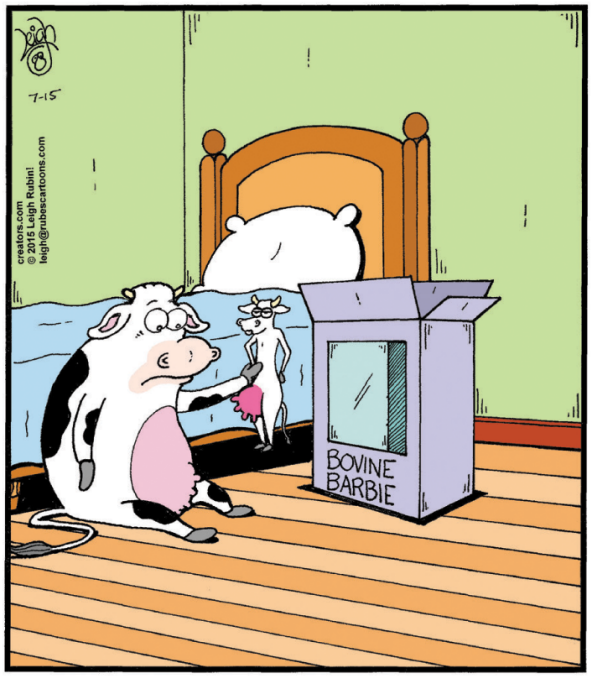
Eating disorders share some commonalities with anxiety disorders (Schaumberg et al., 2021). Those with eating disorders often have low body satisfaction, set perfectionist standards, and ruminate about falling short of expectations and how others perceive them (Farstad et al., 2016; Smith et al., 2018; S. Wang et al., 2019). Some of these factors also predict teen boys' pursuit of unrealistic muscularity (Karazsia et al., 2017; Ricciardelli & McCabe, 2004).

Heredity also matters. Identical twins share these disorders more often than do fraternal twins—with 50 to 60 percent *heritability* for anorexia (Yilmaz et al., 2015). Scientists are searching for culprit genes. The largest study identified gene differences by comparing the genomes of nearly 17,000 people with anorexia with 56,000 others who did not have the disorder (Watson et al., 2019).

But eating disorders also have cultural and gender components. Ideal shapes vary across culture and time. Hungry people find larger bodies more attractive (Saxton et al., 2020). In countries with high poverty rates, plump may mean prosperity and thin may signal poverty or illness (Knickmeyer, 2001; Swami et al., 2010). Not so in high-income Western cultures. In one analysis of 222 studies, the rise in eating disorders in the last half of the twentieth century coincided with a

dramatic decline in Western women's body image (Feingold & Mazzella, 1998). Women have come to overestimate the female thinness that straight men prefer, while men overestimate the male muscularity that straight women prefer (Lei & Perrett, 2021).

Today's weight-obsessed culture—which sends the message that "fat is bad" in countless ways—motivates millions of women to diet constantly, and invites eating binges by pressuring women to live in a constant state of semistarvation. One former model recalled walking into a meeting with her agent, starving and with her organs failing due to anorexia (Carroll, 2013). Her agent's greeting: "Whatever you are doing, keep doing it." Women who view real and doctored images of unnaturally thin models and celebrities often feel ashamed, depressed, and dissatisfied with their own bodies—the very attitudes that predispose eating disorders (Bould et al., 2018; Tiggemann & Miller, 2010). Even ultrathin models do not reflect the impossible standard of the original Barbie doll, who had, when adjusted to a height of 5 feet 7 inches, a 32-inch bust, 16-inch waist, and 29-inch hips (in centimeters, 82–41–73) (Norton et al., 1996).



Leigh Rubes/Creators Syndicate, Inc.

"Up until that point, Bernice had never once had a problem with low self-esteem."

"Why do women have such low self-esteem? There are many complex psychological and societal reasons, by which I mean Barbie." — Humorist Dave Barry, 1999

Most people diagnosed with an eating disorder do improve. In one 22-year study, 2 in 3 women with anorexia nervosa or bulimia nervosa had recovered (Eddy et al., 2017). Prevention is also possible. Interactive programs that teach teen girls to accept their bodies have reduced the risk of eating disorders (Beintner et al., 2012; Melioli et al., 2016; Vocks et al., 2010). By combating cultural learning, those at risk may instead live long and healthy lives.

Retrieval Practice

RP-3 People with _____ _____ (anorexia nervosa/bulimia nervosa) continue to want to lose weight even when they are underweight. Those with _____ _____ (anorexia nervosa/bulimia nervosa) tend to have a weight that fluctuates within or above typical ranges.

ANSWERS IN APPENDIX E

REVIEW

Module 52: Dissociative, Personality, and Eating Disorders

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 52-1: What are *dissociative disorders,* and why are they controversial?

LOQ 52-2: What are the three clusters of personality disorders? What behaviors and brain activity characterize antisocial personality

disorder?

LOQ 52-3: What are the three main eating disorders, and how do biological, psychological, and social-cultural influences make some people more vulnerable to them?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

dissociative disorders
dissociative identity disorder (DID)
personality disorders
antisocial personality disorder
anorexia nervosa
bulimia nervosa
binge-eating disorder

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. Dissociative identity disorder is controversial because
    a. dissociation is quite rare.
    b. it was reported frequently in the 1920s but is rarely reported today.
    c. it is almost never reported outside North America.
    d. its symptoms are nearly identical to those of obsessive-compulsive disorder.

2. A personality disorder, such as antisocial personality, is characterized by
    a. depression.
    b. hallucinations.
    c. enduring inner experiences and behavior patterns that cause distress or impairment.
    d. an elevated level of autonomic nervous system arousal.

3. PET scans of murderers' brains have revealed
    a. higher-than-normal activation in the frontal lobes.
    b. lower-than-normal activation in the frontal lobes.
    c. more frontal lobe tissue than normal.
    d. no differences in brain structures or activity.

4. Which of the following statements is true of bulimia nervosa?
    a. People with bulimia continue to want to lose weight even when they are underweight.
    b. Bulimia is marked by weight fluctuations within or above typical ranges.

c. Those with bulimia do not follow food binges with compensating behaviors.
d. If one twin is diagnosed with bulimia, the chances of the other twin sharing the disorder are greater if they are fraternal rather than identical twins.

MODULE 53: Neurodevelopmental Disorders

Our thoughts and behaviors change as we grow older. For people with **neurodevelopmental disorders**, these typical changes are disrupted in childhood because of unusual features of the central nervous system. These disorders include *intellectual developmental disorders, autism spectrum disorder,* and *attention-deficit/hyperactivity disorder.*

Intellectual Developmental Disorder

LOQ 53-1

What is *intellectual developmental disorder?*

Intellectual developmental disorder is apparent before age 18, often with a known physical cause. *Down syndrome,* for example, is a disorder of varying intellectual and physical severity caused by an extra copy of chromosome 21 in the person's genetic makeup.

To be diagnosed with intellectual developmental disorder, a young person must meet two criteria. The first is low intellectual functioning as reflected in a low intelligence test score. Guidelines specify test score performance that is in the lowest 3 percent of the general

population, or about 70 or below (Schalock et al., 2010). The second criterion is that the person must have difficulty adapting to the normal demands of independent living, as expressed in three areas, or skills: *conceptual* (language, reading, and concepts of money, time, and number); *social* (interpersonal skills, being socially responsible, following basic rules and laws, avoiding being victimized); and *practical* (health and personal care, occupational skill, and travel). Intellectual developmental disorder results from a combination of genetic and environmental factors (Reichenberg et al., 2016).

Retrieval Practice

RP-1 What criteria must be met for someone to be diagnosed with intellectual developmental disorder?

ANSWERS IN APPENDIX E

Autism Spectrum Disorder

LOQ 53-2

What is *autism spectrum disorder?*

Autism spectrum disorder (ASD) is a cognitive and social-emotional disorder that is marked by social deficiencies and repetitive behaviors. Once believed to affect 1 in 2500 children (and referred to simply as

autism), ASD is now diagnosed in 1 in 38 children in South Korea, 1 in 54 in the United States, 1 in 62 in Canada, and 1 in 166 in Germany (CDC, 2020; Chiarotti & Venerosi, 2020). The increase in ASD diagnoses has been offset by a decrease in the number of children with a "cognitive disability" or "learning disability," which suggests a relabeling of children's disorders (Gernsbacher et al., 2005; Grinker, 2007; Shattuck, 2006).



martinedoucet/E+/Getty Images

Comforting connections In this shelter for battered and abandoned animals, children with a neurodevelopmental disorder learn to connect with the animals as a way of building their own strengths.

The underlying source of ASD's symptoms seems to be poor communication among brain regions that typically work together to let us take another's viewpoint. From age 2 months on, children typically spend more and more time looking into others' eyes; those who later develop ASD do so less and less (Baron-Cohen, 2017; Wang et al., 2020). Researchers are debating whether autistic people have an *impaired theory of mind* (Gernsbacher & Yergeau, 2019; Matthews &

Goldberg, 2018; Velikonja et al., 2019). Reading faces *(Is that face conveying a smile or a sneer?)* or even recognizing faces is often difficult for those with ASD (Griffin et al., 2021). Autistic people have difficulty inferring how others think differently than they do (Deschrijver & Palmer, 2020). For example, they may not appreciate that playmates and parents might view things differently, or understand that their teachers know more than they do (Boucher et al., 2012; Frith & Frith, 2001; Knutsen et al., 2015).

> **"I'm autistic, which means everyone around me has a disorder that makes them … creepily stare into my eyeballs."** — Facebook.com/autisticnotweird, 2020

A national survey of parents and school staff reported that 46 percent of adolescents with ASD had endured the taunts and torments of bullying—four times the 11 percent rate for other children (Sterzing et al., 2012). Children with ASD do make friends, but their peers often find such relationships emotionally unsatisfying (Mendelson et al., 2016). This helps explain why people with ASD have a quadrupled risk of experiencing depression in their lifetime (Hudson et al., 2019).

ASD has differing levels of severity. Some (those diagnosed with what used to be called *Asperger syndrome*) function at a high level, with average intelligence, often accompanied by exceptional skill or talent in a specific area. But those with more severe ASD may lack the motivation and ability to interact and communicate socially, and they tend to become distracted by irrelevant stimuli (Clements et al., 2018;

Remington et al., 2009). Those at the spectrum's most severe end struggle to use language.

> **"Autism makes my life difficult, but it also makes my life beautiful. When everything is more intense, then the everyday, the mundane, the typical, the normal—those things become outstanding."** — Erin McKinney, "The Best Way I Can Describe What It's Like to Have Autism," 2015

ASD gets diagnosed in about four boys for every girl, perhaps partly because girls may be more skilled in hiding ASD-related traits (CDC, 2020; Dean et al., 2017; Loomes et al., 2017). Psychologist Simon Baron-Cohen (2010), who has been knighted for his autism research, believes the imbalance is because boys—whether or not they have ASD—are "systemizers." They tend to understand things according to rules or laws, as in mathematical and mechanical systems. Girls, he contends, are more often predisposed to be "empathizers." They tend to excel at reading facial expressions, predicting what others will feel, and knowing what to do in social situations. Whether male or female, those with ASD are systemizers who have more difficulty reading facial expressions, intuitively knowing what others feel, and understanding how to have smooth social interactions (Greenberg et al., 2018; Velikonja et al., 2019). People working in STEM (science, technology, engineering, or mathematics) careers are also somewhat more likely than others to exhibit some ASD-like traits (Ruzich et al., 2015).



Justin Sellers/The Clarion Ledger/USA TODAY NETWORK/Imagn Content Services

"Autism" case number 1 In 1943, Donald Gray Triplett, an "odd" child with unusual gifts and social limitations, was the first person to receive the diagnosis of "autism." (After a 2013 change in the diagnosis manual, his condition is now called *autism spectrum disorder.*) At age 82, Triplett—a retired bank teller who often played golf—was living independently in his family home and Mississippi town (Atlas, 2016). He is shown here (left) walking with his brother.

Biological factors contribute to ASD (Ecker et al., 2021; J. Zhou et al., 2019). Prenatal environment matters, especially when altered by maternal infection, psychiatric drug use, or stress hormones (NIH, 2013; Wang, 2014). Genes also matter. One five-nation study of 2 million people found the hereditability of ASD was near 80 percent (Bai et al., 2019). If one identical twin is diagnosed with ASD, the chances are near 9 in 10 that the co-twin will be as well, though such twins often differ in symptom severity (Castelbaum et al., 2020). No one "autism gene" accounts for the disorder. Rather, many genes—

with more than 400 identified so far—contribute (Krishnan et al., 2016; Yuen et al., 2016). Random genetic mutations in sperm cells may also play a role. As men age, these mutations become more frequent, which helps explain why a man over age 40 has a much higher risk of fathering a child with ASD than does a man under age 30 (Wu et al., 2017).

Researchers are also sleuthing ASD's telltale signs in the brain's structure. Several studies have revealed "underconnectivity"—fewer-than-normal fiber tracts connecting the front of the brain to the back (Picci et al., 2016). With underconnectivity, there is less of the whole-brain synchrony that, for example, integrates visual and emotional information. In children as young as 3 months, EEG-recorded brain activity can foretell ASD (Bosl et al., 2018).

Biology's role in ASD also appears in the brain's functioning. People without ASD often yawn after seeing others yawn. And as they view and imitate another's smiling or frowning, they feel something of what the other is feeling. Not so among those with ASD, who are less imitative and show less activity in brain areas involved in mirroring others' actions (Edwards, 2014; Yang & Hoffmann, 2015). When people with ASD watch another person's hand movements, for example, their brain displays less mirroring activity than is typical (Oberman & Ramachandran, 2007; Théoret et al., 2005). Scientists are exploring whether treatment with oxytocin, the hormone that promotes social bonding, might improve social understanding in those with ASD (Gordon et al., 2013; Lange & McDougle, 2013).

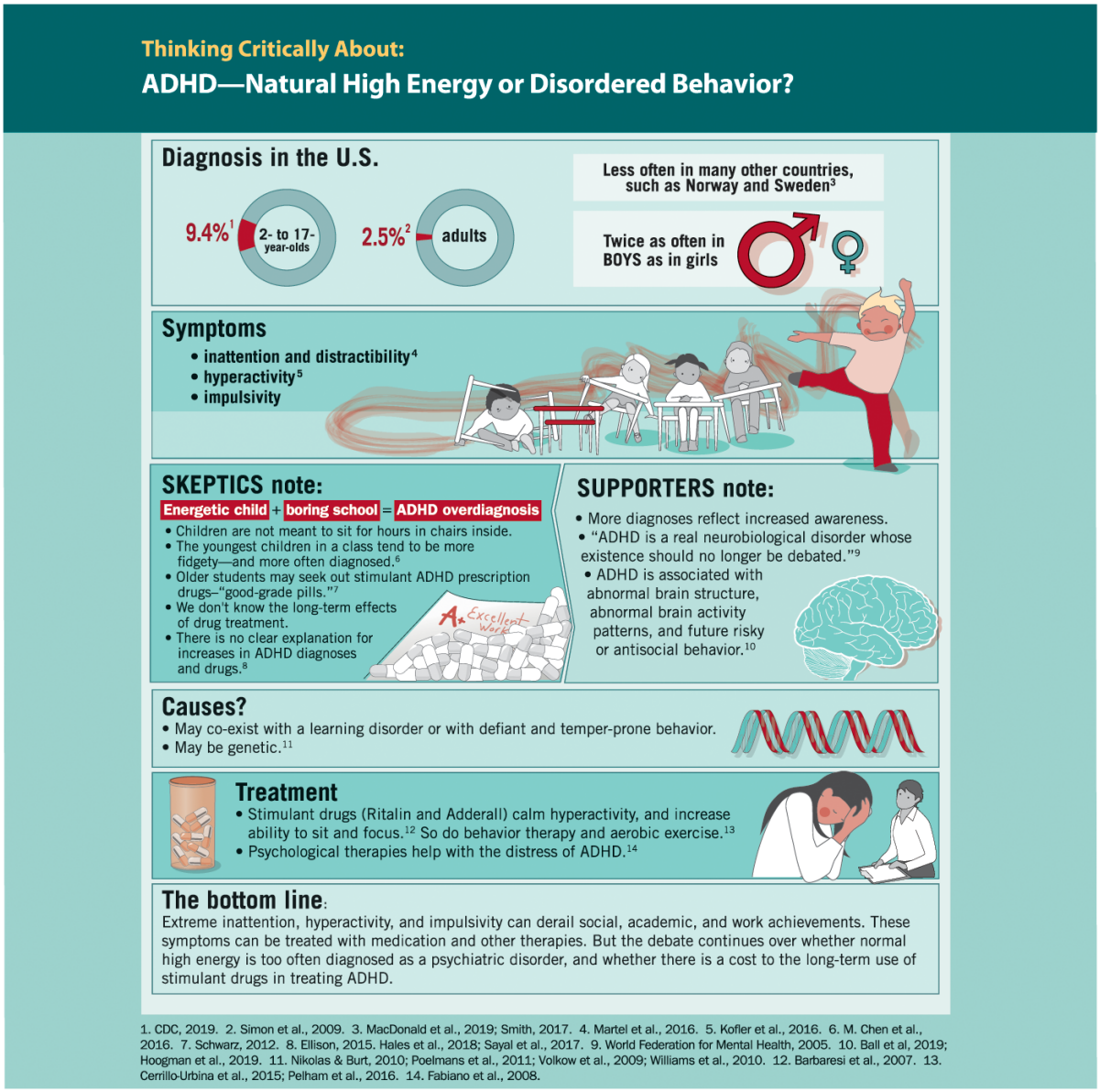
There is overwhelming evidence that childhood vaccinations, which—despite a fraudulent 1998 study claiming otherwise—*have no connection* to ASD. In fact, in one recent study following nearly 700,000 Danish children, those receiving the measles/mumps/rubella vaccine were slightly *less* likely to later be among the 6517 children diagnosed with ASD (Hviid et al., 2019). *The bottom line:* When deciding whether to vaccinate their children, parents should trust the scientific evidence. Childhood vaccinations do not increase the risk for ASD.

Attention-Deficit/Hyperactivity Disorder

For children who experience the challenging symptoms of **attention-deficit/hyperactivity disorder (ADHD)**, diagnosis and treatment can help (Kupfer, 2012; Maciejewski et al., 2016). The DSM has broadened the diagnostic criteria for this disorder, prompting critics to wonder whether the criteria are now too broad (Frances, 2013). Shall we say such a child is hyperactive—or energetic? Impulsive—or spontaneous? Excessively talkative—or excited? One 10-year study in Sweden found children's attentional behaviors unchanging, while national ADHD diagnoses increased fivefold (Rydell et al., 2018). (See Thinking Critically About: ADHD—Natural High Energy or Disordered Behavior?)

LOQ 53-3

Why is there controversy over attention-deficit/hyperactivity disorder?



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The bewilderment, fear, and sorrow caused by psychological disorders are real. But, as the Therapy modules show, hope, too, is

real.

REVIEW

Module 53: Neurodevelopmental Disorders

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 53-1: What is *intellectual developmental disorder?*

LOQ 53-2: What is *autism spectrum disorder?*

LOQ 53-3: Why is there controversy over attention-deficit/hyperactivity disorder?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

neurodevelopmental disorders
intellectual developmental disorder
autism spectrum disorder (ASD)
attention-deficit/hyperactivity disorder (ADHD)

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. Which of the following statements is true of intellectual developmental disorder?
    a. People with this condition can generally adapt to the normal demands of independent living.
    b. This condition typically presents with no known physical cause.
    c. People with this condition have an intelligence test score of about 70 or below.
    d. People with this condition are systemizers who tend to have difficulty reading facial expressions.

2. What differences in brain structure and function are characteristic of ASD?

3. Some critics believe that the DSM-5-TR may pathologize everyday life and typical behaviors. How does the ADHD controversy relate to this concern?

CHAPTER 16
Therapy (Modules 54–56)



xavierarnau/E+/Getty Images

MODULE 54 Introduction to Therapy and the Psychological Therapies

- Treating Psychological Disorders
- Psychoanalysis and Psychodynamic Therapies
- Humanistic Therapies
- Behavior Therapies

Cognitive Therapies
Group Therapy, Couples Therapy, and Family Therapy
MODULE 55 Evaluating Psychotherapies
Is Psychotherapy Effective?
Which Psychotherapies Work Best?
How Do Psychotherapies Help People?
Human Diversity and Psychotherapy
Seeking Psychotherapy
Ethical Principles in Psychotherapy
MODULE 56 The Biomedical Therapies and Preventing Psychological Disorders
THINKING CRITICALLY ABOUT: Therapeutic Lifestyle Change
Drug Therapies
Brain Stimulation
Psychosurgery
Preventing Psychological Disorders and Building Resilience

Psychologist Kay Redfield Jamison, a renowned expert on the emotional extremes of bipolar disorders, knows her subject firsthand. As she recalled in *An Unquiet Mind:*

> For as long as I can remember, I was frighteningly, although often wonderfully, beholden to moods. Intensely emotional as a child, mercurial as a young girl, first severely depressed as an adolescent, and then unrelentingly caught up in the cycles of manic-depressive illness [now known as *bipolar I disorder*] by the time I began my professional life, I became, both by necessity and intellectual inclination, a student of moods. (1995, pp. 4–5)

Jamison's life was blessed with times of intense sensitivity and passionate energy. But like her father's, it was also sometimes plagued by reckless spending, racing conversation, and sleeplessness, alternating with swings into "the blackest caves of the mind."

Then, "in the midst of utter confusion," she made a life-changing decision. Risking professional embarrassment, she made an appointment with a therapist, a psychiatrist she would visit weekly for years to come.

> He kept me alive a thousand times over. He saw me through madness, despair, wonderful and terrible love affairs, disillusionments and triumphs, recurrences of illness, an almost fatal suicide attempt, the death of a man I greatly loved, and the enormous pleasures and aggravations of my professional life…. He was very tough, as well as very kind, and even though he understood more than anyone how much I felt I was losing—in energy, vivacity, and originality—by taking medication, he never [lost] sight of the overall perspective of how costly, damaging, and life threatening my illness was…. Although I went to him to be treated for an illness, he taught me … the total beholdenness of brain to mind and mind to brain. (pp. 87–88)





Left: John Shearer/Getty Images; right: Kevin Winter/Getty Images for Variety

Value of therapy Actor Kerry Washington and singer Katy Perry have spoken publicly about the benefits of psychotherapy. “I’ve been going to therapy for about five years,” Perry said, “and I think it has really helped my mental health incredibly” (Chen, 2017).

These modules explore healing options available to therapists and those who seek their help. We begin by exploring and evaluating *psychotherapies* (Modules 54 and 55), and then focus on *biomedical therapies* and preventing disorders (Module 56).

MODULE 54: Introduction to Therapy and the Psychological Therapies

The long history of treating psychological disorders has included a bewildering mix of harsh and gentle methods. Would-be healers have cut holes in people's heads and restrained, bled, or "beat the devil" out of them. But they also have given warm baths and massages and placed people in sunny, serene environments. They have given them helpful drugs. And they have talked with them about childhood experiences, current feelings, and negative thoughts and behaviors.



The Granger Collection

The history of treatment Visitors to eighteenth-century psychiatric hospitals paid to gawk at patients, as though they were viewing zoo animals. William Hogarth's (1697–1764) painting captured one of these visits to London's St. Mary of Bethlehem hospital (commonly called Bedlam).

Reformers Philippe Pinel (1745–1826) and Dorothea Dix (1802–1887) pushed for gentler, more humane treatments and for constructing psychiatric hospitals. Since the 1950s, the introduction of effective drug therapies and community-based treatment programs has emptied most of those hospitals. Unfortunately, this *deinstitutionalization* has left many people with mental illness untreated, which has contributed to their increased homelessness and incarceration.



Macmillan Learning

Dorothea Dix "I … call your attention to the state of the Insane Persons confined within this Commonwealth, in cages" (*Memorial to the Legislature of Massachusetts*, 1843).

Treating Psychological Disorders

Learning Objective Question LOQ 54-1

How do *psychotherapy* and the *biomedical therapies* differ?

Modern Western therapies take two main forms.

- In **psychotherapy**, a trained therapist uses psychological techniques to help someone overcome difficulties and achieve personal growth. The therapist may explore a client's early relationships, encourage the client to adopt new ways of thinking, or coach the client in replacing old behaviors with new ones.
- **Biomedical therapy** offers medication or other biological treatments for psychological disorders. For example, a person with severe depression may receive antidepressants, electroconvulsive therapy (ECT), or brain stimulation.

Today, 1 in 5 Americans annually receives some form of mental health therapy (Olfson et al., 2019). The care provider's training and expertise, and the disorder itself, influence the choice of treatment. Psychotherapy and medication are often combined to treat psychological disorders. Kay Redfield Jamison received psychotherapy and took medications to control her dramatic mood swings.

Let's look first at some influential psychotherapy options. Each is built on one or more of psychology's major theories: psychodynamic,

humanistic, behavioral, and cognitive. Most of these techniques can be used one-on-one or in groups. Therapy often occurs in person, but people may also receive treatment by phone or online via *teletherapy*. Some therapists combine techniques. Indeed, many psychotherapists describe their approach as **eclectic** or integrative, using a blend of therapies.

Psychoanalysis and Psychodynamic Therapies

LOQ 54-2

What are the goals and techniques of psychoanalysis, and how have they been adapted in psychodynamic therapy?

The first major psychological therapy was Sigmund Freud's **psychoanalysis.** Although few clinicians today practice therapy as Freud did, his work deserves discussion. It helped form the foundation for treating psychological disorders, and it continues to influence contemporary therapists working from the modern *psychodynamic* perspective.

The Goals of Psychoanalysis

Freud believed that in therapy, people could achieve healthier, less anxious living by releasing the energy they had previously devoted to *id-ego-superego* conflicts (Personality modules). Freud believed that

there are things we *repress*—things we do not want to know because they may cause distress, so we deny or avoid them. Psychoanalysis was Freud's method of helping people bring these repressed feelings into conscious awareness. By helping them reclaim their unconscious thoughts and feelings, and by giving them *insight* into the origins of their distress, the therapist *(analyst)* could help them reduce growth-impeding inner conflicts.

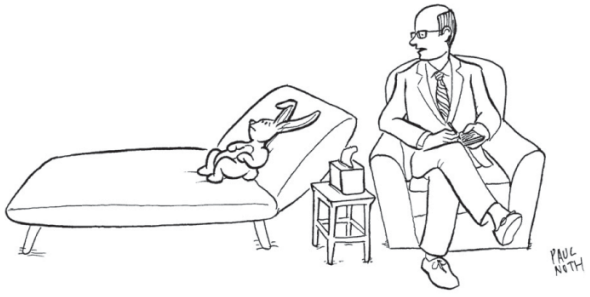
The Techniques of Psychoanalysis

Psychoanalytic theory emphasizes the power of early life experiences to mold the adult. It aims to unearth the past in the hope of loosening its hold on the present. After discarding hypnosis as an unreliable excavator, Freud turned to *free association*.

Imagine yourself as a patient using free association. You begin by relaxing, perhaps by lying on a couch. The psychoanalyst, who sits out of your line of vision, asks you to say aloud whatever comes to mind. At one moment, you're relating a childhood memory. At another, you're describing a disturbing dream and then what you ate for breakfast. Your thoughts may jump from one thing to the next. It sounds easy, but soon you notice how often you edit your thoughts as you speak. You pause for a second before uttering an embarrassing thought. You omit what seems trivial, irrelevant, or shameful. Sometimes your mind goes blank or you clutch up, unable to remember important details. You may joke or change the subject to something less threatening.

Freud thought that these mental blocks were signs of **resistance.** They hint that anxiety lurks and you are defending against uncomfortable material. An analyst would note your resistance and then provide insight into its meaning. If offered at the right moment, this **interpretation**—of, say, your reluctance to call or message your mother—may illuminate the underlying wishes, feelings, and conflicts you are avoiding. The analyst may also offer an explanation of how this resistance fits with other pieces of your psychological puzzle, including those based on analysis of your dream content.

Over many such sessions, your relationship patterns surface in your interaction with your analyst. You may find yourself experiencing strong positive or negative feelings for this confidant. The analyst may suggest you are **transferring** feelings, such as dependency or mingled love and anger, that you experienced in earlier relationships with family members or other important people. By exposing such feelings, you may gain insight into your current relationships.



Paul Noth/Cartoon Stock

"I'm more interested in hearing about the eggs you're hiding from yourself."

Today's therapists rarely offer Freud's traditional psychoanalysis. Much of its underlying theory is not supported by scientific research.

Analysts' interpretations cannot be proven or disproven. Psychoanalysis takes considerable time and money, often years of several sessions per week. Some of these problems have been addressed in the modern *psychodynamic perspective* that has evolved from psychoanalysis.

Retrieval Practice

RP-1 In psychoanalysis, when patients experience strong feelings for their analyst, this is called _____. Patients are said to demonstrate anxiety when they put up mental blocks around sensitive memories, indicating _____. The analyst will attempt to provide insight into the underlying anxiety by offering a(n) _____ of the mental blocks.

ANSWERS IN APPENDIX E

Psychodynamic Therapy

Although influenced by Freud's ideas, **psychodynamic therapists** don't talk much about symbolic id-ego-superego conflicts. Instead, they try to help people understand their current thoughts and feelings by focusing on important relationships and events, including early childhood experiences and the therapist-client relationship. "We can have loving feelings and hateful feelings toward the same person," observed psychodynamic therapist Jonathan Shedler (2009), and "we can desire something and also fear it." Client-therapist sessions occur weekly (rather than several times per week) and often for only a few weeks or months (rather than years). Clients meet with their therapist

in person, over the phone, or online. And in contrast to Freud's prescribing cocaine to his depressed patients(!), today's psychodynamic therapists might prescribe antidepressant drugs that have been researched, tested, and deemed safe for use (Driessen et al., 2020).

In their sessions, clients explore and gain perspective on defended-against thoughts and feelings. Therapist David Shapiro (1999, p. 8) illustrated this with the case of a young man who had told women he loved them but knew that he didn't. The client's explanation: They expected it, so he said it. But later, with his wife, who wished he would say that he loved her, he found himself unable—"I don't know why, but I can't."

> ***Therapist:*** Do you mean, then, that if you could, you would like to?
> ***Patient:*** Well, I don't know.… Maybe I can't say it because I'm not sure it's true. Maybe I don't love her.

Further interactions revealed that the client could not express real love because it would feel "mushy" and "soft" and therefore unmanly. He was "in conflict with himself, and … cut off from the nature of that conflict." Shapiro noted that with such patients, who are estranged from themselves, therapists using psychodynamic techniques "are in a position to introduce them to themselves. We can restore their awareness of their own wishes and feelings, and their awareness, as well, of their reactions against those wishes and feelings."

Humanistic Therapies

LOQ 54-3

What are the basic themes of humanistic therapy? What are the goals and techniques of Rogers' person-centered approach?

The *humanistic* perspective emphasizes people's innate goodness and potential for self-fulfillment. To this end, humanistic therapists help clients discover new insights. Indeed, because they share this goal, the psychodynamic and humanistic therapies are often referred to as **insight therapies.** But humanistic therapies differ from psychodynamic therapies in many ways, including their focus on three main ideas:

1. ***Growth.*** Humanistic therapists focus not on illness, but on helping people grow in self-awareness and self-acceptance. Thus, they call those in therapy "persons" or "clients" rather than "patients" (a change many other therapists have adopted).
2. ***The present.*** Humanistic psychologists believe the present and the future are more important than the past. Rather than uncovering hidden internal conflicts from the past, they encourage clients to take immediate responsibility for their current feelings and actions.
3. ***The conscious mind.*** Humanistic therapies focus on clients' conscious thoughts, which they believe are more important than unconscious thoughts.

These themes are present in the widely used **person-centered therapy**, a humanistic technique that Carl Rogers (1902–1987) developed. In this *nondirective* therapy, the client leads the discussion. The therapist listens, without judging or interpreting, and refrains from directing the client toward certain insights. Believing that most people possess the resources for growth, Rogers (1961, 1980) encouraged therapists to foster that growth through acceptance, genuineness, and empathy. By being *accepting*, therapists may help clients feel freer and more open to change. By being *genuine*, therapists hope to encourage clients to express their true feelings. By being *empathic*, therapists try to sense and reflect their clients' feelings, helping them experience a deeper self-understanding and self-acceptance (Hill & Nakayama, 2000). As Rogers (1980) explained nearly a half century ago,[1]

> Hearing has consequences. When I truly hear a person and the meanings that are important to him at that moment, hearing not simply his words, but him, and when I let him know that I have heard his own private personal meanings, many things happen. There is first of all a grateful look. He feels released. He wants to tell me more about his world. He surges forth in a new sense of freedom. He becomes more open to the process of change.
>
> I have often noticed that the more deeply I hear the meanings of the person, the more there is that happens. Almost always, when a person realizes he has been deeply heard, his eyes moisten. I think in some real sense he is weeping for joy. It is as though he were saying, "Thank God, somebody heard me. Someone knows what it's like to be me." (p. 10)

To Rogers, "hearing" was **active listening.** The therapist echoes, restates, and seeks clarification of what the person expresses (verbally or nonverbally). The therapist also acknowledges those expressed feelings. Active listening is now an accepted part of counseling practices in many schools, colleges, and clinics. Counselors listen attentively. They interrupt only to restate and confirm feelings, to accept what is being expressed, or to seek clarification. In the following brief excerpt, note how Rogers tried to provide a psychological mirror that would help the client see himself more clearly (Meador & Rogers, 1984, p. 167):

> ***Rogers:*** Feeling that now, hm? That you're just no good to yourself, no good to anybody. Never will be any good to anybody. Just that you're completely worthless, huh?—Those really are lousy feelings. Just feel that you're no good at all, hm?
> ***Client:*** Yeah. *(Muttering in low, discouraged voice)* That's what this guy I went to town with just the other day told me.
> ***Rogers:*** This guy that you went to town with really told you that you were no good? Is that what you're saying? Did I get that right?
> ***Client:*** M-hm.
> ***Rogers:*** I guess the meaning of that if I get it right is that here's somebody that meant something to you and what does he think of you? Why, he's told you that he thinks you're no good at all. And that just really knocks the props out from under you. *(Client weeps quietly.)* It just brings the tears. *(Silence of 20 seconds)*
> ***Client:*** *(Rather defiantly)* I don't care though.
> ***Rogers:*** You tell yourself you don't care at all, but somehow I guess some part of you cares because some part of you weeps over it.



Michael Rougier/The LIFE Picture Collection/Getty Images

Active listening Carl Rogers (right) empathized with a client during this group therapy session.

Can a therapist be a perfect mirror, without selecting and interpreting what is reflected? Rogers conceded that one cannot be *totally* nondirective. Nevertheless, he said, the therapist's most important contribution is to accept and understand the client. Given a nonjudgmental, grace-filled environment that provides **unconditional positive regard,** people may accept even their worst traits and still feel valued and whole.

How can we improve communication in our own relationships by listening more actively? Three Rogers-inspired hints may help:

1. ***Paraphrase.*** Check your understanding by summarizing the person's words out loud, in your own words. "You felt

disappointed when your friend canceled your plans. Is that right?"

2. ***Invite clarification.*** "What might be an example of that?" may encourage the person to say more.
3. ***Reflect feelings.*** "It sounds frustrating" might mirror what you're sensing from the person's body language and intensity.

Ask Yourself

Think of your closest friends. Do they tend to express more empathy than those you feel less close to? How might *you* more deeply and actively listen to your friends?

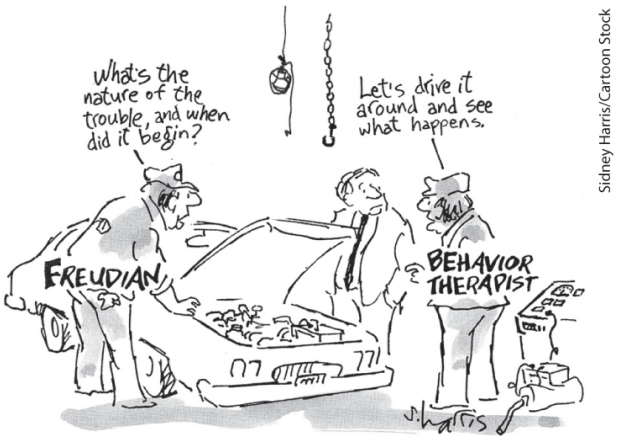
Behavior Therapies

LOQ 54-4

How does the basic assumption of behavior therapy differ from the assumptions of psychodynamic and humanistic therapies? What classical conditioning techniques are used in exposure therapies and aversive conditioning?

The insight therapies assume that self-awareness and psychological well-being go hand in hand. For example, psychodynamic therapists expect people's problems to diminish as they gain insight into their unresolved and unconscious tensions. And humanistic therapists expect problems to diminish as people get in touch with their feelings. **Behavior therapists**, however, doubt the healing power of self-

awareness. Rather than delving deeply below the surface looking for inner causes, behavior therapists assume that problem behaviors *are* the problems. (You can become aware of why you are highly anxious during exams and still be anxious.) If specific phobias, sexual dysfunctions, or other maladaptive symptoms are learned behaviors, why not apply the learning principles of classical and operant conditioning to replace them with new, constructive behaviors?



Classical Conditioning Techniques

One cluster of behavior therapies derives from principles developed in Ivan Pavlov's early twentieth-century conditioning experiments. As Pavlov and others showed, we learn various behaviors and emotions through *classical conditioning* (Learning modules). If a dog attacks us, we may thereafter have a conditioned fear response when other dogs approach. If our fear generalizes and all dogs become conditioned stimuli, we may even develop a specific phobia for dogs.

Could maladaptive symptoms be examples of conditioned responses? If so, might reconditioning be a solution? Learning theorist O. H. Mowrer (1907–1982) thought so. He developed a successful conditioning therapy for chronic bed-wetting, using a liquid-sensitive pad connected to an alarm. If the sleeping child wets the bed pad, moisture triggers the alarm, waking the child. After several trials, the child associates bladder relaxation with waking. In three out of four cases, the treatment has been effective and the success has boosted the child's self-esteem (Christophersen & Edwards, 1992; Houts et al., 1994).

Can we unlearn fear responses, such as to public speaking or flying, through new conditioning? Many people have. An example: The fear of riding in an elevator is often a learned aversion to being in a confined space. **Counterconditioning**, such as with *exposure therapy*, pairs the trigger stimulus (in this case, the enclosed space of the elevator) with a new relaxation response that is incompatible with fear. Therapists use such techniques as slow and deep breathing or imagining peaceful images.

Retrieval Practice

RP-2 What might a psychodynamic therapist say about Mowrer's therapy for bed-wetting? How might a behavior therapist defend it?

ANSWERS IN APPENDIX E

Exposure Therapies

Picture this scene: Behavioral psychologist Mary Cover Jones is working with 3-year-old Peter, who is petrified of rabbits and other furry objects. To rid Peter of his fear, Jones plans to associate the fear-evoking rabbit with the pleasurable, relaxed response associated with eating a favorite snack. As Peter begins his midafternoon snack, she introduces a caged rabbit on the other side of the huge room. Peter, eagerly munching away on his crackers and drinking his milk, hardly notices. On succeeding days, she gradually moves the rabbit closer and closer. Within 2 months, Peter is holding the rabbit in his lap, even stroking it while he eats. Moreover, his fear of other furry objects subsides as well, having been *countered*, or replaced, by a relaxed state that cannot coexist with fear (Fisher, 1984; Jones, 1924).

Unfortunately for many who might have been helped by Jones' counterconditioning procedures, her story of Peter and the rabbit didn't become well-known when it was reported in 1924. It was more than 30 years before psychiatrist Joseph Wolpe (1958; Wolpe & Plaud, 1997) refined Jones' counterconditioning technique into the **exposure therapies** used today. These therapies, in a variety of ways, try to change people's reactions by repeatedly exposing them to stimuli that trigger unwanted reactions. We all experience this process in everyday life. A person moving to a new apartment may be annoyed by nearby loud traffic noise, but only for a while. With repeated exposure, the person adapts. So, too, with people who have fear reactions to specific events, such as people with PTSD (Thompson-Hollands et al., 2018). Exposed repeatedly to the situation that once petrified them, with

support from talk therapy, they can learn to react less anxiously (Holder et al., 2020). Exposure therapy is neither pleasant nor easy, so it helps to have supportive family and friends (Meis et al., 2019).

One exposure therapy used to treat specific phobias is **systematic desensitization.** You cannot simultaneously be anxious and relaxed. Therefore, if you can repeatedly relax when facing anxiety-provoking stimuli, you can gradually eliminate your anxiety. The trick is to proceed gradually. If you fear public speaking, a behavior therapist might first help you construct an *anxiety hierarchy*—a kind of ladder of speaking situations that trigger increasing anxiety levels. Yours might range from mildly anxiety-provoking situations (perhaps speaking up in a small group of friends) to panic-provoking situations (having to address a large audience).

Next, the therapist would train you in *progressive relaxation*. You would learn to release tension in one muscle group after another, until you achieve a comfortable, complete state of relaxation. Then the therapist might ask you to imagine, with your eyes closed, a mildly anxiety-arousing situation: You are having coffee with a group of friends and are trying to decide whether to speak up. If imagining the scene causes you to feel any anxiety, you are told to signal by raising your finger. Seeing the signal, the therapist will instruct you to switch off the mental image and go back to deep relaxation. This imagined scene is repeatedly paired with relaxation until you feel no trace of anxiety.

The therapist will then move to the next item in your anxiety hierarchy, again using relaxation techniques to desensitize you to each imagined situation. After several sessions, you move to actual situations and practice what you had only imagined before, beginning with relatively easy tasks (like speaking up among friends) and gradually moving to more anxiety-filled ones (like giving a public speech). Conquering your anxiety in an actual situation, not just in your imagination, will increase your self-confidence (Foa & Kozak, 1986; Williams, 1987). Eventually, you may even become a confident public speaker. Often people fear not just a situation, such as public speaking, but also being incapacitated by their own fear response. As their fear subsides, so also does their fear of the fear.

> **"According to most studies, people's number one fear is public speaking. Number two is death. Does that sound right? This means to the average person, if you go to a funeral, you are better off in the casket than doing the eulogy."** — Comedian Jerry Seinfeld

If anxiety-arousing situations (such as those that evoke fears of flying, heights, particular animals, and public speaking) are too expensive, difficult, or risky to re-create, the therapist may recommend **virtual reality exposure therapy**. Imagine donning a head-mounted display unit that projects a lifelike three-dimensional virtual world tailored to your particular fear (**FIGURE 54.1**). If you fear flying, for example, you could peer out of a simulated plane, feel the engine's vibrations, and hear it roar as the plane taxis down the runway and takes off. If you

fear social interactions, you could experience simulated stressful situations, such as entering a roomful of people. In controlled studies, people treated with virtual reality exposure therapy have experienced relief from real-life fear and social anxiety (Meyerbröker & Morina, 2021).

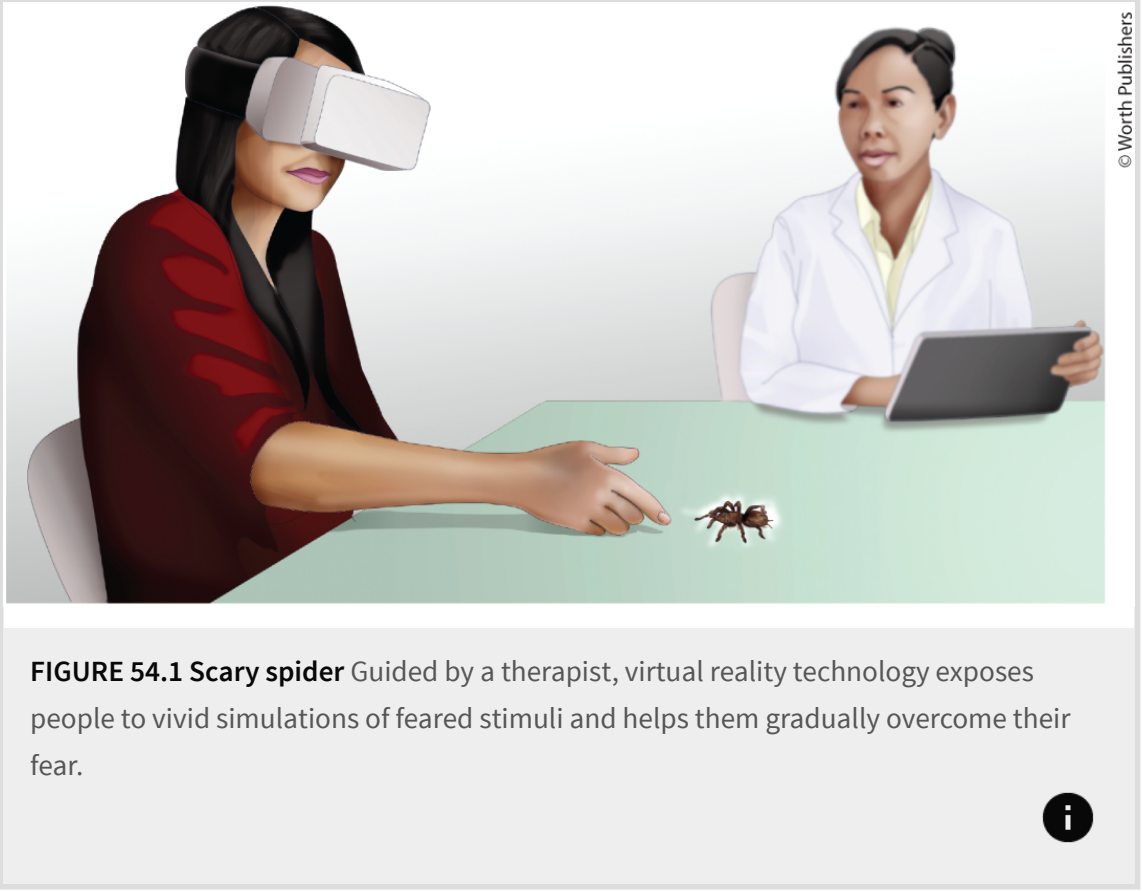


FIGURE 54.1 Scary spider Guided by a therapist, virtual reality technology exposes people to vivid simulations of feared stimuli and helps them gradually overcome their fear.

Aversive Conditioning

Exposure therapy helps you learn what you *should* do; it enables a more relaxed, positive response to an upsetting *harmless* stimulus. **Aversive conditioning** helps you learn what you *should not* do; it creates a negative (aversive) response to a *harmful* stimulus (such as

alcohol). The aversive conditioning procedure is simple: It associates the unwanted behavior with unpleasant feelings. To treat compulsive nail biting, the therapist may suggest painting the fingernails with a nasty-tasting nail polish (Brush, 2014). To treat alcohol use disorder, the therapist may offer the client appealing alcoholic drinks laced with a drug that produces severe nausea. If that therapy links alcohol with violent nausea, the person's reaction to alcohol may change from positive to negative (FIGURE 54.2).

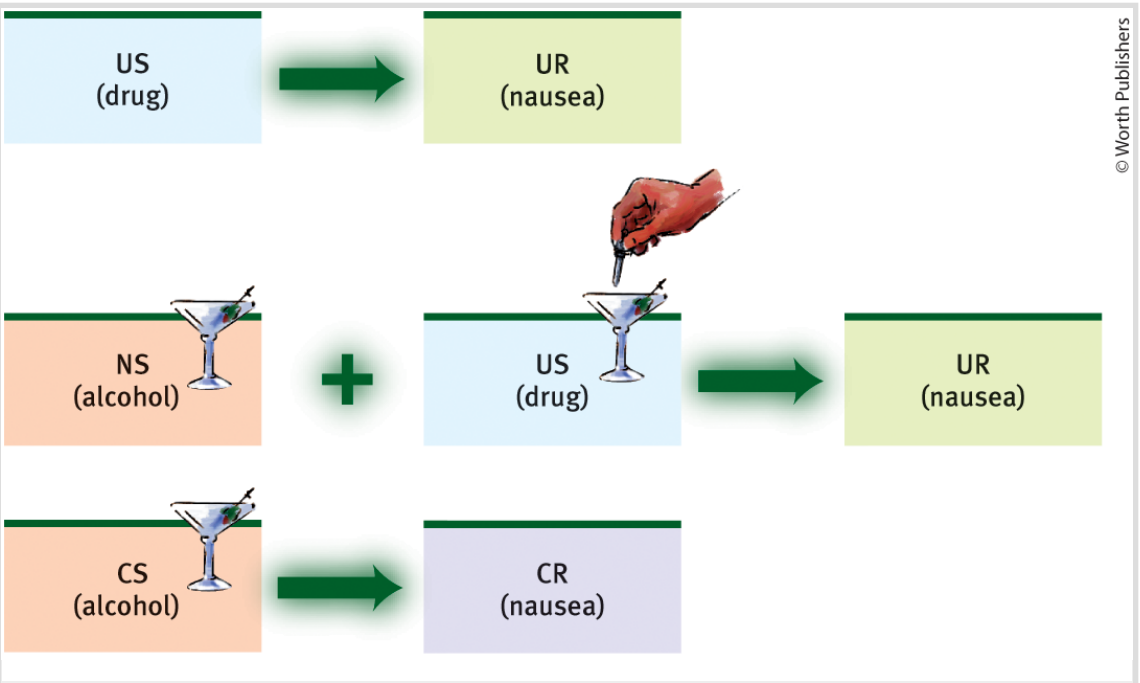


FIGURE 54.2 Aversion therapy for alcohol use disorder After repeatedly imbibing an alcoholic drink mixed with a drug that produces severe nausea, some people with a history of alcohol use disorder develop at least a temporary conditioned aversion to alcohol. (Remember: US is unconditioned stimulus, UR is unconditioned response, NS is neutral stimulus, CS is conditioned stimulus, and CR is conditioned response.)

Taste aversion learning has been a successful alternative to killing predators in some animal protection programs (Dingfelder, 2010; Garcia & Gustavson, 1997). After being sickened by eating a tainted sheep, wolves may later avoid sheep. Does aversive conditioning also transform humans' reactions to alcohol? In the short run it may. In one classic study, 685 participants with alcohol use disorder completed an aversion therapy program (Wiens & Menustik, 1983). Over the next year, they returned for several booster treatments that paired alcohol with sickness. At the end of that year, 63 percent were not drinking alcohol. But the effects diminished when the boosters stopped: After three years, only 33 percent were alcohol free.

In therapy, as in research, cognition influences conditioning. People know that outside the therapist's office they can drink without fear of nausea. This ability to discriminate between the therapy situation and all others can limit aversive conditioning's effectiveness. Thus, therapists often combine aversive conditioning with other treatments.

Operant Conditioning Techniques

LOQ 54-5

What is the main premise of behavior therapy based on operant conditioning principles, and what are the views of its proponents and critics?

If you have learned to swim, you learned to hold your breath with your head under water, to pull your body through the water, to bring your

face above water to breathe, and perhaps even to dive safely. Operant conditioning shaped your swimming. You were reinforced for safe, effective behaviors. And you were naturally punished, as when you swallowed water, for improper swimming behaviors.

Consequences strongly influence our voluntary behaviors. Knowing this basic principle of operant conditioning, behavior therapists can apply *behavior modification*. They reinforce desirable behaviors, and they fail to reinforce—or sometimes punish—undesirable behaviors.

Using operant conditioning to solve specific behavior problems has raised hopes for some seemingly hopeless cases. Children with intellectual developmental disorder have been taught to care for themselves. Socially withdrawn children with autism spectrum disorder (ASD) have learned to interact. People with schizophrenia have been helped to behave more rationally. In such cases, therapists use positive reinforcers to *shape* behavior. In a step-by-step manner, they reward closer and closer approximations of the desired behavior.

Rewards used to modify behavior vary. For some people, the reinforcing power of attention or praise is sufficient. Others require concrete rewards, such as food. In institutional settings, therapists may create a **token economy**. When people display a desired behavior, such as getting out of bed, washing, dressing, eating, talking coherently, cleaning up their rooms, or playing cooperatively, they receive a token or plastic coin. Later, they can exchange a number of these tokens for rewards, such as candy, TV time, day trips, or better

living quarters. Token economies have proven successful in a number of settings, including group homes, classrooms, and correctional institutions, and among people with various disabilities (Matson & Boisjoli, 2009). They have been widely used for children with ADHD, ASD, and other behavioral difficulties (Coehlo et al., 2015; Gilley & Ringdahl, 2014; Kazdin, 1982).



John D. Buffington/DigitalVision/Getty Images

Behavior modification critics express two concerns:

- ***How durable are the behaviors?*** Will people become so dependent on extrinsic rewards that the desired behaviors will stop when reinforcers stop? Behavior modification advocates believe the behaviors will endure if therapists wean people from the tokens by shifting them toward other, real-life rewards, such as social approval. Further, they point out, the desired behaviors themselves can be rewarding. As people become more socially competent, the intrinsic satisfaction of social interaction may sustain the behaviors.
- ***Is it right for one human to control another's behavior?*** Those who set up token economies deprive people of something they

desire and decide which behaviors to reinforce. To critics, this whole process feels authoritarian. Advocates reply that control already exists: People's destructive behavior patterns are being maintained and perpetuated by natural reinforcers and punishers in their environments. Isn't using positive rewards to reinforce adaptive behavior more humane than institutionalizing or punishing people? Advocates also argue that the right to effective treatment and an improved life justifies temporary deprivation.

Ask Yourself

What is your judgment of behavior modification techniques, such as those used in token economies? Do you agree or disagree with this approach?

Retrieval Practice

RP-3 What are the *insight therapies,* and how do they differ from behavior therapies?

RP-4 Some maladaptive behaviors are learned. What hope does this fact provide?

RP-5 Exposure therapies and aversive conditioning are applications of _____ conditioning. Token economies are an application of _____ conditioning.

ANSWERS IN APPENDIX E

Cognitive Therapies

LOQ 54-6

What are the goals and techniques of the cognitive therapies and of cognitive-behavioral therapy?

People with specific fears and problem behaviors may respond to behavior therapy. But how might behavior therapists modify the wide assortment of behaviors that accompany depressive disorders? Or treat people with generalized anxiety disorder, where unfocused anxiety doesn't lend itself to a neat list of anxiety-triggering situations? The *cognitive revolution* that has profoundly changed other areas of psychology since the 1960s has also influenced therapy.

> **"You have power over your mind."** — Marcus Aurelius (121–180 C.E.), *Meditations*

The **cognitive therapies** assume that our *thinking* colors our *feelings* (**FIGURE 54.3**). Between an event and our response lies the mind. Anxiety, for example, can arise from an "attention bias to threat" (MacLeod & Clarke, 2015). Self-blaming and overgeneralized explanations of bad events feed depression. If depressed, we may interpret a suggestion as criticism, disagreement as dislike, praise as flattery, friendliness as pity. Dwelling on such thoughts (ruminating) sustains or worsens negative thinking.

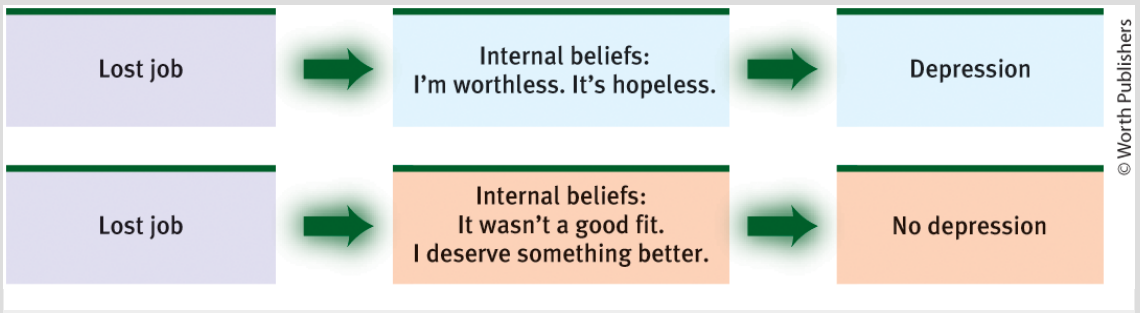


FIGURE 54.3 A cognitive perspective on psychological disorders The person's emotional reactions are produced not directly by the event, but by the person's thoughts in response to the event.

If feeling depressed is sometimes nature's way of getting us to slow down and solve a problem, cognitive therapies may speed up that problem solving (Hollon, 2020). Cognitive therapies help people change their mind with new, more constructive ways of perceiving and interpreting events (Burns, 1981; Persons, 2016; Schmidt et al., 2019).

> **"Life does not consist mainly, or even largely, of facts and happenings. It consists mainly of the storm of thoughts that are forever blowing through one's head."** — Writer Mark Twain, *Autobiography, Volume 1,* 1924

Beck's Cognitive Therapy

In the late 1960s, a woman left a party early. Things had not gone well. She felt disconnected from the other partygoers and assumed no one liked her. A few days later, she visited cognitive therapist Aaron Beck.

Rather than go down the traditional path to her childhood, Beck questioned her current thinking. After she then listed a dozen people who *did* like her, Beck realized that challenging people's automatic negative thoughts could be therapeutic. After trying this approach with other clients, he developed cognitive therapy, which assumes that changing people's thinking can change their functioning (Spiegel, 2015).



Macmillan Learning

Aaron Beck (1921–2021) "Cognitive therapy seeks to alleviate psychological stresses by correcting faulty conceptions and beliefs. By correcting erroneous beliefs we can lower excessive reactions" (Beck, 1978).

People with depression, Beck found, often reported dreams with negative themes of loss, rejection, and abandonment. These themes extended into their waking thoughts, and even into therapy, as clients

recalled and rehearsed their failings and worst impulses (Kelly, 2000). Beck and his colleagues (1979) used cognitive therapy to reverse clients' negativity about themselves, their situations, and their futures. With this technique, gentle questioning seeks to reveal irrational thinking, and then to persuade people to remove the dark glasses through which they view life (Beck et al., 1979):

> ***Client:*** I agree with the descriptions of me but I guess I don't agree that the way I think makes me depressed.
> ***Beck:*** How do you understand it?
> ***Client:*** I get depressed when things go wrong. Like when I fail a test.
> ***Beck:*** How can failing a test make you depressed?
> ***Client:*** Well, if I fail I'll never get into law school.
> ***Beck:*** So failing the test means a lot to you. But if failing a test could drive people into clinical depression, wouldn't you expect everyone who failed the test to have a depression? … Did everyone who failed get depressed enough to require treatment?
> ***Client:*** No, but it depends on how important the test was to the person.
> ***Beck:*** Right, and who decides the importance?
> ***Client:*** I do.
> ***Beck:*** And so, what we have to examine is your way of viewing the test (or the way that you think about the test) and how it affects your chances of getting into law school. Do you agree?
> ***Client:*** Right.
> ***Beck:*** Do you agree that the way you interpret the results of the test will affect you? You might feel depressed, you might have trouble sleeping, not feel like eating, and you might even wonder if you should drop out of the course.
> ***Client:*** I have been thinking that I wasn't going to make it.
> ***Beck:*** Now what did failing mean?
> ***Client:*** *(tearful)* That I couldn't get into law school.
> ***Beck:*** And what does that mean to you?

Client: That I'm just not smart enough.

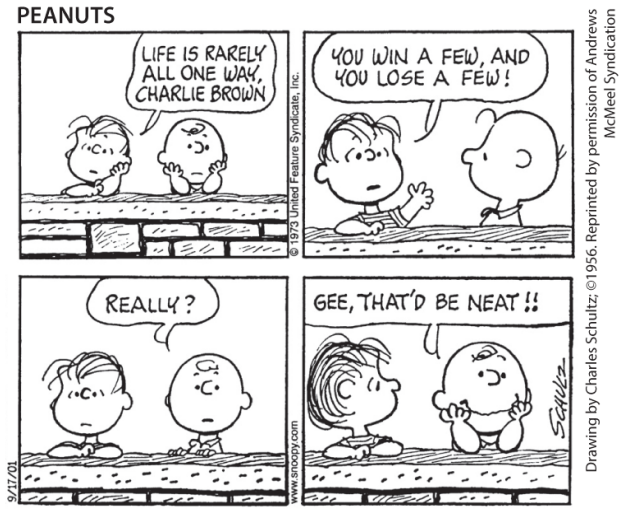
Beck: Anything else?

Client: That I can never be happy.

Beck: And how do these thoughts make you feel?

Client: Very unhappy.

Beck: So it is the meaning of failing a test that makes you very unhappy. In fact, believing that you can never be happy is a powerful factor in producing unhappiness. So, you get yourself into a trap—by definition, failure to get into law school equals "I can never be happy." (pp. 145–146)



We often think in words. Therefore, getting people to change what they say to themselves is an effective way to change their thinking. Perhaps you can identify with the anxious students who, before an exam, make matters worse with self-defeating thoughts: "This exam's going to be impossible. All these other students are so confident. I didn't study hard enough. I'll probably forget everything."

Psychologists call this sort of relentless, overgeneralized, self-blaming behavior *catastrophizing*.

To change such negative *self-talk,* cognitive therapists have offered *stress inoculation training*: teaching people to restructure their thinking in stressful situations (Meichenbaum, 1977, 1985). Sometimes it may be enough simply to say more positive things to yourself: "Relax. The exam may be hard, but it will be hard for everyone else, too. I studied harder than most people. Besides, I don't need a perfect score to get a good grade." After learning to "talk back" to negative thoughts, depression-prone children, teens, and college students have shown a greatly reduced rate of future depression (Reivich et al., 2013; Seligman et al., 2009). Ditto for anxiety (Krueze et al., 2018). To a large extent, it *is* the thought that counts. For a sampling of commonly used cognitive therapy techniques, see **TABLE 54.1**.

TABLE 54.1 Selected Cognitive Therapy Techniques

Aim of Technique	Technique	Therapists' Directives
Reveal beliefs	Question your interpretations	Explore your beliefs, revealing faulty assumptions such as "I must be liked by everyone."
	Rank thoughts and emotions	Gain perspective by ranking your thoughts and emotions from mildly to extremely upsetting.

Test beliefs	Examine consequences	Explore difficult situations, assessing possible consequences and challenging faulty reasoning.
	Decatastrophize thinking	Work through the actual worst-case consequences of the situation you face (it is often not as bad as imagined). Then determine how to cope with the real situation you face.
Change beliefs	Take appropriate responsibility	Challenge total self-blame and negative thinking, noting aspects for which you may be truly responsible, as well as aspects that aren't your responsibility.
	Resist extremes	Develop new ways of thinking and feeling to replace maladaptive habits. For example, change from thinking "I am a total failure" to "I got a failing grade on that paper, and I can make these changes to succeed next time."

It's not just depressed people who can benefit from positive self-talk. We all talk to ourselves (thinking "I wish I hadn't said that," for example, can protect us from repeating the blunder). The findings of nearly three dozen sport psychology studies show that self-talk interventions can even enhance the learning of athletic skills (Hatzigeorgiadis et al., 2011). Novice basketball players may be trained to think "focus" and "follow through," swimmers to think "high elbow," and tennis players to think "look at the ball." People anxious about public speaking have grown in confidence if asked to recall a speaking success and then asked this: "Explain WHY you were able to achieve such a successful performance" (Zunick et al., 2015).

Ask Yourself

Have you ever struggled to reach a goal at school or work because of your own self-defeating thoughts? How could you challenge those thoughts?

Cognitive-Behavioral Therapy

"The trouble with most therapy," said therapist Albert Ellis (1913–2007), "is that it helps you to feel better. But you don't get better. You have to back it up with action, action, action." **Cognitive-behavioral therapy (CBT)** takes a combined approach to treating depression, anxiety, and many other disorders. This widely practiced *integrative* therapy aims to alter not only the way people *think* but also the way they *act*. Like other cognitive therapies, CBT seeks to make people aware of their irrational negative thinking and to replace it with new ways of thinking. And like other behavior therapies, it trains people to *practice* the more positive approach in everyday settings.

Anxiety, depressive, and bipolar disorders share a common problem: unhealthy emotion regulation (Aldao & Nolen-Hoeksema, 2010; Gruber et al., 2011; Szkodny et al., 2014). An effective CBT program for these emotional disorders trains people both to replace their catastrophizing *thinking* with more realistic appraisals, and, as homework, to practice *behaviors* that are incompatible with their problem (Kazantzis et al., 2010; Moses & Barlow, 2006). A person might record daily situations associated with negative and positive

emotions, and engage more in activities that increase well-being. Those who fear social situations might learn to restrain the negative thoughts surrounding their social anxiety and practice approaching people.



arturs foto/iStock/Getty Images

CBT for eating disorders aided by journaling
Cognitive-behavioral therapists guide people with eating disorders toward new ways of explaining their good and bad food-related experiences (Linardon et al., 2017). By recording positive events and how she has enabled them, this woman may become more aware of her self-control and more optimistic.

CBT is an effective treatment for people with obsessive-compulsive and related disorders (Öst et al., 2015; Tolin et al., 2019). In one classic study, people learned to prevent their compulsive behaviors by relabeling their obsessive thoughts (Schwartz et al., 1996). Feeling the urge to wash their hands again, they would tell themselves, “I’m having a compulsive urge.” They would explain to themselves that the hand-washing urge was a result of their brain’s abnormal activity,

which they had previously viewed in PET scans. Then, instead of giving in, they would spend 15 minutes in an enjoyable, alternative behavior—practicing an instrument, taking a walk, gardening. This helped "unstick" the brain by shifting attention and engaging other brain areas. For two or three months, the weekly therapy sessions continued, with relabeling and refocusing practice at home. By the study's end, most participants' symptoms had diminished and their PET scans revealed normalized brain activity. Many other studies confirm CBT's effectiveness for treating other disorders, such as PTSD and alcohol or other substance use disorders (Lewis et al., 2020; Magill et al., 2020).

CBT variations have added new angles to treat clients' thinking and behavior. For example, *dialectical behavior therapy (DBT)* helps change harmful and even suicidal behavior patterns (Linehan, 2020; McCauley et al., 2018). *Dialectical* means "opposing," and this therapy attempts to make peace between two opposing forces—acceptance and change. Therapists create an accepting and encouraging environment, helping clients feel they have an ally who will offer them constructive feedback and guidance. In individual sessions, clients learn new ways of thinking that help them tolerate distress and regulate their emotions. They may also receive training in social skills and in *mindfulness meditation,* which helps alleviate depression and anxiety (Haller et al., 2021; Wielgosz et al., 2019). Group training sessions offer additional opportunities to practice new skills in a social context, with further practice as homework.

Acceptance and commitment therapy (ACT) helps clients learn to *accept* their feelings and *commit* to actions that are more consistent with their life values (Hayes et al., 2009). ACT effectively treats depression and anxiety, and even chronic pain (Bai et al., 2020; van Agteren et al., 2021).

Retrieval Practice

RP-6 How do the humanistic and cognitive therapies differ?

RP-7 A critical attribute of the _____ _____ developed by Aaron Beck focuses on the belief that changing people's thinking can change their functioning.

RP-8 What is *cognitive-behavioral therapy,* and what sorts of problems does this therapy best address?

ANSWERS IN APPENDIX E

Group Therapy, Couples Therapy, and Family Therapy

LOQ 54-7

What are the aims and benefits of group therapy, couples therapy, and family therapy?

Group Therapy

Except for traditional psychoanalysis, most therapies may also occur in small groups. **Group therapy** does not provide the same degree of therapist involvement with each client. However, it offers other benefits:

- ***It saves therapists' time and clients' money,*** and often is no less effective than individual therapy (Burlingame et al., 2016).
- ***It offers a social laboratory for exploring social behaviors and developing social skills.*** Therapists frequently suggest group therapy for people experiencing frequent conflicts or whose behavior distresses others. The therapist guides people's interactions as they discuss issues and try out new behaviors.
- ***It enables people to see that others share their problems.*** It can be a relief to discover that others have experienced similar stressors, troublesome feelings, and behaviors (Rahman et al., 2019).
- ***It helps clients understand their feelings around others.*** Sometimes our most difficult feelings happen in our close relationships. Couples therapy helps people understand and work through unhealthy emotions and communication patterns with their partners.
- ***It provides feedback as clients try out new ways of behaving.*** Hearing that you look or sound poised, even though you feel anxious and self-conscious, can be very reassuring.



*"We are communicating better,
but we are still not out of the woods."*

Family Therapy

One special type of group interaction, **family therapy**, assumes that no person is an island (Baucom & Crenshaw, 2019). We live and grow in relation to others, especially our family. We struggle to differentiate ourselves from our families, but we also need to connect with them emotionally. These two opposing tendencies can create stress for both the individual and the family.

Family therapists view families as systems, in which each person's actions trigger reactions from others. A child's rebellion, for example, affects and is affected by other family tensions. Therapists are often successful in helping family members identify their roles within the family's social system, improve communication, and discover new ways of preventing or resolving conflicts (Hazelrigg et al., 1987;

Shadish et al., 1993). Family-focused treatments focus on understanding and building healthier and more supportive family interactions, especially for younger family members who have mood difficulties (Miklowitz & Chung, 2016).





Left: Hispanolistic/E+/Getty Images; right: Prostock-Studio/iStock/Getty Images

Group and couples therapy People in group therapy may find comfort in knowing others share their challenges. *Couples therapy* focuses on how romantic partners' ways of relating to each other create problems, and how they might change their interactions. Couples therapy often increases emotional intimacy, healthy communication, and relationship satisfaction (Roddy et al., 2020).

Self-Help Groups

More than 100 million in the United States have belonged to religious, special-interest, or support groups that meet regularly—with 9 in 10 reporting that group members "support each other emotionally" (Gallup, 1994). Self-help groups often provide support to people who struggle to find it elsewhere (Dingle et al., 2021). One analysis of more than 14,000 self-help groups reported that most focus on stigmatized, hard-to-discuss problems (Davison et al., 2000).

Many self-help groups use a 12-step program modeled on that of Alcoholics Anonymous (AA), the grandparent of support groups. Such a program asks members to admit their powerlessness, to seek help from a higher power and from one another, and (the twelfth step) to take the message to others in need of it (Galanter, 2016). Studies of 12-step programs such as AA have found that they help reduce alcohol use disorder at rates comparable to other treatment interventions (Ferri et al., 2006; Moos & Moos, 2005). An 8-year, $27 million investigation found that AA participants reduced their drinking sharply, as did those assigned to CBT or an alternative therapy (Project Match, 1997). The more meetings AA members attend, the greater their alcohol abstinence (Moos & Moos, 2006). Those whose personal stories include a "redemptive narrative"—who see something good as having come from their struggles—more often sustain sobriety (Dunlop & Tracy, 2013).

> With close to 2 million members in 180 countries, AA is said to be "the largest organization on Earth that nobody wanted to join" (Finlay, 2000).

In an individualist age, with more and more people living alone or feeling isolated, the popularity of support groups—for the addicted, the bereaved, the divorced, or simply those seeking fellowship and growth—may reflect a longing for community and connectedness.

***

For a synopsis of these modern psychotherapies, see TABLE 54.2.

TABLE 54.2 Comparing Modern Psychotherapies

Therapy	Targeted Problem	Therapy Aim	Therapy Technique
Psychodynamic	Unconscious conflicts from childhood experiences	Reduce anxiety through self-insight.	Interpret clients' memories, dreams, and feelings.
Person-centered	Barriers to self-understanding and self-acceptance	Enable growth via unconditional positive regard, acceptance, genuineness, and empathy.	Listen actively and reflect clients' feelings.
Behavior	Dysfunctional behaviors	Learn adaptive behaviors; extinguish problem behaviors.	Use classical conditioning (via exposure or aversion therapy) or operant conditioning (as in token economies).
Cognitive	Negative, self-defeating thinking	Promote healthier thinking and self-talk.	Train people to dispute their negative thoughts and attributions.
Cognitive-behavioral	Self-harmful thoughts and behaviors	Promote healthier thinking and adaptive behaviors.	Train people to counter self-harmful thoughts and to act out their new ways of thinking.
Group, couples, and family	Stressful relationships	Heal relationships.	Develop an understanding of family and other social systems, explore roles, and improve communication.

REVIEW

Module 54: Introduction to Therapy and the Psychological Therapies

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 54-1: How do *psychotherapy* and the *biomedical therapies* differ?

LOQ 54-2: What are the goals and techniques of psychoanalysis, and how have they been adapted in psychodynamic therapy?

LOQ 54-3: What are the basic themes of humanistic therapy? What are the goals and techniques of Rogers' person-centered approach?

LOQ 54-4: How does the basic assumption of behavior therapy differ from the assumptions of psychodynamic and humanistic therapies? What classical conditioning techniques are used in exposure therapies and aversive conditioning?

LOQ 54-5: What is the main premise of behavior therapy based on operant conditioning principles, and what are the views of its

proponents and critics?

LOQ 54-6: What are the goals and techniques of the cognitive therapies and of cognitive-behavioral therapy?

LOQ 54-7: What are the aims and benefits of group therapy, couples therapy, and family therapy?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

psychotherapy
biomedical therapy
eclectic approach
psychoanalysis
resistance
interpretation
transference
psychodynamic therapy
insight therapies
person-centered therapy
active listening
unconditional positive regard
behavior therapy
counterconditioning

exposure therapies
systematic desensitization
virtual reality exposure therapy
aversive conditioning
token economy
cognitive therapy
cognitive-behavioral therapy (CBT)
group therapy
family therapy

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. A therapist who helps clients search for the unconscious roots of their problem and offers interpretations of their behaviors, feelings, and dreams is drawing from
   a. psychoanalysis.
   b. humanistic therapies.
   c. person-centered therapy.
   d. behavior therapy.

2. _____ therapies are designed to help individuals discover the unconscious thoughts and feelings that guide

their motivation and behavior.

3. Compared with psychoanalysts, humanistic therapists are more likely to emphasize
   a. hidden or repressed feelings.
   b. childhood experiences.
   c. psychological disorders.
   d. self-fulfillment and growth.

4. A therapist who restates and clarifies the client's statements is practicing the technique of _____ _____.

5. The goal of behavior therapy is to
   a. identify and treat the underlying causes of the problem.
   b. improve learning and insight.
   c. eliminate the unwanted behavior.
   d. improve communication and social sensitivity.

6. Behavior therapies often use _____ techniques, such as systematic desensitization and aversive conditioning, to encourage clients to produce new responses to old stimuli.

7. The technique of _____ _____ teaches people to relax in the presence of progressively more anxiety-provoking stimuli.

8. After a near-fatal car accident, Rico developed such an intense fear of driving on the highway that he takes lengthy alternative routes to work each day. Which psychological

therapy might best help Rico overcome his specific phobia, and why?

9. At a treatment center, people who display a desired behavior receive coins that they can later exchange for other rewards. This is an example of a(n) _____ _____.

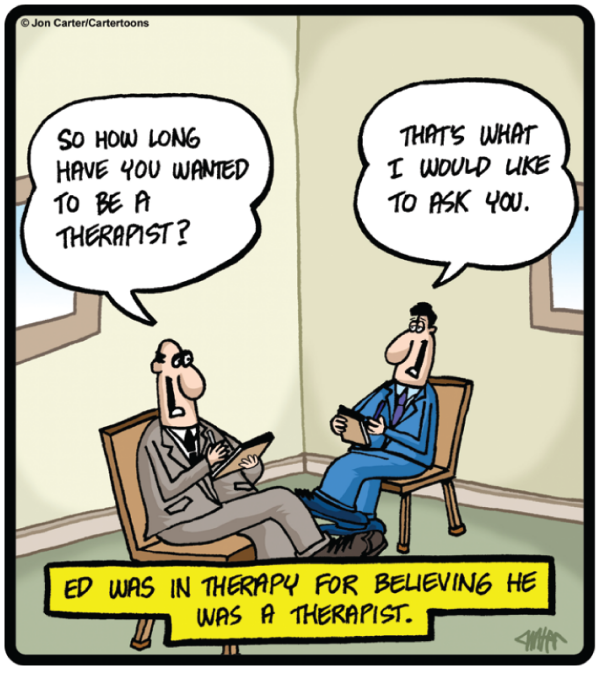
10. Cognitive therapy has been especially effective in treating
    a. nail biting.
    b. specific phobias.
    c. alcohol use disorder.
    d. depressive disorders.

11. _____-_____ therapy helps people to change their self-defeating ways of thinking and to act out those changes in their daily behavior.

12. In family therapy, the therapist assumes that
    a. only one family member needs to change.
    b. each person's actions trigger reactions from other family members.
    c. dysfunctional family behaviors are based largely on genetic factors.
    d. therapy is most effective when clients are treated apart from the family unit.

MODULE 55: Evaluating Psychotherapies

Many people presume psychotherapy's effectiveness. "Seek counseling" or "Ask your partner to find a therapist," advice columnists often urge. Before 1950, psychiatrists were the primary providers of mental health care. Today's providers include clinical and counseling psychologists; clinical social workers; pastoral, marital, abuse, and school counselors; and psychiatric nurses. With such an enormous outlay of time as well as money and effort, it is important to ask: Are the millions of people worldwide justified in placing their hopes in psychotherapy?



Is Psychotherapy Effective?

LOQ 55-1

Does psychotherapy work? How can we know?

The question, though simply put, is not simply answered. If an infection quickly clears, we may assume an antibiotic has been effective. But how can we assess psychotherapy's effectiveness? By how we feel about our progress? By how our therapist feels about it? By how our friends and family feel about it? By how our behavior has changed?

Client Perceptions

If client testimonials were the only measuring stick, we could strongly affirm psychotherapy's effectiveness. Consider one early survey of 2900 *Consumer Reports* readers who related their experiences with mental health professionals (*Consumer Reports*, 1995; Kotkin et al., 1996; Seligman, 1995). How many were at least "fairly well satisfied"? Almost 90 percent. Among those who recalled feeling *fair* or *very poor* when beginning therapy, 9 in 10 now were feeling *very good, good*, or at least *so-so*. Worldwide, most people report benefiting from

psychotherapy (Stein et al., 2020). We have clients' word for it—and who should know better?

We should not dismiss these testimonials. But consider some reasons for skepticism:

People often enter therapy in crisis. When, with the normal ebb and flow of events, the crisis passes, people may attribute their improvement to the therapy. Depressed people often get better no matter what they do.

Clients believe that treatment will be effective. The *placebo effect* is the healing power of positive expectations.

Clients generally speak kindly of their therapists. Even if the problems remain, clients "work hard to find something positive to say. The therapist had been very understanding, the client had gained a new perspective, [they] learned to communicate better, [their] mind was eased, anything at all so as not to have to say treatment was a failure" (Zilbergeld, 1983, p. 117).

Clients want to believe the therapy was worth the effort. If you invested time and money in something, wouldn't you be motivated to find something positive about it? Psychologists call this *effort justification*.

Consider the testimonials gathered in a massive experiment with over 500 Massachusetts boys, aged 5 to 13 years, many of whom seemed bound for delinquency. By the toss of a coin, half the boys were assigned to a 5-year treatment program. The treated boys were visited by counselors twice a month. They participated in community

programs, and they received academic tutoring, medical attention, and family assistance as needed. Some 30 years later, Joan McCord (1978, 1979) located 485 participants, sent them questionnaires, and checked public records from courts, psychiatric hospitals, and other sources. Was the treatment successful?

Client testimonials were glowing. Some men noted that, had it not been for their counselors, "I would probably be in jail," "My life would have gone the other way," or "I think I would have ended up in a life of crime." Court records offered apparent support: Even among the "difficult" boys in the treatment group, 66 percent had no official juvenile crime record.

But recall psychology's most powerful tool for sorting reality from wishful thinking: the *control group*. For every boy in the treatment group, there was a similar boy in a control group receiving no counseling. Of these untreated men, *70 percent* had no juvenile record. On several other measures, such as a record of having committed a second crime, alcohol use disorder, death rate, and job satisfaction, the untreated men exhibited slightly *fewer* problems. Unfortunately, the glowing testimonials of those treated were misleading.

Clinician Perceptions

If clinician perceptions were proof of therapy's effectiveness, we would have even more reason to celebrate. Case studies of successful treatment abound. The problem is that clients enter psychotherapy

focused on their unhappiness and leave it focused on their well-being. Therapists treasure compliments from those clients saying good-bye or later expressing their gratitude. But they hear little from clients who experience only temporary relief and seek out new therapists for their recurring problems. Thus, therapists are most aware of the failures of *other* therapists. With the same recurring anxieties, depression, or marital difficulty, the same person may be a "success" story in several therapists' files. Moreover, therapists, like the rest of us, are vulnerable to cognitive errors. **Confirmation bias** can lead them to unconsciously seek evidence that confirms their beliefs and to ignore contradictory evidence, and *illusory correlations* can lead them to perceive associations that don't really exist (Lilienfeld et al., 2015).

Outcome Research

How, then, can we objectively measure the effectiveness of psychotherapy? What *outcomes* can we expect—what types of people and problems are helped, and by what type of psychotherapy?

In search of answers, psychologists have turned to the well-traveled path of controlled research. In the 1800s, skeptical physicians began to realize that many patients were dying despite receiving then-mainstream treatments (such as bloodletting), and many others were getting better on their own. Sorting fact from superstition required observing patients and recording outcomes with and without a particular treatment. Typhoid fever patients, for example, often

improved after bloodletting, convincing most physicians that the treatment worked. But when a control group was given mere bed rest, 5 weeks later 70 percent had improved, showing that the bloodletting was worthless (as reported in Thomas, 1992).

A similar result—and spirited debate—followed the summary of 24 studies of psychotherapy outcomes (Eysenck, 1952). Two-thirds of people who received psychotherapy for disorders not involving hallucinations or delusions improved markedly. To this day, no one disputes that optimistic estimate. But there was a catch. Similar improvement occurred among people who were *untreated,* such as those who sought treatment but were placed on waiting lists. With or without psychotherapy, roughly two-thirds improved noticeably. Time was a great healer.



Feng Li/Getty Images

Trauma and resilience Those who suffer through trauma, such as these women in China mourning the devastating loss of lives and homes in the 2010 Yushu earthquake, may benefit from counseling. But many people recover on their own or with the help of supportive relationships with family and friends. "Life itself still remains a very effective therapist," noted psychodynamic therapist Karen Horney (*Our Inner Conflicts*, 1945).

Later research revealed shortcomings in the 24-study summary's analyses and methods. The sample was small—only 24 outcome studies in 1952, compared with thousands available today. The best of these are *randomized clinical trials*, in which researchers randomly assign people on a waiting list to therapy or to no therapy. Later, they evaluate everyone and compare outcomes, using tests and assessments done by others who don't know whether therapy was given.

A glimpse of psychotherapy's overall effectiveness can then be provided by means of a **meta-analysis**, a statistical procedure that combines the conclusions of a large number of different studies. Simply said, a meta-analysis summarizes lots of studies' results. Therapists welcomed the first meta-analysis of some 475 psychotherapy outcome studies. It showed that the average therapy client ends up better off than 80 percent of the untreated individuals on waiting lists (**FIGURE 55.1**). Psychologist Mary Lee Smith and her

colleagues summed it up: “Psychotherapy benefits people of all ages as reliably as schooling educates them, medicine cures them, or business turns a profit” (Smith et al., 1980, p. 183).

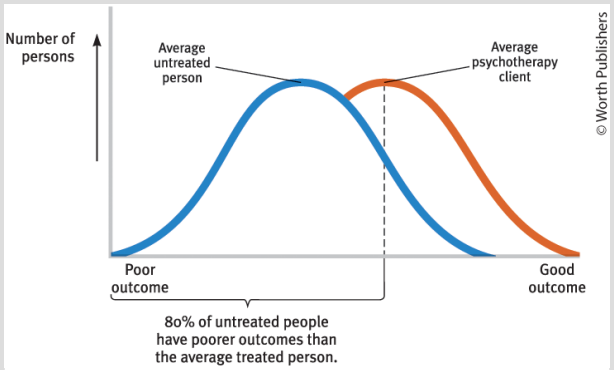


FIGURE 55.1 Treatment worked, as shown by the outcomes of treated versus untreated clients

Dozens of subsequent summaries have now examined psychotherapy’s effectiveness. Their verdict replicated earlier results: *Those not undergoing therapy often improve, but those undergoing therapy are more likely to improve—and to improve more quickly and with less risk of relapse* (Eckshtain et al., 2020; Weisz et al., 2017). (One qualification: Compared with studies that find no therapy benefit, those that do find a positive therapy effect are more likely to get published [Driessen et al., 2015].) After therapy, many people exhibit improved insight and emotional awareness, with a more patient, outgoing personality (Høglend & Hagtvet, 2019; Roberts et al., 2017). Some people with depression or anxiety also experience sudden symptom reductions

between their treatment sessions (Aderka et al., 2012). Those *sudden gains* bode well for long-term improvement (Shalom & Aderka, 2020).

Psychotherapy also can be cost-effective. Studies show that when people seek psychological treatment, their search for other medical treatment drops substantially—by 16 percent in one digest of 91 studies (Chiles et al., 1999). Substance abuse and other psychological disorders exert a staggering cost on society, including crime, accidents, and lost work. By one estimate, the opioid epidemic cost the United States more than $1 trillion between 2001 and 2017 (Altarum, 2018). Given such costs, psychotherapy is a good investment, much like investing time and money in healthy foods and exercise (de Oliveira et al., 2020; Johnson et al., 2019). Both reduce long-term costs. Boosting employees' psychological well-being can lower medical costs, improve work efficiency, and diminish absenteeism. It's no wonder that U.S. health insurers and the National Health Service in Britain have increasingly funded therapy (Hockenberry et al., 2019; NHS, 2020).

But note that the claim—that psychotherapy, *on average*, is somewhat effective—refers to no one therapy in particular. It is like reassuring lung-cancer patients that "on average," medical treatment of health problems is effective. But what distressed people—and those paying for their therapy—want to know is whether a *particular* treatment is effective for their specific problems.

Retrieval Practice

RP-1 How might the *placebo effect* bias clients' and clinicians' appraisals of the effectiveness of psychotherapies?

ANSWERS IN APPENDIX E

Which Psychotherapies Work Best?

LOQ 55-2

Are some psychotherapies more effective than others for specific disorders?

The early statistical summaries and surveys did not find that any one type of psychotherapy is generally superior (Smith & Glass, 1977; Smith et al., 1980). Later studies have similarly found that clients can benefit from psychotherapy regardless of their clinicians' experience, training, supervision, and licensing (Cuijpers, 2017; Kivlighan et al., 2015; Wampold et al., 2017). Were clients treated by a psychiatrist, psychologist, social worker, marriage counselor, or other mental health professional? Were they seen in a group or individual context? Did the therapist have extensive or relatively limited training and experience? It didn't matter.

So, was *Alice in Wonderland*'s dodo bird right: "Everyone has won and all must have prizes"? Not quite. One general finding emerges from

the studies: The more specific the problem, the greater the hope that psychotherapy might solve it (Singer, 1981; Westen & Morrison, 2001). Those who experience panic or specific phobias, who are unassertive, or who are frustrated by sexual performance problems can hope for improvement. Those with less-focused problems, such as depression and anxiety, usually benefit in the short term but often relapse later. There often is also an overlapping of disorders (*comorbidity*), which can make successful treatment more challenging.

Nevertheless, some forms of therapy do get prizes for effectively treating *particular* problems:

Cognitive and cognitive-behavioral therapies: primarily anxiety, panic disorder, posttraumatic stress disorder, insomnia, and depression (Qaseem et al., 2016; Scaini et al., 2016; Tolin, 2010).

Behavioral conditioning therapies: behavior problems such as bed-wetting, specific phobias, compulsions, marital difficulties, and sexual dysfunctions (Baker et al., 2008; Hunsley & DiGiulio, 2002; Shadish & Baldwin, 2005).

Psychodynamic therapy: depression and anxiety (Driessen et al., 2010; Leichsenring & Rabung, 2008; Shedler, 2010). Some analyses suggest that psychodynamic therapy and cognitive-behavioral therapy are equally effective in reducing depression (Driessen et al., 2017; Steinert et al., 2017).

Nondirective (person-centered) counseling: mild to moderate depression (Cuijpers et al., 2012).

> **"Different sores have different salves."** — English proverb

The tendency of many disordered states of mind to return to healthy states, combined with the placebo effect (the healing power of mere belief in a treatment), creates fertile soil for pseudotherapies. No prizes—and no scientific support—go to these alternative therapies (Arkowitz & Lilienfeld, 2006; Lilienfeld et al., 2015). We would all be wise to avoid therapies that propose to manipulate invisible "energy fields," therapies that reenact the supposed trauma of a client's birth, and therapies that use "facilitated communication," in which "responders" guide noncommunicative people's arms or hands to point to letters to compose messages.

Like some medical treatments, some psychological treatments are not only ineffective but also harmful. The American Psychiatric Association, the Canadian Psychological Association, and the British Psychological Society have warned against conversion therapies that purport to change people's gender identity or sexual orientation. APA president Barry Anton has described such therapies as an attempt to "repair … something that is not a mental illness and therefore does not require therapy" (2015). Indeed, conversion therapy entails "a significant risk of harm" (APA, 2018; Turban et al., 2020). Such evidence has led to conversion therapy bans in many cities, states, and countries, especially for minors. Other initiatives have been found ineffective or harmful (Walton & Wilson, 2018). These failed programs include the Scared Straight program designed to curb

teenage delinquency and the police-promoted D.A.R.E. anti-drug effort. Numerous weight-reduction programs, and several pedophile rehabilitation efforts have also proven unsuccessful.

The evaluation question—which therapies get prizes and which do not?—lies at the heart of what some call psychology's civil war. To what extent should science guide both clinical practice and insurers' willingness to pay for psychotherapy? On one side are research psychologists using scientific methods to extend the list of well-defined and validated therapies for various disorders. They decry clinicians who seem to "give more weight to their personal experience than to science" (Baker et al., 2008). On the other side are some therapists who view their practice as more art than science, arguing that people are too complex and psychotherapy is too intuitive to describe in a manual or test in an experiment.

Between these two factions stand the science-oriented clinicians calling for **evidence-based practice**, which has been endorsed by the American Psychological Association and others (APA, 2006; Holmes et al., 2018; Sakaluk et al., 2019; **FIGURE 55.2**). After rigorous evaluation, clinicians apply therapies suited to their own skills and their clients' unique situations. Some are using technology, too. By analyzing many pieces of clients' information, computer programs can help clinicians offer personalized therapeutic solutions (Ewbank et al., 2019; Webb et al., 2020). Increasingly, insurer and government support for mental health services require evidence-based practice.



FIGURE 55.2 Evidence-based practice Ideal clinical decision making can be visualized as a three-legged stool, upheld by research evidence, clinical expertise, and knowledge of the client.

Retrieval Practice

RP-2 Therapy is most likely to be helpful for those with problems that _____ (are/are not) well-defined.

RP-3 What is *evidence-based practice?*

ANSWERS IN APPENDIX E

How Do Psychotherapies Help People?

LOQ 55-3

What three elements are shared by all effective forms of psychotherapy?

Why have studies found little correlation between therapists' training and experience and clients' outcomes? One answer seems to be that all effective psychotherapies share three basic benefits (Cuijpers et al., 2019; Frank, 1982; Wampold, 2007):

- ***Hope for discouraged people*** People seeking therapy typically feel anxious, depressed, self-disapproving, and incapable of turning things around. What any psychotherapy offers is the expectation that, with commitment from the therapy seeker, things can and will get better. This belief, apart from any therapeutic technique, may improve morale, create feelings of self-efficacy, and diminish symptoms (Corrigan, 2014; Meyerhoff & Rohan, 2016).
- ***A new perspective*** Every therapy offers people a plausible explanation of their symptoms. Armed with a believable fresh perspective, they may approach life with a new attitude, open to making changes in their behaviors and their views of themselves.
- ***An empathic, trusting, caring relationship*** No matter what technique they use, effective therapists are empathic. They seek to understand the client's experience. They communicate care and concern, and they earn trust through respectful listening and guidance (Ovenstad et al., 2020). These qualities were clear in

recorded therapy sessions from 36 recognized master therapists (Goldfried et al., 1998). Some took a cognitive-behavioral approach. Others used psychodynamic principles. Although the master therapists used different approaches, they showed some striking *similarities*. They helped clients evaluate themselves, link one aspect of their life with another, and gain insight into their interactions with others. The emotional bond between therapist and client—the **therapeutic alliance**—helps explain why empathic, caring therapists are especially effective (Flückiger et al., 2020). Whether experienced in Canada or Cambodia, a strong therapeutic alliance fosters psychological health (Falkenström et al., 2019; Gold, 2019). It may even save lives. In one analysis of a dozen studies, a strong therapeutic alliance predicted less frequent suicidal thoughts, self-harming behaviors, and suicide attempts (Dunster-Page et al., 2017).



"The thing is, you have to really want to change."

These three common elements—hope, a fresh perspective, and an empathic, caring relationship—help us understand why

paraprofessionals (briefly trained caregivers, who sometimes have firsthand experience with a specific mental health challenge) can assist many troubled people so effectively (Bryan & Arkowitz, 2015; Christensen & Jacobson, 1994). They are also part of what the growing numbers of in-person and online *self-help and support groups* offer their members. And they are part of what traditional healers have offered (Jackson, 1992). Healers everywhere—special people to whom others disclose their suffering, whether psychiatrists or shamans—have listened to understand and to empathize, reassure, advise, console, interpret, or explain (Torrey, 1986). Such qualities may explain why people who feel supported by close relationships—who enjoy the fellowship and friendship of caring people—have been less likely to seek therapy (Frank, 1982; O'Connor & Brown, 1984).



Rainer Kwiotek/Friendship Bench

Friendship bench Some Zimbabwe health clinics have added outdoor "friendship benches," where paraprofessional community health workers offer therapy (Chibanda et al., 2016). Psychiatrist Dixon Chibanda created this free therapy for rural communities after a client, lacking bus fare to get to Chibanda's office, died by suicide. "We have to take

> [psychiatry] to the community," Chibanda said (Rosenberg, 2019).

***

To recap, people who seek help usually improve. So do many of those who do not, which is a tribute to our human resourcefulness and our capacity to care for one another. Nevertheless, though the therapist's orientation and experience appear not to matter much, people who receive some psychotherapy usually improve more than those who do not. People with clear-cut, specific problems tend to improve the most.

Ask Yourself

Based on what you've read, would you seek therapy if you were struggling with a mental health challenge? Why or why not? If you've experienced therapy, does what you've learned here influence your feelings about the experience?

Retrieval Practice

RP-4 Those who undergo psychotherapy are _____ (more/less) likely to show improvement than those who do not undergo psychotherapy.

ANSWERS IN APPENDIX E

Human Diversity and Psychotherapy

LOQ 55-4

What personal factors influence the therapist-client relationship?

All psychotherapies offer hope, and nearly all psychotherapists attempt to enhance their clients' sensitivity, openness, personal responsibility, and sense of purpose (Jensen & Bergin, 1988). But in matters of culture, values, and personal identity, psychotherapists differ from one another and may differ from their clients (Delaney et al., 2007; Kelly, 1990).

These differences can create a mismatch—for example, when a therapist from one culture interacts with a client from another. Therapists tend to prefer clients who are culturally similar to themselves (Desai et al., 2021). In North America, Europe, and Australia, most psychotherapists reflect their culture's *individualism*, which often gives priority to personal desires and identity. Clients with a *collectivist* perspective, as with many from Asian cultures, may be more mindful of social and family responsibilities, harmony, and group goals. These clients may have trouble relating to therapists who ask them to think only of their own well-being (Markus & Kitayama, 1991). In one experiment, Asian American clients matched with counselors who shared their cultural values (rather than mismatched with those who did not) perceived more counselor empathy and felt a stronger alliance with the counselor (Kim et al., 2005).

Client-psychotherapist mismatches may also stem from other personal differences. Highly religious people may prefer and benefit from religiously similar therapists who share their values and beliefs (Masters, 2010; Pearce et al., 2015). Likewise, therapists' attitudes toward LGBTQ people can affect the client-therapist relationship. Transgender people, for example, may understandably seek out therapists who affirm them (Bettergarcia & Israel, 2018).



AAMIR QURESHI/AFP/Getty Images

Meeting the needs of the community In 2021, the Pakistani government opened this Transgender Protection Center to provide legal aid, health services, and psychological counseling for the transgender community.

Cultural differences help explain some groups' reluctance to use mental health services (Eken et al., 2021). People living in "cultures of honor" (Social Psychology modules) prize being strong and tough. They may feel that seeking mental health care is an admission of weakness rather than an opportunity for growth (Brown et al., 2014). Refugees, despite having frequently endured trauma and discrimination, tend to avoid seeking mental health services due to

distrust, poverty, and language barriers (Byrow et al., 2020). And some cultural groups tend to be both reluctant to seek therapy and quick to leave it (Chen et al., 2009; Sue et al., 2009). Hesitancy to seek psychotherapy is often higher among African Americans than for other groups, due to social pressure against seeking help, mistrust of therapists, and microaggressions experienced during therapy (Taylor & Kuo, 2018).

The bottom line: By building their *cultural competence*—understanding and respecting different cultural groups' values, beliefs, and traditions—therapists can better serve their clients (Soto et al., 2018).

Seeking Psychotherapy

LOQ 55-5

When should people seek therapy, and what should they look for when selecting a therapist?

Life for everyone is marked by a mix of serenity and stress, blessing and bereavement, good moods and bad. So, when should we seek a mental health professional's help? The American Psychological Association offers these trouble signals:

- Feelings of hopelessness
- Deep and lasting depression
- Self-destructive behavior, such as substance abuse and self-injury

- Disruptive fears
- Sudden mood shifts
- Thoughts of suicide
- Compulsive rituals, such as lock checking
- Sexual difficulties
- Hearing voices or seeing things that others don't experience
- Struggling to understand others' thoughts and emotions

In looking for a psychotherapist, you may want to have a preliminary session with two or three. Meeting with more than one therapist gives you multiple opportunities to find someone with whom you feel comfortable. College or university health centers are generally good starting points; you may be able to access qualified therapists and some free services by browsing their web page or visiting in person. You may also get a referral from your primary care provider or visit a walk-in clinic. If you have insurance coverage, your provider may supply a list of participating therapists. Many people also use the internet to search for therapists, and many receive help online or via one of the more than 10,000 mental health apps (Kocsis, 2018; Levin et al., 2018; Nielssen et al., 2019). Therapist-guided treatment online or via apps can help reduce depression, social anxiety disorder, and panic disorder (Niles et al., 2021). Being able to meet remotely with a therapist has helped people who may struggle to attend in-person sessions (Guo et al., 2020; Markowitz et al., 2021). Such online therapy also offered a useful alternative solution when it was unsafe to attend in-person therapy sessions during the Covid-19 pandemic.

> **"Being physically present with a client does not appear essential to generating therapeutic outcomes."** — Psychologist Ashley Batastini and colleagues (2020)

During your in-person or remote session, you can describe your problem and learn each therapist's treatment approach. You can ask questions about the therapist's values, credentials (TABLE 55.1), and fees. And you can assess your own feelings about each therapist. The emotional bond between therapist and client is perhaps the most important factor in effective therapy.

TABLE 55.1 Therapists and Their Training

Type	Description
Clinical psychologists	Most are psychologists with a Ph.D. (includes research training) or Psy.D. (focuses on therapy) supplemented by a supervised internship and, often, postdoctoral training. About half work in agencies and institutions, half in private practice.
Psychiatrists	Psychiatrists are physicians who specialize in the treatment of psychological disorders. Not all psychiatrists have had extensive training in psychotherapy, but as M.D.s or D.O.s they can prescribe medications. Thus, they tend to see those with the most serious problems. Many have their own private practice.
Clinical or psychiatric social workers	A master of social work (M.S.W.) plus postgraduate supervision prepares some social workers to offer psychotherapy, mostly to people with everyday personal and family problems. About half of U.S. social workers have earned the National Association of Social Workers' designation of clinical social worker.

Counselors	Family and couples counselors specialize in problems arising from family relations. Clergy provide counseling to countless people. Counselors may work with people with substance use disorders and with spouse and child abusers and victims of abuse. Mental health and other counselors may be required to have a master's degree.



Macmillan Learning

Therapy for all Therapy was once available only for the wealthy and well-connected. Teletherapy, low-cost and no-cost community programs, and mental health apps have put help just a few clicks away.

The American Psychological Association recognizes the importance of a strong therapeutic alliance, and it welcomes diverse therapists who can relate well to diverse clients. It accredits programs that provide training in cultural sensitivity (for example, to differing values,

communication styles, and languages) and that recruit underrepresented cultural groups.

Ethical Principles in Psychotherapy

LOQ 55-6

What ethical principles guide psychotherapy and psychological research on mental illness?

Psychotherapists use different approaches to help reduce their clients' suffering. Likewise, researchers apply many methods to understand how to lessen people's disordered thoughts, feelings, and behaviors. But before psychotherapists or researchers begin their treatment or investigation, they must follow their country's ethical principles and code of conduct (APA, 2017).

According to the American Psychological Association, your therapist should follow these principles:

- Seek to benefit you and do you no harm.
- Establish a feeling of trust and a defined role as your therapist, as well as be of service to the therapeutic community.
- Be honest, truthful, and accurate.
- Be fair and promote justice for you and others, helping everyone to have access to the benefits of therapy.

- Respect the dignity and worth of you and others, recognizing the right to privacy, confidentiality, and self-determination.

Psychological researchers use the same ethical guidelines when studying how to lessen mental illness. They aim to benefit others, to be honest and truthful, and to never expose people to experiences that pose greater than a *minimal risk*—to more than what people may encounter in their daily lives.

Retrieval Practice

RP-5 There are many acceptable mental health treatment and study approaches, but all therapists and psychological researchers must follow _____ principles.

ANSWERS IN APPENDIX E

REVIEW

Module 55: Evaluating Psychotherapies

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the

answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 55-1: Does psychotherapy work? How can we know?

LOQ 55-2: Are some psychotherapies more effective than others for specific disorders?

LOQ 55-3: What three elements are shared by all effective forms of psychotherapy?

LOQ 55-4: What personal factors influence the therapist-client relationship?

LOQ 55-5: When should people seek therapy, and what should they look for when selecting a therapist?

LOQ 55-6: What ethical principles guide psychotherapy and psychological research on mental illness?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

psychotherapy
confirmation bias
meta-analysis
evidence-based practice

therapeutic alliance

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. The most enthusiastic or optimistic view of the effectiveness of psychotherapy comes from
   a. outcome research.
   b. randomized clinical trials.
   c. reports of clinicians and clients.
   d. a government study of treatment for depression.

2. Studies show that _____ therapy is the most effective treatment for most psychological disorders.
   a. behavior
   b. humanistic
   c. psychodynamic
   d. no one type of

3. What are the three components of evidence-based practice?

4. Psychotherapies help people by providing _____, a new perspective, and an empathic, trusting, caring

relationship.

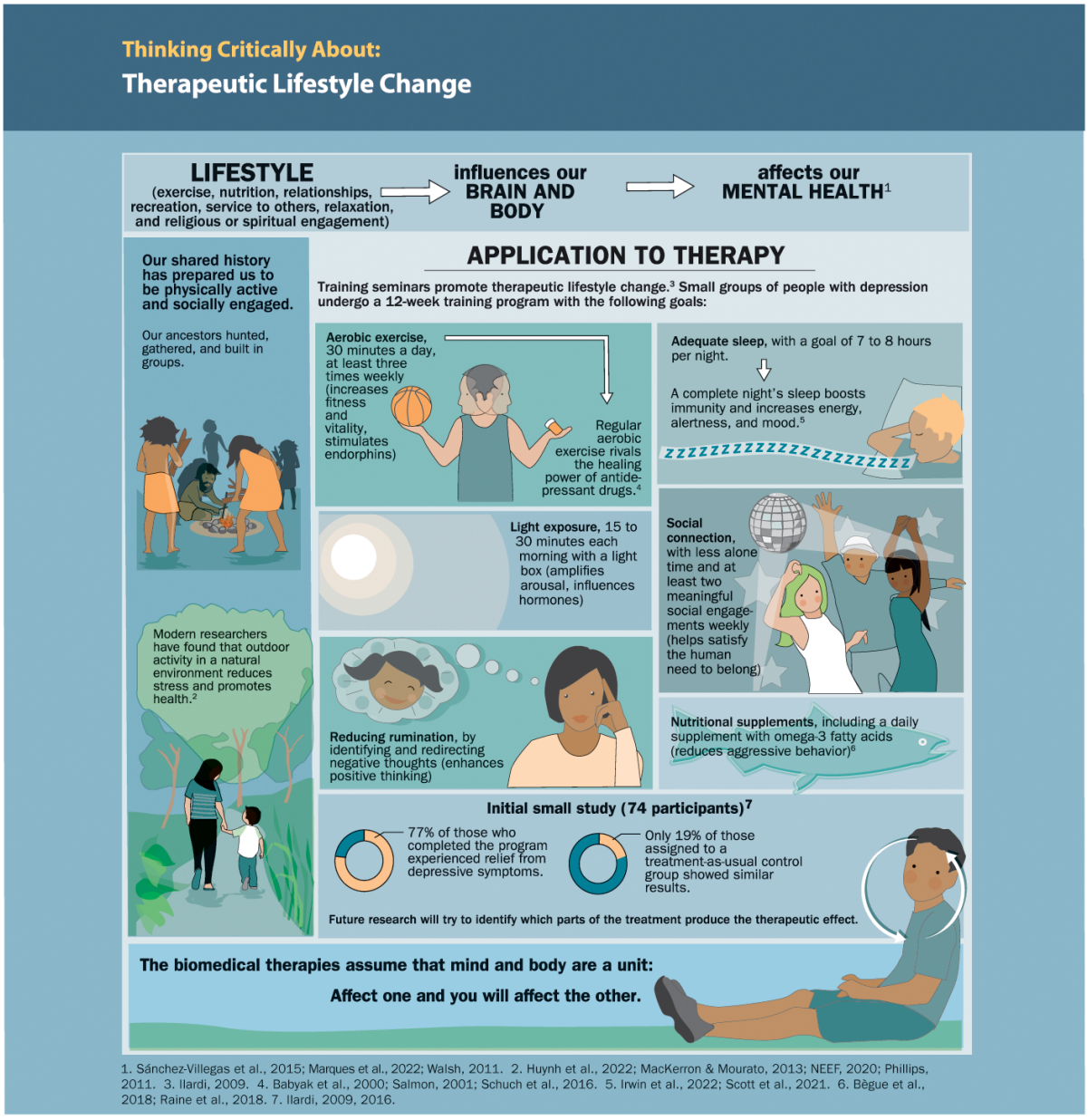
MODULE 56: The Biomedical Therapies and Preventing Psychological Disorders

Psychotherapy is one way to treat psychological disorders. The other is **biomedical therapy**. Biomedical treatments can change the brain's chemistry with drugs; affect its circuitry with electrical stimulation, magnetic impulses, or psychosurgery; or influence its responses with lifestyle changes.

Are you surprised to find *lifestyle changes* in this list? We find it convenient to talk of separate psychological and biological influences, but everything psychological is also biological. Thus, our lifestyle—exercise, sleep, nutrition, relationships, recreation, relaxation, religious or spiritual engagement, and our service to others—affects our mental health (Bennie et al., 2020; Walsh, 2011). (See Thinking Critically About: Therapeutic Lifestyle Change.)

LOQ 56-1

Why is therapeutic lifestyle change considered an effective biomedical therapy, and how does it work?



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Every thought and feeling depends on the functioning brain. Every creative idea, every moment of joy or anger, every experience of depression emerges from the electrochemical activity of the living brain. Anxiety disorders, obsessive-compulsive disorder, posttraumatic stress disorder, depressive disorders, bipolar disorders,

and schizophrenia are all biological events. Some psychologists even see psychotherapy as a biological treatment: Changing the way we think and act is brain-changing (Kandel, 2013). When psychotherapy relieves behaviors associated with obsessive-compulsive disorder, depression, or schizophrenia, PET scans reveal a less agitated brain (Habel et al., 2010; Kennedy et al., 2007; Porto et al., 2009). As we have seen over and over, *a human being is an integrated biopsychosocial system*.

Retrieval Practice

RP-1 What are some examples of lifestyle changes people can make to enhance their mental health?

ANSWERS IN APPENDIX E

Drug Therapies

LOQ 56-2

What are the drug therapies? How do double-blind studies help researchers evaluate a drug's effectiveness?

By far the most widely used biomedical treatments today are the drug therapies. Most drugs for anxiety and depression are prescribed by primary care providers, followed by psychiatrists and, in some U.S. states, psychologists.

Since the 1950s, **psychopharmacology** discoveries have revolutionized the treatment of people with severe disorders, liberating hundreds of thousands from hospital confinement. Thanks to drug therapies and community mental health programs, today's resident population of psychiatric hospitals has dropped to a small fraction of what it once was. For some who are unable to care for themselves, however, release from hospitals has meant experiencing homelessness, not liberation.

Almost any new treatment, including a drug therapy, is greeted by an initial wave of enthusiasm as many people apparently improve. But that enthusiasm often diminishes on closer examination. To evaluate any new drug's effectiveness, researchers also need to know the following:

- How many people recover *without* treatment, and how quickly?
- How does the drug therapy's effectiveness compare to that of nondrug treatments, like psychotherapy?

Is recovery due to the drug or to the placebo effect? When clients or mental health workers expect positive results, they may see what they expect, not what really happens. Even mere exposure to advertising about a drug's supposed effectiveness can increase its effect (Kamenica et al., 2013).



Peter C. Vey/Cartoon Stock

"If this doesn't help you don't worry, it's a placebo."

To control for these influences, drug researchers often give about half of study participants the drug, and the other half a similar-appearing placebo. Because neither the staff nor the participants know who gets which, this is called a *double-blind procedure*. The good news: Worldwide, double-blind studies show that several types of drugs effectively treat psychological disorders in children, adolescents, and adults (Correll et al., 2022; Leichsenring et al., 2022).

Antipsychotic Drugs

An accidental discovery launched a treatment revolution for people with hallucinations or delusions—what psychologists call *psychoses*. The discovery: Certain drugs, originally developed to reduce presurgical agitation, calmed these patients' split from reality. First-generation **antipsychotic drugs**, such as chlorpromazine (sold as Thorazine), helped people with schizophrenia who were experiencing auditory hallucinations and paranoia (Leucht et al., 2018).

(Antipsychotic drugs are less effective in changing negative symptoms, such as apathy and withdrawal.)

The molecules of most conventional antipsychotic drugs are similar enough to molecules of the neurotransmitter dopamine to occupy its receptor sites and block its activity. This finding reinforces the idea that an overactive dopamine system contributes to schizophrenia. Second-generation antipsychotics also act on serotonin systems.

Antipsychotics have powerful side effects. Some produce sluggishness, tremors, and twitches similar to those of Parkinson's disease (Kaplan & Sadock, 1989). Long-term use of antipsychotics can produce *tardive dyskinesia*, with involuntary motor movements of the facial muscles (such as grimacing), tongue, and limbs. Second-generation antipsychotics, such as clozapine (Clozaril), quetiapine (Seroquel), and olanzapine (Zyprexa), are less likely than first-generation antipsychotics to cause these effects. These drugs may, however, increase the risk of obesity and diabetes (Buchanan et al., 2010; Tiihonen et al., 2009). To identify doses that reduce symptoms with fewer side effects, researchers have combed through data for more than 20 antipsychotic medications (Leucht et al., 2020).

Perhaps you can guess an occasional side effect of L-dopa, a drug that raises dopamine levels for Parkinson's patients: hallucinations.

Antipsychotics, combined with life-skills programs and support from family and close others, have given new hope to many people with schizophrenia (Goff et al., 2017; Guo et al., 2010). Computer programs are beginning to help clinicians identify which people with schizophrenia will benefit from specific antipsychotic medications (Lee et al., 2018; Yu et al., 2018). Hundreds of thousands have returned to work and to near-typical lives due to symptom relief from these medications (Leucht et al., 2003; Saks, 2007).



USC Gould School of Law

Effective treatment Elyn Saks, a University of Southern California law professor, has written about what it's like to live with schizophrenia. Thanks to her treatment, which combines an antipsychotic drug and psychotherapy, she says, "Now I'm mostly well. I'm mostly

> thinking clearly. I do have episodes, but it's not like I'm struggling all of the time to stay on the right side of the line" (Saks, 2007).

Antianxiety Drugs

Antianxiety drugs, such as Xanax, Klonopin, and Ativan, depress central nervous system activity. Some antianxiety drugs have been successfully combined with psychological therapy to enhance exposure therapy's extinction of learned fears and to help relieve the symptoms of anxiety-related disorders, including posttraumatic stress disorder and obsessive-compulsive disorder (Davis, 2005; Kushner et al., 2007). Antianxiety drugs depress central nervous system activity, so they should not be used in combination with alcohol.

Some critics fear that antianxiety drugs may reduce symptoms without resolving underlying problems, especially when used as an ongoing treatment. "Popping a Xanax" at the first sign of tension can create a learned response: The immediate relief reinforces a person's tendencies to take drugs when anxious and avoid learning how to cope with distressing situations. Antianxiety drugs can also be addictive. Regular users who stop taking these drugs may experience increased anxiety, insomnia, and other withdrawal symptoms.

Antidepressant Drugs

The **antidepressant drugs** were named for their ability to lift people up from a state of depression, and this was their main use until

recently. These drugs are now also increasingly used to treat anxiety disorders, obsessive-compulsive and related disorders, and posttraumatic stress disorder (Beaulieu et al., 2019; Merz et al., 2019; Slee et al., 2019). Many antidepressant drugs work by increasing the availability of neurotransmitters, such as norepinephrine or serotonin, which elevate arousal and mood and are scarce when a person experiences feelings of depression or anxiety.

The most prescribed drugs in this group, including Prozac and its cousins Zoloft and Paxil, work by prolonging the time serotonin molecules remain in the brain's synapses. They do this by blocking the normal reuptake process. Given their use in treating disorders other than depressive ones—from anxiety to strokes—these particular drugs are most often called *SSRIs (selective serotonin reuptake inhibitors)* rather than antidepressants (Kramer, 2011).

But be advised: Patients with depression who begin taking antidepressants do not wake up the next morning singing, "It's a beautiful day!" Antidepressants begin to influence neurotransmission within hours, but their full psychological effect may take 4 weeks. One possible reason for the delay is that increased serotonin promotes neural changes, including new synapses and *neurogenesis*—the birth of new brain cells—perhaps reversing stress-induced neuron loss (Launay et al., 2011; Nord et al., 2021).

Cognitive therapy, by helping people reverse their habitual negative thinking style, helps prevent depression, boosts drug-aided relief from

depression, and reduces posttreatment relapses (Amick et al., 2015; Cuijpers et al., 2021). Some clinicians, for example, attack youth depression and anxiety from both below and above (Strawn et al., 2022): They use antidepressant drugs to work, bottom-up, on the emotion-related limbic system. And they use cognitive-behavioral therapy to work, top-down, to change frontal lobe activity and thinking.

Researchers agree that many people with depression often improve after a month on antidepressant drugs. But after allowing for natural recovery and the placebo effect, how big is the effect? The effect is consistent but, critics argue, not very big (Cipriani et al., 2018; Kirsch, 2010). In double-blind clinical trials, placebos produced improvement comparable to about 75 percent of the active drug's effect. For those with severe depression, there is less of a placebo effect and the added drug benefit is somewhat greater (Fournier et al., 2010; Kirsch et al., 2008; Olfson & Marcus, 2009). Antidepressants can have negative side effects, such as increased appetite, nausea, fatigue, reduced sex drive, and withdrawal symptoms when discontinued (Horowitz & Wilcock, 2022). So some clinicians advise beginning with psychotherapy before introducing antidepressants (Strayhorn, 2019; Svaldi et al., 2019). "If [drugs] are to be used at all," notes Irving Kirsch (2016), "it should be as a last resort."

Antidepressant drugs are not the only way to boost our mental health. Aerobic exercise can also reduce anxiety and depression. Combining exercise with psychotherapy produces a particularly powerful

antidepressant effect (Lee et al., 2021). For adults worldwide, three or more weekly exercise hours predicts a lower risk of future depression and a greater sense of life purpose (Choi et al., 2019; Schuch et al., 2018; Yemiscigil & Vlaev, 2021). *The point to remember*: If you're concerned about your mental health, consult a mental health professional to determine the best treatment for you.



Paul Noth/Cartoon Stock

"Of course you feel great.
These things are loaded with antidepressants."

Psychedelic Drugs

For those who have a depressive or anxiety disorder, suicidal thoughts, posttraumatic stress disorder (PTSD), or a substance use disorder, researchers are assessing possible benefits of small doses of **psychedelic drugs** (Reiff et al., 2021). Proponents claim that, when psychedelics are administered under guided conditions and in combination with psychotherapy, *microdosing* works quickly and with few side effects.

After preparatory talk therapy sessions, the typical client might swallow a pill that administers a small drug dose in a safe, comfortable setting. Over the next several hours, the lying-down client, perhaps wearing eyeshades and listening to calm music, may experience striking visions, emotions, and memories. Talk therapy then helps the client process the experience, which they may repeat in additional sessions.

> **"One good way to understand a complex system is to disturb it and then see what happens."** — Michael Pollan, *How to Change Your Mind: What the New Science of Psychedelics Teaches Us About Consciousness, Dying, Addiction, Depression, and Transcendence*, 2018

The drugs in this group include ketamine (an anesthetic that is also sometimes used as a risky party drug), psilocybin (the active ingredient in "magic mushrooms"), and MDMA (also known as Ecstasy).



Damon Casarez/The New York Times/Redux Pictures

Psychedelics offer a new perspective Jose Martinez is a former Army gunner whose legs and right arm were blown off by a roadside bomb in Afghanistan. To cope with chronic pain and suicidal thoughts, Martinez has turned to the psychedelic drug psilocybin. “Psychedelics helped me realize that my problems are small compared to the world’s bigger problems,” he says (Jacobs, 2021).

Ketamine. Dozens of experiments show that ketamine can provide relief from depression and suicidal thinking within hours (Alnefeesi et al., 2022; Riggs & Gould, 2021). Those dependent on alcohol use have also become more abstinent after ketamine treatment (Dakwar et al.,

2019; Grabski et al., 2022). But ketamine is not a magic bullet. Relief often dissipates, which raises questions about the risks of repeated use (Schatzberg, 2019; Zimmermann et al., 2020). Given that ketamine acts as an opioid, one skeptic wonders if ketamine clinics are "nothing more than modern opium dens" (George, 2018). But others note that ketamine stimulates new synapses, which for some aids lasting change (Beyeler, 2019).

Psilocybin. Experiments have found psilocybin-assisted therapy benefits at least equal to those of antidepressant drugs, and with fewer side effects (Carhart-Harris et al., 2021; Davis et al., 2021; Gukasyan et al., 2022). Microdosing psilocybin has also produced relief from excessive drinking. In one experiment, nearly half of those receiving psilocybin were abstinent 8 months later, as were only a quarter of those who received a placebo (Bogenschutz et al., 2022). One apparent reason for the lessened depression and alcohol use: The drug-assisted treatment stimulates brain cell growth and increases neural network connections (Daws et al., 2022). But the mind matters, too. Psilocybin's benefits are enhanced when patients have positive expectations (Gill et al., 2022; Kaertner et al., 2021).

MDMA. When paired with psychotherapy, MDMA has offered relief to people who for years had struggled with severe PTSD. In one experiment, 90 people across clinical sites in Canada, the United States, and Israel received either MDMA in three 8-hour sessions, or a placebo (Mitchell et al., 2021). By the end of the 18-week study, 67 percent of those who microdosed MDMA, and 32 percent of those who received the placebo, no longer had clinical PTSD.

Stay tuned. More clinical trials (experiments) are underway, and as many as 50 companies are working to make psychedelics into a billion-dollar business (Smith, 2022). Soon we will know whether psychedelic-assisted therapy is a revolutionary therapeutic aid—for many, the trip of a lifetime—or another therapeutic fad that flourishes and fades.

Mood-Stabilizing Medications

In addition to antipsychotic, antianxiety, and antidepressant drugs, psychiatrists have *mood-stabilizing drugs* in their arsenal. One of them, Depakote, was originally used to treat epilepsy. It also controlled the manic episodes associated with bipolar disorders. Another, the simple salt *lithium*, effectively levels the emotional highs and lows of bipolar disorders.

In the 1940s, Australian physician John Cade discovered that lithium calmed guinea pigs. Wondering if it might do the same for humans, he first tried it himself (to confirm its safety) and then on 10 people with mania—all of whom improved dramatically (W. Brown, 2019). About 7 in 10 people with bipolar disorders benefit from a long-term daily dose of this cheap salt, which helps prevent or ease manic episodes and, to a lesser extent, lifts depression (Solomon et al., 1995). Kay Redfield Jamison (1995) described the effect:

> Lithium prevents my seductive but disastrous highs, diminishes my depressions, clears out the wool and webbing from my disordered thinking, slows me down, gentles me out, keeps me from ruining my career and

> relationships, keeps me out of a hospital, alive, and makes psychotherapy possible. (pp. 88–89)

Among people with bipolar disorders, taking lithium also correlates with a greatly lowered risk of suicide (Oquendo et al., 2011). Naturally occurring lithium in drinking water has also correlated with lower suicide rates (across 808 Japanese cities and towns) and lower crime rates (across 27 Texas counties) (Kugimiya et al., 2021; Schrauzer & Shrestha, 1990, 2010). Lithium works.

Retrieval Practice

RP-2 How do researchers determine if particular drug therapies are effective?

RP-3 The drugs given most often to treat depression are called _____. Schizophrenia is often treated with _____ drugs.

ANSWERS IN APPENDIX E

Brain Stimulation

LOQ 56-3

How are brain stimulation and psychosurgery used in treating specific disorders?

Electroconvulsive Therapy

Another biomedical treatment, **electroconvulsive therapy (ECT)**, manipulates the brain with mild electric shocks. When ECT was introduced in 1938, the wide-awake person was strapped to a table and jolted with electricity to the brain. This early ECT, which produced convulsions and brief unconsciousness, gained a barbaric image. Today's ECT is much kinder and gentler, and no longer "convulsive." The person receives a general anesthetic and a muscle relaxant (to prevent bodily convulsions). A psychiatrist then delivers a brief electrical pulse, sometimes only to the brain's right side, which triggers a 30- to 60-second brain seizure (McCall et al., 2017). Within 30 minutes, the person awakens and remembers nothing of the treatment or of the preceding hours. The mysteriously effective treatment is roughly similar to rebooting a computer.

Many studies confirm that ECT effectively treats severe depression in "treatment-resistant" people who have not responded to drug therapy (Fink, 2009; Giacobbe et al., 2018; Ross et al., 2018). After three such sessions each week for 2–4 weeks, 70 percent or more of those receiving today's ECT improve markedly, with less memory loss than with earlier versions of ECT and without discernible brain damage or increased dementia risk (Osler et al., 2018). ECT also reduces suicidal thoughts, making it "often life-saving" (Maixner et al., 2021; Rhee et al., 2021). A *Journal of the American Medical Association* editorial concluded that "the results of ECT in treating severe depression are

among the most positive treatment effects in all of medicine" (Glass, 2001).

> The medical use of electricity is an ancient practice. Physicians treated the Roman Emperor Claudius (10 B.C.E.–54 C.E.) for headaches by pressing electric eels to his temples. Today, about 17 people per 100,000—people whose depression has not responded to other treatments—have received ECT (Lesage et al., 2016).

How does ECT alleviate severe depression—and, in some newer studies, mania (Elias et al., 2021)? After more than 80 years, no one knows for sure. One recipient likened ECT to the smallpox vaccine, which was saving lives before we knew how it worked. Perhaps the brief electric current calms neural centers where overactivity produces depression. Some research indicates that ECT stimulates neurogenesis (new neurons) and new synaptic connections (An & Wang, 2022).

No matter how impressive the results, the idea of electrically shocking a person's brain still strikes many as barbaric, especially given our ignorance about why ECT works. Moreover, the mood boost may not last long. Many ECT-treated people eventually relapse back into depression, although relapses are somewhat fewer for those who also receive antidepressant drugs or do aerobic exercise (Rosenquist et al., 2016; Salehi et al., 2016). *The bottom line*: In the minds of many psychiatrists and clients, ECT is a lesser evil than severe depression's anguish and risk of suicide. After ECT, psychiatrist Rebecca Barchas

(2021) reported "regaining my joie de vivre, my high level of motivation, and my ability to make decisions."

Alternative Neurostimulation Therapies

Three other neural stimulation techniques—transcranial direct current stimulation, transcranial magnetic stimulation, and deep brain stimulation—also aim to treat the depressed brain (FIGURE 56.1).

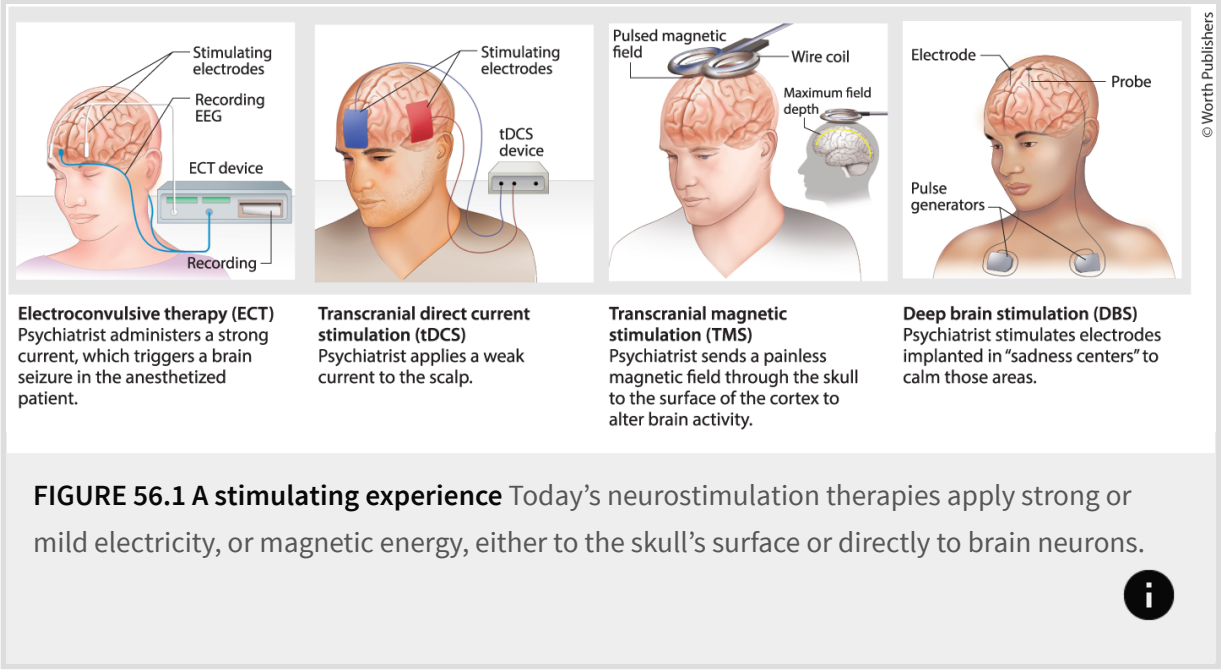


FIGURE 56.1 A stimulating experience Today's neurostimulation therapies apply strong or mild electricity, or magnetic energy, either to the skull's surface or directly to brain neurons.

Transcranial Direct Current Stimulation

In contrast to ECT, which produces a brain seizure with about 800 milliamps of electricity, *transcranial direct current stimulation (tDCS)* administers a weak 1- to 2-milliamp current to the scalp. Skeptics argue that such a current is too weak to penetrate the brain

(Underwood, 2016). But research suggests that tDCS is a modestly effective treatment for depression and obsessive-compulsive disorder (Gao et al., 2022; Razza et al., 2020).

Transcranial Magnetic Stimulation

Depressed moods also sometimes improve when a painless procedure called **transcranial magnetic stimulation (TMS)** is performed on wide-awake patients in sessions over several weeks. Repeated pulses surging through a magnetic coil held close to the skull can stimulate or suppress activity in areas of the cortex. Like tDCS (and unlike ECT), the TMS procedure produces no memory loss or other serious side effects, aside from possible headaches.

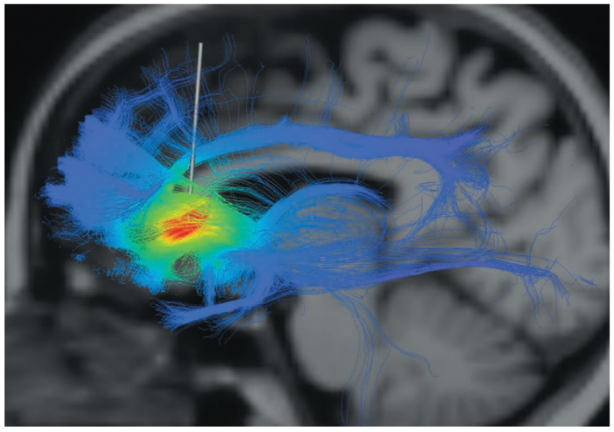
Results are mixed. Some studies have found that, for 30 to 40 percent of people with depression, TMS works, although it is less effective than ECT (Carmi et al., 2019; Mutz et al., 2019). But researchers are exploring higher-dose and precisely targeted stimulation techniques that hold promise of greater relief (Cole et al., 2022; Ferrarelli & Phillips, 2021).

TMS also reduces some schizophrenia symptoms, such as social apathy and memory loss (Osoegawa et al., 2018; Xiu et al., 2020). How it works is unclear. Repeated stimulation may cause nerve cells to form new functioning circuits through *long-term potentiation*. Another possible explanation is a placebo effect: People benefit when, after being given a credible explanation, they *believe* TMS will work (Geers et al., 2019; Yesavage et al., 2018).

Deep Brain Stimulation

Other clients have benefited from an experimental treatment pinpointing a neural hub that bridges the thinking frontal lobes to the limbic system (Becker et al., 2016; Brunoni et al., 2017; Ryder & Holtzheimer, 2016). This area, which is overactive in the brain of a depressed or temporarily sad person, typically calms when treated by ECT or antidepressants. If not calmed, then to activate neurons that inhibit this negative activity, neuroscientist Helen Mayberg applied *deep brain stimulation (DBS)* technology, sometimes used to treat Parkinson's tremors. Since 2003, she and her colleagues have used DBS to treat more than 200 depressed patients via implanted electrodes in a brain area that functions as the neural "sadness center" (Lozano & Mayberg, 2015; Scangos et al., 2021). For some clients, DBS produces large and enduring reductions in depression (Crowell et al., 2019; Scangos et al., 2021). "The bottom line," notes Mayberg, "is that if you get better, you stay better" (Carey, 2019).





Left: Jared Siskin/Patrick McMullan/Getty Images; right: Helen Mayberg, M.D. Psychiatric Neuroimaging and Therapeutics, The Mayberg Lab at Emory University, Atlanta, GA/V. J. Wedeen and L.L.Wald/Athinoula A. Martinos Center For Biomedical Imaging and The Human Connectome Project, Boston, MA.

A depression switch? By comparing the brains of clients with and without depression, researcher Helen Mayberg identified a brain area (highlighted in red) that appears active in

people who are depressed or sad, and whose activity may be calmed by deep brain stimulation.

Psychosurgery

Because its effects are irreversible, **psychosurgery** is the most drastic and least-used biomedical intervention for changing behavior. In the 1930s, Portuguese physician Egas Moniz developed what would become the best-known psychosurgical operation: the **lobotomy**. Moniz found that cutting the nerves connecting the frontal lobes with the inner brain's emotion-controlling centers calmed uncontrollably emotional and violent patients. In what would later become, in others' hands, a crude but relatively simple procedure, a neurosurgeon would shock the patient into a coma, hammer an icepick-like instrument through the top of each eye socket into the brain, and then wiggle it to sever connections running up to the frontal lobes. Between 1936 and 1954, tens of thousands of people with mental illness were "lobotomized," including 35,000 in the United States alone (Valenstein, 1986).

Although the intention was simply to disconnect emotion from thought, the effect was often more drastic. A lobotomy usually decreased misery or tension, but also produced a permanently lethargic, immature, uncreative person. During the 1950s, when calming drugs became available, psychosurgery became scorned.



New York Times Co./Getty Images

Failed lobotomy This 1940 photo shows Rosemary Kennedy (center) at age 22 with brother (and future U.S. president) John and their sister Jean. When doctors suggested that a lobotomy would control Rosemary's reportedly violent mood swings, her father approved the procedure. The lobotomy, performed after this photo was taken, left her confined to a hospital with an infantile mentality for the next 63 years, until her death in 2005.

Today, lobotomies are history. More precise, microscale psychosurgery is sometimes used in extreme cases. For example, if a

person experiences uncontrollable seizures, surgeons can deactivate the specific nerve clusters that cause or transmit the convulsions. MRI-guided precision surgery is also occasionally done to cut the circuits involved in severe major depressive disorder and obsessive-compulsive disorder (Carey, 2009, 2011; M. Kim et al., 2018; Sachdev & Sachdev, 1997). Because these procedures are irreversible, neurosurgeons perform them only as a last resort.

***

TABLE 56.1 summarizes some aspects of the biomedical therapies we've discussed.

TABLE 56.1 Comparing Biomedical Therapies

Therapy	Targeted Problem	Therapy Aim	Therapy Technique
Therapeutic lifestyle change	Anxiety and depressive disorders	Restore healthy biological state.	Alter lifestyle through adequate exercise, sleep, nutrition, and other changes.
Drug therapies	Neurotransmitter malfunction	Control symptoms of psychological disorders.	Alter brain chemistry through drugs.
Brain stimulation	Depressive disorders and mania (ECT is used for severe, treatment-resistant depressive disorders, mania, and catatonia)	Alleviate depression and mania, especially when it is unresponsive to drugs or other forms of therapy.	Stimulate brain through electroconvulsive shock, mild electrical stimulation, magnetic pulses, or deep brain stimulation.

Psychosurgery	Brain malfunction	Relieve severe disorders.	Remove or destroy brain tissue.

Ask Yourself

What were your impressions of biomedical therapies before reading this section? Are any of your views different now? Why or why not?

Retrieval Practice

RP-4 Severe depression that has not responded to other therapy may be treated with _____ _____, which can cause some memory loss of the preceding hours. More moderate neural stimulation techniques designed to help alleviate depression include transcranial _____ _____ stimulation, transcranial _____ stimulation, and _____ _____ stimulation.

ANSWERS IN APPENDIX E

Preventing Psychological Disorders and Building Resilience

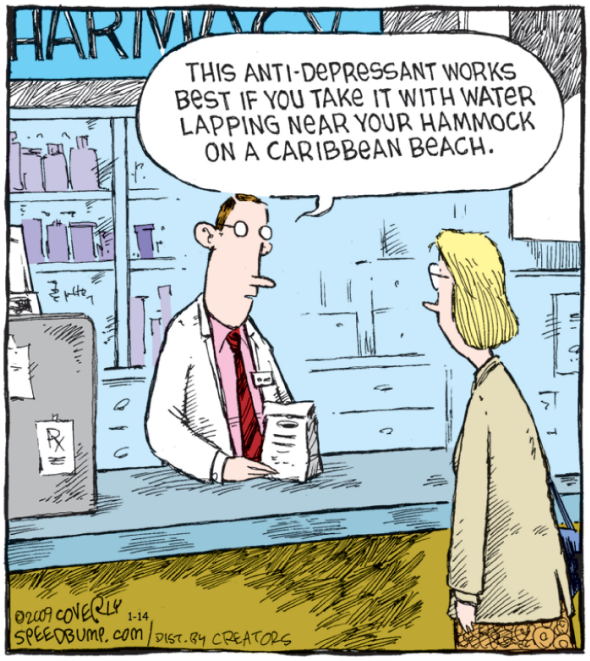
LOQ 56-4

What may help prevent psychological disorders, and why is it important to develop resilience?

Psychotherapies and biomedical therapies locate the cause of psychological disorders within the person. We infer that people who act cruelly must be cruel and that people who act "crazy" must be "sick." We attach labels to such people, thereby distinguishing them from "normal" folks. It follows, then, that we try to treat people with mental disorders by giving them insight into their problems, by changing their thinking, by helping them gain control with drugs.

There is an alternative viewpoint: We could interpret many psychological disorders as understandable responses to a disturbing and stressful world. According to this view, it is not just the person who needs treatment. Rather, as the soaring mental health problems during the Covid-19 pandemic illustrated, it's also the person's social context. It is better to prevent problems by reforming an unhealthy situation and developing people's coping competencies than to wait for and treat the problems that develop.

Life's stresses and challenges endure, and thus so do psychological disorders. Medical interventions such as antibiotics and vaccinations have greatly lengthened our life expectancy. Yet our growing understanding of suicide risks has not diminished suicide. Our understanding the neuroscience of addiction has been followed by *increased* overdose deaths. And more widely available psychotherapy has not reduced U.S. rates of depression and anxiety (Insel, 2022). So, what might we do to alleviate the root causes of such problems?



Preventive Mental Health

A story about the rescue of a drowning person from a rushing river illustrates this viewpoint: Having successfully administered first aid to the victim, the rescuer spots another struggling person and pulls that person out, too. After a half-dozen repetitions, the rescuer suddenly turns and starts running away while the river sweeps yet another floundering person into view. “Aren’t you going to rescue that person?” asks a bystander. “No way,” the rescuer replies. “I’m going upstream to find out what’s pushing all these people in.”

Preventive mental health is upstream work. It seeks to prevent psychological casualties by identifying and alleviating the conditions that cause them. As clinical psychologist George Albee (1986, 2006) pointed out, there is abundant evidence that poverty, safety concerns,

lack of meaningful work, constant criticism, unemployment, and discrimination undermine people's sense of competence, personal control, and self-esteem. Such stresses increase their risk of depression, substance use disorder, and suicide. To prevent psychological casualties we should, Albee contended, support programs that work to improve these distressing situations.

> **"It is better to prevent than to cure."** — Peruvian folk wisdom

Preventing psychological problems means empowering those who have learned an attitude of helplessness, and changing environments that breed loneliness, suicidal thinking, and excessive alcohol and drug use. It means teaching children how to manage their emotions, get along with others, and keep up with academic demands (Godwin, 2020). It means harnessing positive psychology interventions to enhance human flourishing. One intervention taught adolescents that personality isn't fixed—people can change—and reduced their chances of future depression by 40 percent (Miu & Yeager, 2015). This result is no fluke: Preventive therapies have consistently reduced the risk for depression (Breedvelt et al., 2018).

In short, "everything aimed at improving the human condition, at making life more fulfilling and meaningful, may be considered part of primary prevention of mental or emotional disturbance" (Kessler & Albee, 1975, p. 557). Prevention can sometimes provide a double payoff. People with a strong sense of life's meaning are more engaging

socially (Stillman et al., 2011). By strengthening people's sense of meaning in life, we may also lessen their loneliness as they become more engaging companions.

Among the upstream prevention workers are *community psychologists*. Mindful of how people interact with their environment, they focus on creating environments that support psychological health. Through their research and social action, community psychologists aim to empower people and to enhance their competence, health, and well-being.

> **"Mental disorders arise from physical ones, and likewise physical disorders arise from mental ones."** — *The Mahabharata*, 200 B.C.E.

Building Resilience

Preventive mental health includes efforts to build individuals' **resilience**.

Faced with extreme suffering or trauma, some people experience lasting harm, some experience stable resilience, and some experience growth (Myers, 2019). In the aftermath of the September 11, 2001, terror attacks, many New Yorkers exhibited resilience. This resilience was especially true for those who enjoyed supportive close relationships and who had not recently experienced other stressful events (Bonanno et al., 2007). More than 9 in 10 New Yorkers, although

stunned and grief-stricken by 9/11, did *not* have a dysfunctional stress reaction. Among those who did, the stress symptoms were mostly gone by the following January (Person et al., 2006). The initial isolation during the Covid-19 pandemic increased the rate of depressive disorders. But many people quickly adapted and their mental health returned to prepandemic levels (Robinson et al., 2022).



(a) (b)

Left: © Stephen Voss 2020/Redux Pictures; right: Chip Somodevilla/Getty Images

Disability and resilience (a) "I get to appreciate the gift of sight—any sight at all," said U.S. Congressman and Retired Navy SEAL Dan Crenshaw, who lost his eye to an improvised explosive device in the war in Afghanistan.

(b) "Sometimes it takes dealing with a disability—the trauma, the relearning, the months of rehabilitation therapy—to uncover our true abilities and how we can put them to work for us in ways we may have never imagined," said U.S. Senator and Retired Lieutenant Colonel Tammy Duckworth, who lost both legs as an Army helicopter pilot in the Iraq War.

Struggling with challenging crises can lead to **posttraumatic growth**. Many people who have lost a loved one to suicide have reported a greater appreciation for life, more meaningful relationships, and a

richer spiritual life (Levi-Belz et al., 2021). Out of even our worst experiences, some good can come, especially when we can imagine new possibilities (Mangelsdorf et al., 2019; Roepke, 2015). As with positive experiences, suffering can beget sensitivity and strength.



AJ Shorter Photography

Power and healing to the people APA President Thema Bryant aims to reduce negative outcomes among members of marginalized communities. “APA and the science of psychology,” she says, “are ideally situated to address the triple threat of trauma, loss and inequities that currently plagues our society” (APA, 2021).

Let the globe, if nothing else, say this is true:
That even as we grieved, we grew

That even as we hurt, we hoped
That even as we tired, we tried
— Poet Amanda Gorman, "The Hill We Climb" (U.S. Presidential inaugural poem, 2021)

Retrieval Practice

RP-5 What is the difference between preventive mental health and the psychological or biomedical therapies?

ANSWERS IN APPENDIX E

If you just finished reading this book, your introduction to psychological science is completed. Our tour of psychological science has taught us much—and you, too?—about our moods and memories, about the reach of our unconscious, about how we flourish and struggle, about how we perceive our physical and social worlds, and about how our biology and culture shape us. As your guides on this tour, we hope that you have shared our fascination, grown in your understanding and compassion, and sharpened your critical thinking. And we hope you enjoyed the ride.

With every good wish in your life journey ahead,

David G. Myers
DavidMyers.org; @DavidGMyers

C. Nathan DeWall

@cndewall

June Gruber
@junegruber

REVIEW

Module 56: The Biomedical Therapies and Preventing Psychological Disorders

Learning Objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ 56-1: Why is therapeutic lifestyle change considered an effective biomedical therapy, and how does it work?

LOQ 56-2: What are the drug therapies? How do double-blind studies help researchers evaluate a drug's effectiveness?

LOQ 56-3: How are brain stimulation and psychosurgery used in treating specific disorders?

LOQ 56-4: What may help prevent psychological disorders, and why is it important to develop resilience?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

biomedical therapy
psychopharmacology
antipsychotic drugs
antianxiety drugs
antidepressant drugs
psychedelic drugs
electroconvulsive therapy (ECT)
transcranial magnetic stimulation (TMS)
psychosurgery
lobotomy
resilience
posttraumatic growth

Module Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. Some antipsychotic drugs, used to calm people with schizophrenia, can have unpleasant side effects, most notably
   a. hyperactivity.
   b. momentary memory loss.
   c. sluggishness, tremors, and twitches.
   d. paranoia.

2. Drugs such as Xanax and Ativan, which depress central nervous system activity, can become addictive when used as ongoing treatment. These drugs are referred to as _____ drugs.

3. A simple salt that often brings relief to people with bipolar disorders is _____.

4. When drug therapies have not been effective, electroconvulsive therapy (ECT) may be used as a treatment for people with
   a. severe obsessive-compulsive disorder.
   b. severe depression.

c. schizophrenia.
d. anxiety disorders.

5. An approach that seeks to identify and alleviate conditions that put people at higher risk for developing psychological disorders is called
   a. deep brain stimulation.
   b. the mood-stabilizing perspective.
   c. spontaneous recovery.
   d. preventive mental health.

Appendix A

The Story of Psychology: A Timeline

Charles L. Brewer, *Furman University*, and Salena Brody, *University of Texas, Dallas*

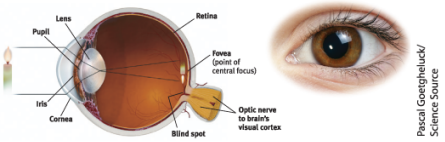
B.C.E.

387— Plato, who believed in innate ideas, suggests that the brain is the seat of mental processes.

335— Aristotle, who denied the existence of innate ideas, suggests that the heart is the seat of mental processes.

C.E.

1604— Johannes Kepler describes the inverted image on the retina.



Pascal Goetgheluck/ Science Source

Inverted image on the retina

1605— Francis Bacon publishes *The Proficiency and Advancement of Learning*.

1637— René Descartes, the French philosopher and mathematician who proposed mind–body interaction and the doctrine of innate ideas, publishes *A Discourse on Method*.

1690— John Locke, the British philosopher who rejected Descartes' notion of innate ideas and insisted that the mind at birth is a "blank slate" *(tabula rasa)*, publishes *An Essay Concerning Human Understanding*, which stresses empiricism over speculation.

1774— Franz Mesmer, an Austrian physician, performs his first supposed cure using "animal magnetism" (later called mesmerism and hypnosis). In **1777,** he was expelled from the practice of medicine in Vienna.

1793— Philippe Pinel releases the first psychiatric patients from their chains at the Bicêtre Asylum in France and advocates for more humane treatment of psychiatric patients.

1802— Thomas Young publishes *A Theory of Color Vision* in England. (His theory was later called the trichromatic theory.)

1808— Franz Joseph Gall, a German physician, describes phrenology, the false belief that the shape of a person's skull reveals mental faculties and character traits.

1813— The first private psychiatric hospital in the United States opens in Philadelphia.

1834— Ernst Heinrich Weber publishes *The Sense of Touch*, in which he discusses the "just noticeable difference (jnd)" and what we now call Weber's law.

1840— 

Dorothea Dix begins advocating for humane treatment of people in mental health institutions, persuading politicians to construct psychiatric hospitals.

Dorothea Dix (1802–1887)

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1844— In Philadelphia, 13 superintendents form the *Association of Medical Superintendents of American Institutions for the Insane* (now known as the American Psychiatric Association).

1848— Phineas Gage suffers massive brain damage when a large iron rod accidentally pierces his brain, leaving his intellect and memory intact but altering his personality.





Warren Anatomical Museum in the Francis A. Countway Library of Medicine. Gift of Jack and Beverly Wilgus.

Phineas Gage

1850— Hermann von Helmholtz measures the speed of the nerve impulse.

1859— Charles Darwin publishes *On the Origin of Species by Means of Natural Selection*, synthesizing much previous work on the theory of evolution, including that of Herbert Spencer, who coined the phrase "survival of the fittest."

1861— Paul Broca, a French physician, discovers an area in the left frontal lobe of the brain (now called Broca's area) that is critical for the production of spoken language.

1869— Francis Galton, Charles Darwin's cousin, publishes *Hereditary Genius*, in which he claims that intelligence is inherited. In **1876,** he coins the expression "nature and nurture" to correspond with "heredity and environment." Later, Galton proposes harmful ideas about how to improve the genetic quality of human populations (called *eugenics*) that would inform prejudiced and discriminatory policies.

1874— Carl Wernicke, a German neurologist and psychiatrist, shows that damage to a specific area in the left temporal lobe (now called Wernicke's area) disrupts ability to comprehend or produce spoken or written language.

1878— G. Stanley Hall receives from Harvard University's Department of Philosophy the first U.S. Ph.D. degree based on psychological research.

1879 

Wilhelm Wundt establishes at the University of Leipzig, Germany, the first psychology laboratory, which becomes a mecca for psychology students from all over the world.

Wilhelm Wundt (1832–1920)

1883 G. Stanley Hall, student of Wilhelm Wundt, establishes the first formal U.S. psychology laboratory at Johns Hopkins University.

1885 Hermann Ebbinghaus publishes *On Memory,* summarizing his extensive research on learning and memory, including the "forgetting curve."

1886 Joseph Jastrow receives from Johns Hopkins University the first Ph.D. degree awarded by a U.S. Department of Psychology.

1889 

Henri-Étienne Beaunis and Alfred Binet establish France's first psychology laboratory at the Sorbonne.

Alfred Binet (1857–1911)

The first International Congress of Psychology meets in Paris.

1890 

William James, Harvard University philosopher and psychologist, publishes *The Principles of Psychology,* describing psychology as "the science of mental life."

William James (1842–1910)

1891 James Mark Baldwin establishes the first psychology laboratory in the British Commonwealth at the University of Toronto.

1892 G. Stanley Hall spearheads the founding of the American Psychological Association (APA) and becomes its first president.

1893 



Mary Whiton Calkins and Christine Ladd-Franklin are the first women elected to membership in the APA.

Mary Whiton Calkins (1863–1930)

Christine Ladd-Franklin (1847–1930)

1894 Margaret Floy Washburn is the first woman to receive a Ph.D. degree in psychology (Cornell University).

Harvard University denies Mary Whiton Calkins admission to doctoral candidacy because of her gender. She goes on to publish more than 100 scientific articles related to memory and the self.

1896 John Dewey publishes "The Reflex Arc Concept in Psychology," helping to formalize the school of psychology called functionalism.

1898 In *Animal Intelligence,* Edward L. Thorndike describes his learning experiments with cats in "puzzle boxes." In **1905,** he proposes the "law of effect."

Doctoral student Alice Lee uses published data from the *Journal of Anatomy* to debunk the popular phrenology and eugenics arguments that skull size predicts intelligence.

1900 Sigmund Freud publishes *The Interpretation of Dreams,* his major theoretical work on psychoanalysis.

1901 Ten founders establish the British Psychological Society.

1904 Ivan Pavlov is awarded the Nobel Prize for Physiology or Medicine for his studies on the physiology of digestion.

1905 Mary Whiton Calkins becomes the first woman president of the APA.



Ivan Pavlov begins publishing studies of conditioning in animals.

Ivan Pavlov (1849–1936)

Alfred Binet and Théodore Simon produce the first intelligence test for assessing the abilities and academic progress of Parisian schoolchildren.

1909 

Sigmund Freud makes his only trip to America to deliver a series of lectures at Clark University.

Sigmund Freud (1856–1939)

1913 

John B. Watson outlines the tenets of behaviorism in a *Psychological Review* article, "Psychology as the Behaviorist Views It."

John Watson (1878–1958)

1914 Lillian Gilbreth publishes *Principles of Management,* a foundational text for the field of industrial-organizational psychology.

During World War I, Robert Yerkes and his staff develop a group intelligence test for evaluating U.S. military personnel, which increases the U.S. public's acceptance of psychological testing.

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1920 — 

Leta Stetter Hollingworth publishes *The Psychology of Subnormal Children,* an early classic. In **1921,** she is cited in *American Men of Science* for her research on the psychology of women.

Leta Stetter Hollingworth
(1886–1939)



Francis Cecil Sumner becomes the first Black person in the U.S. to receive a Ph.D. degree in psychology (Clark University). He later co-founds the psychology department at Howard University.

Francis Cecil Sumner
(1895–1954)

John B. Watson and Rosalie Rayner report conditioning a fear reaction in a child called "Little Albert."

1921 — Hermann Rorschach, a Swiss psychiatrist, introduces the Rorschach inkblot test.

1923 — Developmental psychologist Jean Piaget publishes *The Language and Thought of the Child.*

1924 — Mary Cover Jones reports reconditioning a fear reaction in a child (Peter), a forerunner of systematic desensitization developed by Joseph Wolpe.

1927 — In *Introduction to the Technique of Child Analysis,* Anna Freud discusses psychoanalysis in the treatment of children.

1929 — Wolfgang Köhler publishes *Gestalt Psychology,* which criticizes behaviorism and outlines essential elements of the gestalt theory.

1931 — 

Margaret Floy Washburn becomes the first female psychologist (and the second female scientist in any discipline) elected to the U.S. National Academy of Sciences.

Margaret Floy Washburn
(1871–1939)

1932 — In *The Wisdom of the Body,* Walter B. Cannon coins the term "homeostasis," discusses the fight-or-flight response, and identifies hormonal changes associated with stress.

1933 — 

Inez Beverly Prosser becomes the first Black woman to receive a Ph.D. degree in psychology from a U.S. institution (University of Cincinnati).

Inez Beverly Prosser
(1895–1934)

1934 — 

Ruth Winifred Howard becomes the second Black woman in the U.S. to receive a Ph.D. degree in psychology (University of Minnesota) and spends her career doing clinical work with children and young people.

Ruth Winifred Howard
(1900–1997)

1935 — Christiana Morgan and Henry Murray introduce the Thematic Apperception Test to elicit fantasies from people undergoing psychoanalysis.

1936 — Egas Moniz, a Portuguese physician, publishes work on the first frontal lobotomies performed on humans.

1938 — B. F. Skinner publishes *The Behavior of Organisms,* which describes operant conditioning of animals.

In *Primary Mental Abilities,* Louis L. Thurstone proposes seven such abilities.

Ugo Cerletti and Lucio Bini introduce electroshock treatment with a human patient.

1939 — David Wechsler publishes the Wechsler–Bellevue intelligence test, forerunner of the Wechsler Intelligence Scale for Children (WISC) and the Wechsler Adult Intelligence Scale (WAIS).



Mamie Phipps Clark receives a master's degree from Howard University. She later earns her doctorate and, with Kenneth B. Clark, provides joint research cited in the U.S. Supreme Court's 1954 decision to end racial segregation in public schools.

Mamie Phipps Clark
(1917–1983)

Edward Alexander Bott helps found the Canadian Psychological Association. He becomes its first president in 1940.

World War II provides many opportunities for psychologists to enhance the popularity and influence of psychology, especially in applied areas.

1941 — Raymond Cattell and John Horn distinguish fluid and crystallized intelligence. Decades later, John Carroll synthesizes these ideas as a bridge between a general intelligence factor (*g*) and specific abilities, to create the Cattell-Horn-Carroll (CHC) theory of intelligence.

1943 — Psychologist Starke Hathaway and physician J. Charnley McKinley publish the Minnesota Multiphasic Personality Inventory (MMPI).

1945 — 

Karen Horney, who criticized Freud's theory of female sexual development, publishes *Our Inner Conflicts.*

Karen Horney
(1885–1952)

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1946 U.S. Congress creates the National Institute of Mental Health, making mental health a national priority.

Benjamin Spock's first edition of *The Commonsense Book of Baby and Child Care* appears; the book will influence child raising in North America for several decades.

1948 Alfred Kinsey and his colleagues publish *Sexual Behavior in the Human Male,* and they publish *Sexual Behavior in the Human Female* in **1953.**



B. F. Skinner's novel, *Walden Two,* describes a utopian community based on positive reinforcement, which becomes a clarion call for applying psychological principles in everyday living, especially communal living.

B. F. Skinner
(1904–1990)

Ernest R. Hilgard publishes *Theories of Learning,* which was required reading for several generations of psychology students in North America.

1949 Raymond B. Cattell publishes the Sixteen Personality Factor Questionnaire (16PF).

The scientist-practitioner model of training is approved at the Boulder Conference on Graduate Education in Clinical Psychology.

In *The Organization of Behavior: A Neuropsychological Theory,* Canadian psychologist Donald O. Hebb outlines a new and influential conceptualization of how the nervous system functions.

1950 Solomon Asch publishes studies of effects of conformity on judgments of line length.

In *Childhood and Society,* Erik Erikson outlines his stages of psychosocial development.

1951 Carl Rogers publishes *Client-Centered Therapy.*

1952 The American Psychiatric Association publishes the *Diagnostic and Statistical Manual of Mental Disorders,* an influential book that will be updated periodically.

1953 Eugene Aserinsky and Nathaniel Kleitman describe rapid eye movements (REM) that occur during sleep.

Janet Taylor's Manifest Anxiety Scale appears in the *Journal of Abnormal Psychology.*

1954 In *Motivation and Personality,* Abraham Maslow proposes a hierarchy of motives ranging from physiological needs to self-actualization. (Maslow later updates the hierarchy to include self-transcendence needs.)

James Olds and Peter Milner, McGill University neuropsychologists, describe the rewarding effects of electrical stimulation of the hypothalamus in rats.

Gordon Allport publishes *The Nature of Prejudice.*

1956 In his *Psychological Review* article titled "The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information," George Miller coins the term "chunk" for memory researchers.

1957 Robert Sears, Eleanor Maccoby, and Harry Levin publish *Patterns of Child Rearing.*

Charles Ferster and B. F. Skinner publish *Schedules of Reinforcement.*

1958 Harry Harlow publishes "The Nature of Love," outlining his work on attachment in monkeys.

1959 Noam Chomsky's critical review of B. F. Skinner's *Verbal Behavior* appears in the journal *Language.*



Keturah Whitehurst becomes the first Black person in the U.S. to be licensed as a psychologist. She later co-founds a human development and learning laboratory that provides educational opportunities to children in need.

Keturah Whitehurst
(1912–2000)

Eleanor Gibson and Richard Walk report their research on infants' depth perception in "The Visual Cliff."

Lloyd Peterson and Margaret Peterson, in the *Journal of Experimental Psychology* article, "Short-Term Retention of Individual Verbal Items," highlight the importance of rehearsal in memory.

John Thibaut and Harold Kelley publish *The Social Psychology of Groups.*

1960 George Sperling publishes "The Information Available in Brief Visual Presentations."

1961 Georg von Békésy receives a Nobel Prize for research on the physiology of hearing.

David McClelland publishes *The Achieving Society.*

1962 Jerome Kagan and Howard Moss publish *Birth to Maturity.*



Martha E. Bernal becomes the first Latina to earn a U.S. doctoral degree (Ph.D. in clinical psychology, Indiana University).

Martha E. Bernal
(1931–2001)

Stanley Schachter and Jerome Singer publish findings that support the two-factor theory of emotion.

Albert Ellis' *Reason and Emotion in Psychotherapy* is published; it is a milestone in the development of rational-emotive therapy (RET).

1963 Stanley Milgram's "Behavioral Study of Obedience" appears in the *Journal of Abnormal and Social Psychology.*

1964



Marigold Linton becomes the first Native American to receive a doctoral degree in psychology (University of California, Los Angeles). She is a founding member of both the Society for Advancement of Chicanos and Native Americans in Science, and the National Indian Education Association.

Marigold Linton
(born 1936)

1965 Canadian researcher Ronald Melzack and British researcher Patrick Wall propose the gate-control theory of pain.

The Archives of the History of American Psychology is founded at the University of Akron.

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1966 Nancy Bayley becomes the first woman to receive the APA's Distinguished Scientific Contribution Award.

Jerome Bruner and colleagues at Harvard University's Center for Cognitive Studies publish *Studies in Cognitive Growth*.

William Masters and Virginia Johnson publish results of their research in *Human Sexual Responses*.

Allen Gardner and Beatrix Gardner begin training a chimpanzee named Washoe in American Sign Language at the University of Nevada, Reno. (Washoe dies in 2007.)



John Garcia
(1917–1983)

John Garcia and Robert Koelling publish a study on taste aversion in rats.

David M. Green and John A. Swets publish *Signal Detection Theory and Psychophysics*.

Julian Rotter publishes research on locus of control.

1967 Publication of Ulric Neisser's *Cognitive Psychology*, which helps to steer psychology away from behaviorism and toward cognitive processes.

Martin Seligman and Steven Maier publish the results of their research on "learned helplessness" in dogs.

1968 Richard Atkinson and Richard Shiffrin's influential three-stage memory model appears in *The Psychology of Learning and Motivation*.

Neal E. Miller's article in *Science*, describing instrumental conditioning of autonomic responses, stimulates research on biofeedback.

1969 Albert Bandura publishes *Principles of Behavior Modification*.

The Association for Women in Psychology is founded. E. Kitch Childs is instrumental in this effort, pioneering therapy techniques grounded in "intersectionality" (considering how race, class, and other aspects of identity may combine to create discrimination or disadvantage).

George Miller, in his APA presidential address, "Psychology as a Means of Promoting Human Welfare," emphasizes the importance of "giving psychology away."

1970



Reiko Homma True
(born 1933)

Psychologist Reiko Homma True lobbies successfully to open the Asian American Community Mental Health program—the first to focus on a minority population.

1971



Kenneth B. Clark
(1914–2005)

Kenneth B. Clark becomes the first Black president of the APA. He spends his career studying racial bias in schools. His research helps desegregate U.S. schools and leads the federal government to prioritize spending to improve Black children's educational experiences.

Albert Bandura publishes *Social Learning Theory*.

B. F. Skinner publishes *Beyond Freedom and Dignity*.

1972 Elliot Aronson publishes *The Social Animal*.

Fergus Craik and Robert Lockhart's "Levels of Processing: A Framework for Memory Research" appears in the *Journal of Verbal Learning and Verbal Behavior*.

Robert Rescorla and Allan Wagner publish their associative model of Pavlovian conditioning.



Derald Wing Sue
(born 1942)



Stanley Sue
(born 1944)

Under the leadership of Derald Wing Sue and Stanley Sue, the Asian American Psychological Association is founded.

1973 APA votes to remove "homosexuality" as a psychological disorder from the *Diagnostic and Statistical Manual of Mental Disorders*.

Ethologists Karl von Frisch, Konrad Lorenz, and Nikolaas Tinbergen receive the Nobel Prize for their research on animal behavior.

1974 APA's Division 2 first publishes its journal, *Teaching of Psychology*, with Robert S. Daniel as editor.

Eleanor Maccoby and Carol Jacklin publish *The Psychology of Sex Differences*.

1975 Biologist Edward O. Wilson's *Sociobiology* is published; it will be a controversial precursor to evolutionary psychology.

1976 Sandra Wood Scarr and Richard A. Weinberg publish "IQ Test Performance of Black Children Adopted by White Families" in *American Psychologist*.



Robert V. Guthrie
(1930–2005)

Psychologist Robert V. Guthrie publishes *Even the Rat Was White*, the first history of Black psychologists in the U.S.

Saundra Murray Nettles chairs the Task Force on Black Women's Priorities, which leads to the creation of APA's Division 35, Section 1: The Psychology of Black Women.

Psychologist Carolyn Payton becomes Director of the U.S. Peace Corps, the first woman and the first Black person to serve in that role.

1978 Psychologist Herbert A. Simon, Carnegie-Mellon University, wins a Nobel Prize for pioneering research on computer simulations of human thinking and problem solving.

All Portraits: Macmillan Learning

1979 James J. Gibson publishes *The Ecological Approach to Visual Perception*.

Elizabeth Loftus publishes *Eyewitness Testimony*, showing that eyewitness memory is often inaccurate.

1981 David Hubel and Torsten Wiesel receive a Nobel Prize for research on single-cell recordings that identified feature detector cells in the visual cortex.

Roger Sperry receives a Nobel Prize for research on split-brain patients.

U.S. sociologist Harriette Pipe McAdoo publishes *Black Families*, an anthology of work done with John Lewis McAdoo on middle class Black families. Previous studies had focused on dysfunctional families, such as those in contact with prison and drug treatment programs.

Paleontologist Stephen Jay Gould publishes *The Mismeasure of Man*, highlighting the debate concerning biological determination of intelligence.

1983 In his *Frames of Mind*, Howard Gardner outlines his theory of multiple intelligences.

1984 44 Society for the Psychology of Sexual Orientation and Gender Diversity — The APA creates Division 44 (Society for the Psychology of Sexual Orientation and Gender Diversity).

1987 Elizabeth Scarborough and Laurel Furumoto publish *Untold Lives: The First Generation of American Women Psychologists*.

Fluoxetine (Prozac) is introduced as a treatment for depression.

Wilbert J. McKeachie, University of Michigan, receives the first APA Award for Distinguished Career Contributions to Education and Training in Psychology.

1988 The American Psychological Society is founded. The organization changes its name to the Association for Psychological Science in **2006.**

1990 Psychiatrist Aaron Beck receives the Distinguished Scientific Award for the Applications of Psychology for advancing understanding and treatment of psychopathology, including pivotal contributions to the development of cognitive therapy.

B. F. Skinner receives APA's first Citation for Outstanding Lifetime Contributions to Psychology and presents his last public address, "Can Psychology Be a Science of Mind?" (He died a few days later at age 86.)

1991 Martin Seligman publishes *Learned Optimism*, which foreshadows the "positive psychology" movement.

1992 Teachers of Psychology in Secondary Schools (TOPSS) is established as part of the APA.

About 3000 U.S. secondary school students take the first Advanced Placement (AP) Examination in Psychology.

1993 Psychologist Judith Rodin is elected president of the University of Pennsylvania, becoming the first female president of an Ivy League school.

1996 Dorothy Cantor becomes the first president of the APA with a Psy.D. degree.

1998 *The Handbook of Asian American Psychology* is published.

2002 New Mexico becomes the first U.S. state to allow qualified clinical psychologists to prescribe certain drugs. Many U.S. states now allow nurse practitioners and other providers to prescribe psychiatric medication.

Psychologist Daniel Kahneman, Princeton University, receives a Nobel Prize for research on decision making later summarized in his **2011** book, *Thinking Fast and Slow*.

2009 Psychologist Judy Chu becomes the first Chinese American woman elected to the U.S. Congress.

2011 Proposed by participants at the 2008 national conference at the University of Puget Sound, the document "Principles for Quality Undergraduate Education in Psychology," is approved as official APA policy.



Melba J. T. Vasquez becomes the first Latina president of the APA.

Melba J. T. Vasquez (born 1951)

2013 U.S. President Barack Obama announces $100 million in funding for an interdisciplinary project to advance understanding of the human brain.

2015 The *Independent Review Relating to APA Ethics Guidelines, National Security Interrogations, and Torture* is presented to the APA.

2018 Kristina Olson becomes the first psychologist to receive the National Science Foundation's Waterman Award. She also receives a 2018 MacArthur Fellowship for her work studying the social and cognitive development of transgender and gender-nonconforming youth.

2020 MacArthur Fellowship awardee and implicit bias researcher Jennifer L. Eberhardt receives multiple awards for authoring *Biased: Uncovering the Hidden Prejudice That Shapes What We See, Think, and Do.*

Cognitive neuroscientist Damien Fair wins a MacArthur award for his work studying neurodiverse children.

2021 The APA issues an official "Apology to People of Color for APA's Role in Promoting, Perpetuating, and Failing to Challenge Racism, Racial Discrimination, and Human Hierarchy in the U.S."

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Appendix B

Career Fields in Psychology

Jennifer Zwolinski, *University of San Diego*

What can you do with a degree in psychology? Lots!

As a psychology major, you will graduate with a scientific mindset and an awareness of basic principles of human behavior (biological mechanisms, nature–nurture interactions, life-span development, cognition, psychological disorders, social interaction). This background will prepare you for success in many areas, including business, the helping professions, health services, marketing, law, sales, and teaching. You may even go on to graduate school for specialized training to become a psychology professional. This appendix provides an overview of some of psychology's key career fields, most of which require a graduate degree in psychology.[1] For an expanded discussion, see ***Pursuing a Psychology Career*** in Achieve, where you can learn more about the many interesting options available to those with bachelor's, master's, and doctoral degrees in psychology. You can also read about the professional skills and abilities a psychology major (or even psychology

coursework, if you are a non-major) can provide, how to articulate those skills and abilities to potential employers, and other steps you can take to help you secure a job after graduation.

If you are like most psychology students, you may be unaware of the wide variety of specialties and work settings available in psychology (Terre & Stoddart, 2000). To date, the American Psychological Association (APA) has 54 divisions that represent the popular subfields and interest groups of APA members (TABLE B.1). APA Division 2 (Society for the Teaching of Psychology) offers an excellent career exploration resource for those interested in learning about the hundreds of career options available for students with an undergraduate degree in psychology.

TABLE B.1 APA Divisions by Number and Name

1. Society for General Psychology
2. Society for the Teaching of Psychology
3. Society for Experimental Psychology and Cognitive Science
4. *There is no active Division 4*.
5. Quantitative and Qualitative Methods
6. Society for Behavioral Neuroscience and Comparative Psychology
7. Developmental Psychology
8. Society for Personality and Social Psychology
9. Society for the Psychological Study of Social Issues (SPSSI)
10. Society for the Psychology of Aesthetics, Creativity and the Arts
31. State, Provincial and Territorial Psychological Association Affairs
32. Society for Humanistic Psychology
33. Intellectual and Developmental Disabilities/Autism Spectrum Disorder
34. Society for Environmental, Population and Conservation Psychology
35. Society for the Psychology of Women
36. Society for the Psychology of Religion and Spirituality
37. Society for Child and Family Policy and Practice
38. Society for Health Psychology
39. Society for Psychoanalysis and Psychoanalytic Psychology

11. *There is no active Division 11*.
12. Society of Clinical Psychology
13. Society of Consulting Psychology
14. Society for Industrial and Organizational Psychology
15. Educational Psychology
16. School Psychology
17. Society of Counseling Psychology
18. Psychologists in Public Service
19. Society for Military Psychology
20. Adult Development and Aging
21. Applied Experimental and Engineering Psychology
22. Rehabilitation Psychology
23. Consumer Psychology
24. Society for Theoretical and Philosophical Psychology
25. Behavior Analysis
26. Society for the History of Psychology
27. Society for Community Research and Action: Division of Community Psychology
28. Psychopharmacology and Substance Abuse
29. Society for the Advancement of Psychotherapy
30. Society of Psychological Hypnosis
40. Society for Clinical Neuropsychology
41. American Psychology-Law Society
42. Psychologists in Independent Practice
43. Society for Couple and Family Psychology
44. Society for the Psychology of Sexual Orientation and Gender Diversity
45. Society for the Psychological Study of Culture, Ethnicity and Race
46. Society for Media Psychology and Technology
47. Society for Sport, Exercise and Performance Psychology
48. Society for the Study of Peace, Conflict and Violence: Peace Psychology Division
49. Society of Group Psychology and Group Psychotherapy
50. Society of Addiction Psychology
51. Society for the Psychological Study of Men and Masculinities
52. International Psychology
53. Society of Clinical Child and Adolescent Psychology
54. Society of Pediatric Psychology
55. Society for Prescribing Psychology
56. Trauma Psychology

Information from: American Psychological Association (2020).

The following paragraphs (arranged alphabetically) describe some of psychology's main career fields.

Biological Psychologists

Biological psychologists seek to understand and explain how biological and psychological processes influence behavior. Biological psychologists typically use advanced technologies in research settings with human participants or animals to investigate the influence of biological factors on sensation, learning, memory, motivation, and emotion. Although many biological psychologists work in academic research or teaching environments, the interdisciplinary nature of their training prepares them to work in various other settings, including private consulting, public or government health, and the pharmaceutical, biotechnology, or medical industries. Subfields of biological psychology include neuropsychology, behavioral neuroscience, and cognitive neuroscience.

Clinical Psychologists

Clinical psychologists promote psychological health in individuals, groups, and organizations. Some clinical psychologists specialize in specific psychological disorders. Others treat a range of disorders, from adjustment difficulties to severe psychopathology. Clinical psychologists often provide therapy but may also engage in research, teaching, assessment, and consultation. Clinical psychologists work in a variety of settings, including private practice, mental health service organizations, schools, universities, industry, legal systems, medical systems, counseling centers,

government agencies, correctional facilities, nonprofit organizations, and military services.

To become a clinical psychologist, you will need to earn a doctorate from a clinical psychology program. The APA sets the standards for clinical psychology graduate programs, offering *accreditation* (official recognition) to those who meet their standards. To serve clients representing a variety of races, ethnicities, genders, ages, socioeconomic backgrounds, sexual orientations, and physical abilities, the APA also encourages professional psychologists to seek ongoing diversity training throughout their careers. In all U.S. states, clinical psychologists working in independent practice must obtain a license to offer services such as therapy and testing.

Cognitive Psychologists

Cognitive psychologists study thought processes and focus on such topics as perception, language, attention, problem solving, memory, judgment and decision making, and intelligence. Research interests include designing computer-based models of thought processes and identifying biological correlates of cognition. As a cognitive psychologist, you might work as a professor, industrial consultant, or human factors specialist in an educational or business setting.



iStock/Getty Images

Cognitive consulting Cognitive psychologists may advise businesses on how to operate more effectively by understanding the human factors involved.

Community Psychologists

Community psychologists move beyond focusing on specific individuals or families and deal with broad problems of mental health in community settings. These psychologists believe that human behavior is powerfully influenced by the interaction between people and their physical, social, political, and economic environments. Community psychologists value the uniqueness of individuals, communities, and social groups, and they actively integrate their clients' diverse backgrounds into their work. With this understanding and appreciation, they seek to promote psychological health by enhancing environmental settings—focusing on preventive measures and crisis intervention, with special attention to the problems of underserved and underrepresented groups. Many community psychologists

collaborate with professionals in other areas, such as public health, with a shared emphasis on prevention. As a community psychologist, your work settings could include federal, state, and local departments of mental health, corrections, and welfare. You might conduct research or help evaluate research in health service settings, serve as an independent consultant for a private or government agency, or teach and consult as a college or university faculty member.



AP Photo

Community care Community psychologists have helped people in Haiti to work through the ongoing emotional challenges that come with enduring repeated natural disasters.

Counseling Psychologists

Counseling psychologists help people adjust to life transitions or make lifestyle changes. Although similar to clinical psychologists, counseling psychologists typically help people with adjustment problems rather than severe psychopathology. Like clinical psychologists, counseling psychologists conduct therapy and provide assessments to individuals and groups. As a counseling psychologist, you would likely emphasize your clients' strengths, helping them to use their own skills, interests, and abilities to cope during transitions. You might find yourself working in an academic setting as a faculty member or administrator or in a university counseling center, community mental health center, business, or private practice. As with clinical psychology, if you plan to work in independent practice you will need to obtain a state license to provide counseling services to the public. And, as is the case for clinical psychology, the APA promotes diversity and cultural awareness and competencies across all phases of career development—from graduate training to continuing education after licensure.

Developmental Psychologists

Developmental psychologists conduct research on age-related behavioral changes and apply their scientific knowledge to educational, child-care, policy, and related settings. As a

developmental psychologist, you would investigate change across a broad range of topics, including the biological, psychological, cognitive, and social aspects of development. Developmental psychology informs a number of applied fields, including educational psychology, school psychology, child psychopathology, and gerontology. This field also informs public policy in areas such as education and child-care reform, maternal and child health, and attachment and adoption. You would probably specialize in a specific stage of the life span, such as infancy, childhood, adolescence, or middle or late adulthood. Your work setting could be an educational institution, day-care center, youth group program, or senior center.

Educational Psychologists

Educational psychologists are interested in the psychological processes involved in learning. They study the relationship between learning and physical and social environments, and they develop strategies for enhancing the learning process. As an educational psychologist working in a university psychology department or school of education, you might conduct basic research on topics related to learning, or develop innovative methods of teaching to enhance the learning process. You might design effective tests, including measures of aptitude and achievement. You might be employed by a school or government agency or charged with designing and implementing effective employee-training programs in a business setting.

Environmental Psychologists

Environmental psychologists study the interaction of individuals with their natural and built (urban) environments. They are interested in how we influence and are affected by these environments. As an environmental psychologist, you might study wildlife conservation, the impact of urbanization on health, or cognitive factors involved in sustainable lifestyle choices. Environmental psychologists tend to address these kinds of issues by working with other professionals as part of an interdisciplinary team. As an environmental psychologist, you might work in a consulting firm, an academic setting, the nonprofit sector, or the government.

Experimental Psychologists

Experimental psychologists are a diverse group of scientists who investigate a variety of basic behavioral processes in humans and other animals. Prominent areas of experimental research include comparative methods of science, motivation, learning, thought, attention, memory, perception, and language. Most experimental psychologists identify with a particular subfield, such as cognitive psychology, depending on their interests and training. Experimental research methods are not limited to the field of experimental psychology; many other subfields rely on experimental methodology to conduct studies. As an experimental psychologist, you would most likely work in an academic setting, teaching courses

and supervising students' research in addition to conducting your own research. Or you might be employed by a research institution, zoo, business, or government agency.

Forensic Psychologists

Forensic psychologists apply psychological principles to legal issues. They conduct research on the interface of law and psychology, help to create public policies related to mental health, help law enforcement agencies in criminal investigations, or consult on jury selection and deliberation processes. They also provide assessment to assist the legal community. Although most forensic psychologists are clinical psychologists, many have expertise in other areas of psychology, such as social or cognitive psychology. Some also hold law degrees. As a forensic psychologist, you might work in a university psychology department, law school, research organization, community mental health agency, law-enforcement agency, court, or correctional setting.



Rick Wood/Milwaukee Journal-Sentinel/AP Photo

Forensics in court Forensic psychologists may be called on to assist police officers who are investigating a crime scene, but most forensic work occurs in the lab and for the judicial system.

Health Psychologists

Health psychologists are researchers and practitioners concerned with psychology's contribution to promoting health and preventing disease. As applied psychologists or clinicians, they may help individuals lead healthier lives by designing, conducting, and evaluating programs to stop smoking, lose weight, improve sleep, manage pain, prevent the spread of sexually transmitted infections, or treat psychosocial problems associated with chronic and terminal illnesses. As researchers and clinicians, they identify conditions and practices associated with health and illness to help create effective interventions. In public service, health psychologists study and work to improve government policies and health care systems. As a health psychologist, you could be employed in a hospital, medical school, rehabilitation center, public health agency, college or university, or, if you are also a clinical psychologist, in private practice.

Industrial-Organizational (I/O) Psychologists

Industrial-organizational psychologists study the relationship between people and their working environments. They may develop new ways to increase productivity, improve personnel selection, or promote job satisfaction in an organizational setting. Their interests include organizational structure and change, consumer behavior, and personnel selection and training. As an I/O psychologist, you might conduct workplace training or provide organizational analysis and development. You may find yourself working in business, industry, the government, or a college or university. Or you may be self-employed as a consultant or work for a management consulting firm. (For more on I/O psychology, see Appendix C, Psychology at Work.)

Neuropsychologists

Neuropsychologists investigate the relationship between neurological processes (structure and function of the brain and nervous system) and behavior. As a neuropsychologist you might assess, diagnose, or treat central nervous system disorders, such as Alzheimer's disease or stroke. You might also evaluate individuals for evidence of head injuries; specific learning disorders; and neurodevelopmental disorders, such as autism spectrum disorder and attention-deficit/hyperactivity disorder (ADHD). If you are a

clinical neuropsychologist, you might work in a hospital's neurology, neurosurgery, or psychiatric unit. Neuropsychologists also work in academic settings, where they conduct research and teach.

Personality Psychologists

Personality psychologists study how individuals differ in their feelings, thoughts, motivations, and behaviors. Because their interests are complementary, personality psychologists and social psychologists often collaborate to understand how both individual and social factors impact phenomena such as romantic attraction, persuasion, prosocial behavior, and conformity. As a personality psychologist, you would probably be a researcher or college or university faculty member. Your research might take place in a laboratory, clinic, or field setting, and your work might focus on factors that impact personality development or how personality is related to other areas, such as law, business, or education. You might also work in the private sector, as a consultant to businesses, or in a public nonprofit organization.

Psychometric and Quantitative Psychologists

Psychometric and quantitative psychologists study the methods and techniques used to acquire psychological knowledge. A psychometric psychologist may update existing neurocognitive or

personality tests, or devise new tests for use in clinical settings, in schools and other institutional settings, and in business and industry. These psychologists also administer, score, and interpret such tests. Quantitative psychologists collaborate with researchers to design, analyze, and interpret the results of research programs. As a psychometric or quantitative psychologist, you would need to be well trained in research methods, statistics, and computational software. You would most likely be employed by a university or college, a testing company, a private research firm, or a government agency.



amriphoto/Getty Images

Evaluating cognitive functioning The APA projects that by 2030, those age 65 and older will be the U.S. age group requiring the most psychological care (APA, 2018). Psychologists can

use neuropsychological assessments to evaluate cognitive capacities, helping to diagnose, treat, and manage psychological disorders such as Alzheimer's disease.

Rehabilitation Psychologists

Rehabilitation psychologists are researchers and practitioners who work with people who have lost optimal functioning after an accident, illness, or other event. As a rehabilitation psychologist, you would probably work in a medical rehabilitation facility or hospital. You might also work in a medical school, university, or government vocational rehabilitation agency, or in private practice serving people with physical disabilities.

School Psychologists

School psychologists are involved in the assessment of and intervention for children in educational settings. They diagnose and treat cognitive, social, and emotional problems that may negatively influence children's learning or overall functioning at school. As a school psychologist, you would collaborate with teachers, parents, and administrators, making recommendations to improve student learning. You might work at a school or child guidance center, for a government agency, or at a behavioral research laboratory.



© Spencer Grant/PhotoEdit

Assessing and supporting children School psychologists may find themselves working with children individually or in groups. They receive interdisciplinary training in mental health assessment and behavior analysis, research methods and design, and special needs education. They work primarily in schools, but also in a range of other settings.

Social Psychologists

Social psychologists are interested in our interactions with others. Social psychologists study how our beliefs, feelings, and behaviors are affected by and influence other people. They study topics such as attitudes, aggression, prejudice, interpersonal attraction, group

behavior, and leadership. In an initiative to use social psychological and personality research to address social problems, APA's Division 8 (Society for Personality and Social Psychology) has established a frequently updated repository of research, videos, and other resources to increase public awareness of racism, bias, and diversity in general. As a social psychologist, you would probably be a college or university faculty member. You might also work in organizational consultation, market research, or other applied psychology fields, including social neuroscience. Some social psychologists work for hospitals, government agencies, social networking sites, or businesses performing applied research.

Sport Psychologists

Sport psychologists study the psychological factors that influence, and are influenced by, participation in sports and other physical activities. Their professional activities include coach education and athlete preparation, as well as research and teaching. Sport psychologists who also have a clinical or counseling degree can apply those skills to working with individuals with psychological problems, such as anxiety or substance use disorder, that might interfere with optimal performance. As a sport psychologist, if you were not working in an academic or research setting, you would most likely work as part of a team or an organization, or in a private capacity.



Nigel French/EMPICS/Getty Images

Improving athletic achievement Sussex cricket player Stuart Meaker gathers input from sport psychologist Rebecca Symes during warmup.

* * *

The next time someone asks you what you will do with your psychology degree, tell them you have lots of options. You might use your acquired skills and understanding to get a job and succeed in any number of fields, or you might pursue graduate school and then career opportunities in associated professions. In any case, what you have learned about behavior and mental processes will surely enrich your life (Hammer, 2003).

Appendix C

Psychology at Work

- **Work and Life Satisfaction**
  - Flow at Work
  - Finding Your Own Flow, and Matching Interests to Work
- **Industrial-Organizational Psychology**
- **Personnel Psychology**
  - Using Strengths for Successful Selection
  - Do Interviews Predict Performance?
  - Appraising Performance
- **Organizational Psychology**
  - Satisfaction and Engagement at Work
  - Effective Leadership
- **Human Factors Psychology**

For many people, to live is to work. Work supports us, enabling food, water, and shelter. Work connects us, meeting our social needs. Work helps define us. Meeting people and wondering about their identity, we may ask, “So, what do you do?”

We vary in our job satisfaction: On the day we leave the workforce, some of us will sadly bid our former employer farewell, while others will gladly bid

them good riddance. We vary in the predictability of our career path: We will change jobs, some of us often, for a variety of reasons—cutbacks, a desire for better work-life balance, or to pursue a passion project. And we vary in how we view our work as a way to earn a paycheck or to pursue a meaningful calling, an opportunity to do the bare minimum or to maximize our potential. Let's take a look at how psychologists can help explain these differences.

The jobs people do: Columnist Gene Weingarten (2002) noted that sometimes a humorist knows "when to just get out of the way." Here are some sample self-reported job titles from the U.S. Department of Labor: animal impersonator, human projectile, banana ripening-room supervisor, impregnator, impregnator helper, dope sprayer, finger waver, rug scratcher, egg smeller, bottom buffer, cookie breaker, brain picker, hand pouncer, bosom presser, and mother repairer.

Work and Life Satisfaction

People across various occupations vary in their attitudes toward their work. Some view their work as a *job,* a possibly unfulfilling but necessary way to make money. Others view their work as a *career,* an opportunity to advance from one position to a better position. The rest—those who view their work as a *calling,* a fulfilling and socially useful activity—report the highest satisfaction with their work and with their lives (Dik & Duffy, 2012; Wrzesniewski & Dutton, 2001).

> **"Some people have *jobs.* Some people have *careers*.... When you've got a career, there ain't enough time in the day.... When you've got a job, there's too much time."** — Comedian Chris Rock

Flow at Work

Learning Objective Question LOQ C-1

What is *flow?*

The work satisfaction findings would not have surprised Mihaly Csikszentmihalyi [chick-SENT-me-hi] (1934–2021). He observed that our quality of life increases when we are purposefully engaged.

Between the anxiety of being overwhelmed and stressed, and the apathy of being underwhelmed and bored, lies the experience of **flow** (Csikszentmihalyi, 1990, 1999). "Flow," Csikszentmihalyi noted, "occurs in that delicate zone between anxiety and boredom" (Goleman, 1986). We might experience it when we clean a kitchen, organize a spreadsheet, or read a psychology text. (Are you experiencing flow right now?) Perhaps you can recall being in a zoned-out flow state while scrolling social media.

Csikszentmihalyi formulated the flow concept after studying artists who spent hour after hour painting or sculpting with focused concentration. Immersed in a project, they worked as if nothing else mattered, and then, when finished, they promptly moved on. The artists seemed driven less by external rewards—money, praise, promotion—than by the intrinsic rewards of creating their art. Nearly 200 other studies confirm that *intrinsic motivation* enhances performance (Cerasoli et al., 2014).

Csikszentmihalyi studied dancers, chess players, surgeons, writers, parents, mountain climbers, sailors, and farmers. His research included Australian, North American, Korean, Japanese, and Italian participants, who ranged in age from the teen years to the golden years. A clear principle emerged: It's exhilarating to flow with an activity that fully engages our skills (Fong et al., 2015). Flow experiences boost our sense of self-esteem, competence, and well-being. One research team studying 10,000 Swedes found that frequent

flow experiences reduced their risk of depression and burnout (Mosing et al., 2018). A focused mind is a happy mind.

> Have you ever noticed that when you are immersed in an activity, time flies? And that when you are watching the clock, it seems to move more slowly? French researchers have confirmed that the more we attend to an event's duration, the longer it seems to last (Couli et al., 2004).

Idleness may sound like bliss. You may dream of a future filled with streaming movies, sleeping in, and no responsibilities. In reality, purposeful work enriches our lives. People who leave the workforce tend to become unhappy, but rejoining the workforce rapidly improves their mood (Y. Zhou et al., 2019). Busy people are often happy people (Hsee et al., 2010; Robinson & Martin, 2008).



Jacob Ammentorp Lund/iStock/Getty Images

Attention theft It takes energy to resist checking our phones, and time to refocus mental concentration after each disruption. Such frequent interruptions disrupt flow. A solution: Disable notifications, and check the phone only during scheduled breaks.

Finding Your Own Flow, and Matching Interests to Work

Want to identify your own path to flow? You can start by pinpointing your strengths and the types of work that may prove satisfying and successful. Marcus Buckingham and Donald Clifton (2001) suggested asking yourself four questions:

1. What activities give me pleasure? Bringing order out of chaos? Playing host? Helping others? Challenging sloppy thinking?
2. What activities leave me wondering, "When can I do this again?" rather than, "When will this be over?"
3. What sorts of challenges do I relish? And which do I dread?
4. What sorts of tasks do I learn easily? And which do I struggle with?

You may find your skills engaged and time flying when teaching or selling or writing or cleaning or consoling or creating or repairing. If an activity feels good, if it comes easily, if you look forward to it, then look deeper. You'll see your strengths at work (Buckingham, 2007). For a free (requires registration) assessment of your own strengths, take the "Brief Strengths Test" at tinyurl.com/AssessStrengths.

The U.S. Department of Labor also offers a career interest questionnaire through its Occupational Information Network (O*NET). At MyNextMove.org/explore/ip you will need about 10 minutes to respond to 60 items, indicating how much you would like or dislike activities ranging from building kitchen cabinets to playing

a musical instrument. You will then receive feedback on how strongly your responses reflect six interest types (Holland, 1996):

- ***Realistic*** (hands-on doers)
- ***Investigative*** (thinkers)
- ***Artistic*** (creators)
- ***Social*** (helpers, teachers)
- ***Enterprising*** (persuaders, deciders)
- ***Conventional*** (organizers)

Finally, depending on how much training or schooling you are willing to complete, you will be shown occupations that fit your interest pattern (selected from a national database of 900+ occupations).

Do what you love and you will love what you do. Career counseling science aims, first, to assess people's differing values, personalities, and, especially, *interests,* which are remarkably stable and predictive of future life choices and outcomes (Hanna & Rounds, 2020). (Your job may change, but your interests today will likely still be your interests in 10 years.) Second, it aims to alert people to well-matched vocations —vocations with a good *person-environment fit.* It pays to have a job that fits your personality. People high in openness earn more if they hold jobs that demand openness; people who are highly extraverted earn more if they work in jobs that require extraversion (Denissen et al., 2018).

"Find a job you love, and you'll never work another day of your life." — Popular saying expressed in a Facebook hiring video, 2016

One study assessed 400,000 high school students' interests and then followed the students over time. The take-home finding: "Interests uniquely predict academic and career success over and above cognitive ability and personality" (Rounds & Su, 2014). Sixty other studies confirm the point both for students in school and workers on the job: Interests predict both performance and persistence (Nye et al., 2012). Lack of job fit can fuel frustration, resulting in unproductive and even hostile work behavior (Harold et al., 2016). *Industrial-organizational psychologists* put career counseling science into action. First, they use surveys to assess people's interests, values, personalities, and workplace culture preferences. Next, they use the data to suggest occupations and connect respondents with job listings.



Michael Maslin/The Cartoon Bank

"Let's face it: you and this organization have never been a good fit."

Ask Yourself

What have you discovered about your own strengths and about the kind of career you might see yourself pursuing?

Retrieval Practice

RP-1 What is the value of finding flow in our work?

ANSWERS IN APPENDIX E

Industrial-Organizational Psychology

LOQ C-2

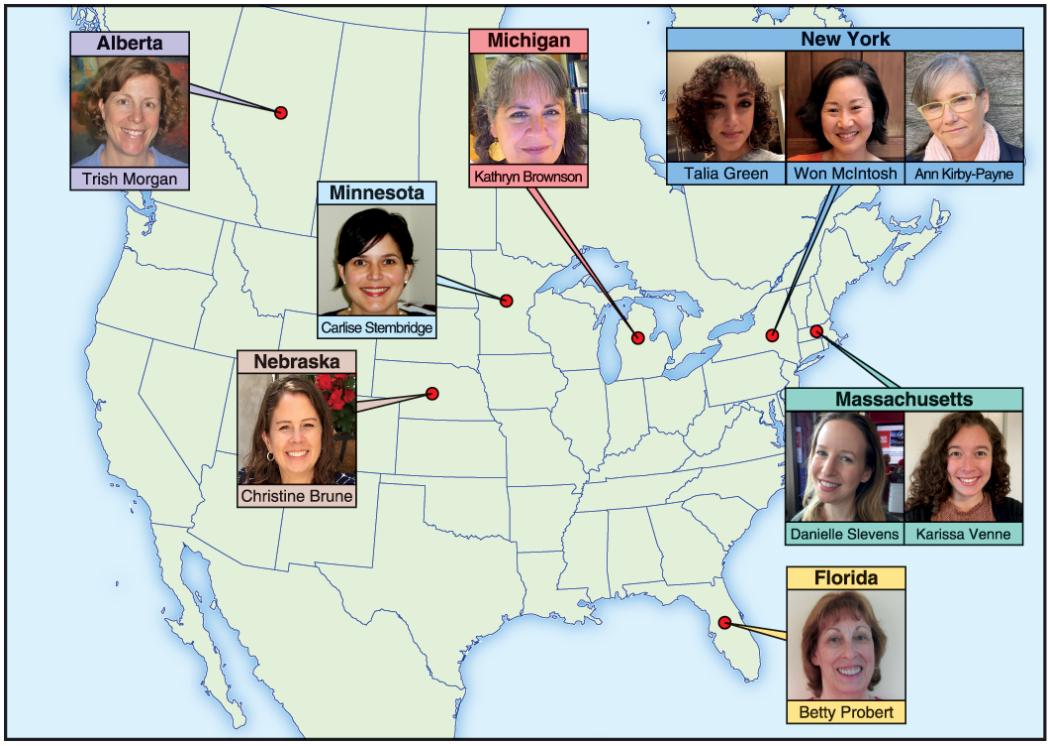
What are industrial-organizational psychology's three key areas of study?

In developed nations, work has expanded, from farming to manufacturing to *knowledge work*. More and more work is outsourced to temporary employees and consultants, or to workers telecommuting from off-site workplaces (Gallup, 2020). (The three-author team for this book and its teaching package is aided immeasurably by a team of people across North America, from Alberta to Florida.)

The Covid pandemic dramatically increased remote work and virtual teamwork. This raised new issues for I/O psychologists to study (Kniffin et al., 2021):

- How will remote work affect workers' attitudes toward their employer and co-workers?
- How does remote versus in-person work affect workers' well-being?

- How can leaders best communicate with and mentor remote workers?
- How can remote work inclusively support and connect workers of all ages, abilities, cultural backgrounds, and ethnicities?



Photos top to bottom: Trish Morgan; Kathryn Brownson; Talia Green; Steven McIntosh; Dan Payne; Stephanie Ellis; Jeff Brune; Danielle Slevens; ©2022 Macmillan, Photo by Karissa Venne; Don Probert
© Worth Publishers

Collaboration across the miles The editorial and production team that guides the development of this book and its resources works from far-flung places across North America.

As work has changed, have our attitudes toward our work also changed? Has our satisfaction with work increased or decreased? Has the *psychological contract*—the sense of mutual obligation between workers and employers—become more or less trusting and secure? How can psychologists help organizations make work more

satisfying and productive? These are among the questions that fascinate **industrial-organizational (I/O) psychologists** as they apply psychology's principles to the workplace (**TABLE C.1**).

- The I/O psychology subfield of **personnel psychology** applies psychology's methods and principles to selecting, placing, training, and evaluating workers. Personnel psychologists match people with jobs by identifying and placing well-suited candidates.
- The **organizational psychology** subfield considers how work environments and management styles influence worker motivation, satisfaction, and productivity. It focuses on modifying jobs and supervision in ways that boost morale and productivity.
- **Human factors psychology**, a distinct field allied with I/O psychology, explores how machines and environments can be optimally designed to fit human abilities. Human factors psychologists study people's natural perceptions and inclinations, using this research to create user-friendly machines and work settings.

TABLE C.1 I/O Psychology and Human Factors Psychology at Work

As scientists, consultants, and management professionals, industrial-organizational (I/O) psychologists may be found helping organizations to resolve work-family conflicts, build employee retention, improve organizational spirit, or promote teamwork. Human factors psychologists also contribute to human safety and improved designs.

Personnel Psychology: Maximizing Human Potential

Developing training programs to increase job seekers' success

Selecting and placing employees

- Developing and testing assessment tools for selecting, placing, and promoting workers
- Analyzing job content
- Optimizing worker placement

Training and developing employees

- Identifying needs
- Designing training programs, including for ethical and diverse workplaces
- Evaluating training programs

Appraising performance

- Developing guidelines
- Measuring individual performance
- Measuring organizational performance

Organizational Psychology: Building Better Organizations

Developing organizations

- Analyzing organizational structures
- Maximizing worker satisfaction and productivity
- Facilitating organizational change

Enhancing quality of work life

- Expanding individual productivity
- Identifying elements of satisfaction
- Redesigning jobs
- Balancing work and nonwork life in an era of social media, smartphones, and rapid technological change

Human Factors Psychology: Optimizing Machines and Environments

- Designing optimal work environments
- Optimizing person-machine interactions
- Developing systems technologies

Information from the Society of Industrial and Organizational Psychology. For more information about I/O psychology, more than 500 North American I/O graduate programs, and related job opportunities, visit SIOP.org.

Personnel Psychology

LOQ C-3

How do personnel psychologists facilitate job seeking, employee selection, work placement, and performance appraisal?

Psychologists assist organizations at various stages of selecting and assessing employees. They may help identify needed job skills, develop effective selection methods, recruit and evaluate diverse applicants, introduce and train new employees, appraise performance, and facilitate team building among people with differing cultural backgrounds. They also seek to enhance the well-being and productivity of *neurodiverse* workers—those on the autism spectrum, or those challenged by ADHD, a learning disorder, or brain injury (Weinberg & Doyle, 2017).

Psychologists also assist job seekers. Across four dozen studies, training programs (which teach job-search skills, improve self-presentation, boost self-confidence, promote goal setting, and enlist support) have nearly tripled job seekers' success (Liu et al., 2014).

Using Strengths for Successful Selection

As a new AT&T human resources executive, psychologist Mary Tenopyr (1997) was assigned to solve a problem: Customer-service representatives were failing at a high rate. After concluding that many of the hires were ill-matched to the demands of their new job, Tenopyr developed a new selection instrument:

1. She asked new applicants to respond to various test questions (without as yet making any use of their responses).
2. She followed up later to assess which of the applicants excelled on the job.
3. She identified the earlier test questions that best predicted success.

The happy result of her data-driven work was a new test that enabled AT&T to identify likely-to-succeed representatives. Personnel selection techniques such as this one aim to recruit people with strengths that will enable them and their organization to flourish. Marry the strengths of people with the tasks of organizations and the results are often prosperity, profit, and pleased employees.

Do Interviews Predict Performance?

Employee selection usually includes an interview, and many interviewers feel confident of their ability to predict long-term job performance from a get-acquainted *(unstructured)* interview. What's

therefore shocking is how error-prone interviewers' predictions may be when predicting job or graduate school success. General mental ability has been a better predictor, especially for complex jobs—for which it indicates people's ability to learn new skills (Schmidt & Hunter, 2004; Warne, 2020). Informal interviews are less informative than aptitude tests, work samples, job knowledge tests, and past job performance. After studying thousands of informal interviews and later job success, Google found "zero relationship. It's a complete random mess" (Bock, 2013).

Unstructured Interviews and the Interviewer Illusion

Traditional, unstructured interviews can provide a sense of someone's personality—their expressiveness, warmth, and verbal ability, for example. But these informal interviews also give interviewees considerable power to control the impression they are making in the interview situation (Barrick et al., 2009). Why, then, do many interviewers have such faith in their ability to discern interviewees' fitness for a job? "I have excellent interviewing skills," I/O psychology consultants often hear, "so I don't need reference checking as much as someone who doesn't have my ability to read people." Overrating one's ability to predict people's futures is called the *interviewer illusion* (Dana et al., 2013; Nisbett, 1987). Five factors explain interviewers' overconfidence:

- ***Interviewers presume that people are what they seem to be in the interview situation.*** An unstructured interview may create a

false impression of a person's behavior toward others in different situations. Some interviewees may feign desired attitudes; others may be nervous. As social psychologists explain, when meeting others, we commit the *fundamental attribution error:* We discount the enormous influence of varying situations and mistakenly presume that what we see is what we will get. But research on everything from chattiness to conscientiousness reveals that how we behave reflects not only our enduring traits, but also the details of the particular situation (such as wanting to impress in a job interview).

- ***Interviewers' preconceptions and moods color how they perceive interviewees' responses*** (Cable & Gilovich, 1998; Macan & Dipboye, 1994). If interviewers instantly like a person who perhaps is similar to themselves (opening the door to unintended racial or gender bias), they may interpret the person's assertiveness as indicating "confidence" rather than "arrogance." If told certain applicants have been prescreened, interviewers are disposed to judge them more favorably. Such interviewers are showing *confirmation bias:* They search for information that supports their preconceptions about a job candidate and ignore or distort contradictory evidence (Skov & Sherman, 1986).
- ***Interviewers judge people relative to those interviewed just before and after them*** (Simonsohn & Gino, 2013). If you are being interviewed for a job or graduate program, hope for a day when the other interviewees have been weak.

- ***Interviewers more often follow the successful careers of those they have hired than the successful careers of those they have rejected.*** This missing feedback prevents interviewers from getting a reality check on their hiring ability.
- ***Interviews disclose the interviewee's good intentions, which are less revealing than habitual behaviors*** (Ouellette & Wood, 1998). Intentions matter. People can change. But the best predictor of our future habits will be our past habits. Educational attainments predict job performance partly because people who have the ability and motivation to show up for school each day and stay on task also tend to show up for work and stay on task (Ng & Feldman, 2009). Wherever we go, we take ourselves along.

Hoping to improve prediction and selection, personnel psychologists have put people in simulated work situations, sought information on past performance, aggregated evaluations from multiple interviews, administered tests, and developed job-specific interviews.

Structured Interviews

Unlike casual conversation aimed at getting a feel for someone, **structured interviews** offer a disciplined method of collecting information. A personnel psychologist may analyze a job, script questions, and train interviewers. The interviewers then ask all

applicants the same questions, in the same order, and rate each applicant on established scales.

In an unstructured interview, someone might ask, “How organized are you?” “How well do you get along with people?” or “How do you handle stress?” Street-smart applicants know how to score high: “Although I sometimes drive myself too hard, I handle stress by prioritizing and delegating, and leaving time for sleep and exercise.”

By contrast, structured interviews pinpoint strengths (attitudes, behaviors, knowledge, and skills) that distinguish high performers in a particular line of work. The process includes outlining job-specific situations and asking candidates to explain how they would handle them, and how they handled similar situations in their prior employment. “Tell me about a time when you were caught between conflicting demands, without time to accomplish both. How did you handle that?” In its interviews, Google has asked, “Give me an example of a time when you solved an analytically difficult problem” (Bock, 2013).

To reduce memory distortions and bias, the interviewer takes notes, makes ratings as the interview proceeds, and avoids irrelevant and follow-up questions. The structured interview therefore feels less friendly, but that can be explained to the applicant: “This conversation won’t typify how we relate to each other in this organization.”

A review of 150 findings revealed that structured interviews had double the predictive accuracy of unstructured interviews (Schmidt & Hunter, 1998; Wiesner & Cronshaw, 1988). Structured interviews also reduce bias, such as against overweight applicants (Kutcher & Bragger, 2004).

If, instead, we let our intuitions bias the hiring process, noted Malcolm Gladwell (2000, p. 86), then "all we will have done is replace the old-boy network, where you hired your nephew, with the new-boy network, where you hire whoever impressed you most when you shook his hand. Social progress, unless we're careful, can merely be the means by which we replace the obviously arbitrary with the not so obviously arbitrary."

To recap, personnel psychologists help train job seekers, and they assist organizations in analyzing jobs, recruiting well-suited applicants, and selecting and placing employees. They also appraise employees' performance (**FIGURE C.1**)—our next topic.

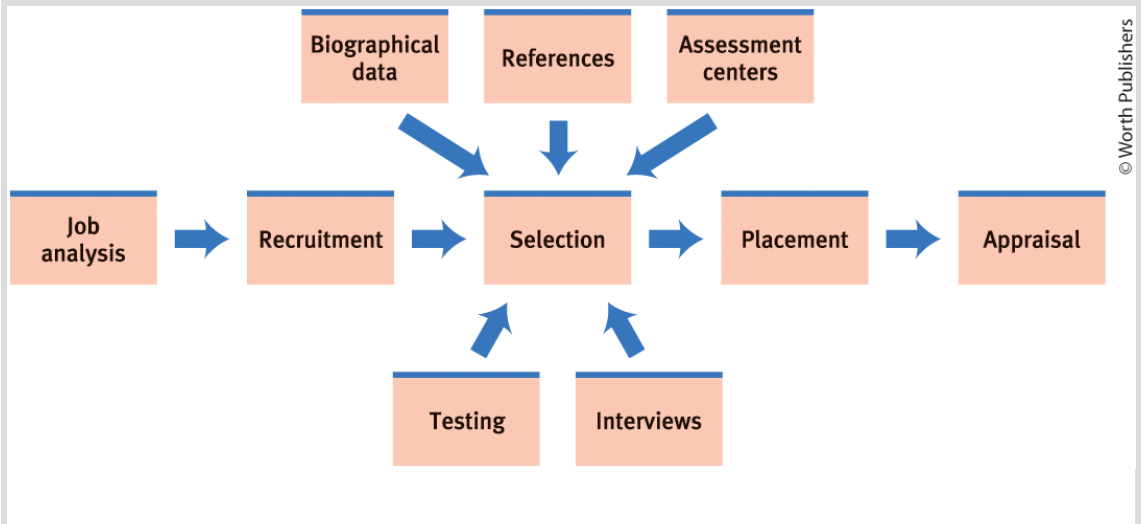


FIGURE C.1 Personnel psychologists at work Personnel psychologists consult in human resources activities, from job definition to recruitment to employee appraisal. The *assessment center* approach (see the Personality modules), which includes simulated job tasks, may be used to evaluate potential and existing employees.



Appraising Performance

Performance appraisal serves organizational purposes: It helps decide who to keep on staff, how to appropriately reward and pay people, and how to better harness employee strengths, sometimes with job shifts or promotions. Performance appraisal also serves individual purposes: Feedback affirms workers' strengths and helps motivate needed improvements.

Performance appraisal methods include

- ***checklists*** on which supervisors simply check specific behaviors that describe the worker ("always attends to customers' needs"; "takes long breaks").
- ***graphic rating scales*** on which a supervisor checks, perhaps on a five-point scale, how often a worker is dependable, productive, and so forth.
- ***behavior rating scales*** on which a supervisor checks scaled behaviors that describe a worker's performance. If rating the extent to which a worker "follows procedures," the supervisor might mark the employee somewhere between "often takes

shortcuts" and "always follows established procedures" (Levy, 2003).

In some organizations, performance feedback comes not only from supervisors, but also from all organizational levels. If you join an organization that practices *360-degree feedback* (**FIGURE C.2**), you will rate yourself, your manager, and your other colleagues, and you will be rated by your manager, other colleagues, and customers (Green, 2002). The net result is often more open communication and more complete appraisal.

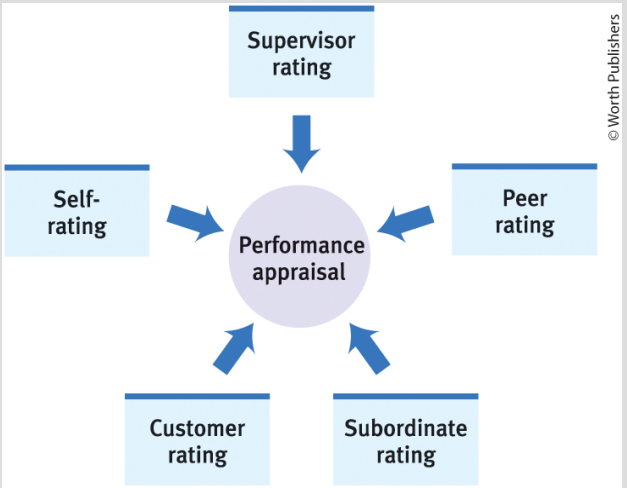


FIGURE C.2 360-degree feedback With multisource 360-degree feedback, our knowledge, skills, and behaviors are rated by ourselves and surrounding others. Professors, for example, may be rated by their department chairs, their students, and their colleagues. After receiving all these ratings, professors discuss the 360-degree feedback with their department chair.

Performance appraisal, like other social judgments, is vulnerable to bias (Murphy & Cleveland, 1995). *Halo errors* occur when one's overall evaluation of an employee, or of a personal trait such as their friendliness, biases ratings of their specific work-related behaviors, such as their reliability. *Leniency* and *severity errors* reflect evaluators' tendencies to be either too easy or too harsh on everyone. *Recency errors* occur when raters focus only on easily remembered recent behavior. By using multiple raters and developing objective, job-relevant performance measures, personnel psychologists seek to support their organizations while also helping employees perceive the appraisal process as fair.

Retrieval Practice

RP-2 A human resources director explains to you that "I don't bother with tests or references. It's all about the interview." Based on I/O psychology research, what concerns does this raise?

ANSWERS IN APPENDIX E

Organizational Psychology

Recruiting, hiring, training, and appraising capable and diverse workers matters, but so does employee motivation and morale. Organizational psychologists assist with efforts to motivate and engage employees, and they also explore effective leadership.

Satisfaction and Engagement at Work

LOQ C-4

Why are organizational psychologists interested in employee satisfaction and engagement?

I/O psychologists have found that satisfaction with work, and a desirable work-life balance, feed overall satisfaction with life (Bowling et al., 2010). Lower job stress (sometimes enabled by telecommuting) supports better health (Allen et al., 2015).

Satisfied employees also contribute to successful organizations. Positive moods at work enhance creativity, persistence, and helpfulness (Ford et al., 2011; Jeffrey et al., 2014; Shockley et al., 2012). Are engaged, happy workers also less often absent? Less likely to quit? Less prone to theft? More punctual? More productive? Statistical digests of prior research have found a modest positive correlation

between individual job satisfaction and performance (Judge et al., 2001; Ng et al., 2009). In one analysis, employee job satisfaction at 31 firms predicted those firms' profitability over the ensuing 4 years (Kessler et al., 2020).



Courtesy of New Lanark Trust

Doing well while doing good—"the great experiment" At the end of the 1700s, the New Lanark, Scotland, cotton mill had more than 1000 workers. Many were children drawn from Glasgow's poorhouses. They worked 13-hour days and lived in grim conditions.

On a visit to Glasgow, Welsh-born Robert Owen—an idealistic young cotton-mill manager—met and married the mill owner's daughter. Owen and some partners purchased the

mill and on the first day of the 1800s began what he called "the most important experiment for the happiness of the human race that had yet been instituted at any time in any part of the world" (Owen, 1814). The exploitation of child and adult labor was, he observed, producing unhappy and inefficient workers. Owen showed *transformational leadership* (discussed later in this appendix) when he undertook numerous innovations: a nursery for preschool children, education for older children (with encouragement rather than corporal punishment), Sundays off, health care, paid sick days, unemployment pay for days when the mill could not operate, and a company store selling goods at reduced prices. He also innovated a goals- and worker-assessment program that included detailed records of daily productivity and costs but with "no beating, no abusive language."

The ensuing commercial success fueled a humanitarian reform movement. By 1816, with decades of profitability still ahead, Owen believed he had demonstrated "that society may be formed so as to exist without crime, without poverty, with health greatly improved, with little if any misery, and with intelligence and happiness increased a hundredfold." Although his utopian vision has not been fulfilled, Owen's great experiment laid the groundwork for employment practices that have today become accepted in much of the world.

Some organizations seem to have a knack for cultivating more engaged and productive employees. In the United States, *Fortune*'s "100 Best Companies to Work For" have also produced markedly higher-than-average returns for their investors (Yoshimoto & Frauenheim, 2018). And consider a huge study of more than 198,000 employees in nearly 8000 business units of 36 large companies (including some 1100 bank branches, 1200 stores, and 4200 teams or departments). James Harter, Frank Schmidt, and Theodore Hayes (2002) explored correlations between various measures of organizational success and *employee engagement*—the extent of workers' involvement, enthusiasm, and identification with their organizations (**TABLE C.2**). They found that engaged workers (compared with not-engaged workers who are just putting in their

time) knew what was expected of them, had what they needed to do their work, felt fulfilled in their work, had regular opportunities to do what they do best, perceived that they were part of something significant, and had opportunities to learn and develop. They also found that business units with engaged employees had more loyal customers, lower turnover rates, higher productivity, and greater profits.

TABLE C.2 Three Types of Employees

- ***Engaged:*** Working with commitment and energy, and feeling connected to their company or organization.
- ***Not engaged:*** Putting in the time but investing little passion or energy in their work.
- ***Actively disengaged:*** Unhappy workers undermining what their colleagues accomplish.

Information from Gallup via Crabtree, 2005.



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An engaged employee Mohamed Mamow, left, was joined by his employer in saying the Pledge of Allegiance as he became a U.S. citizen. Mamow and his wife met in a Somali

> refugee camp. Since then, he has supported his family by working as a machine operator at a Michigan packaging company. Mindful of his responsibility—"I don't like to lose my job. I have a responsibility for my children and my family"—he would arrive for work a half hour early and tend to every detail on his shift. "He is an extremely hard-working employee," noted his employer, and "a reminder to all of us that we are really blessed" (Roelofs, 2010).

What percentage of employees are engaged? One massive study of 6.4 million people in 159 countries showed that only about 15 percent of workers reported being engaged (Gallup, 2017, 2020). Engagement is highest among people who have knowledge-based jobs, flexible hours, and freedom to work remotely. More organizations now offer such benefits in the hope of increasing employee engagement (Eisenberger et al., 2019).

But what causal arrows explain this correlation between business success and employee morale and engagement? Does success boost morale, or does high morale boost success? A longitudinal study of 142,000 workers found that, over time, employee attitudes predicted *future* business success (more than the other way around) (Harter et al., 2010). Many other studies confirm that happy workers tend to be good workers (Kleine et al., 2019; Walsh et al., 2018). A longitudinal study of 102 companies showed that employee engagement predicted future company success (Schneider et al., 2018). It pays to have engaged employees.





Left: tdub_video/Getty Images; middle: Hero Images/Getty Images; right: Robert Kneschke/Shutterstock

Task significance People find their work meaningful and engaging when it has *task significance*—when they view their work as benefiting others (Allan, 2017).

Effective Leadership

LOQ C-5

How can leaders be most effective?

Engaged employees don't just happen. Most have effective **leaders**—people who motivate and enable their group's success, and who engage their employees' interests and loyalty (Royal, 2019). Great managers support employees' well-being, articulate goals clearly, and lead in ways that suit the situation and consider the cultural context.

Setting Specific, Challenging Goals

Measurable objectives, such as "finish gathering the history paper information by Friday," focus our attention and stimulate us to persist and to be creative. Goals motivate achievement, especially when combined with progress reports (Harkin et al., 2016). Action plans

increase the odds of on-time completion when they (1) break large goals into smaller steps (subgoals), (2) specify *implementation intentions* (when, where, and how to achieve those steps), and (3) engage accountability (progress checks) (Fishbach et al., 2006; Gollwitzer & Sheeran, 2006). We best sustain our mood and motivation through a task's ups and downs when we focus on immediate goals (such as daily study) rather than distant goals (such as a course grade). Better to have our nose to the grindstone than our eye on the ultimate prize (Houser-Marko & Sheldon, 2008).

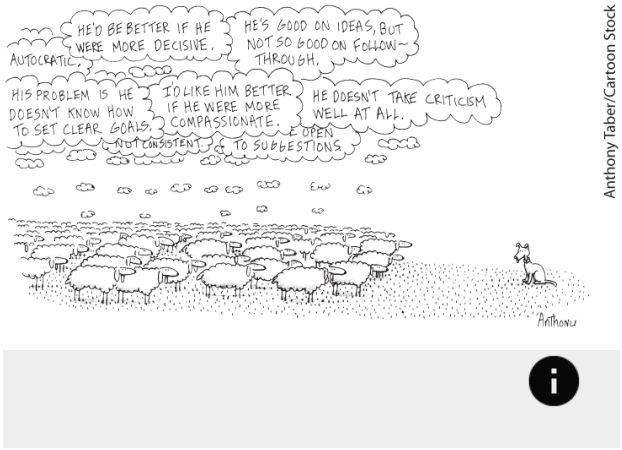
Thus, before beginning each new edition of this book, our author-editor team *manages by objectives*—we agree on target dates for completion of each module draft. Each week, we monitor our progress and make necessary adjustments. If we focus on achieving each of these short-term goals, then the prize—an on-time book—takes care of itself. So, to motivate high productivity, effective leaders work with people to define explicit goals, subgoals, and implementation plans, and then provide feedback on progress. Such goals are SMART—*s*pecific, *m*easurable, *a*ctionable, *r*ealistic, and *t*ime-bound (SIOP, 2018).

"Good leaders don't ask more than their constituents can give, but they often ask—and get—more than their constituents intended to give or thought it was possible to give." — John W. Gardner, *Excellence,* 1984

Choosing an Appropriate Leadership Style

Effective leaders of laboratory groups, work teams, and large corporations often exude *charisma* (Goethals & Allison, 2014; Tskhay et al., 2018). Charismatic people inspire others' loyalty and focus their enthusiasm (Grabo & van Vugt, 2016).

Charisma can bolster leadership, especially when combined with practical managerial skills (Vergauwe et al., 2018). What other qualities help? Leadership styles vary, depending on both the qualities of the leader and the demands of the situation (Badura et al., 2019). In some situations (think of a commander leading troops into battle), a *directive* style may be needed (Fiedler, 1981). In other situations—developing a comedy show, for example—a leader might get better results using a *democratic* style that welcomes team member creativity.



Leaders differ in the personal qualities they bring to the job. Some excel at **task leadership**. To keep the group centered on its mission,

task leaders typically use a directive style, which can work well if the leader gives good directions (Fiedler, 1987).

Other managers excel at **social leadership**. They explain decisions, help group members solve conflicts, and build teams that work well together (Bisbey et al., 2019; Pfaff et al., 2013). Social leaders, many of whom are women, often have a democratic style. They share authority and welcome team members' opinions. Social leadership and team-building increases morale and productivity (Shuffler et al., 2011, 2013). We usually feel more satisfied and motivated, and perform better, when we can participate in decision making (Cawley et al., 1998; Pereira & Osburn, 2007). Moreover, when members are sensitive to one another and participate equally, groups solve problems with greater "collective intelligence" (Woolley et al., 2010).



Luiz Rampelotto/NurPhoto/Getty Images

Social leadership Former Liberian president Ellen Johnson Sirleaf was Africa's first female elected head of state. After earlier being arrested for her opposition to government corruption, her charismatic leadership and achievements led to her receiving the 2011 Nobel Peace Prize for her "non-violent

> struggle for the safety of women and for women's rights to full participation in peace-building work."

In one study of 50 Dutch companies, the firms with the highest morale had chief executives who most inspired their colleagues "to transcend their own self-interests for the sake of the collective" (de Hoogh et al., 2004). *Transformational leadership* of this kind motivates others to identify with and fully commit themselves to the group's mission. Transformational leaders, many of whom are natural extraverts, articulate high standards, inspire people to share their vision, and offer personal attention (Bono & Judge, 2004). The frequent result is more engaged, trusting, and effective workers (Turner et al., 2002). Women more than men tend to exhibit transformational leadership qualities (G. Wang et al., 2018).

Studies in India, Taiwan, and Iran suggest that effective managers—whether in coal mines, banks, or government offices—often exhibit a high degree of *both* task and social leadership (Smith & Tayeb, 1989). As achievement-minded people, effective managers care about how well work is done, yet they are sensitive to their subordinates' needs. Workers in family-friendly organizations that offer flexible hours report feeling greater job satisfaction and loyalty to their employers (Butts et al., 2013; Roehling et al., 2001). Social virtues work.

Positive Reinforcement

Effective leadership often builds on a basic principle of *operant conditioning:* To teach a behavior, catch a person doing something right and reinforce it. It sounds simple, but many managers are like parents who, when a child brings home a near-perfect school report card, focus on the one low grade in a troublesome class and ignore the rest. “Sixty-five percent of Americans received NO praise or recognition in the workplace last year,” reported the Gallup organization (2004).



Scott Eklund/AP Photo

The power of positive coaching Football coach Pete Carroll, who led the University of Southern California to two national championships and the Seattle Seahawks to a Super Bowl championship, combined positive enthusiasm and fun workouts with “a commitment to a nurturing environment that allows people to be themselves while still being accountable to the team” (Trotter, 2014). “It shows you can win with positivity,” noted former Seahawks defensive star Richard Sherman. “It’s literally all positive

reinforcement," said teammate Jimmy Graham (Belson, 2015).

Fulfilling the Need to Belong

A work environment that satisfies employees' need to belong is energizing. Employees who enjoy high-quality colleague relationships engage in their work with more vigor (Carmeli et al., 2009). Gallup researchers have asked more than 15 million employees worldwide if they have a "best friend at work." The 30 percent who do "are *seven times* as likely to be engaged in their jobs" as those who don't, report Tom Rath and James Harter (2010). And, as we noted earlier, positive, engaged employees are a mark of thriving organizations.



"Department hug in five."

Participative Management

Employee participation in decision making is common in Sweden, Japan, the United States, and elsewhere (Cawley et al., 1998;

Sundstrom et al., 1990). Workers given a chance to voice their opinion and be part of the decision-making process have responded more positively to the final decision (van den Bos & Spruijt, 2002). They also feel more empowered, and are likely, therefore, to be more creative and committed (Hennessey & Amabile, 2010; Seibert et al., 2011).

The ultimate in employee participation is the employee-owned company. Approximately 6500 such companies exist in the United States—including Publix Supermarkets with its nearly 225,000 employees (Lapp, 2019; NCEO, 2022; Publix, 2022; Quinton, 2020). One such company in my [DM's] town is the Fleetwood Group, a thriving 165-employee manufacturer of educational furniture and wireless communication devices. Every employee owns part of the company, and as a group they own 100 percent. The more years employees work, the more they own, yet no one owns more than 5 percent. Like every corporate president, Fleetwood's president works for his stockholders—who also just happen to be his employees.

As a company that endorses faith-inspired "respect and care for each team member- owner," Fleetwood is free to place people above profits. Thus, when orders lagged during a recession, the employee-owners decided that job security meant more to them than profits. So the company paid otherwise idle workers to do community service, such as answering phones at nonprofit agencies and building Habitat for Humanity houses. Employee ownership attracts and retains talented people, which for Fleetwood has meant company success.

Cultural Influences on Leadership Styles

LOQ C-6

What cultural influences need to be considered when choosing an effective leadership style?

I/O psychology sprang from North American roots. So, how well do its leadership principles apply to cultures worldwide?

One worldwide investigation, Project GLOBE (Global Leadership and Organizational Behavior Effectiveness), has studied cultural variations in leadership expectations (House et al., 2001). Some cultures, for example, encourage collective sharing of resources and rewards; others are more individualist. Some cultures minimize and others accentuate traditional gender roles. Some cultures prioritize being friendly, caring, and kind, and others encourage a "me-first" attitude. The program's first research phase studied 17,300 leaders of 950 organizations in 61 countries (Brodbeck et al., 2008; Dorfman et al., 2012). One finding: Leaders who fulfill expectations, such as by being directive in some cultures or participative in others, tend to be successful. Cultures shape leadership and what makes for leadership success.

Nevertheless, some leader behaviors are universally effective. From its massive study of nearly 50,000 business units in 45 countries, Gallup observed that thriving companies tend to focus on identifying

and enhancing employee *strengths* (rather than punishing their deficiencies). Doing so predicts increased employee engagement, customer satisfaction, and profitability (Rigoni & Asplund, 2016a,b). *Strengths-based* leadership pays dividends, supporting happier, more creative, more productive employees in workplaces with less absenteeism and turnover (Amabile & Kramer, 2011; De Neve et al., 2013).

Moreover, the same principles affect student satisfaction, retention, and future success (Larkin et al., 2013; Ray & Kafka, 2014). Students who feel supported by caring friends and mentors tend to persist and ultimately succeed during school and after graduation.

***

We have considered *personnel psychology* (the I/O psychology subfield that focuses on training job seekers, and assisting with employee selection, placement, appraisal, and development). And we have considered *organizational psychology* (the I/O psychology subfield that focuses on worker satisfaction and productivity, and on organizational change). Finally, we turn to *human factors psychology,* which explores the human-machine interface.

Ask Yourself

In what type of leadership role do you think you would most excel? If you already have leadership experience, how could you grow to become a more effective leader?

Retrieval Practice

RP-3 What characteristics are important for *transformational leaders?*

ANSWERS IN APPENDIX E

Human Factors Psychology

LOQ C-7

How do human factors psychologists work to create user-friendly machines and work settings?

Designs sometimes neglect the human factor. Cognitive scientist Donald Norman (2001) bemoaned the complexity of assembling his new HDTV, related components, and seven remotes into a usable home theater system: "I was VP of Advanced Technology at Apple. I can program dozens of computers in dozens of languages. I understand television, really, I do.... It doesn't matter: I am overwhelmed." Norman hosts a website (jnd.org) that illustrates good designs that fit people (**FIGURE C.3**).



Top: Ride On Carry On; bottom: OXO Good Grips

FIGURE C.3 Designing products that fit people Human factors expert Donald Norman offers these and other examples of effectively designed products. The Ride On

Carry On foldable chair attachment, “designed by a flight attendant mom,” enables a small suitcase to double as a stroller. The OXO measuring cup allows the user to see the quantity from above.

Human factors psychologists work with designers and engineers to tailor appliances, machines, and work settings to our natural perceptions and inclinations. Bank ATM machines are internally more complex than remote controls ever were, yet thanks to human factors engineering, ATMs are easier to operate. Digital recorders have solved the TV recording problem with a simple select-and-click menu system (“record that one”). Handheld and wearable technologies are increasingly making use of *haptic* (touch-based) feedback—opening a phone with a thumbprint, sharing your heartbeat via a smartwatch, or having GPS directional instructions (“turn left” arrow) “drawn” on your skin with other wrist-worn devices.

Human factors psychologists also help design efficient environments. An ideal kitchen layout, researchers have found, puts needed items close to their usage point and near eye level. It locates work areas to enable doing tasks in order, such as placing the refrigerator, stove, and sink in a triangle. It creates counters that enable hands to work at or slightly below elbow height (Boehm-Davis, 2005).

Understanding human factors can help prevent accidents. By studying the human factor in driving accidents, psychologists seek to devise

ways to reduce the distractions, fatigue, and inattention that contribute to 1.25 million annual worldwide traffic fatalities (WHO, 2016). At least two-thirds of commercial air accidents have been caused by human error (Shappell et al., 2007). After beginning commercial flights in the 1960s, the Boeing 727 was involved in several landing accidents caused by pilot error. Psychologist Conrad Kraft (1978) noted a common context for these accidents: All took place at night, and all involved landing short of the runway after crossing a dark stretch of water or unilluminated ground. Kraft reasoned that, on rising terrain, city lights beyond the runway would project a larger retinal image, making the ground seem farther away than it was. By re-creating these conditions in flight simulations, Kraft discovered that pilots were deceived into thinking they were flying higher than their actual altitudes (FIGURE C.4). Aided by Kraft's finding, airlines began requiring the co-pilot to monitor the altimeter—calling out altitudes during the descent—and the accidents diminished.

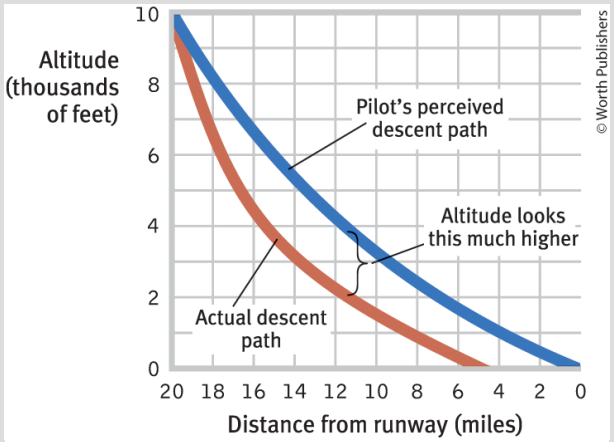


FIGURE C.4 The human factor in accidents
Lacking distance cues when approaching a runway from over a dark surface, pilots

simulating a night landing tended to fly too low. (Data from Kraft, 1978.)



Human factors psychologists can also help us to function in other settings. Consider the available *assistive listening* technologies in various theaters, auditoriums, and places of worship. One technology, commonly available in the United States, requires a headset attached to a pocket-sized receiver. The well-meaning people who provide these systems correctly understand that the technology puts sound directly into the user's ears. Alas, few people with hearing loss elect the hassle and embarrassment of locating, requesting, wearing, and returning a conspicuous headset. Most such units therefore sit in closets. Britain, the Scandinavian countries, Australia, and now many parts of the United States have instead installed *loop systems* (see HearingLoop.org) that broadcast customized sound directly through a person's own hearing aid. When suitably equipped, a hearing aid can be transformed by a discreet touch of a switch into a customized in-the-ear speaker. When offered convenient, inconspicuous, personalized sound, many more people elect to use assistive listening.

Designs that enable safe, easy, and effective interactions between people and technology often seem obvious after the fact. Why, then, aren't they more common? Technology developers, like all of us, sometimes mistakenly assume that others share their expertise—that what's clear to them will similarly be clear to others (Camerer et al., 1989; Nickerson, 1999). When people rap their knuckles on a table to

convey a familiar tune (try this with a friend), they often expect their listener to recognize it. But for the listener, this is a near-impossible task (Newton, 1991). When you know a thing, it's hard to mentally simulate what it's like not to know, and that is called the *curse of knowledge.* As psychologist Steven Pinker (2014) has noted, "The better you know something, the less you remember about how hard it was to learn."

The point to remember: Everyone benefits when designers and engineers tailor machines, technologies, and environments to fit human abilities and behaviors, when they user-test their work before production and distribution, and when they remain mindful of the curse of knowledge.



Steven Day/AP Photo

The human factor in safe landings Advanced cockpit design and rehearsed emergency procedures aided pilot Chesley "Sully" Sullenberger, a U.S. Air Force Academy graduate who earned a master's degree in industrial psychology. In 2009, Sullenberger's instantaneous decisions safely guided his disabled airplane onto New York City's Hudson River, where all 155 of the passengers and crew were safely evacuated.

Ask Yourself

What situations have you experienced (using new technology, visiting buildings, using transportation) in which the design did not work well? What situations have you experienced in which planners did a particularly good job matching machines and physical environments to abilities and expectations?

Retrieval Practice

RP-4 What is the *curse of knowledge,* and what does it have to do with the work of human factors psychologists?

ANSWERS IN APPENDIX E

REVIEW Psychology at Work

Learning objectives

Test Yourself Answer these repeated Learning Objective Questions on your own (before "showing" the answers here, or checking the answers in Appendix D) to improve your retention of the concepts (McDaniel et al., 2009, 2015).

LOQ C-1 What is *flow?*

LOQ C-2 What are industrial-organizational psychology's three key areas of study?

LOQ C-3 How do personnel psychologists facilitate job seeking, employee selection, work placement, and performance appraisal?

LOQ C-4 Why are organizational psychologists interested in employee satisfaction and engagement?

LOQ C-5 How can leaders be most effective?

LOQ C-6 What cultural influences need to be considered when choosing an effective leadership style?

LOQ C-7 How do human factors psychologists work to create user-friendly machines and work settings?

Terms and Concepts to Remember

Test Yourself Write down the definition in your own words, then check your answer.

flow
industrial-organizational (I/O) psychology
personnel psychology
organizational psychology
human factors psychology
structured interview
leadership
task leadership
social leadership

Appendix Test

Test Yourself Answer the following questions on your own first, then "show" the answers here, or check your answers in Appendix E.

1. People whose work fully engages their skills often experience _____, a focused state of consciousness, with diminished awareness of themselves and of time.

2. _____ psychologists assist with job seeking, and the recruitment, selection, placement, training, appraisal, and development of employees; _____ _____ psychologists focus on how people and machines interact, and on optimizing devices and work environments.

3. A personnel psychologist scripted a set of questions to ask all applicants for a job opening. She then trained the firm's interviewers to ask only those questions, to take notes, and to rate applicants' responses. This technique is known as a(n)
   a. structured interview.
   b. unstructured interview.
   c. performance appraisal checklist.
   d. behavior rating scale.

4. In your job, you rate your own performance, your manager's, and your peers'. Your manager, your peers, and your customers in turn rate your performance. Your organization is using a form of performance appraisal called
   a. the assessment center approach.
   b. graphic feedback.

c. structured interviews.
d. 360-degree feedback.

5. What are SMART goals, and why are they effective?

6. Research indicates that women are often social leaders. They are also more likely than men to have a _____ leadership style.

7. Effective managers often exhibit
   a. only task leadership.
   b. only social leadership.
   c. both task and social leadership, depending on the situation and the person.
   d. task leadership for building teams and social leadership for setting standards.

8. Human factors psychologists focus primarily on
   a. training and developing employees.
   b. appraising employee performance.
   c. maximizing worker satisfaction.
   d. improving the design of machines and environments.

Appendix D

Complete Module Reviews

Chapter 1 Thinking Critically With Psychological Science (Modules 1–3)

Module 1: The History and Scope of Psychology

1-1 How is psychology a science?

Psychology's findings, based on an empirical approach, are the result of careful observation and testing. Sifting reality from fantasy requires a scientific attitude.

1-2 What are the three key elements of the scientific attitude, and how do they support scientific inquiry?

The scientific attitude equips us to be curious, skeptical, and humble in scrutinizing competing ideas or our own observations. Curiosity triggers new ideas, skepticism encourages attention to the facts, and humility helps us both discard predictions that can't be verified by research and be open to surprises. Together, these three key elements make modern science possible.

1-3 How does critical thinking feed a scientific attitude, and smarter thinking for everyday life?

Critical thinking puts ideas to the test by examining assumptions, appraising the source, discerning hidden biases, evaluating evidence, and assessing conclusions.

1-4 What were some important milestones in psychology's early history?

Wilhelm Wundt established the first psychological laboratory in 1879 in Germany. Two early schools of thought in psychology were *structuralism* and *functionalism*. Mary Whiton Calkins and Margaret Floy Washburn were two of the first women in the field.

1-5 How did behaviorism, Freudian psychology, and humanistic psychology further the development of psychological science?

Early researchers defined *psychology* as "the science of mental life." In the 1920s, under the influence of John B. Watson and the behaviorists, the field's focus changed to the "scientific study of observable behavior." *Behaviorism* became one of psychology's two major forces well into the 1960s. However, the second major force of Freudian (psychoanalytic) psychology, along with the influence of *humanistic psychology*, revived interest in the study of mental processes.

1-6 How has contemporary psychology focused on cognition, on biology and experience, on culture and gender, and on human flourishing?

The *cognitive revolution* in the 1960s led psychology back to its early interest in the mind, and to its current definition as the science of behavior and mental processes. The field of *cognitive neuroscience* now examines the brain activity underlying mental activity. Our growing understanding of biology and experience has fed psychology's most enduring debate. The *nature–nurture issue* centers on the relative contributions of genes and experience, and their interaction in specific environments. Charles Darwin's view that *natural selection* shapes behaviors as well as bodies led to *evolutionary psychology*'s study of our similarities because of our common biology and evolutionary history, and *behavior genetics*' focus on the relative power and limits of genetic and environmental influences on behavior. Cross-cultural and gender studies have diversified psychology's assumptions while also reminding us of our similarities. Attitudes and behaviors may vary somewhat by gender or across *cultures,* but because of our shared human kinship, the underlying processes and principles are more similar than different. Psychology's traditional focus on understanding and treating troubles has expanded with *positive psychology*'s call for more research on human flourishing and its attempt to discover and promote traits that help people to thrive.

1-7 How do psychologists use the biopsychosocial approach, and how can it help us understand our diverse world?

The *biopsychosocial approach* integrates information from three differing but complementary *levels of analysis*: biological,

psychological, and social-cultural. This approach offers a more complete understanding than could usually be reached by relying on only one of psychology's current theoretical perspectives (neuroscience, evolutionary, behavior genetics, psychodynamic, behavioral, cognitive, and social-cultural). The biopsychosocial approach can help us understand our diverse world: We share a biologically rooted nature, but many psychological and social-cultural influences fine-tune our assumptions, values, and behavior.

1-8 What are psychology's main subfields?

Within the science of psychology, researchers may conduct *basic research* to increase the field's knowledge base (often in biological, developmental, cognitive, personality, and social psychology) or *applied research* to solve practical problems (in industrial-organizational psychology and other areas). Those who engage in psychology as a helping profession may assist people as *counseling psychologists*, helping people with challenges and crises (including academic, vocational, and relationship issues) and to improve their personal and social functioning, or as *clinical psychologists*, assessing and treating people with mental, emotional, and behavior disorders. *Psychiatrists* also assess and treat people with disorders, but as medical doctors, they may prescribe drugs in addition to psychotherapy. *Community psychologists* work to create healthy social and physical environments (in schools and neighborhoods, for example).

1-9 How can psychological principles help you learn, remember, and thrive?

The *testing effect* shows that learning and memory are enhanced by actively retrieving, rather than simply rereading, previously studied material. The *SQ3R* study method—survey, question, read, retrieve, and review—applies principles derived from memory research and can help you learn and remember material. Four additional tips are (1) distribute your study time; (2) learn to think critically; (3) process class information actively; and (4) overlearn. Psychological research has shown that people who live happy, thriving lives manage their time to get a full night's sleep; make space for exercise; set long-term goals, with daily aims; have a growth mindset; and prioritize relationships.

Module 2: Research Strategies: How Psychologists Ask and Answer Questions

2-1 How does our everyday thinking sometimes lead us to a wrong conclusion?

Our everyday thinking can lead us astray because of three phenomena. *Hindsight bias* (the "I-knew-it-all-along phenomenon") is the tendency to believe, after learning an outcome, that we would have foreseen it. Overconfidence is often the result of our readiness to be more confident than correct. These tendencies, along with our

eagerness to perceive patterns in random events, lead us to overestimate the weight of commonsense thinking. Scientific inquiry can help us overcome such biases and shortcomings.

2-2 Why are we so vulnerable to believing untruths?

In our modern "post-truth" culture, our emotions, beliefs, and group affiliations may color our judgments, prevent our acknowledgement of objective facts, and prompt us to accept only the information that confirms our views. Misinformation may spread as a result of repetition and memorable examples, contributing to the post-truth culture. Critical evaluation of information and a scientific mindset can help to combat our biases and distorted thinking.

2-3 How do theories advance psychological science?

Psychological *theories* apply an integrated set of principles to organize observations and to generate *hypotheses*. By testing their hypotheses, researchers can confirm, reject, or revise their theories. To enable other researchers to *replicate* the studies, researchers report them using precise *operational definitions* of their procedures and concepts. If others achieve similar results, confidence in the conclusion will be greater. More and more psychologists use *preregistration* to publicly communicate their planned study design, hypotheses, data collection, and analyses, which promotes openness and transparency. By combining the results of many studies, *meta-analysis* helps increase researchers' confidence in their results by avoiding the problem of small sample sizes.

2-4 How do psychologists use case studies, naturalistic observations, and surveys to observe and describe behavior, and why is random sampling important?

Descriptive methods, which include *case studies* (in-depth analyses of individuals or groups), *naturalistic observations* (recording many individuals' natural behavior), and *surveys* (asking people questions), show us what can happen, and they may offer ideas for further study. The best basis for generalizing about a *population* is a representative sample; in a *random sample*, every person in the entire population being studied has an equal chance of participating. Descriptive methods describe but do not *explain* behavior; they cannot show cause and effect because researchers cannot control variables.

2-5 What does it mean when we say two things are correlated, and what are positive and negative correlations?

Correlation is the degree to which two variables are related, and how well one predicts the other. In a positive correlation, two variables increase or decrease together; in a negative correlation, one variable increases as the other decreases. The strength and direction of their relationship is expressed as a *correlation coefficient*, which ranges from +1.00 (a perfect positive correlation) through 0 (no correlation) to −1.00 (a perfect negative correlation).

2-6 What are *illusory correlations*, and what is *regression toward the mean?*

Illusory correlations are random events that we notice and falsely assume are related.

2-7 Why do correlations enable prediction but not cause-effect explanation?

Correlations enable prediction because they show how two factors are related—either positively or negatively. A correlation can indicate the possibility of a cause-effect relationship, but it does not prove the direction of the influence, or whether an underlying third factor may explain the correlation.

2-8 What are the characteristics of experimentation that make it possible to isolate cause and effect?

To discover cause-effect relationships, psychologists conduct *experiments*, manipulating one or more variables of interest and controlling other variables. Using *random assignment*, they can minimize confounding variables, such as preexisting differences between the *experimental group* (exposed to the treatment) and the *control group* (not given the treatment). The *independent variable* is the factor the experimenter manipulates to study its effect; the *dependent variable* is the factor the experimenter measures to discover any changes occurring in response to the manipulation of

the independent variable. Studies may use a *double-blind procedure* to avoid the *placebo effect* and researcher bias.

2-9 How would you know which research design to use?

Psychological scientists design studies and choose research methods that will best provide meaningful results. Researchers generate testable questions, and then carefully consider the best design to use in studying those questions (experimental, correlational, case study, naturalistic observation, twin study, longitudinal, or cross-sectional). Next, psychologists measure the variables they are studying, and finally they interpret their results, keeping possible confounding variables in mind. (The online *How Would You Know?* research activities allow you to play the role of the researcher, making choices about the best ways to test interesting questions.)

2-10 How can simplified laboratory experiments help us understand general principles of behavior?

Researchers intentionally create a controlled, artificial environment in the laboratory to test general theoretical principles. It is the general principles—not the specific findings—that help explain everyday behaviors.

2-11 Why do psychologists study animals, and what ethical research guidelines safeguard human and animal welfare? How do psychologists' values influence what they study and how they apply their results?

Some psychologists are primarily interested in animal behavior; others want to better understand the physiological and psychological processes shared by humans and other species. Government agencies have established standards for animal care and housing. Professional associations and funding agencies also have guidelines for protecting animals' well-being. The ethics codes of the American Psychological Association (APA) and the British Psychological Society (BPS) outline standards for safeguarding human participants' well-being, including obtaining their *informed consent* and *debriefing* them later. Universities and research organizations have Institutional Review Boards to screen research proposals and ensure participants' well-being. Scientific scrutiny and replication help to guard against the fabrication of data, which has the potential to cause great harm. Psychologists' values influence their choice of research topics, their theories and observations, and their labels for behavior. Applications of psychology's principles have been used mainly in the service of humanity

Module 3: Statistical Reasoning in Everyday Life

3-1 Why does statistical literacy matter?

Statistical literacy involves not only the ability to understand numbers and basic math, but also the ability to think about what numbers mean in context. Improving your statistical literacy will

give you a more accurate understanding of the world and the people around you, and a clearer sense of the risks that affect your life.

3-2 How do we describe data using three measures of central tendency?

Researchers use descriptive statistics to measure and describe characteristics of groups under study. A measure of central tendency is a single score that represents a whole set of scores. Three such measures that we use to describe data are the *mode* (the most frequently occurring score), the *mean* (the arithmetic average), and the *median* (the middle score in a group of data).

3-3 What is the relative usefulness of the two measures of variation?

Measures of central tendency neatly summarize data; measures of variation tell us how diverse data are. Two measures of variation are the *range* (which describes the gap between the highest and lowest scores) and the *standard deviation* (which states how much scores vary around the mean, or average, score). Scores often form a *normal* (or bell-shaped) *curve*.

3-4 How do we know whether an observed difference can be generalized to other populations?

Researchers use inferential statistics (which include ways of determining the reliability and significance of an observed

difference between the results for different groups) to determine if results can be generalized to a larger population. Reliable differences are based on samples that are representative of the larger population being studied; that demonstrate low variability, on average; that consist of many cases; and that comprise multiple studies (using *meta-analysis*). The effect size—the size of the difference between groups—helps determine *statistical significance*: When the sample averages are reliable and the difference between them is large, we can reject the null hypothesis of no existing differences. Many psychological tests provide *p-values*, which indicate the probability of the null hypothesis being true given the sample data.

Chapter 2 The Biology of Mind (Modules 4–7)

Module 4: Neural and Hormonal Systems

4-1 Why are psychologists concerned with human biology?

Psychologists working from a *biological* perspective study the links between biological processes and psychological processes. We are biopsychosocial systems, in which biological, psychological, and social-cultural factors interact to influence behavior.

4-2 How do biology and experience together enable neuroplasticity?

Neuroplasticity enables our brain to build new neural pathways as we adjust to new experiences; so, our brain is sculpted by both genes and life. While neuroplasticity is lifelong, it is greatest early in life. With practice, our brain develops unique patterns that reflect our life experiences.

4-3 What are *neurons,* and how do they transmit information?

Neurons are the elementary components of the nervous system, the body's speedy electrochemical information system. A neuron (a *cell*

body and its branching fibers) receives signals through its often bushy, branching *dendrites* and sends signals through its *axons.* Some axons are encased in a *myelin sheath,* which enables faster transmission. *Glial cells* support, nourish, and protect neurons and also play a role in learning, thinking, and memory. If the combined signals received by a neuron exceed a minimum *threshold,* the neuron fires, transmitting an electrical impulse (the *action potential*) down its axon by means of a chemistry-to-electricity process. Neurons need a short rest called the *refractory period,* after which they can fire again. The neuron's reaction is an *all-or-none response.*

4-4 How do nerve cells communicate with other nerve cells?

When action potentials reach the end of an axon (the button-like axon terminals), they stimulate the release of *neurotransmitters.* These chemical messengers carry a message from the sending neuron across a *synapse* to receptor sites on a receiving neuron. The sending neuron, in a process called *reuptake,* then normally reabsorbs the excess neurotransmitter molecules in the synaptic gap. If incoming signals are strong enough, the receiving neuron generates its own action potential and relays the message to other cells.

4-5 How do neurotransmitters influence behavior, and how do drugs and other chemicals affect neurotransmission?

Neurotransmitters travel designated pathways in the brain and may influence specific behaviors and emotions. Acetylcholine (ACh) enables muscle action, learning, and memory. *Endorphins* are natural opioids released in response to pain and exercise. Drugs and other chemicals affect brain chemistry at synapses. *Agonists* increase a neurotransmitter's action, and may do so in various ways. *Antagonists* decrease a neurotransmitter's action by blocking production or release.

4-6 What are the functions of the nervous system's main divisions, and what are the three main types of neurons?

The *central nervous system (CNS)*—the brain and the spinal cord—is the *nervous system's* decision maker. The *peripheral nervous system (PNS)*, which connects the CNS to the rest of the body by means of *nerves*, gathers information and transmits CNS decisions to the rest of the body. The two main PNS divisions are the *somatic nervous system* (which enables voluntary control of the skeletal muscles) and the *autonomic nervous system* (which controls involuntary muscles and glands by means of its *sympathetic* and *parasympathetic* divisions). The three types of neurons cluster into working networks: (1) *Sensory (afferent) neurons* carry incoming information from the body's tissues and sensory receptors to the brain and spinal cord. (2) *Motor (efferent) neurons* carry outgoing information from the brain and spinal cord to the muscles and glands. (3) *Interneurons*

communicate within the brain and spinal cord and process information between the sensory inputs and motor outputs.

4-7 How does the endocrine system transmit information and interact with the nervous system?

The *endocrine system's* glands and fat tissue secrete *hormones* into the bloodstream; these hormones travel through the body and affect other tissues, including the brain. The endocrine system's master gland, the *pituitary*, influences hormone release by other glands, including the *adrenal glands.* In an intricate feedback system, the brain's hypothalamus influences the pituitary gland, which influences other glands, which release hormones, which in turn influence the brain.

Module 5: Tools of Discovery: Having Our Head Examined

5-1 How do neuroscientists study the brain's connections to behavior and mind?

Clinical observations and lesioning reveal the general effects of brain damage. Electrical, chemical, or magnetic stimulation can also reveal aspects of information processing in the brain. MRI scans show anatomy. EEG, MEG, PET, and fMRI (functional MRI) recordings reveal brain function.

Module 6: Brain Regions and Structures

6-1 What are the *hindbrain, midbrain,* and *forebrain?*

Vertebrate brains have three main divisions. The *hindbrain* contains brainstem structures that direct essential survival functions, such as breathing, sleeping, arousal, coordination, and balance. The *midbrain* connects the hindbrain with the forebrain; it controls some movement and transmits information that enables seeing and hearing. The *forebrain* manages complex cognitive activities, sensory and associative functions, and voluntary motor activities.

6-2 What structures make up the brainstem, and what are the functions of the brainstem, thalamus, reticular formation, and cerebellum?

The *brainstem* is responsible for automatic survival functions. It includes the *medulla* (which controls heartbeat and breathing), the pons (which helps coordinate movements and control sleep), and the *reticular formation* (which filters incoming stimuli, relays information to other brain areas, and affects arousal). The *thalamus*, sitting above the brainstem, acts as the brain's sensory control center. The *cerebellum*, attached to the rear of the brainstem, coordinates voluntary movement and balance and enables nonverbal learning and memory.

6-3 What are the limbic system's structures and functions?

The *limbic system* is linked to emotions, memory, and drives. Its neural centers include the *amygdala* (involved in behavioral and emotional responses, such as aggression and fear); the *hypothalamus* (directs various bodily maintenance functions, helps govern the endocrine system, and is linked to emotion and reward); and the *hippocampus* (helps process explicit, conscious memories). The hypothalamus controls the pituitary (the "master gland") by stimulating it to trigger the release of hormones.

6-4 What four lobes make up the cerebral cortex, and what are the functions of the motor cortex, somatosensory cortex, and association areas?

The *cerebral cortex* has two hemispheres, and each hemisphere has four lobes: *frontal, parietal, occipital*, and *temporal*. Each lobe performs many functions and interacts with other areas of the cortex. The *motor cortex*, at the rear of the frontal lobes, controls voluntary movements. The *somatosensory cortex*, at the front of the parietal lobes, registers and processes body touch and movement sensations. Body parts requiring precise control (in the motor cortex) or those that are especially sensitive (in the somatosensory cortex) occupy the greatest amount of space. Most of the brain's cortex—the major portion of each of the four lobes—is devoted to uncommitted *association areas*, which integrate information involved in higher mental functions such as learning, remembering,

thinking, and speaking. Our mental experiences arise from coordinated brain activity.

6-5 Is it true that 90 percent of our brain isn't really used?

The unresponsiveness of our association areas to electrical probing led to the false claim that we use only 10 percent of our brain. But these vast areas of the brain are responsible for interpreting, integrating, and acting on sensory information and linking it with stored memories. Evidence from brain damage shows that the neurons in association areas are busy with higher mental functions; a bullet would not land in an "unused" area.

Module 7: Damage Responses and Brain Hemispheres

7-1 To what extent can a damaged brain reorganize itself, and what is *neurogenesis?*

While brain and spinal cord neurons usually do not regenerate, some neural tissue can reorganize in response to damage. The damaged brain may demonstrate neuroplasticity, especially in young children, as new pathways are built and functions migrate to other brain regions. Reassignment of functions to different areas of the brain may also occur in blindness and deafness, or as a result of damage and disease. Some research suggests that the brain may

sometimes mend itself by forming new neurons, a process known as *neurogenesis.*

7-2 What do split brains reveal about the functions of our two brain hemispheres?

Split-brain research (experiments on people with a severed *corpus callosum*) has confirmed that in most people, the left hemisphere is the more verbal. The right hemisphere excels in visual perception and making inferences, and helps us modulate our speech and orchestrate our self-awareness. Studies of the intact brain in healthy people confirm that each hemisphere makes unique contributions to the integrated functioning of the whole brain.

Chapter 3 Consciousness and the Two-Track Mind (Modules 8–10)

Module 8: Basic Consciousness Concepts

8-1 What is the place of *consciousness* in psychology's history?

After initially claiming consciousness as their area of study in the nineteenth century, psychologists abandoned it in the first half of the twentieth century, turning instead to the study of observable behavior because they believed consciousness was too difficult to study scientifically. Since the 1960s, our awareness of ourselves and our environment—our *consciousness*—has reclaimed its place as an important area of research, such as in the interdisciplinary field of *cognitive neuroscience.*

8-2 How does *selective attention* direct our perceptions?

We *selectively attend* to, and process, a very limited portion of incoming information, blocking out much and often shifting the spotlight of our attention from one thing to another. Focused intently on one task, we often display *inattentional blindness* to other events, including *change blindness* to changes around us.

8-3 What is the *dual processing* being revealed by today's cognitive neuroscience?

Scientists studying the brain mechanisms underlying consciousness and cognition have discovered that the mind processes information on two separate tracks, one operating at a conscious level *(sequential processing)* and the other at an unconscious level *(parallel processing)*. Parallel processing takes care of the routine business, while sequential processing is best for solving new problems that require our attention. Together, this *dual processing*—conscious and unconscious—affects our perception, memory, attitudes, and other cognitions.

Module 9: Sleep and Dreams

9-1 What is *sleep?*

Sleep is the periodic, natural loss of normal consciousness—as distinct from unconsciousness resulting from a coma, general anesthesia, or hibernation.

9-2 How do our biological rhythms influence our daily functioning?

Our bodies have an internal biological clock, roughly synchronized with the 24-hour cycle of night and day. This *circadian rhythm* appears in our daily patterns of body temperature, arousal, sleeping,

and waking. Age and experience can alter these patterns, resetting our biological clock.

9-3 What is the biological rhythm of our sleeping and dreaming stages?

Younger adults cycle through four distinct sleep stages about every 90 minutes. (The sleep cycle repeats more frequently for older adults.) Leaving the *alpha waves* of the awake, relaxed stage, we descend into the irregular brain waves of N1 sleep, often with *hallucinations.* N2 sleep (in which we spend about half our sleep time) follows, lasting about 20 minutes, with its characteristic sleep spindles. We then enter N3 sleep, lasting about 30 minutes, with large, slow *delta waves.* About an hour after falling asleep, we ascend from our initial sleep dive and begin periods of *REM* (rapid eye movement or *R*) *sleep.* REM sleep, which includes most dreaming, is described as a paradoxical sleep stage because of internal arousal but external calm (near paralysis). During a normal night's sleep, N3 sleep shortens and REM and N2 sleep lengthen.

9-4 How do biology and environment interact in our sleep patterns?

Our biology—our circadian rhythm as well as our age and our body's production of melatonin (influenced by the brain's *suprachiasmatic nucleus*)—interacts with social, cultural, and economic influences and individual emotions and behaviors to determine our sleeping and waking patterns. Being bathed in (or deprived of) light disrupts

our 24-hour biological clock. Those who are chronically deprived of natural sunlight, such as night-shift workers, may experience desynchronization. Artificial light, including from light-emitting electronic devices, delays sleep and affects sleep quality.

9-5 What are sleep's functions?

Sleep may have played a protective role in human evolution by keeping people safe during potentially dangerous periods. Sleep also helps restore the immune system and repair damaged neurons. Sleep consolidates our memories by replaying recent learning and strengthening neural connections. Sleep promotes creative problem solving the next day. During slow-wave sleep, the pituitary gland secretes a growth hormone necessary for muscle development. As a result of these benefits, a regular full night's sleep can greatly enhance athletic performance.

9-6 How does sleep loss affect us, and what are the major sleep disorders?

Sleep deprivation causes fatigue and irritability, and it impairs concentration and memory consolidation. It can also lead to depression, obesity, joint inflammation, a suppressed immune system, and slowed performance (with greater vulnerability to accidents). Sleep disorders include *insomnia* (recurring problems in falling or staying asleep); *narcolepsy* (sudden uncontrollable sleepiness, sometimes lapsing directly into REM sleep); *sleep apnea* (the repeated stopping of breathing while asleep; associated with

obesity, especially in men); *REM sleep behavior disorder* (acting out dreams by moving or speaking while asleep); *night terrors* (high arousal and the appearance of being terrified; N3 disorder found mainly in children); sleepwalking; and sleeptalking.

9-7 What do we dream, and what functions have theorists proposed for dreams?

We usually *dream* of ordinary events and everyday experiences, most involving some anxiety or misfortune. Fewer than 10 percent of dreams among men (and fewer still among women) have any sexual content. Most dreams occur during REM sleep. There are five major views of the function of dreams. (1) Freud's wish fulfillment: Dreams provide a psychic "safety valve," with *manifest content* (story line) acting as a censored version of *latent content* (underlying meaning that gratifies our unconscious wishes). (2) Information processing: Dreams help us sort out the day's events and consolidate them in memory. (3) Neurocognitive function: REM sleep preserves memory and processes emotional information. (4) Activation synthesis: The brain attempts to make sense of neural static by weaving it into a story line. (5) Cognitive development: Dreams reflect the dreamers' level of development—their knowledge and understanding. Most sleep theorists agree that REM sleep and its associated dreams serve an important function, as shown by the *REM rebound* that occurs following REM deprivation in humans and other species.

Module 10: Drugs And Consciousness

10-1 What are *substance use disorders?*

Those with a *substance use disorder* experience continued substance craving and use despite significant life disruption and/or physical risk. *Psychoactive drugs* alter perceptions and moods. A substance/medication-induced disorder occurs when drug use causes changes that resemble a psychological disorder.

10-2 What roles do tolerance and addiction play in substance use disorders, and how has the concept of *addiction* changed?

Psychoactive drugs may produce *tolerance*—requiring larger doses to achieve the desired effect, a result of neuroadaptation—and *withdrawal*—the discomfort and distress that follow discontinuing an addictive drug or behavior. Addiction prompts users to crave the drug and to continue use despite known adverse consequences. Therapy or group support may help; it helps to believe that addictions are controllable and that people can change. Although psychologists try to avoid overuse of the term *addiction* to label driven, excessive behaviors, there are some behavior addictions (such as gambling disorder and internet gaming disorder) in which behaviors become compulsive and dysfunctional.

10-3 What are *depressants*, and what are their effects?

Depressants, such as alcohol, *barbiturates*, and the *opioids*, reduce neural activity and slow body functions. Alcohol disinhibits, increasing the likelihood that we will act on our impulses, whether harmful or helpful. It also impairs judgment by slowing neural processing, disrupts memory processes by suppressing REM sleep, and reduces self-awareness and self-control. User expectations strongly influence alcohol's behavioral effects. Alcohol can shrink the brain in those with *alcohol use disorder* (marked by tolerance, withdrawal if use is suspended, and a drive to continue problematic use).

10-4 What are *stimulants*, and what are their effects?

Stimulants—including caffeine, nicotine, cocaine, the amphetamines, methamphetamine, and Ecstasy—excite neural activity and speed up body functions, triggering energy and mood changes. Stimulants can be highly addictive. *Nicotine's* effects make tobacco product use a difficult habit to kick, yet repeated attempts to quit seem to pay off. *Cocaine* gives users a fast high, followed shortly by a crash. Its risks include cardiac arrest, respiratory failure, convulsions, and emotional disturbances. *Amphetamines* stimulate neural activity, leading to heightened energy and mood. *Methamphetamine* use may permanently reduce dopamine production. *Ecstasy (MDMA)* is a combined stimulant and mild hallucinogen that produces euphoria and feelings of intimacy. Its users risk immune system suppression, permanent damage to

mood, memory impairment, and (if taken during physical activity) dehydration and escalating body temperatures.

10-5 What are *hallucinogens*, and what are their effects?

Hallucinogens, such as *LSD* and marijuana, distort perceptions and evoke hallucinations. The user's mood and expectations influence the effects of LSD, but common experiences are hallucinations and emotions varying from euphoria to panic. Marijuana's main ingredient, *THC*, may trigger feelings of disinhibition, euphoria, relaxation, relief from pain, and intense sensitivity to sensory stimuli, but may increase the risk of psychological disorders and lead to impaired attention, learning, and memory.

10-6 Why do some people become regular users of consciousness-altering drugs?

Some people may be biologically vulnerable to particular drugs. Psychological factors (such as stress, depression, and anxiety) and social factors (such as peer pressure and cultural influences) combine to lead many people to experiment with—and sometimes become addicted to—drugs. Cultural and ethnic groups have differing rates of drug use. Each type of influence—biological, psychological, and social-cultural—offers a possible path for drug misuse prevention and treatment programs.

Chapter 4 Nature, Nurture, and Human Diversity (Modules 11–13)

Module 11: Behavior Genetics: Predicting Individual Differences

11-1 What are *chromosomes, DNA, genes,* and the human *genome?* How do behavior geneticists explain our individual differences?

Genes are the biochemical units of *heredity* that make up *chromosomes,* the threadlike coils of *DNA*. When genes are expressed, they provide the code for creating the proteins that form our body's building blocks. The human *genome* is the shared genetic profile that distinguishes humans from other species, consisting at an individual level of all the genetic material in an organism's chromosomes. *Behavior geneticists* study the relative power and limits of genetic and *environmental* influences on behavior. Most of our differing traits are polygenic, and are influenced by the interaction of our individual environments with these genetic predispositions.

11-2 How do twin and adoption studies help us understand the effects and interactions of nature and nurture?

Studies of *identical (monozygotic) twins* versus *fraternal (dizygotic) twins*, separated twins, and biological versus adoptive relatives allow researchers to consider the effects of shared environment and shared genes, which sheds light on how nature and nurture influence our traits. Shared family environments have surprisingly little effect on personality, though parenting does influence other factors.

11-3 What have psychologists learned about temperament?

The stability of *temperament*, a person's characteristic emotional reactivity and intensity, from the first weeks of life suggests a genetic predisposition. The genetic effect appears in physiological differences such as heart rate and nervous system reactivity.

11-4 What is *heritability*, and how does it relate to individuals and groups?

Heritability is the proportion of variation among individuals in a group that can be attributed to genes. Heritable individual differences (in traits such as height or intelligence) need not imply heritable group differences. Genes mostly explain why some people are taller than others, but not why people are taller today than they were a century ago.

11-5 How is molecular genetics research changing our understanding of the effects of nature and nurture?

Our genetic predispositions and our specific environments *interact.* Environments can trigger genetic expression, and genetically influenced traits can influence the experiences we seek and the responses we evoke from others. *Molecular geneticists* study the molecular structure and function of genes, including those that affect behavior. One goal of *molecular behavior genetics* is to identify specific genes—or, more often, teams of genes—that together orchestrate complex traits (such as body weight, sexual orientation, and impulsivity) or put people at risk for disorders. The field of *epigenetics* studies the molecular mechanisms by which environments can trigger or block genetic expression.

Module 12: Evolutionary Psychology: Explaining Human Nature and Nurture

12-1 How do evolutionary psychologists use natural selection to explain behavior tendencies?

Evolutionary psychologists attempt to understand how *natural selection* has shaped traits and behavior tendencies found in all people. Genetic variations that increase the odds of reproducing and surviving in a particular environment are most likely to be passed on to future generations. Some variations arise from *mutations,* others from new gene combinations at conception. Humans share a genetic legacy and are predisposed to behaviors that promoted our

ancestors' survival and reproduction. Charles Darwin's theory of evolution is one of biology's fundamental organizing principles. He anticipated today's application of evolutionary principles in psychology.

12-2 How might an evolutionary psychologist explain male-female differences in sexuality and mating preferences?

Females tend to be more selective than males when choosing sexual partners. Evolutionary psychologists reason that male's attraction to multiple fertile-appearing partners increases their chances of spreading their genes widely. Because females incubate and nurse babies, they increase their own and their children's chances of survival by searching for mates with the potential for long-term investment in their joint offspring.

12-3 What are the key criticisms of evolutionary explanations of human sexuality, and how do evolutionary psychologists respond?

Critics argue that evolutionary psychologists start with an effect and work backward to an explanation, minimize contemporary social and cultural influences (including learned *social scripts*), and relieve people from taking responsibility for their sexual behavior, including sexual aggression. Evolutionary psychologists respond that they recognize the importance of social and cultural influences, but note the value of testable predictions based on evolutionary principles: Understanding our predispositions can help us overcome them.

Module 13: Cultural and Gender Diversity: Understanding Nature and Nurture

13-1 How do early experiences modify the brain?

The brain's nerve cells are sculpted by heredity and experience. As a child's brain develops, neural connections grow more numerous and complex. Experiences then prompt a pruning process, in which unused connections weaken and heavily used ones strengthen. Early childhood is an important period for shaping the brain, but thanks to neuroplasticity, the brain modifies itself throughout our lives in response to our learning.

13-2 In what ways do parents and peers shape children's development?

Family environment and parental expectations can affect children's motivation and future success. Personality, however, is mostly not attributable to the effects of nurture. As children attempt to fit in with peers, they tend to adopt their peers' culture.

13-3 How does culture affect our behavior?

A *culture* is an enduring set of behaviors, ideas, attitudes, values, and traditions shared by a group and transmitted from one generation to the next. Culture enables innovation and division of labor. Cultural *norms*, which differ across time and place, are understood rules that

inform members of a culture about accepted and expected behaviors. Cultures differ in how strictly people follow norms: People more often obey norms in *tight cultures*, but those in *loose cultures* expect greater variability.

13-4 How do individualist and collectivist cultures shape values and goals?

Our personality is culturally influenced. Although individuals vary, different cultures tend to emphasize either individualism or collectivism. Cultures based on self-reliant *individualism* tend to value personal independence and individual achievement. They define identity in terms of self-esteem, personal goals and attributes, and personal rights and liberties. Cultures based on socially connected *collectivism* tend to value group goals, social identity, and commitments. They define identity in terms of interdependence, tradition, and harmony.

13-5 How does the meaning of *gender* differ from the meaning of *sex?*

Gender refers to the behavioral characteristics that people associate with boy, girl, man, and woman. *Sex* refers to the biologically influenced characteristics by which people define *male, female,* and *intersex.* Our understanding of gender arises from the interplay between our biology and our experiences.

13-6 What are some of the ways males and females tend to be alike and to differ?

Whether male, female, or intersex, most of us receive 23 chromosomes from our mother and 23 from our father, of which 45 are unisex. Humans are in most ways alike, thanks to similar genetic makeup—they see, learn, and remember similarly, with comparable creativity, intelligence, and emotions. Male-female differences include age of onset of puberty, life expectancy, emotional expressiveness, and vulnerability to certain disorders. Men display more *aggression* than women do, and they are more likely to be physically (rather than *relationally*) aggressive. In most societies, men have more social power. Males tend to be more independent, while females tend to be more interdependent. Women often focus more on social connectedness than do men, and they "tend and befriend."

13-7 What factors contribute to gender bias in the workplace?

Workplace gender bias is revealed in differences in perception, compensation, and family-care responsibility. Social norms, interaction styles, and everyday behaviors also contribute. Men's leadership style tends to be directive, whereas women's tends to be more democratic. In their everyday behaviors and interactions, men tend to act more assertive and opinionated; women tend to act more supportive and apologetic.

13-8 How do sex hormones influence prenatal and adolescent sexual development?

Both sex chromosomes and sex hormones influence development. About seven weeks after conception, a gene on the *Y chromosome* from the father—who can contribute either this or an *X chromosome* (the mother always contributes the latter)—triggers the production of *testosterone*. This promotes male sex organ development. *Estrogens* contribute to female sex characteristics and are secreted in greater amounts by females than by males. During the fourth and fifth prenatal months, sex hormones bathe the fetal brain, with different patterns developing due to the male's greater testosterone and the female's estrogens. Prenatal exposure of females to unusually high levels of male hormones can later dispose them to more male-typical interests. Males prenatally exposed to low male hormone levels tend to grow up with more female-typical interests. Another flood of hormones occurs in *puberty*, triggering a growth spurt, the development of *primary* and *secondary sex characteristics*, and the landmark events of *menarche* and *spermarche*. Sexual development variations may occur through unusual combinations of male and female chromosomes, hormones, and anatomy.

13-9 What are some cultural influences on gender roles?

Gender roles—a set of expected behaviors, attitudes, and traits for men and women—vary across place and time. Gender roles in many parts of the world have changed dramatically in the last century.

Expectations about gender roles also influence cultural attitudes about *sexual aggression.*

13-10 What are the effects of sexual aggression? How have cultural views changed, and how can we reduce sexual aggression?

Sexual aggression, which includes sexual harassment and sexual assault, can increase anxiety, depression, and the risk of posttraumatic stress disorder; disrupt sleep; harm physical health; and make it difficult to trust new relationship partners. Cultural views of sexual aggression differ across time and place, with some cultures continuing to blame survivors, but changes in global norms over the last half-century have made such blaming less acceptable. Therapy for sexual aggressors has not proven effective, but we may reduce sexual aggression by encouraging people to report and share their experiences, empowering survivors, and educating communities about preventive bystander intervention strategies.

13-11 How do we form our gender identity?

Social learning theory proposes that we learn our *gender identity*—our personal sense of being male, female, neither, or some combination of male and female—in the same way that we learn other things: through reinforcement, punishment, and observation. But *gender typing* varies from child to child, indicating that imitation and reward, alone, do not explain gender identity. Some children organize themselves into "boy worlds" and "girl worlds"; others prefer *androgyny.* For people who identify as cisgender, gender

identity corresponds with birth-assigned sex. For those who identify as *transgender*, gender identity differs from what is typical for that person's birth-assigned sex. Gender identity is distinct from sexual orientation; transgender people may be sexually attracted to people of any gender or to no one at all.

13-12 How do nature, nurture, and our own choices influence gender roles and sexuality?

Individual development results from the interaction of biological, psychological, and social-cultural influences. Biological influences include our shared human genome; individual variations; prenatal environment; and sex-related genes, hormones, and physiology. Psychological influences include gene–environment interactions; the effect of early experiences on neural networks; responses evoked by our own characteristics, such as gender and temperament; and personal beliefs, feelings, and expectations. Social-cultural influences include parental and peer influences; cultural traditions and values; and cultural gender norms. And our individual choices affect the way all of these influences interact.

Chapter 5 Developing Through the Life Span (Modules 14–17)

Module 14: Developmental Issues, Prenatal Development, and the Newborn

14-1 What three issues have engaged developmental psychologists?

Developmental psychologists study physical, cognitive, and social changes across the life span. They often use *cross-sectional* (comparing people of different ages at one point in time) and *longitudinal studies* (retesting the same people over a period of years) to explore three issues: nature and nurture (the interaction between our genetic inheritance and our experiences); continuity and stages (which aspects of development are gradual and continuous and which change relatively abruptly); and stability and change (whether our traits endure or change as we age).

14-2 What is the course of prenatal development, and how do teratogens affect that development?

The life cycle begins at conception, when one sperm cell unites with an egg to form a *zygote.* The zygote's inner cells become the *embryo,*

and the outer cells become the placenta. In the next 6 weeks, body organs begin to form and function, and by 9 weeks, the *fetus* is recognizably human. *Teratogens* are potentially harmful agents that can pass through the placenta and harm the developing embryo or fetus, as happens with *fetal alcohol syndrome.*

14-3 What are some newborn abilities, and how do researchers explore infants' mental abilities?

Babies are born with sensory equipment and reflexes that facilitate their survival and their social interactions with adults. For example, they quickly learn to discriminate their mother's smell, and they prefer the sound of human voices. Researchers use techniques that test *habituation* to explore infants' abilities.

Module 15: Infancy and Childhood

15-1 During infancy and childhood, how do the brain and motor skills develop?

The brain's nerve cells are sculpted by heredity and experience. As a child's brain develops, neural connections grow more numerous and complex. Experiences then trigger a pruning process, in which unused connections weaken and heavily used ones strengthen. In childhood, complex motor skills—sitting, standing, walking—develop in a predictable sequence, though the timing of that sequence is a function of individual *maturation* and culture. We have few or no conscious memories of events occurring before about age

4. This infantile amnesia occurs in part because major brain areas have not yet matured.

15-2 How did Piaget broaden our understanding of the way a child's mind develops, and how have today's researchers built on his work?

As he studied children's *cognitive* development, Jean Piaget proposed that they actively construct and modify their understanding of the world through the processes of *assimilation* and *accommodation.* They form *schemas* that help them organize their experiences. Progressing from the simplicity of the *sensorimotor stage* of the first 2 years, in which they develop *object permanence*, children move to more complex ways of thinking. In the *preoperational stage* (about age 2 to about 6 or 7), children are *egocentric* and unable to perform simple logical operations. By about age 7, they enter the *concrete operational stage* and are able to comprehend the principle of *conservation.* By age 12, children enter the *formal operational stage* and can reason systematically. Research supports the sequence Piaget proposed, but it also shows that young children are more capable, and their development more continuous, than he believed.

15-3 How did Vygotsky view children's cognitive development?

Lev Vygotsky's studies of child development focused on the ways a child's mind grows by interacting with the social environment. In

his view, parents, teachers, and other children provide temporary *scaffolds* enabling children to step to higher levels of thinking.

15-4 What does it mean to develop a *theory of mind*, and how is this impaired in those with autism spectrum disorder?

Our *theory of mind — our* ideas about our own and others' mental states — develops during early childhood. Children with *autism spectrum disorder (ASD)* have an impaired theory of mind: They have difficulty understanding others' state of mind, as well as reflecting on their own.

15-5 How do caregiver-infant attachment bonds form?

At about 8 months, soon after object permanence develops, children separated from their caregivers display *stranger anxiety.* Infants form *attachments* with caregivers who gratify biological needs but, more importantly, who are comfortable, familiar, and responsive. Many birds and other animals have a more rigid attachment process, called *imprinting*, that occurs during a *critical period.*

15-6 How have psychologists studied attachment differences, and what have they learned?

Attachment has been studied in strange situation experiments, which show that some children are securely attached and others are insecurely (anxiously or avoidantly) attached. Infants' differing attachment styles reflect both their individual temperament and the

responsiveness of their parents and child-care providers. Adult relationships seem to reflect the attachment styles of early childhood, lending support to Erik Erikson's idea that *basic trust* is formed in infancy by our experiences with responsive caregivers.

15-7 How does experiencing adversity affect children's social development?

Most children growing up under adversity are resilient, and they may be hardier when facing future stresses. But extreme trauma in childhood may alter the brain, affecting our stress responses or leaving epigenetic marks. Children who experience neglect, bullying, poverty, wartime atrocities, or severe or prolonged abuse are at increased risk for health problems, psychological disorders, substance abuse, and criminality.

15-8 How do children's self-concepts develop?

Self-concept, an understanding and evaluation of who we are, emerges gradually. By 15 to 18 months, children recognize themselves in a mirror. By school age, they can describe many of their own traits and by age 8 or 10 their self-image is stable.

15-9 What are the four main parenting styles?

The main parenting styles are authoritarian (coercive), permissive (unrestraining), neglectful (uninvolved), and authoritative (confrontive).

15-10 What outcomes are associated with each parenting style?

Authoritative parenting is associated with greater self-esteem, self-reliance, self-regulation, and social competence; authoritarian parenting with lower self-esteem, less social skill, and a brain that overreacts to mistakes; permissive parenting with greater aggression and immaturity; and neglectful parenting with poor academic and social outcomes. However, correlation does not equal causation (it's possible that children with positive characteristics are more likely to bring out positive parenting methods).

Module 16: Adolescence and Emerging Adulthood

16-1 How is *adolescence* defined, and how do physical changes affect developing teens?

Adolescence is the transition period from childhood to adulthood, extending from *puberty* to social independence. Early maturation can be a challenge for developing adolescents. The brain's frontal lobes mature and myelin growth increases during adolescence and the early twenties, enabling improved judgment, impulse control, and long-term planning.

16-2 How did Piaget, Kohlberg, and later researchers describe adolescent cognitive and moral development?

Piaget theorized that adolescents develop a capacity for formal operations and that this development is the foundation for moral judgment. Lawrence Kohlberg proposed a stage theory of moral reasoning, from a preconventional morality of self-interest, to a conventional morality concerned with upholding laws and social rules, to (in some people) a postconventional morality of basic rights and self-defined ethical principles. Other researchers believe that morality lies in moral intuition and moral action as well as thinking. Kohlberg's critics note that the postconventional level is culturally limited (representing morality only from the perspective of an individualist society), and male-focused (since women more often emphasize care for those in need over what is "fair"). Life success can grow from the ability to delay gratification.

16-3 What are the social tasks and challenges of adolescence?

Erik Erikson proposed eight stages of psychosocial development across the life span. He believed we need to achieve trust, autonomy, initiative, competency, *identity* (in adolescence), *intimacy* (in young adulthood), generativity, and integrity. Each life stage has its own psychosocial task. Solidifying one's sense of self in adolescence means trying out a number of different roles. *Social identity* is the part of the self-concept that comes from a person's group memberships.

16-4 How do parents and peers influence adolescents?

During adolescence, parental influence diminishes and peer influence increases. Adolescents adopt their peers' ways of dressing, acting, and communicating. Positive parent-teen relationships correlate with positive peer relationships, however. Personalities and temperaments are shaped by both nature and nurture, including parental and peer influences.

16-5 What is *emerging adulthood?*

Due to earlier sexual maturity and later independence, the transition from adolescence to adulthood is taking longer than it once did. *Emerging adulthood* is the period from age 18 to the mid-twenties, when many young people are not yet fully independent. This stage is found mostly in today's Western cultures.

Module 17: Adulthood

17-1 What physical changes occur during middle and late adulthood?

Muscular strength, reaction time, sensory abilities, and cardiac output begin to almost imperceptibly decline in the mid-twenties; this downward trajectory accelerates through middle and late adulthood, varying considerably with personal health and exercise habits. Women's period of fertility ends with *menopause* around age 50; men experience a more gradual decline. In late adulthood, the immune system weakens, increasing susceptibility to life-threatening illnesses. But exercising can slow aging, enhancing

physical health as well as boosting memory, improving judgment, and reducing the risk of severe cognitive decline.

17-2 How does memory change with age?

Recall begins to decline, especially for meaningless information, but recognition memory remains strong. Developmental researchers study age-related changes such as in memory with cross-sectional studies and longitudinal studies. “Terminal decline” describes the cognitive decline in the final few years of life.

17-3 How do neurocognitive disorders and Alzheimer’s disease affect cognitive ability?

Neurocognitive disorders (NCDs) are acquired (not lifelong) disorders marked by cognitive deficits, which are often related to Alzheimer’s disease, brain injury or disease, or substance abuse. This damage to brain cells results in the erosion of mental abilities that is not typical of normal aging. *Alzheimer’s disease* causes the deterioration of memory, then reasoning. After 5 to 20 years, the person becomes emotionally flat, disoriented, disinhibited, incontinent, and finally mentally vacant.

17-4 What themes and influences mark our social journey from early adulthood to death?

Adults do not progress through an orderly sequence of age-related social stages. Chance events can determine life choices. The *social clock* is a culture’s preferred timing for events such as marriage,

parenthood, and retirement. Many people in Western cultures today feel freer about setting their own timing. Adulthood's dominant themes are love and work (Erikson's intimacy and generativity).

17-5 How does our well-being change across the life span?

Surveys show that until the very end, life satisfaction is unrelated to age. Positive emotions increase after midlife and negative ones decrease; with age come fewer extremes of emotion and mood. While older adults do have smaller social networks, with fewer friendships and greater loneliness, they also experience fewer relationship problems.

17-6 What range of reactions does a loved one's death trigger?

People do not grieve in predictable stages, as was once supposed, and bereavement therapy is not significantly more effective than grieving without such aid. Life can be affirmed even at death, especially for those who experience what Erikson called a sense of integrity—a feeling that one's life has been meaningful.

Chapter 6 Sensation and Perception (Modules 18–20)

Module 18: Basic Concepts of Sensation and Perception

18-1 What are *sensation* and *perception?* What do we mean by *bottom-up processing* and *top-down processing?*

Sensation is the process by which our *sensory receptors* and nervous system receive and represent stimulus energies from our environment. *Perception* is the process of organizing and interpreting this information, enabling recognition of meaningful objects and events. Sensation and perception are one continuous process. *Bottom-up processing* is sensory analysis that begins at the entry level, with information flowing from the sensory receptors to the brain. *Top-down processing* is information processing guided by high-level mental processes, as when we construct perceptions by filtering information through our experience and expectations.

18-2 What three steps are basic to all of our sensory systems?

Our senses (1) receive sensory stimulation, often using specialized receptor cells; (2) transform that stimulation into neural impulses; and (3) deliver the neural information to the brain. *Transduction* is

the process of converting energy into a form that our brain can use. Researchers in *psychophysics* study the relationships between stimuli's physical characteristics and our psychological experience of them.

18-3 How do *absolute thresholds* and *difference thresholds* differ?

Our *absolute threshold* for any stimulus is the minimum stimulation necessary for us to detect it 50 percent of the time. *Signal detection theory* predicts how and when we will detect a faint stimulus amid background noise. Individual absolute thresholds vary, depending on the strength of the signal and also on our experience, expectations, motivation, and alertness. Our *difference threshold* (also called the *just noticeable difference*, or *jnd*) is the minimum difference we can discern between two stimuli 50 percent of the time. *Weber's law* states that two stimuli must differ by a constant minimum percentage (not a constant amount) to be perceived as different.

18-4 How are we affected by subliminal stimulation?

We do sense some stimuli *subliminally*—less than 50 percent of the time—and can be affected by these sensations. But although we can be *primed*, subliminal sensations have no powerful, enduring influence.

18-5 What is the function of sensory adaptation?

Sensory adaptation (our diminished sensitivity to constant or routine odors, sounds, and touches) focuses our attention on informative changes in our environment.

18-6 How do our expectations, contexts, motivation, and emotions influence our perceptions?

Perceptual set is a mental predisposition that functions as a lens through which we perceive the world. Our learned concepts (schemas) prime us to organize and interpret ambiguous stimuli in certain ways. Our expectations, contexts, motivation, and emotions can color our interpretation of events and behaviors.

Module 19: Vision: Sensory and Perceptual Processing

19-1 What are the characteristics of the energy that we see as visible light? What structures in the eye help focus that energy?

What we see as light is only a thin slice of the broad spectrum of electromagnetic energy. The portion visible to humans extends from the shorter blue-violet wavelengths to the longer red light wavelengths. After entering the eye through the cornea, passing through the pupil and iris, and being focused by a lens, light energy particles strike the eye's inner surface, the *retina.* The *hue* we perceive in a light depends on its *wavelength,* and its brightness depends on its *intensity.*

19-2 How do the rods and cones process information, and what is the path information travels from the eye to the brain?

Light entering the eye triggers chemical changes that convert light energy into neural impulses. Photoreceptors called *cones* and *rods* at the back of the retina each provide a special sensitivity—cones to detail and color, rods to faint light and peripheral motion. After processing by bipolar and ganglion cells, neural impulses travel from the retina through the *optic nerve* to the thalamus, and on to the visual cortex. A lack of receptor cells at the point where the optic nerve leaves the eye creates a *blind spot* in the field of vision.

19-3 How do we perceive color in the world around us?

According to the *Young-Helmholtz trichromatic (three-color) theory*, the retina contains three types of color receptors. Contemporary research has found three types of cones, each most sensitive to the wavelengths of one of the three primary colors of light (red, green, or blue). According to Hering's *opponent-process theory*, there are three additional sets of opposing retinal processes (red-green, blue-yellow, black-white). Research has confirmed that, en route to the brain, neurons in the retina and the thalamus code the color-related information from the cones into pairs of opponent colors. These two theories, and the research supporting them, show that color processing occurs in two stages.

19-4 Where are feature detectors located, and what do they do?

Feature detectors, specialized nerve cells in the visual cortex, respond to specific features of the visual stimulus, such as shape, angle, or movement. Feature detectors pass information on to other cortical areas, where supercell clusters respond to more complex patterns.

19-5 How does the brain use parallel processing to construct visual perceptions?

Through *parallel processing*, the brain handles many aspects of vision (color, movement, form, and depth) simultaneously. Other neural teams integrate the results, comparing them with stored information and enabling perceptions.

19-6 How did the Gestalt psychologists understand perceptual organization, and how do figure-ground and grouping principles contribute to our perceptions?

Gestalt psychologists searched for rules by which the brain organizes fragments of sensory data into *gestalts*, or meaningful forms. In pointing out that the whole may exceed the sum of its parts, they noted that we filter sensory information and construct our perceptions. To recognize an object, we must first perceive it (see it as a *figure*) as distinct from its surroundings (the *ground*). We bring order and form to stimuli by organizing them into meaningful *groups*, following such rules as proximity, continuity, and closure.

19-7 How do binocular and monocular cues enable three-dimensional vision, and how does motion perception occur?

For those of us with vision, *depth perception* is the ability to see objects in three dimensions and to judge distance. The *visual cliff* and other research demonstrate that many species perceive the world in three dimensions at, or very soon after, birth. *Binocular cues*, such as *retinal disparity*, are depth cues that rely on information from both eyes. *Monocular cues* (such as relative height, relative size, relative motion, linear perspective, and interposition) let us judge depth using information transmitted by only one eye. The brain computes motion imperfectly, based partly on its assumption that shrinking objects are retreating and enlarging objects are approaching. A quick succession of images on the retina can create an illusion of movement, as in stroboscopic movement or the *phi phenomenon*.

19-8 How do perceptual constancies help us construct meaningful perceptions?

Perceptual constancies, such as in color, brightness (or lightness), shape, or size, enable us to perceive objects as stable despite the changing image they cast on our retinas. Our brain constructs our experience of an object's color or brightness through comparisons with other surrounding objects. Knowing an object's size gives us clues to its distance; knowing its distance gives clues about its size, but we sometimes misread monocular distance cues and reach the wrong conclusions, as in the Moon illusion.

19-9 What does research on restored vision, sensory restriction, and perceptual adaptation reveal about the effects of experience on perception?

Experience guides our perceptual interpretations. People blind from birth who gain sight after surgery lack the experience to visually recognize shapes and forms. Sensory restriction research indicates that there is a critical period for some aspects of sensory and perceptual development. Without early stimulation, the brain's neural organization does not develop normally. People given glasses that shift the world slightly to the left or right, or even upside down, experience *perceptual adaptation*. They are initially disoriented, but they manage to adapt to their new context.

Module 20: Hearing, Skin, Chemical, and Body Senses

20-1 What are the characteristics of the air pressure waves that we hear as sound?

Sound waves are bands of compressed and expanded air. Our ears detect these changes in air pressure and transform them into neural impulses, which the brain decodes as sound. Sound waves vary in amplitude, which we perceive as differing loudness (with sound intensity measured in decibels), and in *frequency* (measured in hertz), which we experience as differing *pitch*.

20-2 How does the ear transform sound energy into neural messages?

The *middle ear* is the chamber between the eardrum and cochlea; the *inner ear* consists of the cochlea, semicircular canals, and vestibular sacs. Sound waves traveling through the auditory canal cause tiny vibrations in the eardrum. The bones of the middle ear amplify the vibrations and relay them to the fluid-filled cochlea. Rippling of the basilar membrane, caused by pressure changes in the cochlear fluid, causes movement of the tiny hair cells, triggering neural messages to be sent (via the thalamus) to the auditory cortex in the brain. *Sensorineural hearing loss* (or nerve deafness) results from damage to the cochlea's hair cells or their associated nerves. *Conduction hearing loss* results from damage to the mechanical system that transmits sound waves to the cochlea. *Cochlear implants* can restore hearing for some people.

20-3 How do we detect loudness, discriminate pitch, and locate sounds?

Loudness is not related to the intensity of a hair cell's response, but rather to the number of activated hair cells. *Place theory* (place coding) explains how we hear high-pitched sounds, and *frequency theory* (temporal coding) extended by the volley principle explains how we hear low-pitched sounds. A combination of the two theories explains how we hear pitches in the middle range. Sound waves strike one ear sooner and more intensely than the other. To locate

sounds, the brain analyzes the minute differences in the sounds received by the two ears and computes the sound's source.

20-4 What are the four basic touch sensations, and how do we sense touch?

Our sense of touch is four basic sensations—pressure, warmth, cold, and pain—that combine to produce other sensations, such as "itchy" or "wet."

20-5 What biological, psychological, and social-cultural influences affect our experience of pain? How do placebos, distraction, and hypnosis help control pain?

The biopsychosocial perspective views our perception of pain as the sum of biological, psychological, and social-cultural influences. Pain reflects bottom-up sensations and top-down processes. One theory of pain is that a *"gate"* in the spinal cord either opens to permit pain signals traveling up small nerve fibers to reach the brain, or closes to prevent their passage. Pain treatments often combine physical and psychological elements. Combining a placebo with distraction, and amplifying the effect with *hypnosis* (which increases our response to suggestions), can help relieve pain. *Posthypnotic suggestion* is used by some clinicians to control undesired symptoms and behavior.

20-6 In what ways are our senses of taste and smell similar, and how do they differ?

Taste and smell are both chemical senses. Taste *(gustation)* is a composite of five basic sensations—sweet, sour, salty, bitter, and umami—and of the aromas that interact with information from the taste receptor cells of the taste buds. There are no basic sensations for smell *(olfaction).* From the top of each nasal cavity, some 20 million olfactory receptor cells for smell send messages to the brain's olfactory bulb and then onward to the temporal lobe's primary smell cortex and to the parts of the limbic system involved in memory and emotion.

20-7 How do we sense our body's position and movement?

Position and motion sensors in muscles, tendons, and joints called proprioceptors enable *kinesthesia*, our sense of the position and movement of our body parts. We monitor our head's (and thus our body's) position and movement, and maintain our balance, with our *vestibular sense*, which relies on the semicircular canals and vestibular sacs to sense the tilt or rotation of our head.

20-8 How does *sensory interaction* influence our perceptions, and what is *embodied cognition?*

Our senses influence one another. This *sensory interaction* occurs, for example, when the smell of a favorite food amplifies its taste. *Embodied cognition* is the influence of bodily sensations, gestures, and other states on cognitive preferences and judgments.

20-9 What are the claims of ESP, and what have most research psychologists concluded after putting these claims to the test?

Parapsychology is the study of paranormal phenomena, including *extrasensory perception (ESP)* and psychokinesis. The three most testable forms of ESP are telepathy (mind-to-mind communication), clairvoyance (perceiving remote events), and precognition (perceiving future events). To refute those who say there is no ESP, one need only produce a single person who can demonstrate a single, reproducible ESP event. Although study continues, researchers have been unable to replicate ESP phenomena under controlled conditions.

Chapter 7 Learning (Modules 21–23)

Module 21: Basic Learning Concepts and Classical Conditioning

21-1 How do we define *learning*, and what are some basic forms of learning?

Learning is the process of acquiring through experience new and relatively enduring information or behaviors. In *associative learning*, we learn that certain events occur together. In classical conditioning, we learn to associate two *stimuli* and thus to anticipate events. Automatically responding to stimuli we do not control is called *respondent behavior.* In operant conditioning, we learn to associate a response and its consequence. These associations produce *operant behaviors.* Through *cognitive learning*, we acquire mental information that guides our behavior. For example, in observational learning, we learn new behaviors by observing events and watching others.

21-2 What is behaviorism's view of learning?

Ivan Pavlov's work on classical conditioning laid the foundation for *behaviorism*, the view that psychology should be an objective science

that studies behavior without reference to mental processes. The behaviorists believed that the basic laws of learning are the same for all species, including humans.

21-3 Who was Pavlov, and what are the basic components of classical conditioning?

Ivan Pavlov, a Russian physiologist, created novel experiments on learning. His early twentieth-century research over the last three decades of his life demonstrated that classical conditioning is a basic form of learning. *Classical conditioning* is a type of learning in which an organism comes to associate stimuli and anticipate events. A *UR* (unconditioned response) is an event that occurs naturally (such as salivation), in response to some stimulus. A *US* (unconditioned stimulus) is something that naturally and automatically (without learning) triggers the unlearned response (as food in the mouth triggers salivation). A *CS* (conditioned stimulus) is originally an *NS* (neutral stimulus, such as a tone) that, after association with a US (such as food) comes to trigger a CR. A *CR* (conditioned response) is the learned response (salivating) to the originally neutral (but now conditioned) stimulus.

21-4 In classical conditioning, what are the processes of *acquisition, extinction, spontaneous recovery, generalization,* and *discrimination?*

In classical conditioning, the first stage is *acquisition*, associating an NS with the US so that the NS begins triggering the CR. Acquisition occurs most readily when the NS is presented just before (ideally, about a half-second before) a US, preparing the organism for the upcoming event. This finding supports the view that classical conditioning is biologically adaptive. *Extinction* is diminished responding, which occurs if the CS appears repeatedly by itself without the US. *Spontaneous recovery* is the reappearance of a weakened conditioned response, following a rest period. *Generalization* is the tendency to respond to stimuli that are similar to a CS. *Discrimination* is the learned ability to distinguish between a CS and other irrelevant stimuli.

21-5 Why does Pavlov's work remain so important?

Pavlov taught us that significant psychological phenomena can be studied objectively and that classical conditioning is a basic form of learning that applies to all species.

21-6 What have been some applications of Pavlov's work to human health and well-being? How did Watson apply Pavlov's principles to learned fears?

Classical conditioning techniques are used to improve human health and well-being in many areas, including behavioral therapy for some types of psychological disorders. The body's immune system may also respond to classical conditioning. Pavlov's work also provided a basis for Watson's idea that human emotions and

behaviors, though biologically influenced, are mainly a bundle of conditioned responses. Watson applied classical conditioning principles in his studies of "Little Albert" to demonstrate how specific fears might be conditioned.

Module 22: Operant Conditioning

22-1 What is *operant conditioning?*

Operant conditioning is a type of learning in which behavior becomes more likely to recur if followed by a reinforcer or less likely to recur if followed by a punisher.

22-2 Who was Skinner, and how is operant behavior reinforced and shaped?

B. F. Skinner was a college English major and aspiring writer who later entered graduate school for psychology. He became modern behaviorism's most influential and controversial figure. Expanding on Edward Thorndike's *law of effect*, Skinner and others found that the behavior of rats or pigeons placed in an *operant chamber* (Skinner box) can be *shaped* by using reinforcers to guide successive approximations of the desired behavior.

22-3 How do positive and negative reinforcement differ, and what are the basic types of reinforcers?

Reinforcement is any event that strengthens the behavior it follows. *Positive reinforcement* adds a desirable stimulus to increase the frequency of a behavior. *Negative reinforcement* reduces or removes an aversive stimulus to increase the frequency of a behavior. *Primary reinforcers* (such as receiving food when hungry or having nausea end during an illness) are innately satisfying—no learning is required. *Conditioned* (or secondary) *reinforcers* (such as money) are satisfying because we have learned to associate them with more basic rewards (such as the desirable things we buy). Immediate reinforcers (such as a food reward given right after a desired behavior) offer immediate payback; delayed reinforcers (such as a paycheck) require the ability to delay gratification.

22-4 How do different reinforcement schedules affect behavior?

A *reinforcement schedule* defines how often a response will be reinforced. In *continuous reinforcement* (reinforcing desired responses every time they occur), learning is rapid, but so is extinction if rewards cease. In *partial (intermittent) reinforcement* (reinforcing responses only sometimes), initial learning is slower, but the behavior is much more resistant to extinction. *Fixed-ratio schedules* reinforce behaviors after a set number of responses; *variable-ratio schedules*, after an unpredictable number. *Fixed-interval schedules* reinforce behaviors after set time periods; *variable-interval schedules*, after unpredictable time periods.

22-5 How does punishment differ from negative reinforcement, and how does punishment affect behavior?

Punishment aims to decrease the frequency of a behavior (such as a child's disobedience). Positive punishment administers, or adds, an undesirable consequence (such as a speeding ticket) or withdraws something desirable (such as taking away a favorite toy). Negative punishment aims to increase the frequency of a behavior (such as putting on your seat belt) by withdrawing, or subtracting, something undesirable (the annoying beeping).

This desired consequence (silencing the annoying beeping) increases the likelihood that the behavior (putting on your seat belt) will be repeated. Physical punishment can have undesirable side effects, such as suppressing rather than changing unwanted behaviors, failing to provide a direction for appropriate behavior, encouraging discrimination (so that the undesirable behavior appears when the punisher is not present), creating fear, and teaching aggression.

22-6 Why did Skinner's ideas provoke controversy, and how might his operant conditioning principles be applied?

Critics of Skinner's principles believed the approach dehumanized people by neglecting their personal freedom and seeking to control their actions. Skinner replied that people's actions are already controlled by external consequences and that reinforcement is more humane than punishment as a means for controlling behavior.

Teachers can use shaping techniques to guide students' behaviors and use interactive media such as online adaptive quizzing to provide immediate feedback. (The LearningCurve adaptive quizzing system available with this text provides such feedback and allows students to direct the pace of their own learning.) Coaches can build players' skills and self-confidence by rewarding small improvements. Computer programmers and game developers can use reinforcement principles to train artificial intelligence (AI) machines that simulate human learning. Managers can boost productivity and morale by rewarding well-defined and achievable behaviors. Parents can reward desired behaviors but not undesirable ones. We can shape our own behaviors by stating realistic goals, planning how to work toward those goals, monitoring the frequency of desired behaviors, reinforcing desired behaviors, and gradually reducing rewards as behaviors become habitual.

22-7 How does operant conditioning differ from classical conditioning?

In operant conditioning, an organism learns associations between its own behavior and resulting events; this form of conditioning involves operant behavior (behavior that operates on the environment, producing rewarding or punishing consequences). In classical conditioning, the organism forms associations between stimuli—events it does not control; this form of conditioning involves respondent behavior (automatic responses to some stimulus).

Module 23: Biology, Cognition, and Learning

23-1 How do biological constraints affect classical and operant conditioning?

An animal's capacity for conditioning is limited by biological constraints, so some associations are easier to learn. Each species has a biological predisposition to learn associations that aid its survival—a phenomenon called *preparedness*. Those who readily learned taste aversions were unlikely to eat the same toxic food again and were more likely to survive and leave descendants. Nature constrains each species' capacity for both classical conditioning and operant conditioning. Our preparedness to associate a CS with a US that follows predictably and immediately is often (but not always) adaptive. During operant training, animals may display *instinctive drift* by reverting to biologically predisposed patterns.

23-2 How do cognitive processes affect classical and operant conditioning?

In classical conditioning, animals may learn when to expect a US and may be aware of the link between stimuli and responses. In operant conditioning, *cognitive mapping* and *latent learning* research demonstrate the importance of cognitive processes in learning.

23-3 What is *observational learning?*

Observational learning (also called *social learning*) involves learning by watching and imitating, rather than through direct experience.

23-4 How may observational learning be enabled by neural mirroring?

Our brain's frontal lobes have a demonstrated ability to mirror the activity of another's brain, which may enable imitation and observational learning. Some scientists argue that *mirror neurons* are responsible for this ability, while others attribute it to distributed brain networks.

23-5 What is the impact of prosocial modeling and of antisocial modeling?

Children tend to imitate what a model does and says, whether the behavior being *modeled* is *prosocial* (positive, constructive, and helpful) or antisocial. If a model's actions and words are inconsistent, children may imitate the hypocrisy they observe.

23-6 What is the violence-viewing effect?

Media violence can contribute to aggression. This violence-viewing effect may be prompted by imitation and desensitization. Correlation does not equal causation, but study participants have reacted more cruelly to provocations when they have viewed violence (instead of entertaining nonviolence).

Chapter 8 Memory (Modules 24–26)

Module 24: Studying and Encoding Memories

24-1 What is *memory*, and how is it measured?

Memory is learning that has persisted over time, through the encoding, storage, and retrieval of information. Evidence of memory may be seen in an ability to *recall* information, *recognize* it, or *relearn* it more easily on a later attempt. Psychologists can measure these different forms of memory separately.

24-2 How do memory models help us study memory, and how has later research updated the three-stage information-processing model?

Psychologists use memory models to think about and explain how our brain forms and retrieves memories. Information-processing models involve three processes: *encoding, storage*, and *retrieval.* Our agile brain processes many things simultaneously by means of *parallel processing.* The connectionism information-processing model focuses on this multitrack processing, viewing memories as products of interconnected neural networks. The three processing stages in the Atkinson-Shiffrin model are *sensory memory, short-term*

memory, and *long-term memory*. This model has since been updated to include newer concepts, such as working memory (the active "scratch pad" processing that occurs at the stage when our short-term memories combine with our long-term memories) and *automatic processing* (which occurs behind the scenes to allow information to slip into long-term memory without the need to consciously attend to it).

24-3 How do explicit and implicit memories differ?

The human brain processes information on dual tracks, consciously and unconsciously. Many *explicit* (declarative) *memories — our* conscious memories of facts and experiences — form through *effortful processing*, which requires conscious effort and attention. *Implicit* (nondeclarative) *memories — of* learned skills and classically conditioned associations — happen without our awareness, through *automatic processing*.

24-4 What information do we process automatically?

In addition to skills and classically conditioned associations, we automatically process incidental information about space, time, and frequency and familiar or well-learned information, such as sounds, smells, and word meanings.

24-5 How does sensory memory work?

Sensory memory feeds some information into working memory for active processing there. An *iconic memory* is a very brief (a few tenths of a second) sensory memory of visual stimuli; an *echoic memory* is a three- or four-second sensory memory of auditory stimuli.

24-6 What is our short-term memory capacity?

Short-term memory capacity is about seven bits of information, plus or minus two, but this information disappears from memory quickly without rehearsal. Our working memory capacity for active processing varies, depending on age and other factors, but everyone does better and more efficient work by avoiding task-switching.

24-7 What are some effortful processing strategies that can help us remember new information?

Effective effortful processing strategies include *chunking, mnemonics,* and hierarchies. Each boosts our ability to form new memories.

24-8 How do distributed practice, deep processing, and making new material personally meaningful aid memory?

Distributed practice sessions (the *spacing effect*) produce better long-term recall. The *testing effect* is the finding that consciously

retrieving, rather than simply rereading, information enhances memory. Depth of processing also affects long-term retention. In *shallow processing*, we encode words based on their structure or sound. Retention is best when we use *deep processing*, encoding words based on their meaning. We also more easily remember material when we learn and rephrase it into personally meaningful terms — the self-reference effect.

Module 25: Storing and Retrieving Memories

25-1 What is the capacity of long-term memory? Are our long-term memories processed and stored in specific locations?

Our long-term memory capacity is essentially unlimited. Memories are not stored intact in the brain in single spots. Many parts of the brain interact as we encode, store, and retrieve memories.

25-2 What roles do the frontal lobes and hippocampus play in memory processing?

The frontal lobes and *hippocampus* are parts of the brain network dedicated to explicit memory formation. Many brain regions send information to the frontal lobes for processing. The hippocampus, with the help of nearby brain networks, registers and temporarily holds elements of explicit memories (which are either *semantic* or

episodic) before moving them to other brain regions for long-term storage. The neural storage of long-term memories, which is supported by sleep, is called *memory consolidation.*

25-3 What roles do the cerebellum and basal ganglia play in memory processing?

The cerebellum and basal ganglia are parts of the brain network dedicated to implicit memory formation. The cerebellum is important for storing classically conditioned memories. The basal ganglia are involved in motor movement and help form procedural memories for skills. Many reactions and skills learned during our first 4 years continue into our adult lives, although we cannot consciously remember learning these associations and skills (infantile amnesia).

25-4 How do emotions affect our memory processing?

Emotional arousal causes an outpouring of stress hormones, which leads the amygdala to boost activity in the brain's memory-forming areas. Significantly stressful events can trigger very clear *flashbulb memories.* Through rehearsal, memory of personally important experiences largely endures.

25-5 How do changes at the synapse level affect our memory processing?

Long-term potentiation (LTP) is the neural basis for learning and memory. In LTP, neurons become more efficient at releasing and sensing the presence of neurotransmitters, and more connections develop between neurons.

25-6 How do external cues, internal emotions, and order of appearance influence memory retrieval?

External cues activate associations that help us retrieve memories; this process may occur without our awareness, as it does in *priming*. The *encoding specificity principle* is the idea that cues and contexts specific to a particular memory will be most effective in helping us recall it. Returning to the same physical context or emotional state *(mood congruency)* in which we formed a memory can help us retrieve it. The *serial position effect* is our tendency to recall best the last items (which may still be in working memory) and the first items (which we've spent more time rehearsing) in a list.

Module 26: Forgetting, Memory Construction, and Improving Memory

26-1 Why do we forget?

Some people experience *anterograde amnesia,* an inability to form new memories, or *retrograde amnesia,* an inability to retrieve old memories. Normal forgetting can happen because we have never

encoded information (encoding failure); because the physical memory trace has decayed (storage decay); or because we cannot retrieve what we have encoded and stored (retrieval failure). Retrieval problems may result from *proactive* (forward-acting) *interference,* when prior learning interferes with recall of new information, or from *retroactive* (backward-acting) *interference,* when new learning disrupts recall of old information. Motivated forgetting occurs, but researchers have found little evidence of *repression.*

26-2 How do misinformation, imagination, and source amnesia influence our memory construction? How do we decide whether a memory is real or false?

Memories can be continually revised when retrieved, a process memory researchers call *reconsolidation. The misinformation effect* (exposure to misleading information) and imagination inflation may corrupt our stored memories of what actually happened. When we reassemble a memory during retrieval, we may attribute it to the wrong source *(source amnesia).* Source amnesia may help explain *déjà vu.* Since memory involves reconstruction as well as reproduction, and the misinformation effect and source amnesia occur outside our awareness, it is difficult to separate false memories from real ones.

26-3 Why have reports of repressed and recovered memories been so hotly debated?

The debate focuses on whether memories of early childhood abuse are repressed and can be recovered during therapy. Unless the victim was a child too young to remember, such traumas are usually remembered vividly, not repressed. Psychologists agree that childhood sexual abuse happens; injustice happens; forgetting happens; recovered memories are common; memories of events that happened before age 4 are unreliable; memories "recovered" under hypnosis are especially unreliable; and memories, whether real or false, can be emotionally upsetting.

26-4 How reliable are young children's eyewitness descriptions?

Children's eyewitness descriptions are subject to the same memory influences that distort adult reports, and suggestive interviewing techniques can lead to false memories. But if questioned by a carefully trained interviewer who asks nonleading questions — and especially if they have not spoken to involved adults prior to the interview — children can accurately recall events and people involved in them.

26-5 How can you use memory research findings to do better in this and other courses?

Memory research findings suggest the following strategies for improving memory: Rehearse repeatedly, make the material meaningful, activate retrieval cues, use mnemonic devices, minimize proactive and retroactive interference, sleep more, and

test yourself to be sure you can retrieve, as well as recognize, material.

Chapter 9 Thinking and Language (Modules 27–28)

Module 27: Thinking

27-1 What are *cognition* and *metacognition*, and what are the functions of concepts?

Cognition refers to all the mental activities associated with thinking, knowing, remembering, and communicating. *Metacognition* is cognition about our cognition or keeping track of and evaluating our mental processes. We use *concepts*, mental groupings of similar objects, events, ideas, or people, to simplify and order the world around us. We form most concepts around *prototypes* or best examples of a category.

27-2 What cognitive strategies assist our problem solving, and what obstacles hinder it?

An *algorithm* is a methodical, logical rule, or procedure (such as a step-by-step description for evacuating a building during a fire) that guarantees a solution to a problem. A *heuristic* is a simpler strategy—a mental shortcut (such as running for an exit if you smell smoke)—that is usually speedier than an algorithm but is also more error prone. *Insight* is not a strategy-based solution but rather a sudden flash of inspiration that solves a problem. Obstacles to problem

solving include *confirmation bias*, which predisposes us to verify rather than challenge our preconceptions, and *fixation*, which may prevent us from taking the fresh perspective that would lead to a solution.

27-3 What is *intuition*, and how can the representativeness and availability heuristics influence our decisions and judgments?

Intuition is the effortless, immediate, automatic feelings, or thoughts, we often use instead of systematic reasoning. Heuristics enable snap judgments. Using the *representativeness heuristic*, we judge the likelihood of events based on how well they seem to represent particular prototypes. Using the *availability heuristic*, we judge the likelihood of things based on how readily they come to mind.

27-4 What factors exaggerate our fear of unlikely events?

We tend to be afraid of what our ancestral history has prepared us to fear, what we cannot control, what is immediate, and what is most readily available in memory. We fear too little the ongoing threats that claim lives one by one, such as traffic accidents and diseases.

27-5 How are our decisions and judgments affected by overconfidence, belief perseverance, and framing?

Overconfidence can lead us to overestimate the accuracy of our beliefs. When a belief we have formed and explained has been

discredited, *belief perseverance* may cause us to cling to that belief. A remedy for belief perseverance is to consider how we might have explained an opposite result. *Framing* is the way an issue is posed. Subtle differences in presentation can dramatically alter our responses and *nudge* us toward particular decisions.

27-6 How do smart thinkers use intuition?

Smart thinkers welcome their intuitions (which are usually adaptive) but also know when to override them. When making complex decisions we may benefit from gathering as much information as possible and then taking time to let our two-track mind process it.

27-7 What is *creativity*, and what fosters it?

Creativity, the ability to produce novel and valuable ideas, is supported by a certain level of aptitude but is more than what intelligence tests reveal. Aptitude tests require *convergent thinking*, but creativity requires *divergent thinking.* Robert Sternberg has proposed that creativity involves expertise; imaginative thinking skills; a venturesome personality; intrinsic motivation; and a creative environment that sparks, supports, and refines creative ideas.

27-8 What do we know about thinking in other species?

Researchers make inferences about other species' consciousness and intelligence based on behavior and neural activity. Evidence

from studies of various species shows that many other animals use concepts, numbers, and tools and that they transmit learning from one generation to the next (cultural transmission). And, like humans, some other species show insight, self-awareness, altruism, cooperation, and grief.

Module 28: Language and Thought

28-1 What are the structural components of a language?

Phonemes are a *language's* basic units of sound. *Morphemes* are the elementary units of meaning. *Grammar*—the system of rules that enables us to communicate—includes semantics (rules for deriving meaning from sounds) and *syntax* (rules for ordering words into sentences).

28-2 How do we acquire language, and what did Chomsky mean by *universal grammar?*

As our biology and experience interact, we readily learn the specific grammar and vocabulary of the language we experience as children. Linguist Noam Chomsky has proposed that humans are born with a built-in predisposition to learn grammar rules, which he called universal grammar. Human languages do share some commonalities, but other researchers note that children learn grammar as they discern language patterns.

28-3 What are the milestones in language development, and when is the critical period for acquiring language?

Language development's timing varies, but all children follow the same sequence. Receptive language (the ability to understand what is said to or about you) develops before productive language (the ability to produce words). At about 4 months of age, infants *babble*, making sounds found in languages from all over the world, which by about 10 months includes only the sounds found in their household language. Around 12 months of age, children begin to speak in single words. This *one-word stage* evolves into *two-word* and other short, *telegraphic* utterances before their second birthday, after which they begin speaking in full sentences. Childhood is a critical period for learning language. Children who get a late start on language learning follow the usual developmental sequence, though at a faster pace. But children not exposed to either a spoken or a signed language until age 7 will never be able to fully comprehend or use any language. The importance of early language experiences is often evident in deaf children born to hearing-nonsigning parents.

28-4 What brain areas are involved in language processing and speech?

Aphasia is an impairment of language, usually caused by left-hemisphere damage. Two important language- and speech-processing areas are *Broca's area*, a region of the left frontal lobe that

controls language expression, and *Wernicke's area,* a region in the left temporal lobe that controls language reception. Language processing is spread across other brain areas as well, with different neural networks handling specific linguistic subtasks.

28-5 What is the relationship between thinking and language, and what is the value of thinking in images?

Although Benjamin Lee Whorf's *linguistic determinism* hypothesis suggested that language determines thought, it is more accurate to say that language influences thought *(linguistic relativism).* Different languages embody different ways of thinking, and bilingualism can enhance thinking. We often think in images when we use implicit (nondeclarative, procedural) memory. Thinking in images can increase our skills when we mentally practice an activity. Process simulation (focusing on the steps needed to reach a goal) is effective, but outcome simulation (fantasizing about having achieved the goal) does little.

28-6 What do we know about other species' capacity for language?

Chimpanzees and bonobos have learned to communicate with humans by signing or by pushing buttons. Some have developed vocabularies of nearly 400 words, communicated by stringing these words together, and have demonstrated some understanding of syntax. While only humans communicate in complex sentences, other animals' impressive abilities to think and communicate

challenge humans to consider what this means about the moral rights of other species.

Chapter 10 Intelligence (Modules 29–31)

Module 29: What Is Intelligence?

29-1 How do psychologists define *intelligence?*

Intelligence is the ability to learn from experience, solve problems, and use knowledge to adapt to new situations.

29-2 What are the arguments for *g?*

Charles Spearman proposed that we have one *general intelligence (g)* underlying all other specific mental abilities. Through his work with factor analysis, a statistical procedure that identifies clusters of related variables, he noted that those who score high in one area typically score higher than average in other areas.

29-3 How have the concepts of *fluid intelligence* and *crystallized intelligence,* and the *CHC theory,* affected our understanding of intelligence?

Raymond Cattell and John Horn formulated a theory of general ability based on two factors: *fluid intelligence (Gf)* and *crystallized intelligence (Gc).* The *Cattell-Horn-Carroll (CHC) theory* affirms a general intellectual ability factor, but also identifies more specific

abilities (such as reading and writing ability, memory capacity, and processing speed).

29-4 How do Gardner's and Sternberg's theories of multiple intelligences differ, and what criticisms have they faced?

Howard Gardner proposed eight relatively independent intelligences (linguistic, logical-mathematical, musical, spatial, bodily kinesthetic, intrapersonal, interpersonal, and naturalist), as well as a possible ninth (existential intelligence). The different intelligences of people with *savant syndrome* and certain kinds of brain damage seem to support this view. Robert Sternberg's triarchic theory proposes three intelligence areas that contribute to life success: analytical (academic problem solving), creative (innovative smarts), and practical (required for everyday tasks). Critics note that research has confirmed a general intelligence factor, which widely predicts performance. Highly successful people also tend to be conscientious and doggedly energetic; their achievements arise from both ability *and* deliberate practice.

29-5 What are the four components of emotional intelligence?

Emotional intelligence, which is an aspect of social intelligence, includes the abilities to perceive, understand, manage, and use emotions. Emotionally intelligent people tend to be happy, healthy, and more successful personally and professionally.

Module 30: Intelligence Assessment and Dynamics

30-1 What is an *intelligence test*, and how do *achievement tests* and *aptitude tests* differ?

An *intelligence test* assesses a person's mental aptitudes and compares them with those of others, using numerical scores. *Aptitude tests* measure the ability to learn, while *achievement tests* measure what has already been learned.

30-2 When and why were intelligence tests created, and how do today's tests differ from early intelligence tests?

Francis Galton, who was fascinated with measuring what he believed to be hereditary genius (so that those with exceptional abilities might be encouraged to reproduce), attempted but failed to construct a simple intelligence test in the late 1800s. Alfred Binet, who tended toward an environmental explanation of intelligence differences, started the modern intelligence-testing movement in France in the early 1900s, when he developed questions to help predict children's future progress in the Paris school system. Binet hoped his test, which measured children's *mental age*, would improve children's education; but he feared it might also be used to label children. During the early twentieth century, Lewis Terman of Stanford University revised Binet's work for use in the United States. Terman thought his *Stanford-Binet* could help guide people toward

appropriate opportunities, but his belief that intelligence was fixed at birth and differed among ethnic groups realized Binet's fear that intelligence tests would be used to limit children's opportunities. William Stern contributed the concept of the *IQ (intelligence quotient).* The most widely used intelligence tests today are the *Wechsler Adult Intelligence Scale (WAIS)* and Wechsler's tests for children. These tests differ from their predecessors by offering an overall intelligence score as well as scores for verbal comprehension, perceptual reasoning, working memory, and processing speed.

30-3 What is a *normal curve*, and what does it mean to say that a test has been *standardized* and is *reliable* and *valid?*

The distribution of test scores often forms a *normal* (bell-shaped) *curve* around the central average score, with fewer and fewer scores at the extremes. *Standardization* establishes a basis for meaningful score comparisons by giving a test to a representative sample of future test-takers. *Reliability* is the extent to which a test yields consistent results (on two halves of the test, on alternative forms of the test, or on retesting). *Validity* is the extent to which a test measures or predicts what it is supposed to. A test has *predictive validity* if it predicts a behavior it was designed to predict. (Aptitude tests have predictive validity if they can predict future achievements; their predictive power is best for the early school years.)

30-4 What are the traits of those at the low and high intelligence extremes?

People who score at the two extremes of the normal curve differ noticeably in intelligence test performance. An intelligence test score of or below 70 is one diagnostic factor in the diagnosis of intellectual developmental disorder; limited conceptual, social, and practical skills are other factors. People at the high intelligence extreme—such as those with IQ scores of over 135 whom Terman studied—tend to be healthy and well adjusted, as well as unusually successful academically. "Gifted" and "remedial" programs may create self-fulfilling prophecies, but can be effective when students are appropriately placed.

30-5 What are *cross-sectional studies* and *longitudinal studies*, and why is it important to know which method was used?

Cross-sectional studies, which study people of different ages at the same point in time, compare people of different eras and life circumstances. This can provide an excellent snapshot of a particular moment, but *longitudinal studies*—which follow and retest the same people over time—are superior for tracing the evolution of traits over a longer period. When studying intelligence, psychologists using the cross-sectional method concluded that mental ability declines with age, but those using the longitudinal method learned that it remains stable (or even increases).

30-6 How stable are intelligence test scores over the life span?

The stability of intelligence test scores increases with age. At age 4, scores begin to predict adolescent and adult scores. By age 11, scores are very stable and predictive.

30-7 How does aging affect crystallized intelligence *(Gc)* and fluid intelligence *(Gf)?*

The answers to age-and-intelligence questions depend on what we assess and how we assess it. Fluid intelligence *(Gf)* declines in older adults, who lose recall memory and processing speed; but accumulated knowledge, reflected in crystallized intelligence *(Gc)*, tends to increase with age.

Module 31: Genetic and Environmental Influences on Intelligence

31-1 What is *heritability*, and what do twin and adoption studies tell us about the nature and nurture of intelligence?

Heritability is the proportion of variation among individuals in a group that can be attributed to genes. Studies of twins, family members, and adoptive parents and siblings indicate a significant hereditary contribution to intelligence scores. Intelligence is polygenic.

31-2 How can environmental influences affect cognitive development?

Studies of children raised in impoverished environments with minimal social interaction indicate that life experiences significantly influence cognitive development. No evidence supports the idea that typical, healthy children can be molded into geniuses by growing up in an exceptionally enriched environment. Environments that foster a *growth mindset* do not alter intelligence, but can positively impact achievement.

31-3 How and why do the genders differ in mental ability scores?

Girls and boys have the same average intelligence test scores, but they tend to differ in some specific abilities. Girls, on average, are better spellers, more verbally fluent, better at reading and at locating objects, better at detecting emotions, and more sensitive to touch, taste, and color. Boys outperform girls at spatial ability and complex mathematics, though boys and girls hardly differ in math computation and overall math performance. Boys also outnumber girls at both the low and high extremes of mental abilities. Evolutionary and cultural explanations have been proposed for these gender differences.

31-4 How and why do racial and ethnic groups differ in mental ability scores?

Racial and ethnic groups differ in their average intelligence test scores. Evidence suggests that environmental differences are responsible for these group differences.

31-5 Are intelligence tests biased or unfair? What is *stereotype threat,* and how does it affect test-takers' performance?

The scientific meaning of bias hinges on a test's ability to predict future behavior for all test-takers, not just for some. In this sense, most experts consider the major U.S. aptitude tests unbiased. However, if we consider bias to mean that a test may be influenced by the test-taker's education and cultural experiences, then intelligence tests, by that definition, may be considered unfair. *Stereotype threat,* a self-confirming concern that we will be evaluated based on a negative stereotype, affects performance on all kinds of tests. Some research findings suggest effective strategies for reducing stereotype threat.

Chapter 11 What Drives Us: Hunger, Sex, Belongingness, and Achievement (Modules 32–35)

Module 32: Basic Motivational Concepts

32-1 How do psychologists define *motivation?* What are four key motivation theories?

Motivation is a need or desire that energizes and directs behavior. The *instinct*/evolutionary perspective explores genetic influences on complex behaviors. *Drive-reduction theory* explores how *physiological needs* create aroused, motivated states (drives) that direct us to satisfy those needs. Environmental *incentives* can intensify drives. Drive-reduction's goal is *homeostasis,* maintaining a steady internal state. Arousal theory proposes that some behaviors (such as those driven by curiosity) do not reduce physiological needs but rather are prompted by a search for an optimal level of arousal. The *Yerkes-Dodson law* describes the relationship between arousal and performance. Abraham Maslow's *hierarchy of needs* proposes a pyramid of human needs, from basic needs up to higher-level needs.

Module 33: Hunger

33-1 What physiological factors produce hunger?

Hunger pangs correspond to stomach contractions, but hunger also has other causes. Neural areas in the brain, some within the hippocampus and hypothalamus, monitor blood chemistry (including level of *glucose*) and incoming information about the body's state. Appetite hormones include ghrelin (secreted by an empty stomach), orexin (secreted by the hypothalamus), leptin (secreted by fat cells), and PYY (secreted by the digestive tract). *Basal metabolic rate* is the body's resting rate of energy expenditure. The body may have a *set point* (a biologically fixed tendency to maintain a given weight) or a looser settling point (also influenced by the environment).

33-2 What cultural and situational factors influence hunger?

Hunger reflects our memory of when we last ate and our expectation of when we should eat again. Humans as a species prefer certain tastes (such as sweet and salty), but our individual preferences are also influenced by conditioning, culture, and situation. Some taste preferences have survival value. Situational influences include the presence of others, serving size, the variety of foods offered, and the way food is presented.

33-3 How does obesity affect physical and psychological health? What factors are involved in weight management?

Obesity, defined by a body mass index (BMI) of 30 or above, is associated with increased depression (especially among women) and bullying, and with many physical health risks. Genes and environment interact to produce obesity. Storing fat was adaptive to our ancestors, and fat requires less food intake to maintain than it did to gain. Set point and metabolism matter. Twin and adoption studies indicate that body weight is also genetically influenced. Environmental influences include sleep loss, social influence, and food and activity levels. Those seeking healthier eating habits are advised to adopt a healthy attitude; exercise and get enough sleep; minimize exposure to unhealthy food cues; limit variety and eat healthy foods; reduce and relabel portions; time your intake to avoid nighttime eating and eat heavier meals earlier in the day; monitor your moods; eat unhurriedly; plan ahead before eating with others; allow for an occasional treat; chart and share your progress; and connect to a support group.

Module 34: Sexual Motivation

34-1 How do hormones influence human sexual motivation?

Our *sexuality* consists of feelings and behaviors that reflect both physiological and psychological influences. For all but those of us who are *asexual*, dating and mating often become a high priority from puberty on. The primary female sex hormones (the estrogens, such as estradiol) and male sex hormone (testosterone) influence human sexual behavior less directly than they influence sexual

behavior in other species. More than other female mammals, however, women's sexuality is responsive to their testosterone level. Testosterone level also varies in men, partly in response to stimulation.

34-2 What is the human *sexual response cycle*, and how do sexual dysfunctions and paraphilias differ?

William Masters and Virginia Johnson described four stages in the human *sexual response cycle:* excitement, plateau, orgasm, and resolution. During resolution there is a *refractory period* (briefer for women) in which renewed arousal and orgasm are impossible. *Sexual dysfunctions* are problems that consistently impair sexual arousal or functioning. They include *erectile disorder* and *female orgasmic disorder*, and can often be successfully treated by behaviorally oriented therapy or drug therapy. *Paraphilias* are considered disordered if a person experiences distress from an unusual sexual interest or if it entails harm or risk of harm.

34-3 How can sexually transmitted infections be prevented?

Safe-sex practices help prevent sexually transmitted infections (STIs). Condoms are especially effective in preventing transmission of HIV, the virus that causes *AIDS.* Knowing one's STI status, and telling one's sexual partner, is an important first step in STI prevention.

34-4 How do external and imagined stimuli contribute to sexual arousal?

External stimuli can trigger sexual arousal. Sexually explicit material may diminish relationship satisfaction, and extensive online pornography exposure may warp expectations and desensitize young adults to normal sexuality. Viewing sexually coercive material can lead to increased acceptance of violence toward women. Imagined stimuli (dreams and fantasies) also influence sexual arousal.

34-5 What factors influence teenagers' sexual behaviors and use of contraceptives?

Teen sexuality varies from culture to culture and era to era. Factors contributing to these variations include communication about sex and contraception, impulsivity, alcohol use, and mass media. High intelligence, religious engagement, father presence, comprehensive sex education, and service-learning participation predict teen sexual restraint.

34-6 What do we know about sexual orientation?

Sexual orientation is the direction of our sexual attraction, as reflected in our longings and fantasies. We may have sexual attraction that is female-male (heterosexual orientation), to our own sex (same-sex orientation), to males and females (bisexual orientation), or to no one at all (asexual orientation). Attitudes

toward same-sex attractions vary across cultures and over time. Regardless of whether a culture condemns or accepts same-sex unions, heterosexuality is most common, but same-sex attraction and other variations exist. The number of people who self-report as gay or bisexual has increased with increased social acceptance. Scientists have been unable to find specific environmental influences that contribute to sexual orientation. Evidence for biological influences includes same-sex attraction in other species, gay-straight trait and brain differences, genetic influences, and prenatal influences.

34-7 What role do social factors play in our sexuality?

Scientific research on sexual motivation does not attempt to define the personal meaning of sex in our lives, which is influenced by many social factors. Sex is a socially significant act. Sexual desire motivates people to form intimate, committed relationships, which in turn enable satisfying sex; sexual desire and love feed each other. Sex at its human best is life uniting and love renewing.

Module 35: Affiliation and Achievement

35-1 What evidence points to our human affiliation need — our need to belong?

Our *affiliation need*—to feel connected and identified with others—had survival value for our ancestors, which may explain why

humans in every society live in groups. According *to self-determination theory*, we strive to satisfy our needs for competence, autonomy, and relatedness. Social bonds help us to be healthier and happier, and feeling loved activates brain regions associated with reward and safety systems. *Ostracism* is the deliberate social exclusion of individuals or groups. Social isolation can put us at risk mentally and physically.

35-2 How does social networking influence us?

We connect with others through social networking, strengthening our relationships, meeting new friends or romantic partners, and finding support at difficult times. But increased online time displaces other activities, and social media leads people to compare their lives with others. Researchers are investigating possible connections between increasing screen time and a rise in teen mental health problems. When networking, people tend toward increased self-disclosure. People with high *narcissism* are especially active on social networking sites. Working out strategies for self-control and disciplined usage can help people maintain a healthy balance between their real-world and online time.

35-3 What is *achievement motivation*, and what are some ways to encourage achievement?

Achievement motivation is a desire for significant accomplishment, for mastery of skills or ideas, for control, and for attaining a high standard. High achievement motivation leads to greater success,

especially when combined with determined, persistent *grit.* Research shows that excessive rewards (driving *extrinsic motivation*) can undermine *intrinsic motivation.* To achieve our own goals, we can make a resolution; announce the goal; develop an implementation plan; create short-term rewards; monitor and record progress; create a supportive environment; and transform the behavior into a habit.

Chapter 12 Emotions, Stress, and Health (Modules 36–40)

Module 36: Introduction to Emotion

36-1 How do arousal, expressive behavior, and cognition interact in emotion?

Emotions are responses of the whole organism, involving bodily arousal, expressive behaviors, and conscious experience resulting from one's interpretations. Theories of emotion generally address two major questions: (1) Does physiological arousal come before or after emotional feelings? And (2) How do feeling and cognition interact? The *James-Lange theory* maintains that emotion occurs when we become aware of our body's response to emotion-inducing stimuli (we observe our heart pounding and feel fear). The *Cannon-Bard theory* proposes that our physiological response to an emotion-inducing stimulus occurs at the same time as our subjective experience of the emotion (one does not cause the other).

36-2 To experience emotions, must we consciously interpret and label them?

The Schachter-Singer *two-factor theory* holds that our emotions have two ingredients: physical arousal and a cognitive label. The cognitive labels we put on our states of arousal are an essential

ingredient of emotion. But Zajonc and LeDoux have contended that some simple emotional responses occur instantly, not only outside our conscious awareness, but before any cognitive processing occurs. This interplay between emotion and cognition illustrates our two-track mind. Lazarus agreed that some emotional responses do not require conscious thinking, but he asserted that appraisals can occur outside of conscious awareness and give rise to emotions.

36-3 What is the link between emotional arousal and the autonomic nervous system?

The arousal component of emotion is regulated by the autonomic nervous system's sympathetic (arousing) and parasympathetic (calming) divisions. In a crisis, the fight-or-flight response automatically mobilizes your body for action.

36-4 How do emotions activate different physiological and brain-pattern responses?

The large-scale body changes that accompany fear, anger, and sexual arousal are very similar (increased perspiration, breathing, and heart rate), though they feel different. Emotions may be similarly arousing, but some subtle physiological responses (such as facial muscle movements) distinguish them. More meaningful differences have been found in activity in some brain pathways and cortical areas.

36-5 How effective are polygraphs in using body states to detect lies?

Polygraphs (machines used in attempts to detect lies) measure several emotion-linked physiological changes, but are not accurate enough to justify widespread use in business and law enforcement. Using the Concealed Information Test may produce better indications of lying.

Module 37: Expressing Emotion

37-1 How do we communicate emotions nonverbally?

Much of our communication is through body movements, facial expressions, and vocal tones. Even seconds-long filmed slices of behavior can reveal feelings.

37-2 How do men and women differ in nonverbal communication?

Women tend to read emotional cues more easily and to be more empathic. They also show greater emotional responsiveness and expressiveness, especially for positive emotions.

37-3 How are gestures and facial expressions understood within and across cultures?

The meaning of gestures and some facial expressions varies by culture, but happy facial expressions are similarly understood all over the world. Context and culture can influence the interpretation

of facial expressions; cultural display rules also influence when we express emotions, which emotions we express, and the amount of emotion expressed.

37-4 How do our external facial expressions influence our internal feelings?

Research on the *facial feedback effect* shows that our facial expressions can trigger emotional feelings and signal our body to respond accordingly. We also mimic others' expressions, which helps us empathize. A similar *behavior feedback effect* is the tendency of behavior to influence our own and others' thoughts, feelings, and actions.

Module 38: Experiencing Emotion

38-1 What are some of the basic emotions?

Most emotion scientists agree that anger, fear, disgust, sadness, and happiness are basic human emotions. Carroll Izard's 10 basic emotions are joy, interest-excitement, surprise, sadness, anger, disgust, contempt, fear, shame, and guilt. Other researchers have identified as many as 28 emotions. Emotions are categorized along two dimensions: valence (positive versus negative) and arousal (low versus high).

38-2 What are the causes and consequences of anger?

Facing a threat or a challenge may trigger anger, and chronic hostility is linked to heart disease. Our culture can influence how we express anger. Emotional venting may be temporarily calming, but it does not reduce anger; expressing anger can make us angrier. Experts suggest reducing the level of physiological arousal of anger by waiting, finding a healthy distraction or support, and trying to move away from the situation mentally. Controlled assertions of feelings may resolve conflicts, and expressing grievances in ways that promote reconciliation can benefit a relationship.

38-3 What is happiness? Why does happiness matter?

Happiness means we have more positive feelings than negative feelings. Happy people tend to be healthy, energized, and have higher levels of *subjective well-being* (satisfaction with life). They also are more willing to help others (the *feel-good, do-good phenomenon*).

38-4 How do time, wealth, adaptation, and comparison affect our happiness levels?

With time, our positive and negative emotions tend to balance out—even over the course of the day. Even significantly bad events are usually not permanently depressing. Having enough money to assure comfort, security, and a sense of control predicts happiness; having more than enough does not increase it. Economic growth in many countries has produced rising inequality, which predicts unhappiness; in countries and states with greater inequality, people with lower incomes experience more ill health, social problems, and

mental disorders. Happiness is relative to our own experiences (the *adaptation-level phenomenon*) and to others' success (the *relative deprivation* principle).

38-5 What predicts happiness, and how can we be happier?

Some people, because of their genetic predispositions and personal histories, are happier than others. Cultures, which vary in the traits they value and the behaviors they expect and reward, also influence personal levels of happiness. Tips for increasing happiness levels: Take charge of your schedule, label your feelings, seek meaningful work and leisure, buy shared experiences rather than things, exercise, sleep enough, foster friendships, find meaning beyond the self, challenge negative thinking, take time to express and record your gratitude, nurture your spirituality, and take an "awe walk."

Module 39: Stress and Illness

39-1 How does our appraisal of an event affect our stress reaction, and what are the three main types of stressors?

Stress is the process by which we perceive and respond to stressors that we appraise as challenging or threatening. If we appraise an event as challenging, we will be aroused and focused in preparation for success; if we appraise it as a threat, we will experience a stress reaction, and our health may suffer. The three main types of stressors are catastrophes; significant life changes; and daily hassles, which include social stress. Daily hassles and social stress

may include inequality and prejudice, chronic workplace stress (which may lead to worker "burnout"), and the conflicts we face between our different *approach and avoidance motives.*

39-2 How do we respond and adapt to stress?

Walter Cannon viewed the stress response as a fight-or-flight system. Hans Selye proposed a general three-phase (alarm, resistance, exhaustion*) general adaptation syndrome (GAS).* People may react to stress by withdrawing. Others, especially women, may have a *tend-and-befriend* response.

39-3 How does stress make us more vulnerable to disease?

Psychoneuroimmunology is the study of how psychological, neural, and endocrine processes together affect our immune system and resulting health. Along with other factors such as age, nutrition, and genetics, stress can prompt the immune system either to overreact (causing an allergic reaction or autoimmune disease) or underreact (allowing an infection to flare or cancer cells to multiply). Stress diverts energy from the immune system, inhibiting the activities of its B and T lymphocytes, macrophages, and NK cells. Stress does not cause illness, but by altering our immune functioning it may make us more vulnerable to diseases and influence their progression.

39-4 Why are some of us more prone than others to coronary heart disease?

Coronary heart disease has been linked with the reactive, anger-prone *Type A* personality. Compared with relaxed, easygoing *Type B* personalities, Type A people's more active sympathetic nervous system may divert blood flow from the liver to the muscles, leaving excess cholesterol and fat circulating in the bloodstream for eventual deposit around the heart. Chronic stress also contributes to persistent inflammation, which is associated with heart and other health problems, including depression.

39-5 So, does stress *cause* illness?

Stress may not directly cause illness, but it does make us more vulnerable, by influencing our physiology and our behaviors.

Module 40: Health and Coping

40-1 In what two ways do people try to alleviate stress?

We use *problem-focused coping* to change the stressor or the way we interact with it. We use *emotion-focused coping* to avoid or ignore stressors and attend to emotional needs related to stress reactions.

40-2 How does a perceived lack of control affect health?

A perceived lack of *personal control* provokes a rise in stress hormones and blood pressure and a lowered immune response, which puts people's health at risk. Being unable to avoid repeated aversive events can lead to *learned helplessness.* Poverty entails less

control, which helps explain the link between economic status and longevity. People who perceive an *internal locus of control* achieve more, enjoy better health, and are happier than those who perceive an *external locus of control.* Belief in free will is linked to more helpful behavior, better learning, and superior persistence, performance, and satisfaction at work.

40-3 Why is self-control important, and can our self-control be depleted?

Self-control requires attention and energy, but predicts good health, higher income, and better school performance; it does better than an intelligence test score in predicting future academic and life success. Self-control tends to weaken after use, recover after rest, and grow stronger when exercised. Researchers disagree about whether self-control can be depleted, but strengthening self-control can lead to a healthier, happier, and more successful life.

40-4 How does an optimistic outlook affect health and longevity?

Studies of people with an optimistic outlook show that they are more likely than pessimists to have optimal health, to be successful, and to have a longer life expectancy.

40-5 How does controlling our feelings affect our well-being and health?

Emotion regulation refers to how we manage our emotions, including which emotions we allow ourselves to feel, when we feel them, and

how we express those emotions. Strategies for emotion regulation include: changing the situation (situation selection); changing how you think about a situation (cognitive reappraisal); and hiding or dampening your emotional expression (suppression).

40-6 How does social support promote good health?

Social support promotes health by calming us, improving our sleep, and reducing blood pressure, and it fosters stronger immune functioning. We can significantly reduce our stress and increase our health by building and maintaining relationships, and by confiding rather than suppressing painful feelings.

40-7 How effective is aerobic exercise as a way to manage stress and improve well-being?

Aerobic exercise helps fight heart disease, predicts longevity, and, in later life, is associated with better cognitive functioning. It boosts mood by promoting muscle relaxation and sounder sleep, triggering the production of neurotransmitters, fostering neurogenesis, and enhancing self-image. It increases arousal and can reduce or prevent depression and anxiety.

40-8 In what ways might relaxation and meditation influence stress and health?

Relaxation and meditation have been shown to lower stress, improve immune functioning, and lessen anxiety and depression. *Mindfulness meditation* is a reflective practice of attending to current

experiences in a nonjudgmental and accepting manner. Massage also promotes relaxation and reduces depression.

40-9 What is the *faith factor,* and what are some possible explanations for the link between faith and health?

The faith factor is the finding that religiously active people tend to live longer than those who are not religiously active do. Possible explanations may include intervening variables such as the healthy behaviors, social support, or positive emotions often found among people who regularly attend religious services.

Chapter 13 Social Psychology (Modules 41–44)

Module 41: Social Thinking

41-1 What do social psychologists study? How do we tend to explain others' behavior and our own?

Social psychologists use scientific methods to study how people think about, influence, and relate to one another. They study the social influences that explain why the same person will act differently in different situations. When explaining others' behavior, we may—especially if we come from an individualist Western culture—commit the *fundamental attribution error,* by underestimating the influence of the situation and overestimating the effects of stable, enduring traits. When explaining our own behavior, we more readily attribute it to the influence of the situation.

41-2 How do attitudes and actions interact?

Our *attitudes* and our actions influence one another. When other influences are minimal, attitudes that are stable, specific, and easily recalled can affect our actions. Actions can modify attitudes, as in the *foot-in-the-door phenomenon* and *role* playing. When our attitudes don't fit with our actions, *cognitive dissonance theory* suggests that we will reduce tension by changing our attitudes to match our actions.

41-3 How do *peripheral route persuasion* and *central route persuasion* differ?

Peripheral route persuasion uses attention-getting cues (such as celebrity endorsement) to trigger fast but relatively thoughtless judgments. *Central route persuasion* offers evidence and arguments to trigger thoughtful responses.

41-4 How can we share our views more effectively?

To persuade people with views that differ from your own, avoid yelling at, humiliating, or boring them with complicated or forgettable information. Instead, identify shared goals and relate your aim to their motives. It also helps to make your message vivid, to repeat it, and to engage others in restating it.

Module 42: Social Influence

42-1 How is social contagion a form of conformity, and how do conformity experiments reveal the power of social influence?

Social contagion (the chameleon effect)—our tendency to unconsciously imitate others' behavior, expressions, postures, voice tones, and moods—is a form of *conformity*. Social networks serve as contagious pathways for moods, both good and bad. Solomon Asch and others found that we are most likely to adjust our behavior or thinking to coincide with a group standard when we feel incompetent or insecure, our group has at least three people,

everyone else agrees, we admire the group's status and attractiveness, we have not already committed to another response, we know we are being observed, and our culture encourages respect for social standards. We may conform to gain approval *(normative social influence)* or because we are willing to accept others' opinions as new information *(informational social influence).*

42-2 What did Milgram's obedience experiments teach us about the power of social influence?

Stanley Milgram's experiments—in which people obeyed orders even when they thought they were harming another person—demonstrated that strong social influences can make ordinary people conform to falsehoods or capitulate to cruelty. Obedience was highest when the person giving orders was nearby and was perceived as a legitimate authority figure, the research was supported by a prestigious institution, the victim was depersonalized or at a distance, and there were no role models for defiance.

42-3 What do the social influence studies teach us about ourselves? How much power do we have as individuals?

These experiments have demonstrated that strong social influences can influence behavior. The power of the individual (personal control) and the power of the situation (social control) interact. Minority influence can also be powerful: A small minority that

consistently expresses its views may sway the majority, as may even a single committed individual.

42-4 How does the presence of others influence our actions, via social facilitation, social loafing, and deindividuation?

In *social facilitation,* the mere presence of others arouses us, improving our performance on easy or well-learned tasks but decreasing it on difficult ones. In *social loafing,* group work makes us feel less responsible, and we may free ride on others' efforts. When the presence of others both arouses us and makes us feel anonymous, we may experience *deindividuation*—loss of self-awareness and self-restraint.

42-5 How can group interaction enable group polarization?

In *group polarization,* group discussions with like-minded others strengthen members' prevailing beliefs and attitudes.

42-6 What role does the internet play in group polarization?

Internet communication magnifies the effect of connecting like-minded people, for better and for worse. People find support, which strengthens their ideas, but also often isolation from those with different opinions. Separation plus conversation may thus lead to group polarization.

42-7 How can group interaction enable groupthink?

Groupthink is driven by a desire for harmony within a decision-making group, overriding realistic appraisal of alternatives. Group leaders can harness the benefits of group interaction by assigning people to identify possible problems, and by welcoming various opinions and expert critique. Small but diverse groups, with varied backgrounds and perspectives, can enable superior outcomes.

Module 43: Antisocial Relations

43-1 What is *prejudice?* How do explicit and implicit prejudice differ?

Prejudice is an unjustifiable, usually negative attitude toward a group and its members. Prejudice's three components are beliefs (often *stereotypes*), emotions, and predispositions to action (*discrimination*). Prejudice may be explicit (overt), or it may be implicit—an unthinking knee-jerk response operating below conscious awareness. Implicit prejudice can cause discrimination even when people do not consciously intend to discriminate.

43-2 What groups tend to experience prejudice?

Prejudice involves explicit and implicit negative attitudes toward people of a particular racial or ethnic group, gender, or sexual orientation. In the United States, frequently targeted groups include Black Americans, women, and LGBTQ people.

43-3 What are some social, emotional, and cognitive roots of prejudice, and what are some ways to reduce prejudice?

The social roots of prejudice include social inequalities and divisions. Higher-status groups often justify their privileged position with the *just-world phenomenon.* We tend to favor our own group (*ingroup bias*) as we divide ourselves into "us" (the *ingroup*) and "them" (the *outgroup*). Prejudice can also be a tool for protecting our emotional well-being, as when we focus our anger by blaming events on a *scapegoat.* The cognitive roots of prejudice grow from our natural ways of processing information: forming categories, remembering vivid cases, and believing that the world is just (and that our own and our group's ways of doing things are the right ways). Monitoring our feelings and actions, as well as developing new friendships, can help us free ourselves from prejudice.

43-4 How does psychology's definition of *aggression* differ from everyday usage? What biological factors make us more prone to hurt one another?

In psychology's more specific meaning, *aggression* is any physical or verbal behavior intended to harm someone physically or emotionally. Biology influences our threshold for aggressive behaviors at three levels: genetic (inherited traits), neural (activity in key brain areas), and biochemical (such as alcohol or excess testosterone in the bloodstream). Aggression is a complex behavior resulting from the interaction of biology and experience.

43-5 What psychological and social-cultural factors may trigger aggressive behavior?

Frustration (the *frustration-aggression principle*), previous reinforcement for aggressive behavior, and observing aggressive role models all contribute to aggression. Media violence provides *social scripts* that children learn to follow. Viewing sexual violence contributes to greater aggression toward women. Playing violent video games can increase aggressive thoughts, emotions, and behaviors.

Module 44: Prosocial Relations

44-1 Why do we befriend or fall in love with some people but not others?

Proximity (geographical nearness) increases liking, in part because of the *mere exposure effect*—exposure to novel stimuli increases liking of those stimuli. Physical attractiveness increases social opportunities and improves the way we are perceived. Similarity of attitudes and interests greatly increases liking, especially as relationships develop. We also like those who like us.

44-2 How does romantic love typically change as time passes?

Intimate love relationships start with *passionate love*—an intensely aroused state. Over time, the strong affection of *companionate love*

may develop, especially if enhanced by an *equitable* relationship, intimate *self-disclosure,* and positive support.

44-3 What is *altruism?* When are people most — and least — likely to help?

Altruism is unselfish regard for the well-being of others. We are most likely to help when we notice an incident, interpret it as an emergency, and assume responsibility for helping. Other factors, including our mood and our similarity to the victim, also affect our willingness to help. We are least likely to help if other bystanders are present (the *bystander effect*).

44-4 How do social exchange theory and social norms explain helping behavior?

Social exchange theory is the view that we help others because it is in our own self-interest; in this view, the goal of social behavior is maximizing personal benefits and minimizing costs. Others believe that helping results from socialization, in which we are taught guidelines for expected behaviors in social situations, such as the *reciprocity norm* and the *social-responsibility norm.*

44-5 How do social traps and mirror-image perceptions fuel social conflict?

Social traps are situations in which people in *conflict* pursue their own individual self-interest, harming the collective well-being.

Individuals and cultures in conflict also tend to form *mirror-image perceptions:* Each party views itself as an ethical, peaceful victim, and the opponent as untrustworthy and evil-intentioned. Perceptions can become *self-fulfilling prophecies.*

44-6 What can we do to promote peace?

Peace can result when individuals or groups work together to achieve *superordinate* (shared) *goals.* Research indicates that contact, cooperation, communication, and conciliation—such as the Graduated and Reciprocated Initiatives in Tension-Reduction (*GRIT*) strategy—help promote peace.

Chapter 14 Personality (Modules 45–47)

Module 45: Introduction to Personality and Psychodynamic Theories

45-1 What is *personality*, and what theories inform our understanding of personality?

Personality is an individual's characteristic pattern of thinking, feeling, and acting. Psychoanalytic (and later psychodynamic) theory and humanistic theory have become part of Western culture. They also laid the foundation for later theories, such as trait and social-cognitive theories of personality.

45-2 How did Freud's treatment of psychological disorders lead to his view of the unconscious mind?

Psychodynamic theories of personality view behavior as a dynamic interaction between the conscious and unconscious mind. These theories trace their origin to Sigmund Freud's theory of *psychoanalysis.* In treating patients whose disorders had no clear physical explanation, Freud concluded that these problems reflected unacceptable thoughts and feelings, hidden away in the *unconscious*

mind. To explore this hidden part of a patient's mind, Freud used *free association* and dream analysis.

45-3 What was Freud's view of personality?

Freud believed that personality results from conflict arising from the interaction among the mind's three systems: the *id* (pleasure-seeking impulses), *ego* (reality-oriented executive), and *superego* (internalized set of ideals, or conscience).

45-4 What developmental stages did Freud propose?

He believed children pass through five *psychosexual stages* (oral, anal, phallic, latency, and genital). He proposed that boys develop the *Oedipus complex* during the phallic stage, but then gradually incorporate their father's values into their superegos in a process called *identification.* According to this view, unresolved conflicts at any stage can leave a person's pleasure-seeking impulses *fixated* (stalled) at that stage.

45-5 How did Freud think people defended themselves against anxiety?

For Freud, anxiety was the product of tensions between the demands of the id and superego. The ego copes by using unconscious *defense mechanisms,* such as *repression,* which he viewed as the basic mechanism underlying and enabling all the others.

45-6 Which of Freud's ideas did his followers accept or reject?

Freud's early followers, the neo-Freudians, accepted many of his ideas. They differed in placing more emphasis on the conscious mind and in stressing social motives more than sex or aggression. Most contemporary psychodynamic theorists and therapists reject Freud's emphasis on sexual motivation. They stress, with support from modern research findings, that much of our mental life is unconscious, and they believe that our childhood experiences influence our adult personality and attachment patterns. Many also believe that our species' shared evolutionary history shaped some universal predispositions.

45-7 How do contemporary psychologists view Freud's psychoanalysis?

Freud is credited with drawing attention to the unconscious and the irrational, the importance of human sexuality and the conflict between biological impulses and social restraints, and for formulating some science-backed defense mechanisms. But his concept of repression, and his view of the unconscious as a collection of repressed and unacceptable thoughts, wishes, feelings, and memories, cannot survive scientific scrutiny. Freud offered after-the-fact explanations, which are hard to test scientifically. Research does not support many of Freud's specific ideas, such as the view that development (which we now know is lifelong) is fixed in childhood.

45-8 How has modern research developed our understanding of the unconscious?

Research confirms that we do not have full access to all that goes on in our mind, though today's science views the unconscious as a separate and parallel track of information processing that occurs outside our awareness. This processing includes schemas that control our perceptions, priming, implicit memories of learned skills, instantly activated emotions, and the implicit prejudice and stereotypes that filter our information processing of others' traits and characteristics. Research also supports reaction formation and projection (the false consensus effect), and the idea that we unconsciously defend ourselves from anxiety (as seen in experiments testing *terror-management theory*).

45-9 What are *projective tests,* how are they used, and what are some criticisms of them?

Projective tests show people stimuli that are open to many possible interpretations, treating their answers as revelations of inner dynamics. The *Thematic Apperception Test (TAT)* and the *Rorschach inkblot test* are two such tests. The TAT provides a valid and reliable map of people's implicit motives that is consistent over time. The Rorschach has low reliability and validity, but some clinicians value it as a source of suggestive leads, an icebreaker, or a revealing interview technique.

Module 46: Humanistic Theories and

Trait Theories

46-1 How did humanistic psychologists view personality, and what was their goal in studying personality?

The *humanistic* psychologists' view of personality focused on the potential for healthy personal growth and people's striving for self-determination and self-realization. Abraham Maslow proposed that human motivations form a *hierarchy of needs;* if basic needs are fulfilled, people will strive toward *self-actualization* and *self-transcendence.* Carl Rogers believed that the ingredients of a growth-promoting environment are acceptance (including *unconditional positive regard*), genuineness, and empathy. *Self-concept* was a central feature of personality for both Maslow and Rogers.

46-2 How did humanistic psychologists assess a person's sense of self?

Some rejected any standardized assessments and relied on interviews and conversations. Others, like Rogers, sometimes used questionnaires in which people described their ideal and actual selves; these were later used to judge progress during therapy. Some now use the life story approach, enabling a rich narrative detailing each person's unique life history.

46-3 How have humanistic theories influenced psychology? What criticisms have they faced?

Humanistic psychology has had pervasive cultural impact; it also laid the groundwork for today's scientific subfield of positive psychology. Critics have said that humanistic psychology's concepts are vague and subjective, its values self-centered, and its assumptions naively optimistic.

46-4 How do psychologists use traits to describe personality?

Trait theorists see personality as a stable and enduring pattern of behavior. They have been more interested in trying to describe our differences than in explaining them. Using factor analysis, they identify clusters of behavior tendencies that occur together. Genetic predispositions influence many traits.

46-5 What are some common misunderstandings about introversion?

Western cultures prize extraversion, but introverts have different, equally important skills. Introversion does not equal shyness, and introverted leaders outperform extraverts in some contexts. Introverts handle conflict well, seeking solitude rather than revenge.

46-6 What are *personality inventories,* and what are their strengths and weaknesses as trait-assessment tools?

Personality inventories (such as the *MMPI*) are questionnaires on which people respond (*self-report)* to items designed to gauge a wide range of feelings and behaviors. Test items are *empirically derived,*

and the tests are objectively scored. Objectivity does not guarantee validity; people can fake their answers to create a good impression (but may then score high on a lie scale that assesses faking).

46-7 Which traits seem to provide the most useful information about personality variation?

The *Big Five* personality factors—openness, conscientiousness, extraversion, agreeableness, and neuroticism (OCEAN)—currently offer our best approximation of the basic trait dimensions. These factors are generally stable and describe people in various cultures reasonably well. Many genes, each having small effects, combine to influence our traits.

46-8 Does research support the consistency of personality traits over time and across situations?

A person's average traits persist over time and are predictable over many different situations. But traits cannot predict behavior in any one situation.

Module 47: Social-Cognitive Theories and the Self

47-1 How do social-cognitive theorists view personality development, and how do they explore behavior?

Albert Bandura's *social-cognitive perspective* emphasizes the interaction of our traits with our situations. Social-cognitive researchers apply principles of learning, cognition, and social behavior to personality. *Reciprocal determinism* describes the interaction and mutual influence of behavior, internal cognition, and environment. Assessment situations involving simulated conditions exploit the principle that the best predictor of future behavior is a person's actions in similar situations.

47-2 What criticisms have social-cognitive theories faced?

Social-cognitive theories build on well-established concepts of learning and cognition, sensitizing researchers to the ways situations affect, and are affected by, individuals. They have been faulted for underemphasizing the importance of unconscious motives, emotions, and biologically influenced traits.

47-3 Why has psychology generated so much research on the self?

The *self* is vigorously researched as the center of personality, organizing our thoughts, feelings, and actions. Considering possible selves helps motivate us toward positive development, but focusing too intensely on ourselves can lead to the *spotlight effect.*

47-4 How important is self-esteem to our well-being?

High *self-esteem* and *self-efficacy* correlate with benefits such as higher school achievement and with being able to meet challenges.

But the direction of the correlation is unclear. Rather than unrealistically promoting self-worth, it's better to reward achievements, thus promoting feelings of competence.

47-5 How do excessive optimism, blindness to one's own incompetence, and self-serving bias reveal the costs of self-esteem, and how do defensive and secure self-esteem differ?

Excessive optimism can lead to complacency and prevent us from seeing real risks, while blindness to one's own incompetence may lead us to make the same mistakes repeatedly. People are often most overconfident when they are most incompetent, a phenomenon known as the Dunning-Kruger effect. Asking others for a candid assessment can help us to counter the self-serving bias that would otherwise lead us to overestimate our own skills. *Self-serving bias* is our tendency to perceive ourselves favorably, as when viewing ourselves as better than average or when accepting credit for our successes but not blame for our failures. Excessive self-love leads to *narcissism.* Defensive self-esteem is fragile, focuses on sustaining itself, and views failure or criticism as a threat. Secure self-esteem enables us to feel accepted for who we are.

Chapter 15 Psychological Disorders (Modules 48–53)

Module 48: Introduction to Psychological Disorders

48-1 How should we draw the line between typical behavior and a disorder?

According to psychologists and psychiatrists, *psychological disorders* are marked by a clinically significant disturbance in an individual's cognition, emotion regulation, or behavior. Such dysfunctional or maladaptive thoughts, emotions, or behaviors—which are often accompanied by distress—interfere with daily life, and thus are disordered.

48-2 How do the medical model and the biopsychosocial approach influence our understanding of psychological disorders?

The *medical model* assumes that psychological disorders have physical causes that can be diagnosed, treated, and often cured through therapy, sometimes in a hospital. The biopsychosocial perspective assumes that disordered behavior comes from the interaction of biological characteristics, psychological dynamics, and social-cultural circumstances. This approach has given rise to the vulnerability-stress model, in which individual characteristics

and environmental stressors combine to increase or decrease the likelihood of developing a psychological disorder, a model supported by *epigenetics* research.

48-3 How and why do clinicians classify psychological disorders, and why do some psychologists criticize diagnostic labels?

The American Psychiatric Association's DSM-5-TR (*Diagnostic and Statistical Manual of Mental Disorders,* Fifth Edition, Text Revision) contains diagnostic labels and descriptions that provide a common language and shared concepts for communication and research. Critics of the DSM say it casts too wide a net, pathologizing typical behaviors. A complementary approach to classification is the U.S. National Institute of Mental Health's Research Domain Criteria (RDoC) project, a framework that organizes disorders according to behaviors and brain activity along several dimensions. The Hierarchical Taxonomy of Psychopathology (HiTOP) is another approach that emphasizes the different numbers of people's symptoms and the connections between disorders. Any classification attempt produces diagnostic labels that may create preconceptions, which bias perceptions of the labeled person's past and present behavior.

48-4 What factors increase the risk of suicide, and what do we know about nonsuicidal self-injury?

Suicide rates differ by nation, race, gender, age group, income, religious involvement, marital status, and other factors. In most

countries, suicide rates have been decreasing, but in the United States and Canada they have been increasing. Those lacking social support, such as many gay, transgender, and gender nonconforming youth, are at increased risk, as are people who have been anxious or depressed. Isolation and unemployment can also heighten risk. Forewarnings of suicide may include verbal hints, giving away possessions, social withdrawal, and preoccupation with death. People who talk about suicide should be taken seriously: Listen and empathize, connect them to help, and protect those who appear at immediate risk. Nonsuicidal self-injury (NSSI) does not usually lead to suicide but may escalate to suicidal thoughts and acts if untreated. People who engage in NSSI do not tolerate stress well and tend to be self-critical and impulsive.

48-5 Do psychological disorders predict violent behavior?

Mental disorders seldom lead to violence, and clinicians cannot predict who is likely to harm others. Most people with disorders are nonviolent and are more likely to be victims than attackers. Better predictors of violence are alcohol or drug use, previous violence, gun availability, and brain damage.

48-6 How many people have, or have had, a psychological disorder? What are some of the risk factors?

Psychological disorder rates vary, depending on the time and place of the survey. Poverty is a risk factor. But some disorders, such as schizophrenia, can also drive people into poverty. Immigrants to the

United States may average better mental health than their U.S.-born counterparts with the same ethnic heritage (a phenomenon known as the immigrant paradox).

Module 49: Anxiety Disorders, Obsessive-Compulsive and Related Disorders, Trauma- and Stressor-Related Disorders, and Somatic Symptom and Related Disorders

49-1 How do generalized anxiety disorder, panic disorder, and specific phobias differ?

Anxiety disorders are psychological disorders characterized by distressing, persistent anxiety or maladaptive behaviors that reduce anxiety. People with *generalized anxiety disorder* feel persistently and uncontrollably tense and apprehensive, for no apparent reason. In the more extreme *panic disorder,* anxiety escalates into episodes of intense dread. Those with a *specific phobia* show an intense and irrational fear of a particular object, activity, or situation.

49-2 What is *OCD?*

Persistent and repetitive thoughts (obsessions), actions (compulsions), or both characterize *obsessive-compulsive disorder (OCD).*

49-3 What is *PTSD?*

Symptoms of *posttraumatic stress disorder (PTSD)* include 4 or more weeks of haunting memories, nightmares, hypervigilance, avoidance of trauma-related stimuli, social withdrawal, jumpy anxiety, numbness of feeling, and/or sleep problems following a traumatic event.

49-4 What is a *somatic symptom disorder?*

People who experience bodily symptoms without any apparent physical cause may be experiencing *somatic symptom disorder*. Those with *illness anxiety disorder* (previously known as hypochondriasis) interpret normal physical sensations as symptoms of a disease.

49-5 How do learning, cognition, and biology contribute to the feelings and thoughts that mark anxiety disorders, OCD, PTSD, and somatic symptom disorders?

The learning perspective views these disorders as products of fear conditioning, stimulus generalization, fearful-behavior reinforcement, and observational learning of others' fears and cognitions. The cognitive perspective focuses on the effects of our thoughts, memories, interpretations, and expectations in what we learn to fear. The biological perspective considers genetic predispositions, brain overarousal, and the role that fears of life-threatening dangers played in natural selection and evolution.

Module 50: Depressive Disorders and Bipolar Disorders

50-1 How do depressive disorders and bipolar disorders differ?

Depressive disorders are characterized by an enduring sad, empty, or irritable mood, along with physical and cognitive changes that affect a person's ability to function. A person with *major depressive disorder* experiences at least five symptoms of depression (including either depressed mood or loss of interest or pleasure) for 2 or more weeks. A person with a *bipolar disorder* experiences not only depression but also *mania*—episodes of hyperactive and wildly optimistic, impulsive behavior.

50-2 How can the biological and social-cognitive perspectives help us understand depressive disorders and bipolar disorders?

The biological perspective on depressive disorders and bipolar disorders focuses on genetic predispositions, unusual brain structure and activity (including activity within neurotransmitter systems), and nutritional effects. The social-cognitive perspective views depression as an ongoing cycle of stressful experiences—interpreted through negative beliefs, attributions, and memories, often with relentless *rumination*—leading to negative moods, thoughts, and actions, thereby fueling new stressful experiences.

Module 51: Schizophrenia

51-1 What patterns of perceiving, thinking, and feeling characterize schizophrenia?

Schizophrenia is a *psychotic disorder* characterized by *delusions,* hallucinations, disorganized speech, and/or diminished, inappropriate emotional expression. Hallucinations are sensory experiences without sensory stimulation; delusions are false beliefs. Schizophrenia symptoms may be positive (the presence of inappropriate behaviors) or negative (the absence of appropriate behaviors).

51-2 How do *chronic schizophrenia* and *acute schizophrenia* differ?

Schizophrenia typically strikes during late adolescence or early adulthood, affects slightly more men than women, and occurs in all cultures. In *chronic* (or process) *schizophrenia,* development of symptoms is gradual and recovery is doubtful. In *acute* (or reactive) *schizophrenia,* onset is sudden, in reaction to stress, and prospects for recovery are brighter.

51-3 What brain abnormalities are associated with schizophrenia?

People with schizophrenia have an excess number of dopamine receptors, which may intensify brain signals, creating positive symptoms such as hallucinations and paranoia. Brain scans have revealed abnormal activity in the frontal lobes, thalamus, and

amygdala, as well as a loss of neural connections across the brain network. Brain abnormalities associated with schizophrenia include enlarged, fluid-filled areas and corresponding shrinkage and thinning of cerebral tissue. Smaller-than-normal areas may include the cortex, the hippocampus, the corpus callosum, and the thalamus.

51-4 What prenatal events are associated with increased risk of developing schizophrenia?

Possible contributing factors include maternal diabetes; older paternal age; viral infections, famine conditions, or extreme maternal stress during pregnancy; and low weight or oxygen deprivation at birth.

51-5 How do genes influence schizophrenia? What factors may be early warning signs of schizophrenia in children?

Twin and adoption studies indicate that the predisposition to schizophrenia is inherited. Multiple genes probably interact to produce schizophrenia. No environmental causes invariably produce schizophrenia, but environmental events (such as prenatal viruses or maternal stress) may "turn on" genes in those who are predisposed to this disorder. Possible early warning signs of schizophrenia include social withdrawal; a mother with severe and long-lasting schizophrenia; birth complications; short attention span; poor muscle coordination; emotional unpredictability; poor

peer relations and solo play; separation from parents; and childhood abuse.

Module 52: Dissociative, Personality, and Eating Disorders

52-1 What are *dissociative disorders,* and why are they controversial?

Dissociative disorders are controversial, rare disorders characterized by a disruption of or discontinuity in the normal integration of consciousness, memory, identity, emotion, perception, body representation, motor control, and behavior. Skeptics note that diagnoses of *dissociative identity disorder (DID)* increased dramatically in the late twentieth century, is rarely found outside North America, and may reflect role playing by people vulnerable to therapists' suggestions. Others view DID as a manifestation of feelings of anxiety, or as a response learned when behaviors are reinforced by anxiety reduction.

52-2 What are the three clusters of personality disorders? What behaviors and brain activity characterize antisocial personality disorder?

Personality disorders are characterized by enduring inner experiences or behavior patterns that differ from someone's cultural norms and expectations, are pervasive and inflexible, begin in adolescence or

early adulthood, are stable over time, and cause distress or impairment. The 10 DSM-5-TR disorders tend to form three clusters, characterized by eccentric or odd behaviors (Cluster A); dramatic, emotional, or erratic behaviors (Cluster B); and anxious or fearful behaviors (Cluster C). *Antisocial personality disorder* (one of those in Cluster B) is characterized by a lack of conscience and, sometimes, by aggressive and fearless behavior. The amygdala is smaller, the brain cortex is smaller and thinner, and the frontal lobes are less active in people with this disorder, leading to impaired frontal lobe cognitive functions and decreased responsiveness to others' distress. Genetic predispositions may interact with the environment to produce these characteristics.

52-3 What are the three main eating disorders, and how do biological, psychological, and social-cultural influences make some people more vulnerable to them?

In those with eating disorders, psychological factors overwhelm the body's tendency to maintain a healthy weight. Regardless of their actual weight, people with *anorexia nervosa* (usually adolescent girls) maintain a starvation diet, sometimes exercise excessively, and have an inaccurate self-perception. Those with *bulimia nervosa* binge and then compensate by purging, fasting, or excessively exercising. Bulimia is marked by weight fluctuations within or above typical ranges. Those with *binge-eating disorder* are preoccupied with food and engage in significant bouts of bingeing, but they do not follow binges with purging, fasting, or exercising. Cultural pressures, low

self-esteem, and negative emotions interact with stressful life experiences and genetics to produce eating disorders.

Module 53: Neurodevelopmental Disorders

53-1 What is *intellectual developmental disorder?*

Intellectual developmental disorder is marked by limited mental ability, which is indicated by an intelligence score of 70 or below and difficulty adapting to the demands of life in three skill areas: conceptual, social, and practical.

53-2 What is *autism spectrum disorder?*

Autism spectrum disorder (ASD) is a cognitive and social-emotional disorder that appears in childhood and is marked by limitations in communication and social interaction, as well as rigidly fixated interests and repetitive behaviors.

53-3 Why is there controversy over attention-deficit/hyperactivity disorder*?*

A child (or, less commonly, an adult) who displays extreme inattention and/or hyperactivity and impulsivity may be diagnosed with *attention-deficit/hyperactivity disorder (ADHD).* Controversies center on whether the growing number of ADHD cases reflects

overdiagnosis or increased awareness of the disorder, and on the long-term effects of stimulant-drug treatment.

Chapter 16 Therapy (Modules 54–56)

Module 54: Introduction to Therapy and the Psychological Therapies

54-1 How do *psychotherapy* and the *biomedical therapies* differ?

Psychotherapy is treatment involving psychological techniques that consists of interactions between a trained therapist and someone seeking to overcome psychological difficulties or achieve personal growth. The major psychotherapies derive from psychology's psychodynamic, humanistic, behavioral, and cognitive perspectives, with many psychotherapists taking an *eclectic approach* that blends therapies. *Biomedical therapy* treats psychological disorders with medications or procedures that act directly on a person's physiology.

54-2 What are the goals and techniques of psychoanalysis, and how have they been adapted in psychodynamic therapy?

Through *psychoanalysis,* Sigmund Freud tried to give people self-insight and relief from their disorders by bringing anxiety-laden feelings and thoughts into conscious awareness. Psychoanalytic techniques included using free association and *interpretation* of instances of *resistance* and *transference. Psychodynamic therapy* has

been influenced by traditional psychoanalysis but differs from it in many ways, including little attention to the concepts of id, ego, and superego. This contemporary therapy is briefer, less expensive, and more focused on helping the client find relief from current symptoms. Psychodynamic therapists help clients understand how past relationships create themes that may be acted out in present relationships.

54-3 What are the basic themes of humanistic therapy? What are the goals and techniques of Rogers' person-centered approach?

Both psychodynamic and humanistic therapies are *insight therapies*—they attempt to improve functioning by increasing people's awareness of motives and defenses. Humanistic therapy's goals include helping people grow in self-awareness and self-acceptance; promoting personal growth rather than curing illness; helping people take responsibility for their own growth; focusing on conscious thoughts rather than unconscious motivations; and seeing the present and future as more important than the past. Carl Rogers' *person-centered therapy* proposed that therapists' most important contribution is to function as a psychological mirror through *active listening* and to provide a growth-fostering environment of *unconditional positive regard.*

54-4 How does the basic assumption of behavior therapy differ from the assumptions of psychodynamic and humanistic

therapies? What classical conditioning techniques are used in exposure therapies and aversive conditioning?

Behavior therapies are not insight therapies, and instead assume that problem behaviors *are* the problem. Their goal is to apply learning principles to modify these problem behaviors. Classical conditioning techniques, including *exposure therapies* (such as *systematic desensitization* or *virtual reality exposure therapy*) and *aversive conditioning,* attempt to change behaviors through *counterconditioning*—evoking new responses to old stimuli that trigger unwanted behaviors.

54-5 What is the main premise of behavior therapy based on operant conditioning principles, and what are the views of its proponents and critics?

Operant conditioning operates under the premise that voluntary behaviors are strongly influenced by their consequences. Therapy based on operant conditioning principles therefore uses behavior modification techniques to change unwanted behaviors by positively reinforcing desired behaviors and ignoring or punishing undesirable behaviors. Critics maintain that (1) techniques such as those used in *token economies* may produce behavior changes that disappear when rewards end, and (2) deciding which behaviors should change is authoritarian and unethical. Proponents argue that treatment with positive rewards is more humane than institutionalizing people for undesired behaviors.

54-6 What are the goals and techniques of the cognitive therapies and of cognitive-behavioral therapy?

The *cognitive therapies,* such as Aaron Beck's cognitive therapy for depression, assume that our thinking colors our feelings, and that the therapist's role is to change clients' self-defeating thinking by training them to perceive and interpret events in more constructive ways. The widely researched and practiced *cognitive-behavioral therapy (CBT)* combines cognitive therapy and behavior therapy by helping clients regularly try out their new ways of thinking and behaving in their everyday life. Dialectical behavior therapy (DBT) combines cognitive tactics for tolerating distress and regulating emotions with social skills training and mindfulness meditation. Acceptance and commitment therapy (ACT) helps clients learn to accept their feelings and act in ways that reflect their life values.

54-7 What are the aims and benefits of group therapy, couples therapy, and family therapy?

Group therapy sessions can help more people with less cost than individual therapy. Clients may benefit in person or online from exploring feelings and developing social skills in a group situation, from learning that others have similar problems, and from getting feedback on new ways of behaving. *Couples therapy* focuses on how romantic partners can improve their interactions, which can increase emotional intimacy, healthy communication, and relationship satisfaction. *Family therapy* aims to help family

members discover the roles they play within the family's interactive social system, improve communication, and learn new ways to prevent or resolve conflicts.

Module 55: Evaluating Psychotherapies

55-1 Does psychotherapy work? How can we know?

Clients' and therapists' positive testimonials cannot prove that psychotherapy is effective, and the placebo effect and *confirmation bias* make it difficult to judge whether improvement occurred because of the treatment. Using *meta-analyses* to statistically combine the results of hundreds of randomized psychotherapy outcome studies, researchers have found that those not undergoing treatment often improve, but those undergoing psychotherapy are more likely to improve—and to improve more quickly and with less risk of relapse.

55-2 Are some psychotherapies more effective than others for specific disorders?

No one type of psychotherapy is generally superior to all others. Therapy is most effective for those with clear-cut, specific problems. Some therapies—such as behavior conditioning for treating specific phobias and compulsions—are more effective for particular disorders. Cognitive and cognitive-behavioral therapies have been

effective in coping with anxiety, panic disorder, posttraumatic stress disorder, insomnia, and depression; behavioral conditioning therapies with specific behavior problems; psychodynamic therapy for depression and anxiety; and nondirective (client-centered) counseling for mild to moderate depression. Abnormal states tend to return to normal on their own, and the placebo effect can create the impression that a treatment has been effective. *Evidence-based practice* integrates the best available research with clinicians' expertise and clients' culture, values, personality, identity, and circumstances.

55-3 What three elements are shared by all effective forms of psychotherapy?

All effective psychotherapies offer new hope for demoralized people; a fresh perspective; and (if the therapist is effective) an empathic, trusting, and caring relationship. The emotional bond of trust and understanding between therapist and client—the *therapeutic alliance*—is an important element in effective therapy.

55-4 What personal factors influence the therapist-client relationship?

Therapists differ in the values that influence their goals in therapy and their views of progress. They may also differ from their clients. These differences may create problems if therapists and clients differ in their cultural, religious, or personal values and perspectives.

55-5 When should people seek therapy, and what should they look for when selecting a therapist?

Campus health centers are generally good starting points for counseling options, and they may offer some free services. A person seeking therapy may want to ask about the therapist's treatment approach, values, credentials, and fees. An important consideration is whether the therapy seeker feels comfortable and able to establish a bond with the therapist. Recognizing the importance of a strong therapeutic alliance, the American Psychological Association accredits programs that provide training in cultural sensitivity and that recruit underrepresented cultural groups.

55-6 What ethical principles guide psychotherapy and psychological research on mental illness?

Psychotherapists and psychological researchers on mental health must follow their country's ethical principles and code of conduct, aiming to benefit others, to be honest and truthful, and to never expose people to greater risks than would be encountered in everyday life.

Module 56: The Biomedical Therapies and Preventing Psychological Disorders

56-1 Why is therapeutic lifestyle change considered an effective biomedical therapy, and how does it work?

Therapeutic lifestyle change is considered a biomedical therapy because it influences the way the brain responds. Mind and body are a unit; affect one and you will affect the other. Our exercise, nutrition, relationships, recreation, service to others, relaxation, and religious or spiritual engagement affect our mental health. People who undergo a program of aerobic exercise, adequate sleep, light exposure, social engagement, rumination reduction, and better nutrition have gained relief from depressive symptoms.

56-2 What are the drug therapies? How do double-blind studies help researchers evaluate a drug's effectiveness?

Psychopharmacology has helped make drug therapy the most widely used biomedical therapy. *Antipsychotic drugs* are used in treating schizophrenia; some block dopamine activity. Side effects may include tardive dyskinesia (involuntary movements of facial muscles, tongue, and limbs) or increased risk of obesity and diabetes. *Antianxiety drugs,* which depress central nervous system activity, are used to treat anxiety disorders, obsessive-compulsive disorder, and posttraumatic stress disorder, and can be addictive.

Antidepressant drugs, which often increase the availability of serotonin and norepinephrine, are used to treat depression, anxiety disorders, obsessive-compulsive and related disorders, and posttraumatic stress disorder. Given their use in treating disorders other than depressive ones (from anxiety to strokes), these drugs are more often called SSRIs (selective serotonin reuptake inhibitors) rather than antidepressants. Quicker-acting antidepressants may include ketamine and microdoses of psychedelic drugs such as psilocybin. Lithium and Depakote are mood stabilizers prescribed for those with a bipolar disorder. Studies may use a double-blind procedure to avoid the placebo effect and researcher bias.

56-3 How are brain stimulation and psychosurgery used in treating specific disorders?

Electroconvulsive therapy (ECT), in which a brief electric current is sent through the brain of an anesthetized patient, is an effective treatment for severe depression in people who have not responded to other therapy. Newer alternative treatments for depression include transcranial direct current stimulation (tDCS), *transcranial magnetic stimulation (TMS),* and deep-brain stimulation (DBS; may calm an overactive brain region linked with negative emotions in some patients). *Psychosurgery* removes or destroys brain tissue in hopes of modifying behavior. Radical psychosurgical procedures such as *lobotomy* are no longer performed. Today's microscale psychosurgery and MRI-guided precision brain surgery are rare, last-resort treatments because the effects are irreversible.

56-4 What may help prevent psychological disorders, and why is it important to develop resilience?

Preventive mental health programs are based on the idea that many psychological disorders could be prevented by identifying and alleviating the conditions that cause them, such as poverty, lack of meaningful work, constant criticism, unemployment, and discrimination. Community psychologists work to prevent psychological disorders by turning destructive environments into ones that support psychological health. This includes efforts to build people's *resilience,* helping them cope and recover from stress. Struggling with challenges can lead to *posttraumatic growth*.

Note: There are no learning objective questions in Appendix A, The Story of Psychology: A Timeline; and Appendix B, Career Fields in Psychology.

Appendix C Psychology at Work

Work and Life Satisfaction

C-1 What is *flow?*

Flow is a completely involved, focused state of consciousness with diminished awareness of self and time. It results from fully engaging one's skills. Interests predict both performance and persistence, so

people should aim to find vocations with a strong person-environment fit.

Industrial-Organizational Psychology

C-2 What are industrial-organizational psychology's three key areas of study?

Three key areas of study related to *industrial-organizational (I/O) psychology* are *personnel, organizational,* and *human factors psychology*. Each uses psychological principles to study and benefit the wide range of today's workers, workplaces, and work activities.

Personnel Psychology

C-3 How do personnel psychologists facilitate job seeking, employee selection, work placement, and performance appraisal?

Personnel psychologists work to provide training programs for job seekers, devise selection methods for new employees, recruit and evaluate diverse applicants, design and evaluate training programs, identify people's interests and strengths, analyze job content, appraise individual and organizational performance, and facilitate team building. Unstructured, subjective interviews foster the interviewer illusion; *structured interviews* pinpoint job-relevant strengths and are better predictors of performance. Checklists,

graphic rating scales, and behavior rating scales are useful performance appraisal methods.

Organizational Psychology

C-4 Why are organizational psychologists interested in employee satisfaction and engagement?

Organizational psychologists examine influences on worker satisfaction and productivity and facilitate organizational change. Employee satisfaction and engagement tend to correlate with organizational success; in fact, employee attitudes predict future business success.

C-5 How can leaders be most effective?

Effective leaders set specific, challenging goals and choose an appropriate *leadership style.* Leadership style may be goal-oriented *(task leadership),* group-oriented *(social leadership),* or some combination of the two. Effective management often involves positive reinforcement, fulfilling the need to belong, and participative management.

C-6 What cultural influences need to be considered when choosing an effective leadership style?

Project GLOBE studies cultural variations in leadership expectations. Leaders who fulfill expectations (being directive in some cultures or

participative in others) tend to be successful. But thriving companies worldwide tend to focus on identifying and enhancing employee strengths; strengths-based leadership pays dividends everywhere.

Human Factors Psychology

C-7 How do human factors psychologists work to create user-friendly machines and work settings?

Human factors psychologists contribute to human safety and improved design by encouraging developers and designers to consider human abilities and behaviors, to user-test their work before production and distribution, and to remain mindful of the curse of knowledge.

Appendix E

Answers to the *Retrieval Practice* and *Module Test* Questions

Chapter 1 Thinking Critically With Psychological Science (Modules 1–3)

MODULE 1: The History and Scope of Psychology

Retrieval Practice Answers

RP-1 Examining our own assumptions, appraising the source, discerning hidden biases, and assessing conclusions are essential parts of critical thinking.

RP-2 Scientific psychology began in Germany in 1879, when Wilhelm Wundt opened the first psychology laboratory.

RP-3 People's self-reports varied, depending on the experience and the person's intelligence and verbal ability.

RP-4 structuralism; functionalism.

RP-5 behaviorism; Freudian.

RP-6 It recaptured the field's early interest in mental processes and made them legitimate topics for scientific study.

RP-7 Natural selection is the process by which nature selects from chance variations the traits that best enable an organism to survive and reproduce in a particular environment.

RP-8 Psychological events often stem from the interaction of nature and nurture, rather than from either of them acting alone.

RP-9 By incorporating three different levels of analysis, the biopsychosocial approach can provide a more complete view than any one perspective could offer.

RP-10 social-cultural; behavioral.

RP-11 i. b, ii. c, iii. a.

RP-12 testing effect.

RP-13 Survey, Question, Read, Retrieve, Review.

Module Test Answers

1. Critical thinking is smart thinking. When evaluating media claims (even about topics you might not know much about), look for empirical evidence. Ask the following questions in your analysis: Are the claims based on scientific findings? Have several studies replicated the findings and confirmed them? Are any experts cited? If so, are they affiliated with a credible institution? Have they conducted or written about scientific

research? What agenda might they have? What alternative explanations are possible?

2. Wilhelm Wundt.
3. a.
4. a.
5. b.
6. The environment (nurture) has an influence on us, but that influence is constrained by our biology (nature). Nature and nurture interact. People predisposed to be very tall (nature), for example, are unlikely to become Olympic gymnasts, no matter how hard they work (nurture).
7. b.
8. positive psychology.
9. d.
10. psychiatrist.
11. c.

MODULE 2: Research Strategies: How

Psychologists Ask and Answer Questions

Retrieval Practice Answers

RP-1 We often suffer from hindsight bias— after we've learned a situation's outcome, that outcome seems familiar and therefore obvious.

RP-2 A good theory *organizes* observed facts and implies hypotheses that offer testable *predictions* and, sometimes, practical applications. It also often stimulates further research.

RP-3 When other investigators are able to replicate an experiment with the same (or stronger) results, scientists can confirm the result and become more confident of its reliability.

RP-4 Case studies involve only one individual or group, so we can't know for sure whether the principles observed would apply to a larger population.

RP-5 Naturalistic observation does not explain behavior, and it does not control for all the factors that may influence behavior. Nevertheless, the descriptions it provides can be revealing, expanding our understanding and paving the way for future studies.

RP-6 An unrepresentative sample is a group that does not represent the population being studied. *Random sampling* helps researchers

form a representative sample, because each member of the population has an equal chance of being included.

RP-7 1. Negative correlation, 2. Positive correlation, 3. Positive correlation, 4. Negative correlation.

RP-8 The team's poor performance was not their typical behavior. The return to their more typical play— their winning streak—may just have been a case of regression toward the mean.

RP-9 In this case, as in many others, a third factor can explain the correlation: Golden anniversaries and baldness both accompany aging.

RP-10 Research designed to prevent the placebo effect randomly assigns participants to an *experimental group* (which receives the real treatment) or to a *control group* (which receives a placebo). A double-blind procedure prevents people's beliefs and hopes from affecting the results, because neither the participants nor those collecting the data know who receives the placebo. A comparison of the results will demonstrate whether the real treatment produces better results than *belief* in that treatment.

RP-11 confounding variables.

RP-12 i. c, ii. a, iii. b.

RP-13 We learn more about the drug's effectiveness when we can compare the results of those who took the drug (the experimental

group) with the results of those who did not (the control group). If we gave the drug to all 1000 participants, we would have no way of knowing whether the drug is serving as a placebo or is actually medically effective.

RP-14 Animal protection legislation, laboratory regulation and inspection, and local and university ethics committees (which screen research proposals) attempt to safeguard animal welfare. International psychological organizations urge researchers involving human participants to obtain *informed consent*, protect them from greater-than-usual harm and discomfort, treat their personal information confidentially, and *debrief* them fully at the end of the experiment. Institutional Review Boards serve to enforce these standards.

Module Test Answers

1. Hindsight bias.

2. d.

3. hypothesis.

4. c.

5. random.

6. negative.

7. scatterplot.

8. a.

9. positive

10. Regression toward the mean is a statistical phenomenon describing the tendency of extreme scores or outcomes to return to average after an unusual event. Without knowing this, we may inaccurately decide the return to average was a result of our own behavior.

11. a.

12. (a) *Alcohol use is associated with violence. (One interpretation: Drinking triggers or unleashes aggressive behavior.)* Perhaps anger triggers drinking, or perhaps the same genes or child-raising practices are predisposing both drinking and aggression. (Here researchers have learned that drinking does indeed trigger aggressive behavior.) (b) *Educated people live longer, on average, than less-educated people. (One interpretation: Education lengthens life and enhances health.)* Perhaps richer people can afford more education and better health care. (Research supports this conclusion.) (c) *Teens engaged in team sports are less likely to use drugs, smoke, have sex, carry weapons, and eat junk food than are teens who do not engage in team sports. (One interpretation: Team sports encourage healthy living.)* Perhaps some third factor explains this correlation—teens who use drugs, smoke, have

sex, carry weapons, and eat junk food may be "loners" who do not enjoy playing on any team. (d) *Adolescents who frequently see smoking in movies are more likely to smoke. (One interpretation: Movie stars' behavior influences impressionable teens.)* Perhaps adolescents who smoke and attend movies frequently have less parental supervision and more access to spending money than other adolescents.

13. experiments.

14. placebo.

15. c.

16. independent variable.

17. b.

18. d.

MODULE 3: Statistical Reasoning in Everyday Life

Retrieval Practice Answers

RP-1 Note how the y-axis of each graph is labeled. The range for the y-axis label in graph (a) is only from 95 to 100. The range for graph (b) is from 0 to 100. All the trucks rank as 95 percent and up, so

almost all are still functioning after 10 years, which graph (b) makes clear.

RP-2 mean; mode; median.

RP-3 range; standard deviation.

RP-4 Averages based on fewer courses are more variable, which guarantees a greater number of extremely low and high marks at the end of the first term.

RP-5 Descriptive; inferential.

Module Test Answers

1. b.

2. d.

3. normal curve.

4. a.

Chapter 2 The Biology of Mind (Modules 4–7)

MODULE 4: Neural and Hormonal Systems

Retrieval Practice Answers

RP-1 They share a focus on the links between the brain and behavior. Phrenology faded because it had no scientific basis—skull bumps don't reveal mental traits and abilities.

RP-2 Thanks to its *neuroplasticity*, our brain changes in response to the experiences we have. Learning and practicing a new skill, like playing an instrument, can promote the development of new neural pathways and cause lasting changes in brain organization.

RP-3 dendrites, cell body, axon.

RP-4 Stronger stimuli (the slap) cause more neurons to fire and to fire more frequently than happens with weaker stimuli (the tap).

RP-5 Neurons send neurotransmitters (chemical messengers) across this tiny space between one neuron's terminal branch and the next neuron's dendrite or cell body.

RP-6 Reuptake occurs when excess neurotransmitters are reabsorbed by the sending neuron. Neurotransmitters can also drift

away or be broken down by enzymes.

RP-7 neurotransmitters.

RP-8 Morphine is an agonist; curare is an antagonist.

RP-9 i. c, ii. a, iii. b.

RP-10 The sympathetic division of the autonomic nervous system would have directed arousal (accelerated heartbeat, inhibited digestion, and so forth), and the parasympathetic division would have directed calming.

RP-11 Responding to signals from the hypothalamus, the pituitary releases hormones that trigger other endocrine glands to secrete hormones, which in turn influence brain and behavior.

RP-12 Both of these communication systems produce chemical molecules that act on the body's receptors to influence our behavior and emotions. The endocrine system, which secretes hormones into the bloodstream, delivers its messages much more slowly than the speedy nervous system, and the effects of the endocrine system's messages tend to linger much longer than those of the nervous system.

Module Test Answers

1. The human brain is uniquely designed to be flexible; it can reorganize after damage and build new pathways based on

experience. This neuroplasticity enables us to adapt to our changing world.

2. axon.
3. c.
4. a.
5. neurotransmitters.
6. b.
7. c.
8. autonomic.
9. central.
10. a.
11. adrenal glands.

MODULE 5: Tools of Discovery: Having Our Head Examined

Retrieval Practice Answers

RP-1 i. b, ii. a, iii. c.

Module Test Answers

1. lesioning.

2. a.

3. a.

4. c.

MODULE 6: Brain Regions and Structures

Retrieval Practice Answers

RP-1 brainstem.

RP-2 (a) cerebellum, (b) thalamus, (c) reticular formation, (d) medulla.

RP-3 The sympathetic nervous system.

RP-4 (a) The *amygdala* is involved in aggression and fear responses. (b) The *hypothalamus* is involved in bodily maintenance, pleasurable rewards, and control of the hormonal systems. (c) The *hippocampus* processes memories of facts and events.

RP-5 The cerebral cortex.

RP-6 (a) The right limbs' opposed activities interfere with each other because both are controlled by the same (left) side of your brain. (b)

Opposite sides of your brain control your left and right limbs, so the reversed motion causes less interference.

RP-7 somatosensory; motor.

RP-8 Association areas are involved in higher mental functions—interpreting, integrating, and acting on information processed in other areas.

Module Test Answers

1. b.
2. d.
3. c.
4. cerebellum.
5. b.
6. amygdala.
7. b.
8. hypothalamus.
9. d.
10. The visual cortex is a neural network of sensory neurons connected via interneurons to other neural networks, including

auditory networks. If you can see and hear, this allows you to integrate visual and auditory information to respond when a friend you recognize greets you at a party.

11. c.

12. frontal.

13. association areas.

MODULE 7: Damage Responses and Brain Hemispheres

Retrieval Practice Answers

RP-1 a) yes, (b) no, (c) green.

Module Test Answers

1. c.

2. ON; HER.

3. a.

4. b.

Chapter 3 Consciousness and the Two-Track Mind (Modules 8–10)

MODULE 8: Basic Consciousness Concepts

Retrieval Practice Answers

RP-1 cognitive neuroscience.

RP-2 Our *selective attention* allows us to focus on only a limited portion of our surroundings. *Inattentional blindness* explains why we don't perceive some things when we are distracted. *Change blindness*, for example, happens when we fail to notice a relatively unimportant change in our environment. These principles help magicians fool us, as they direct our attention elsewhere to perform their tricks.

RP-3 Our mind simultaneously processes information on a conscious track and an unconscious track (dual processing) as we organize and interpret information.

Module Test Answers

1. inattentional blindness.

2. unconscious; conscious.

3. selective.

MODULE 9: Sleep and Dreams

Retrieval Practice Answers

RP-1 With each refugee cycling through the sleep stages independently, at any given time at least one of them will likely be in an easily awakened stage.

RP-2 REM, N1, N2, N3; we typically move through N1, then N2, then N3, then back up through N2 before we experience REM sleep.

RP-3 i. b, ii. c, iii. a.

RP-4 suprachiasmatic; circadian.

RP-5 (1) Sleep has survival value. (2) Sleep helps us restore the immune system, heal from infection, and repair brain tissue. (3) During sleep we consolidate memories. (4) Sleep fuels creativity. (5) Sleep plays a role in the growth process.

RP-6 quick reaction times; gain weight.

RP-7 (1) Freud's wish fulfillment (dreams are a psychic safety valve), (2) information processing (dreams sort the day's events and consolidate memories), (3) neurocognitive function (REM sleep expands neural pathways, preserving memory and processing emotional information), (4) activation synthesis (REM sleep triggers

random neural activity that the mind weaves into stories), and (5) cognitive development (dreams reflect the dreamer's developmental stage).

Module Test Answers

1. circadian rhythm.
2. b.
3. N3.
4. It increases in duration.
5. c.
6. With narcolepsy, the person periodically falls directly into REM sleep, with no warning; with sleep apnea, the person repeatedly awakens during the night.
7. d.
8. The activation-synthesis theory suggests that dreams are the brain's attempt to synthesize random neural activity.
9. The information-processing explanation of dreaming proposes that brain activity during REM sleep enables us to sift through the daily events and activities we have been thinking about *(what one has dwelt on by day).*

10. REM rebound.

MODULE 10: Drugs and Consciousness

Retrieval Practice Answers

RP-1 With repeated exposure to a psychoactive drug, the user's brain chemistry adapts and the drug's effect lessens. Thus, it takes bigger doses to get the desired effect.

RP-2 Unless it becomes compulsive or dysfunctional, simply having a strong interest in shopping is not the same as having a physical addiction to a drug. It typically does not involve obsessive craving in spite of known negative consequences.

RP-3 depressants.

RP-4 Nicotine-withdrawal symptoms include strong cravings, insomnia, anxiety, irritability, and distractibility. However, if your friend sticks with it, the craving and withdrawal symptoms will gradually dissipate over about 6 months.

RP-5 Psychoactive drugs create pleasure by altering brain chemistry. With repeated use of the drug, the user develops tolerance and needs more of the drug to achieve the desired effect. Discontinuing use of the substance then produces painful or psychologically unpleasant withdrawal symptoms.

RP-6 Nicotine is powerfully addictive, and those who start paving the neural pathways when young may find it very hard to stop using it. As a result, tobacco product companies may have lifelong customers. Moreover, evidence suggests that if these companies haven't hooked customers by early adulthood, they most likely won't.

RP-7 Possible explanations include (a) biological factors (a person could have a biological predisposition to both early use and later abuse, or alcohol use could modify a person's neural pathways); (b) psychological factors (early use could establish taste preferences for alcohol); and (c) social-cultural factors (early use could influence enduring habits, attitudes, activities, or peer relationships that could foster alcohol use disorder).

Module Test Answers

1. tolerance.

2. a.

3. Alcohol is a disinhibitor—it makes us more likely to do what we would have done when sober, whether that is being helpful or being aggressive.

4. d.

5. hallucinogenic.

6. a.

7. b.

Chapter 4 Nature, Nurture, and Human Diversity (Modules 11–13)

MODULE 11: Behavior Genetics: Predicting Individual Differences

Retrieval Practice Answers

RP-1 gene, chromosome, nucleus.

RP-2 Researchers use twin and adoption studies to understand how much variation among individuals is due to genetic makeup and how much is due to environmental factors. Some studies compare the traits and behaviors of identical twins (same genes) and fraternal twins (different genes, as in any two siblings). They also compare adopted children with their adoptive and biological parents. Some studies compare the traits and behaviors of twins raised together or separately.

RP-3 genes.

RP-4 i. c, ii. b, iii. a.

Module Test Answers

1. chromosomes.

2. gene.

3. b.

4. c.

5. Identical.

6. b.

7. temperament.

8. Heritability.

9. environments.

MODULE 12: Evolutionary Psychology: Explaining Human Nature and Nurture

Retrieval Practice Answers

RP-1 Over many generations, Belyaev and Trut selected and bred foxes that exhibited a trait they desired: tameness. This process is similar to naturally occurring selection, but it differs in that natural selection is much slower, and normally favors traits (including those arising from mutations) that contribute to reproduction and survival.

RP-2 Evolutionary psychologists theorize that females have inherited their ancestors' tendencies to be more cautious sexually because of the challenges associated with incubating and nurturing offspring. Males have inherited a tendency to be more casual about sex, because their act of fathering requires a smaller investment.

RP-3 (1) It starts with an effect and works backward to propose an explanation. (2) This explanation may overlook the effects of cultural expectations and socialization. (3) Men could use such explanations to rationalize irresponsible behavior toward women.

Module Test Answers

1. differences; commonalities.

2. c.

3. *Natural selection* favors traits and behaviors that enable survival and reproduction. Evolutionary psychologists argue that women are choosier about their mates because of the investment required to conceive, birth, nurse, and protect children. Straight women tend to prefer men who seem capable of supporting and protecting their joint offspring. Men, who have less at stake, tend to be more casual about sex, and straight men tend to prefer women whose traits convey health and fertility.

MODULE 13: Cultural and Gender Diversity: Understanding Nature and

Nurture

Retrieval Practice Answers

RP-1 Adolescents tend to *select* similar others and to sort themselves into like-minded groups. For an athletic teen, this could lead to finding other athletic teens and joining school teams together.

RP-2 Individualists give priority to personal goals over group goals and tend to define their identity in terms of their own personal attributes. Collectivists give priority to group goals over individual goals and tend to define their identity in terms of group identifications.

RP-3 Women; men.

RP-4 seven; puberty.

RP-5 *Gender roles* are social rules or norms for expected behavior for women and men. The norms associated with various roles, including gender roles, vary widely in different cultural contexts, which is proof that we are able to learn and adapt to the social demands of different environments.

RP-6 The biopsychosocial approach considers all the factors that influence our individual development: biological factors (including evolution and our genes, hormones, and brain), psychological factors (including our experiences, beliefs, feelings, and

expectations), and social-cultural factors (including parental and peer influences, cultural individualism or collectivism, and gender norms).

Module Test Answers

1. b.

2. sex; gender.

3. c.

4. Y.

5. d.

6. 10; 12.

7. intersex.

8. b.

9. gender identity.

Chapter 5 Developing Through the Life Span (Modules 14–17)

MODULE 14: Developmental Issues, Prenatal Development, and the Newborn

Retrieval Practice Answers

RP-1 continuity; stages.

RP-2 (1) Stage theory is supported by the work of Piaget (cognitive development), Kohlberg (moral development), and Erikson (psychosocial development). (2) Some traits, such as temperament, exhibit remarkable stability across many years.

RP-3 zygote; fetus; embryo.

RP-4 habituation.

Module Test Answers

1. Cross-sectional studies compare people of different ages at one point in time. Longitudinal studies restudy and retest the same people over a long period of time.

2. continuity/stages.

3. b.

4. c.

5. teratogens.

6. a.

MODULE 15: Infancy and Childhood

Retrieval Practice Answers

RP-1 maturation.

RP-2 Object permanence for the sensorimotor stage, pretend play for the preoperational stage, conservation for the concrete operational stage, and abstract logic for the formal operational stage.

RP-3 i. d, ii. b, iii. c, iv. c, v. a, vi. b.

RP-4 Theory of mind focuses on our ability to understand our own and others' mental state. It enables us to infer other people's feelings, perceptions, and thoughts, and the behaviors these might predict. Those with autism spectrum disorder struggle with this ability.

RP-5 Attachment is the normal process by which we form emotional ties with important others. Imprinting occurs only in certain

animals that have a critical period very early in their development during which they must form their attachments, and they do so in an inflexible manner.

RP-6 The authoritarian style would be described as too hard, the permissive style too soft, the neglectful style too uncaring, and the authoritative style just right. Parents using the authoritative style tend to have children with high self-esteem, self-reliance, self-regulation, and social competence.

Module Test Answers

1. frontal.

2. b.

3. We consciously recall little from before age 4, in part because major brain areas have not yet matured.

4. Infants in Piaget's *sensorimotor stag*e tend to be focused only on their own perceptions of the world and may, for example, be unaware that objects continue to exist when unseen. A child in the *preoperational stage* is still egocentric and incapable of appreciating simple logic, such as the reversibility of operations. A preteen in the *concrete operational stage* is beginning to think logically about concrete events but not about abstract concepts.

5. a.

6. stranger anxiety.

7. Before these studies, many psychologists believed that infants simply became attached to those who nourished them.

MODULE 16: Adolescence and Emerging Adulthood

Retrieval Practice Answers

RP-1 preconventional; postconventional; conventional.

RP-2 Kohlberg's work reflected an individualist worldview, so his theory is less culturally universal than he supposed.

RP-3 i. g, ii. h, iii. c, iv. f, v. e, vi. d, vii. a, viii. b.

Module Test Answers

1. b.

2. formal operational.

3. b.

4. emerging adulthood.

MODULE 17: Adulthood

Retrieval Practice Answers

RP-1 love; work.

RP-2 Challenges: decline of muscular strength, reaction times, stamina, sensory keenness, cardiac output, and immune system functioning. Risk of cognitive decline increases. Rewards: positive feelings tend to grow; negative emotions subside; and anger, stress, worry, and social-relationship problems decrease.

Module Test Answers

1. a.

2. generativity.

3. c.

Chapter 6 Sensation and Perception (Modules 18–20)

MODULE 18: Basic Concepts of Sensation and Perception

Retrieval Practice Answers

RP-1 *Sensation* is the bottom-up process by which your sensory receptors and your nervous system receive and represent stimuli. *Perception* is the top-down process by which your brain creates meaning by organizing and interpreting what your senses detect.

RP-2 *Absolute threshold* is the minimum stimulation needed to detect a particular sound (such as an approaching bike on the sidewalk behind you) 50 percent of the time. *Subliminal stimulation* happens when, without your awareness, your sensory system processes a sound that is below your absolute threshold. A *difference threshold* is the minimum difference needed to distinguish between two stimuli (such as between the sound of a bike and the sound of a runner coming up behind you) 50 percent of the time.

RP-3 The shoes provide constant stimulation. Thanks to *sensory adaptation*, we tend to focus primarily on changing stimuli.

RP-4 *Perceptual set* involves top-down processing, because it draws on your experiences, assumptions, and expectations when interpreting stimuli.

Module Test Answers

1. b.
2. perception.
3. d.
4. just noticeable difference.
5. b.
6. d.
7. a.

MODULE 19: Vision: Sensory and Perceptual Processing

Retrieval Practice Answers

RP-1 For those with vision, the blind spot is on the nose side of each retina, which means that objects to the right may fall onto the right eye's blind spot. Objects to the left may fall on the left eye's blind spot. The blind spot does not normally impair vision, because the

eyes are moving and because one eye catches what the other misses. Moreover, even with only one eye open, the brain provides a perception without a hole in it.

RP-2 rods; cones; color.

RP-3 pupils.

RP-4 The *Young-Helmholtz trichromatic theory* shows that the retina contains color receptors for red, green, and blue. The *opponent-process theory* shows that we have opponent-process cells in the retina and thalamus for red-green, blue-yellow, and white-black. These theories are complementary and outline the two stages of color vision. First, the retina's receptors for red, green, and blue respond to different color stimuli. Second, the receptors' signals are then processed by the opponent-process cells on their way to the visual cortex in the brain.

RP-5 Light waves reflect off the person and travel into the eyes. Receptor cells in the retina convert the light waves' energy into neural impulses sent to the brain. The brain's detector cells and work teams process the subdimensions of this visual input—including color, movement, form, and depth—separately but simultaneously. The brain interprets this information, based on previously stored information and our expectations, and forms a conscious perception of that friend.

RP-6 figure; ground.

RP-7 Gestalt psychologists used this saying to describe our perceptual tendency to organize clusters of sensations into meaningful forms or coherent groups.

RP-8 People typically are able to perceive depth thanks to both binocular cues (such as retinal disparity) and monocular cues (which include relative height, relative size, relative motion, linear perspective, and interposition).

Module Test Answers

1. wavelength.

2. a.

3. c.

4. c.

5. d.

6. The brain constructs this perception of color in two stages. In the first stage, the lemon reflects light energy into the eyes, where it is transformed into neural messages. Three sets of cones, each sensitive to a different light frequency (red, blue, and green) process color. In this case, the light energy stimulates both red-sensitive and green-sensitive cones. In the second stage, opponent-process cells sensitive to paired opposites of color (red/green, blue/yellow, and black/white)

evaluate the incoming neural messages as they pass through the optic nerve to the thalamus and visual cortex. When the yellow-sensitive opponent-process cells are stimulated, the viewer identifies the lemon as yellow.

7. feature detectors.

8. parallel processing.

9. a.

10. d.

11. b.

12. c.

13. monocular.

14. b.

15. b.

16. perceptual adaptation.

MODULE 20: Hearing, Skin, Chemical, and

Body Senses

Retrieval Practice Answers

RP-1 loudness.

RP-2 lower; lower.

RP-3 place theory; frequency theory.

RP-4 c.

RP-5 We have four basic touch senses and five basic taste sensations. But we have no specific smell receptors. Instead, different combinations of odor receptors send messages to the brain, enabling us to recognize some 1 trillion different smells.

RP-6 Kinesthetic receptors, called proprioceptors, are located in our joints, tendons, and muscles. Vestibular sense receptors are located in our inner ear.

RP-7 The ESP event would need to be replicated in other scientific studies.

Module Test Answers

1. cochlea.

2. The outer ear collects sound waves, which are translated into mechanical waves by the *middle ear* and turned into fluid waves

in the *inner ear.* The *auditory nerve* then translates the energy into electrical waves and sends them to the brain, which perceives and interprets the sound.

3. Place; frequency; volley.

4. nociceptors.

5. c.

6. Our experience of pain is influenced by biological factors (such as genetic differences in endorphin production), psychological factors (such as our attention), and social-cultural factors (such as the presence of others).

7. We have specialized receptors for detecting sweet, salty, sour, bitter, and umami tastes. Being able to detect pleasurable tastes enabled our ancestors to seek out energy- or protein-rich foods. Detecting aversive tastes deterred them from eating toxic substances, increasing their chances of survival.

8. Kinesthesia; vestibular sense.

9. Your vestibular sense regulates balance and body positioning through kinesthetic receptors triggered by fluid in your inner ear. Wobbly legs and a spinning world are signs that these receptors are still responding to the ride's turbulence. As your vestibular sense adjusts to solid ground, your balance will be restored.

10. d.

11. d.

Chapter 7 Learning (Modules 21–23)

MODULE 21: Basic Learning Concepts and Classical Conditioning

Retrieval Practice Answers

RP-1 Habits form when we repeat behaviors in a given context and, as a result, learn associations—often without our awareness. For example, we may have eaten a sweet pastry with a cup of coffee often enough to associate the flavor of the coffee with the treat, so that the cup of coffee alone just doesn't seem right anymore!

RP-2 NS = tone before conditioning; US = air puff; UR = blink to air puff; CS = tone after conditioning; CR = blink to tone.

RP-3 The pie (including its taste and aroma) is the US. The photo of the apple pie is the CS. Salivation to the photo is the CR.

RP-4 acquisition; extinction.

RP-5 generalization.

RP-6 If viewing a favorite fictional character (a US) elicits a positive response (a UR), then pairing the US with a new NS (a particular brand of car) could turn that brand of car into a conditioned

stimulus (CS) that also prompts a positive, conditioned response (CR).

RP-7 The US was the loud noise; the UR was the fear response to the noise; the NS was the rat before it was paired with the noise; the CS was the rat after pairing; the CR was fear of the rat.

Module Test Answers

1. information; behaviors.
2. c.
3. conditioned.
4. discrimination.
5. b.
6. A sexual image is a US that triggers a UR of interest or arousal. Before the ad pairs a product with a sexual image, the product is an NS. Over time the product can become a CS that triggers the CR of interest or arousal.

MODULE 22: Operant Conditioning

Retrieval Practice Answers

RP-1 do not; resulting.

RP-2 The baby negatively reinforces her parents' behavior when she stops crying once they grant her wish. Her parents positively reinforce her cries by letting her sleep with them.

RP-3 Spammers are reinforced on a variable-ratio schedule (receiving a response after sending a varying number of emails). Cookie checkers are reinforced on a fixed-interval schedule. Sandwich shop rewards programs use a fixed-ratio schedule.

RP-4 1. PR (positive reinforcement); 2. NP (negative punishment); 3. PP (positive punishment); 4. NR (negative reinforcement).

RP-5 If Joslyn is seeking attention, the teacher's scolding may be reinforcing rather than punishing. To change Joslyn's behavior, her teacher could offer reinforcement (such as praise) each time she behaves well. The teacher might encourage Joslyn toward increasingly appropriate behavior through shaping, or by rephrasing rules as rewards instead of punishments. ("You can use the blocks if you play nicely with the other children" [reward] rather than "You may not use the blocks if you misbehave!" [punishment].)

RP-6 respondent; operant.

Module Test Answers

1. Skinner.

2. shaping.

3. c.

4. They fuss or cry until they are fed. When providing food removes something aversive (baby's cry), the baby negatively reinforces the caregiver's desired behavior (feeding).

5. partial (intermittent).

6. a.

7. variable-interval.

8. c.

MODULE 23: Biology, Cognition, and Learning

Retrieval Practice Answers

RP-1 Garcia and Koelling demonstrated that rats may learn an aversion to tastes, on which their survival depends, but not to sights or sounds.

RP-2 The success of operant conditioning is affected not just by environmental cues, but also by biological and cognitive factors.

RP-3 Hannah may be more likely to speed. Observational learning studies suggest that children tend to do as others do and say what they say.

RP-4 i. c (You've probably learned your way by latent learning), ii. d (Observational learning may have contributed to your brother's imitating the actions seen in the movie), iii. a (Through classical conditioning you have associated the smell with the anticipated tasty result), iv. e (You are biologically predisposed to develop a conditioned taste aversion to foods associated with illness), v. b (Through operant conditioning your dog may have come to associate approaching excitedly with attention, petting, and a treat).

Module Test Answers

1. taste-aversion.
2. This finding supports Darwin's principle that natural selection favors traits that aid survival.
3. cognitive map.
4. latent learning.
5. observational learning.
6. vicarious; vicarious.
7. a.
8. mirror.
9. c.

Chapter 8 Memory (Modules 24–26)

MODULE 24: Studying and Encoding Memories

Retrieval Practice Answers

RP-1 recognition; recall.

RP-2 It would be better to test your memory with *recall* (such as with short-answer or fill-in-the-blank self-test questions) rather than *recognition* (such as with multiple-choice questions). Recalling information is harder than recognizing it. So if you can recall it, that means your retention of the material is better than if you could only recognize it. Your chances of test success are, therefore, greater.

RP-3 The Atkinson-Shiffrin model viewed short-term memory as a temporary holding space for briefly storing recent thoughts and experiences. The newer idea of *working memory* expands our understanding of Atkinson-Shiffrin's short-term memory stage, emphasizing the conscious, active processing that takes place as the brain makes sense of new experiences and links them with our long-term memories.

RP-4 Working memory's two basic functions are active integration of new information with existing long-term memories and focusing of

our spotlight of attention.

RP-5 *Automatic* processing occurs unconsciously (automatically) for such things as the sequence and frequency of a day's events, and reading and comprehending words in our own language(s). *Effortful* processing requires attentive awareness and happens, for example, when we work hard to learn new material in class, or new lines for a play.

RP-6 sensory memory.

RP-7 Although cramming and rereading may lead to short-term gains in knowledge, distributed practice, and repeated self-testing will result in the greatest long-term retention.

RP-8 Making material personally meaningful involves processing at a deep level, because you are processing *semantically*—based on the meaning of the words. Deep processing leads to greater retention.

Module Test Answers

1. recall.

2. encoding; storage; retrieval.

3. a.

4. iconic; echoic.

5. seven.

6. mnemonics.

MODULE 25: Storing and Retrieving Memories

Retrieval Practice Answers

RP-1 The cerebellum and basal ganglia are important for *implicit* memory processing, and the frontal lobes and hippocampus are key to *explicit* memory formation.

RP-2 Our *explicit* conscious memories of facts and episodes differ from our *implicit* memories of skills (such as tying shoelaces) and classically conditioned responses. The parts of the brain involved in explicit memory processing (the frontal lobes and hippocampus) may have sustained damage in the accident, while the parts involved in implicit memory processing (the cerebellum and basal ganglia) appear to have escaped harm.

RP-3 the amygdala.

RP-4 long-term potentiation.

RP-5 *Priming* is the activation (often without our awareness) of associations. Seeing a gun, for example, might temporarily predispose someone to interpret an ambiguous face as threatening or to recall a boss as nasty.

RP-6 serial position.

Module Test Answers

1. a.
2. implicit.
3. c.
4. retrieval cues.
5. Memories are stored within a web of many associations, one of which is mood. When you recall happy moments from your past, you activate these positive links. You may then experience mood-congruent memory and recall other happy moments, which could improve your mood and brighten your interpretation of current events.
6. a.

MODULE 26: Forgetting, Memory Construction, and Improving Memory

Retrieval Practice Answers

RP-1 First, through *encoding failure:* Unattended information never entered our memory system. Second, through *storage decay:* Information fades from our memory. Third, through *retrieval failure:*

We cannot access stored information accurately, sometimes due to interference or motivated forgetting.

RP-2 repress.

RP-3 Real experiences would be confused with those we dreamed. When seeing people we know, we might, therefore, be unsure whether we were reacting to something they previously did or to something we dreamed they did.

RP-4 It will be important to remember the key points agreed upon by most researchers and professional associations: Sexual abuse, injustice, forgetting, and memory construction all happen; recovered memories are common; memories from before age 4 are unreliable; memories claimed to be recovered through hypnosis are especially unreliable; and memories, whether real or false, can be emotionally upsetting.

RP-5 Spend more time rehearsing or actively thinking about the material to boost long-term recall. Consider a study group so you can verbalize your learning. Schedule spaced (not crammed) study times. Make the material personally meaningful, with well-organized and vivid associations. Refresh your memory by returning to contexts and moods to activate retrieval cues. Use mnemonic devices. Minimize proactive and retroactive interference. Plan ahead to ensure a complete night's sleep. Test yourself repeatedly—retrieval practice is a proven retention strategy.

Module Test Answers

1. d.
2. d.
3. retroactive.
4. repression.
5. b.
6. Eliza's immature hippocampus and minimal verbal skills made it impossible for her to encode an explicit memory of the wedding reception at the age of two. It's more likely that Eliza learned information (from hearing the story repeatedly) that she eventually constructed into a memory that feels very real.
7. source amnesia.
8. déjà vu.
9. b.
10. b.

Chapter 9 Thinking and Language (Modules 27–28)

MODULE 27: Thinking

Retrieval Practice Answers

RP-1 If a tragic event, such as a plane crash, makes the news, it is noteworthy and unusual, unlike much more common bad events, such as traffic accidents. Knowing this, we can worry less about unlikely events and think more about improving the safety of our everyday activities. (For example, we can wear a seat belt when in a vehicle and use the crosswalk when walking.)

RP-2 i. b, ii. c, iii. e, iv. d, v. a, vi. f, vii. h, viii. j, ix. i, x. g, xi. k.

Module Test Answers

1. concept.

2. algorithm.

3. Omar will need to guard against *confirmation bias* (searching for support for his own views and ignoring contradictory evidence) as he seeks out opposing viewpoints. Even if Omar encounters new information that disproves his beliefs, *belief perseverance*

may lead him to cling to these views anyway. It will take more compelling evidence to change his political beliefs than it took to create them.

4. c.

5. availability.

6. framing.

7. b.

8. neural networks.

MODULE 28: Language and Thought

Retrieval Practice Answers

RP-1 Two morphemes—*cat* and *s*, and four phonemes—*c, a, t*, and *s*.

RP-2 Chomsky maintained that humans are biologically predisposed to learn the grammar rules of language.

RP-3 Infants typically start developing *receptive language* skills (ability to understand what is said to and about them) around 4 months of age. Then, starting with babbling at 4 months and beyond, infants typically start building *productive language* skills (ability to produce sounds and eventually words).

RP-4 Our brain's *critical period* for language learning is in childhood, when we can absorb language structure almost effortlessly. As we move past that stage in our brain's development, our ability to learn a new language diminishes dramatically.

RP-5 Broca's area; Wernicke's area.

RP-6 linguistic determinism.

RP-7 Mental practice uses visual imagery to mentally rehearse future behaviors, activating some of the same brain areas used during the actual behaviors. Visualizing the details of the process is more effective than visualizing only your end goal.

RP-8 These are definitely communications. But if language consists of words and the grammatical rules we use to combine them to communicate meaning, few scientists would label a dog's barking and yipping as language.

Module Test Answers

1. c.

2. phonemes; morphemes; grammar.

3. telegraphic speech.

4. universal grammar.

5. a.

Chapter 10 Intelligence (Modules 29–31)

MODULE 29: What Is Intelligence?

Retrieval Practice Answers

RP-1 People with savant syndrome have limited mental ability overall but possess one or more exceptional skills. According to Howard Gardner, this suggests that our abilities come in separate packages rather than being fully expressed by one general intelligence that encompasses all of our talents.

RP-2 The CHC theory proposes that there is a general ability based on *two* factors—fluid intelligence and crystallized intelligence—but also that there are more specific abilities, such as reading and writing ability, memory capacity, and processing speed.

Module Test Answers

1. general intelligence.

2. c.

3. analytical; creative; practical.

4. d.

MODULE 30: Intelligence Assessment and Dynamics

Retrieval Practice Answers

RP-1 Binet hoped that determining the child's mental age (the age that typically corresponds to a certain level of performance) would help identify appropriate school placements.

RP-2 $125 (5/4 \times 100 = 125)$

RP-3 aptitude; achievement.

RP-4 A psychological test must be *standardized* (pretested on a representative sample of people), *reliable* (yielding consistent results), and *valid* (measuring and predicting what it is supposed to).

RP-5 disagreement; down; zero; agreement; up.

RP-6 Researcher A should develop a *longitudinal study* to examine how intelligence changes in the same people over the life span. Researcher B should develop a *cross-sectional study* to examine the intelligence of people now at various life stages.

Module Test Answers

1. d. $(9/6 \times 100 = 150)$.

2. c.

3. reliability.

4. c.

5. Writers' work relies more on *Gc* (crystallized intelligence)—accumulated knowledge that increases with age. For top performance, scientists doing research may need more *Gf* (the speedy and abstract reasoning of fluid intelligence), which tends to decrease with age.

MODULE 31: Genetic and Environmental Influences on Intelligence

Retrieval Practice Answers

RP-1 a. (Heritability—variation within a group explained by genetic influences—will increase as environmental variation decreases.)

RP-2 Perfectly equal opportunity would create 100 percent heritability, because genes alone would account for any human differences.

RP-3 A test may be *culturally* biased (unfair) if higher scores are achieved by those with certain cultural experiences. That same test is not scientifically biased as long as it has *predictive validity*—if it predicts what it is supposed to predict. For example, the SAT may favor those with experience in the U.S. school system, but it does still accurately predict U.S. college success.

RP-4 stereotype threat.

Module Test Answers

1. c.

2. a.

3. c.

4. Stereotype threat.

Chapter 11 What Drives Us: Hunger, Sex, Belongingness, and Achievement (Modules 32–35)

MODULE 32: Basic Motivational Concepts

Retrieval Practice Answers

RP-1 (a) Well-practiced runners tend to excel when aroused by competition. (b) High anxiety about a difficult exam may disrupt test-takers' performance.

RP-2 According to Maslow, our drive to meet the physiological needs of hunger and thirst takes priority over our safety needs, prompting us to take risks at times.

Module Test Answers

1. b.

2. a.

3. incentive.

4. Arousal.

5. b.

6. a.

MODULE 33: Hunger

Retrieval Practice Answers

RP-1 low; high.

RP-2 You have learned to respond to the sight and aroma that signal the food about to enter your mouth. Both *physiological* cues (low blood sugar) and *psychological* cues (anticipation of the tasty meal) heighten your experienced hunger.

RP-3 Genetically influenced set/settling points, metabolism, and other factors (such as adequate sleep) influence the way our body burns calories.

Module Test Answers

1. Maslow's hierarchy of needs supports this statement because it addresses the primacy of some motives over others. Once our basic physiological needs are met, safety concerns are addressed next, followed by belongingness and love needs (such as the desire to kiss).

2. set.

3. c.

4. low.

5. basal metabolic.

6. d.

7. Sanjay's plan is problematic. After he gains weight, the extra fat will require less energy to maintain than it did to gain in the first place. Sanjay may have a hard time getting rid of it later, when his metabolism slows down in an effort to retain his body weight.

MODULE 34: Sexual Motivation

Retrieval Practice Answers

RP-1 estrogens; testosterone.

RP-2 sexual dysfunction; paraphilia.

RP-3 Influences include biological factors such as sexual maturity and sex hormones, psychological factors such as environmental stimuli and fantasies, and social-cultural factors such as the values and expectations absorbed from family and the surrounding culture.

RP-4 a, c, d.

RP-5 b, c, e.

Module Test Answers

1. b.

2. b.

3. Sexual dysfunctions are problems that consistently impair arousal or sexual function. Paraphilias are conditions, which may be classified as psychological disorders, in which sexual arousal is associated with nonhuman objects, the suffering of self or others, and/or nonconsenting persons.

4. does; doesn't.

5. c.

6. Researchers have found no evidence that any environmental factor (parental relationships, childhood experiences, peer relationships, or dating experiences) influences the development of our sexual orientation.

MODULE 35: Affiliation and Achievement

Retrieval Practice Answers

RP-1 They engaged in more self-defeating behaviors and displayed more disparaging and aggressive behavior. These students' basic *need to belong* seems to have been disrupted.

RP-2 strengthen; increase.

RP-3 self-discipline *(grit).*

Module Test Answers

1. c.

2. Monitor our time spent online, as well as our feelings about that time. Change our online status to unavailable when we don't want to be contacted. Check our devices less often. Get outside and away from technology regularly.

3. should; should.

Chapter 12 Emotions, Stress, and Health (Modules 36–40)

MODULE 36: Introduction to Emotion

Retrieval Practice Answers

RP-1 simultaneously; sequentially (first the physiological response, and then the experienced emotion).

RP-2 cognitive.

RP-3 Zajonc and LeDoux suggested that we experience some emotions without any conscious, cognitive appraisal. Lazarus, Schachter, and Singer emphasized the importance of appraisal and cognitive labeling in our experience of emotion.

RP-4 The *sympathetic division* of the ANS arouses us for more intense experiences of emotion, pumping out the stress hormones epinephrine and norepinephrine to prepare our body for fight or flight. The *parasympathetic division* of the ANS takes over when a crisis passes, restoring our body to a calm physiological and emotional state.

Module Test Answers

1. James-Lange.

2. b.

3. c.

4. A polygraph measures emotion-linked physiological changes, such as in perspiration, heart rate, and breathing. But the measure cannot distinguish between emotions with similar physiology (such as anxiety and guilt).

MODULE 37: Expressing Emotion

Retrieval Practice Answers

RP-1 Women.

RP-2 Some facial expressions, such as those of happiness and sadness, tend to be universally recognizable and thus likely rooted in biology. Context and culture, however, can influence the way facial expressions are interpreted. Like most psychological events, facial expressions are best understood not only as biological and cognitive phenomena, but also as social-cultural phenomena.

RP-3 (a) Most students report feeling more happy than sad when their cheeks are raised upward. (b) Most students report feeling more sad than happy when their cheeks are pulled downward.

Module Test Answers

1. facial feedback.

2. Aiden's droopy posture could negatively affect his mood thanks to the behavior feedback effect, which tends to make us feel the way we act.

MODULE 38: Experiencing Emotion

Retrieval Practice Answers

RP-1 b.

RP-2 a. Age does NOT effectively predict happiness levels. Better predictors are personality traits, sleep and exercise, and religious faith.

Module Test Answers

1. d.

2. Positive.

3. b.

4. relative deprivation.

MODULE 39: Stress and Illness

Retrieval Practice Answers

RP-1 sympathetic; increase; muscles; fight-or-flight.

RP-2 psychoneuroimmunology.

RP-3 Stress tends to reduce our immune system's ability to function properly, so that higher stress generally leads to greater risk of physical illness.

RP-4 Feeling angry and negative much of the time.

Module Test Answers

1. b.

2. d.

3. resistance; exhaustion.

4. tend; befriend.

5. immune system.

6. Type A people frequently experience negative emotions (anger, impatience), during which the sympathetic nervous system diverts blood away from the liver. This leaves fat and cholesterol circulating in the bloodstream for deposit near the heart and

other organs, increasing the risk of heart disease and other health problems. Thus, Type A people actually harm themselves by directing anger at others.

MODULE 40: Health and Coping

Retrieval Practice Answers

RP-1 problem; emotion.

RP-2 b.

RP-3 Aerobic exercise, relaxation, meditation, and active spiritual engagement.

Module Test Answers

1. emotion.

2. b.

3. internal.

4. By allowing ourselves to feel our natural negative and positive emotions, we are better able to navigate the realities of our lives—including good times and bad times. Suppressing or ignoring our feelings has negative consequences, leaving us less able to manage stress or build authentic relationships.

5. d.

6. aerobic.

7. c.

Chapter 13 Social Psychology (Modules 41–44)

MODULE 41: Social Thinking

Retrieval Practice Answers

RP-1 By attributing the other person's behavior to the person ("What a terrible driver") and his own to the situation ("These roads are awful"), Marco has exhibited the *fundamental attribution error.*

RP-2 Our attitudes often influence our actions as we behave in ways consistent with our beliefs. However, our actions also influence our attitudes; we come to believe in what we have done.

RP-3 cognitive dissonance.

RP-4 Avoid yelling at, humiliating, or boring your audience. It's more effective to identify shared values, appeal to others' admirable motives, make your message vivid and repeat it, and get your audience to actively engage with your message.

Module Test Answers

1. fundamental attribution.

2. foot-in-the-door.

3. *Cognitive dissonance theory* best supports this suggestion. If Jamala acts confident, her behavior will contradict her negative self-thoughts, creating cognitive dissonance. To relieve the tension, Jamala may realign her attitudes with her actions by viewing herself as more outgoing and confident.

4. peripheral.

MODULE 42: Social Influence

Retrieval Practice Answers

RP-1 a.

RP-2 normative social influence.

RP-3 Stanley Milgram.

RP-4 The Milgram studies showed that people were most likely to follow orders when the experimenter was nearby and was perceived to be a legitimate authority figure, the authority figure was supported by a powerful or prestigious institution, the victim was depersonalized or at a distance, and there were no models for defiance.

RP-5 This improved performance in the presence of others is most likely to occur with a well-learned task, because the added arousal caused by an audience tends to strengthen the most likely response.

This also predicts poorer performance on a difficult task in others' presence.

RP-6 social loafing.

RP-7 The anonymity provided by the masks, combined with the arousal of the contentious setting, might create deindividuation (lessened self-awareness and self-restraint).

RP-8 group polarization.

RP-9 groupthink.

Module Test Answers

1. c.

2. a.

3. The presence of a large audience generates arousal and strengthens Dr. Huang's most likely response: enhanced performance on a task he has mastered (teaching music history) and impaired performance on a task he finds difficult (statistics).

4. deindividuation.

5. group polarization.

MODULE 43: Antisocial Relations

Retrieval Practice Answers

RP-1 scapegoat.

RP-2 Our biology (our genes, neural systems, and biochemistry—including testosterone and alcohol levels) influences our aggressive tendencies. Psychological factors (such as frustration, previous rewards for aggressive acts, and observation of others' aggression) can trigger any aggressive tendencies we may have. Social influences, such as exposure to violent media, and cultural influences, such as whether we've grown up in a "culture of honor" or a father-absent home, can also affect our aggressive responses.

Module Test Answers

1. stereotypes.

2. b.

3. more.

4. d.

5. frustration-aggression principle.

6. c.

7. c.

8. c.

MODULE 44: Prosocial Relations

Retrieval Practice Answers

RP-1 mere exposure effect.

RP-2 Being physically attractive tends to elicit positive first impressions. People tend to assume that attractive people are healthier, happier, more sensitive, more successful, and more socially skilled than others are.

RP-3 Emotions consist of (1) physical arousal and (2) our interpretation of that arousal. Researchers have found that any source of arousal may be interpreted as passion in the presence of a desirable person.

RP-4 equity; self-disclosure.

RP-5 In the presence of others, an individual is less likely to notice a situation, correctly interpret it as an emergency, and take responsibility for offering help. The inaction of neighbors who heard Kitty Genovese's cries for help demonstrated this *bystander effect,* as each witness assumed many others were also aware of the event.

RP-6 Sports fans may feel they are a part of an *ingroup* (fans of their preferred team) that sets itself apart from an *outgroup* (fans of the archrival team). Ingroup bias tends to develop, leading to prejudice and the view that the outgroup "deserves" misfortune. So, the archrival team's loss may seem justified. In conflicts, this kind of thinking is problematic, especially when each side in the conflict develops *mirror-image perceptions* of the other (distorted, negative images that are ironically similar).

RP-7 Peacemakers should encourage equal-status contact, cooperation to achieve *superordinate goals* (shared goals that override differences), understanding through communication, and reciprocated conciliatory gestures (each side gives a little).

Module Test Answers

1. mere exposure.
2. companionate; passionate.
3. d.
4. c.
5. mirror-image.
6. superordinate.

Chapter 14 Personality (Modules 45–47)

MODULE 45: Introduction to Personality and Psychodynamic Theories

Retrieval Practice Answers

RP-1 ego; id; superego.

RP-2 fixation.

RP-3 unconsciously; anxiety.

RP-4 Freud is credited with first drawing attention to the importance of childhood experiences, to the existence of the unconscious mind, and to our self-protective defense mechanisms. Freud's theory has been criticized as not scientifically testable and offering after-the-fact explanations, focusing too much on sexual conflicts in childhood, and being based on the idea of repression, which has not been supported by modern research.

RP-5 Today's psychodynamic theorists and therapists still use Freud's interviewing techniques, and they still tend to focus on childhood experiences and attachments, unresolved conflicts, and unconscious influences. However, they are not likely to dwell on

fixation at any psychosexual stage, or the idea that sexual issues are the basis of our personality.

RP-6 Projective.

Module Test Answers

1. c.
2. superego.
3. b.
4. anxiety.
5. repression.
6. d.
7. a.
8. a.

MODULE 46: Humanistic Theories and Trait Theories

Retrieval Practice Answers

RP-1 The humanistic theories sought to turn psychology's attention away from drives and conflicts and toward our growth potential.

This movement's focus on the way people strive for self-determination and self-realization was in contrast to Freudian theory and strict behaviorism.

RP-2 To be *empathic* is to share and mirror another person's feelings. Carl Rogers believed that people nurture growth in others by being empathic. Abraham Maslow proposed that *self-actualization* is the motivation to fulfill one's potential, and one of the ultimate psychological needs (another is self-transcendence).

RP-3 extraversion–introversion and emotional stability–instability.

RP-4 The Big Five personality factors are *o*penness, *c*onscientiousness, *e*xtraversion, *a*greeableness, and *n*euroticism (emotional stability vs. instability): OCEAN. These factors may be objectively measured, they are relatively stable over the life span, and they apply fairly well to all cultures in which they have been studied.

RP-5 Our scores on personality tests predict our *average* behavior across many situations much better than they predict our specific behavior in any given situation.

Module Test Answers

1. d.

2. Rogers might assert that the criminal was raised in an environment lacking acceptance (unconditional positive regard), genuineness, and empathy, which inhibited psychological growth and led to a negative self-concept.

3. unconditional positive regard.

4. Trait.

5. c.

6. b.

7. b.

MODULE 47: Social-Cognitive Theories and the Self

Retrieval Practice Answers

RP-1 social-cognitive; reciprocal determinism.

RP-2 To predict someone's future behavior, examine the person's past behavior patterns in similar situations.

RP-3 People who feel confident in their abilities tend to be outgoing, responsible, and open to new experiences, and are often happier, less anxious, and less lonely. Inflated self-esteem can lead to the

Dunning-Kruger effect, self-serving bias, greater aggression, and narcissism.

RP-4 self-serving bias.

RP-5 Defensive; Secure.

Module Test Answers

1. a.
2. social-cognitive.
3. spotlight effect.
4. b.
5. Yes, if that self-love is of the *secure* type. Secure self-esteem promotes a focus beyond the self and a higher quality of life. Excessive self-love may promote artificially high or defensive self-esteem, which is fragile; perceived threats may be met with anger or aggression.

Chapter 15 Psychological Disorders Modules (48–53)

MODULE 48: Introduction to Psychological Disorders

Retrieval Practice Answers

RP-1 dysfunctional or maladaptive.

RP-2 Some psychological disorders are culture-specific. For example, anorexia nervosa occurs mostly in Western cultures, and *taijin kyofusho* appears largely in Japan. Other disorders, such as major depressive disorder and schizophrenia, are universal—they occur in all cultures.

RP-3 Biological, psychological, and social-cultural influences combine to produce psychological disorders. This approach helps us understand that our well-being is affected by our genes, brain functioning, inner thoughts and feelings, and the influences of our social and cultural environment.

RP-4 Therapists and others apply disorder labels to communicate with one another using a common language, and to share concepts during research. Clients may benefit from knowing that they are not the only ones with these symptoms. The dangers of labeling people

are that (1) overly broad classifications may pathologize typical behavior, and (2) the labels can trigger assumptions that will change people's behavior toward those who are labeled.

RP-5 false.

RP-6 true.

RP-7 Poverty-related stresses can help trigger disorders, but disabling disorders can also contribute to poverty. Thus, poverty and disorder are often a chicken-and-egg situation; it's hard to know which came first.

Module Test Answers

1. major depressive disorder.

2. No. Robert's behavior is unusual, causes distress, and may make him a few minutes late on occasion, but it does not appear to significantly disrupt his ability to function. Like most of us, Robert demonstrates some unusual behaviors. Since they are not disabling or dysfunctional, they do not suggest a psychological disorder.

3. medical.

4. There are various culture-linked disorders, including *susto* (in Latin America), *taijin kyofusho* (in Japan), and eating disorders (in food-abundant Western cultures).

5. c.

6. Critics have expressed concerns about the negative effects of labeling by the DSM and other classification systems. Labels have the potential to be both subjective and stigmatizing. Further, critics suggest that the DSM-5 cast too wide a net on disorders, pathologizing typical behavior.

7. Men; women.

8. d.

MODULE 49: Anxiety Disorders, Obsessive-Compulsive and Related Disorders, Trauma- and Stressor-Related Disorders, and Somatic Symptom and Related Disorders

Retrieval Practice Answers

RP-1 generalized anxiety.

RP-2 panic.

RP-3 specific phobia.

RP-4 obsessive-compulsive.

RP-5 posttraumatic stress.

RP-6 Somatic means "relating to the body"; somatic symptom disorders produce distressing bodily symptoms that have no apparent physical cause.

RP-7 Biological factors include inherited temperament and other gene variations; experience-altered brain pathways; and outdated, inherited responses that had survival value for our distant ancestors.

Module Test Answers

1. c.
2. specific phobia.
3. obsessive-compulsive.
4. b.
5. c.

MODULE 50: Depressive Disorders and Bipolar Disorders

Retrieval Practice Answers

RP-1 Many factors contribute to depression, including the biological influences of genetics and brain function. Social-cognitive factors

also matter, including the interaction of explanatory style, mood, our responses to stressful experiences, changes in our patterns of thinking and behaving, and cultural influences. Depression involves the whole body and may disrupt sleep, energy levels, and concentration.

Module Test Answers

1. women's; men's.

2. a.

3. norepinephrine; serotonin.

4. social-cognitive.

MODULE 51: Schizophrenia

Retrieval Practice Answers

RP-1 negative; positive.

RP-2 Biological factors include abnormalities in brain structure and function and a genetic predisposition to the disorder. Environmental factors such as nutritional deprivation, exposure to virus, and maternal stress contribute to activating the genes that increase risk. Exposure to many environmental triggers can increase the odds of developing schizophrenia.

Module Test Answers

1. Schizophrenia involves the altered perceptions, emotions, and behaviors of a mind split from reality. It does not involve the rapid changes in mood or identity suggested by this comparison.

2. b.

3. hallucination.

4. a.

MODULE 52: Dissociative, Personality, and Eating Disorders

Retrieval Practice Answers

RP-1 The psychodynamic explanation of DID symptoms is that they are defenses against anxiety generated by unacceptable urges. The learning perspective attempts to explain these symptoms as behaviors that have been reinforced by relieving anxiety.

RP-2 Twin and adoption studies show that biological relatives of people with antisocial personality disorder are at increased risk for antisocial behavior. Researchers have also observed differences in the brain activity and structure of antisocial criminals. Negative environmental factors, such as poverty or childhood abuse, may

channel genetic traits such as fearlessness in more dangerous directions—toward aggression and away from social responsibility.

RP-3 anorexia nervosa; bulimia nervosa.

Module Test Answers

1. c.
2. c.
3. b.
4. b.

MODULE 53: Neurodevelopmental Disorders

Retrieval Practice Answers

RP-1 To be diagnosed with an intellectual developmental disorder, a person's intelligence test score must be in the lowest 3 percent of the general population, or about 70 or below. In addition, the person must have difficulty adapting to the normal demands of independent living: conceptual (language, reading, and concepts of money, time, and number); social (interpersonal skills, being socially responsible, following basic rules and laws, not being

victimized); and practical (health and personal care, occupational skill, and travel).

Module Test Answers

1. c.

2. Several studies have revealed "underconnectivity" in the brains of people with ASD, which makes it more difficult for different parts of the brain to work together and integrate information. Those with ASD are also less imitative and show less activity in brain areas involved in mirroring others' actions.

3. The DSM has broadened the diagnostic criteria for ADHD, leading to an increase in diagnoses without concurrent changes in children's attentional behavior. Critics suggest that these criteria are now too broad and may pathologize behaviors, labeling everyday childish rambunctiousness as a disorder.

Chapter 16 Therapy (Modules 54–56)

MODULE 54: Introduction to Therapy and the Psychological Therapies

Retrieval Practice Answers

RP-1 transference; resistance; interpretation.

RP-2 A psychodynamic therapist might be more interested in helping the child develop insight about the underlying problems that have caused the bed-wetting response. A behavior therapist would be more likely to agree with Mowrer that the bed-wetting *is* the problem, and that counterconditioning the unwanted behavior would indeed bring emotional relief.

RP-3 The *insight therapies*—psychodynamic and humanistic therapies—seek to relieve problems by providing an understanding of their origins. *Behavior therapies* assume the problem behavior *is* the problem and treat it directly, paying less attention to its origins.

RP-4 If a behavior can be learned, it can be *un*learned and replaced by other, more adaptive responses.

RP-5 classical; operant.

RP-6 By reflecting people's feelings in a nondirective setting, the *humanistic therapies* attempt to foster personal growth by helping people become more self-aware and self-accepting. By making people aware of self-defeating patterns of thinking, *cognitive therapies* guide them toward more adaptive ways of thinking about themselves and their world.

RP-7 cognitive therapy.

RP-8 *Cognitive-behavioral therapy* helps people change self-defeating thinking and behavior. It has been shown to be effective for those with anxiety disorders, obsessive-compulsive and related disorders, depressive disorders, bipolar disorders, ADHD, eating disorders, and alcohol or other substance use disorders.

Module Test Answers

1. a.
2. Insight.
3. d.
4. active listening.
5. c.
6. counterconditioning.
7. systematic desensitization.

8. Behavior therapies are often the best choice for treating specific phobias. Viewing Rico's fear of the highway as a learned response, a behavior therapist might help Rico learn to replace his anxious response to highway driving with a relaxation response.

9. token economy.

10. d.

11. Cognitive-behavioral.

12. b.

MODULE 55: Evaluating Psychotherapies

Retrieval Practice Answers

RP-1 The *placebo effect* is the healing power of belief in a treatment. Patients and therapists who expect a treatment to be effective may believe it was effective.

RP-2 are.

RP-3 When using an evidence-based approach, therapists make decisions about treatment based on research evidence, clinical expertise, and knowledge of the client.

RP-4 more.

RP-5 ethical.

Module Test Answers

1. c.
2. d.
3. research evidence, clinical expertise, and knowledge of the patient.
4. hope.

MODULE 56: The Biomedical Therapies and Preventing Psychological Disorders

Retrieval Practice Answers

RP-1 Exercise regularly, get enough sleep, get more exposure to light (get outside or use a light box), nurture important relationships, redirect negative thinking, and eat a diet rich in omega-3 fatty acids.

RP-2 Researchers assign people to treatment and no-treatment conditions to see if those who receive the drug therapy improve more than those who don't. Double-blind controlled studies are most effective. If neither the therapist nor the client knows which participants have received the drug treatment, then any difference

between the treated and untreated groups will reflect the drug treatment's actual effect.

RP-3 antidepressants; antipsychotic.

RP-4 electroconvulsive therapy; direct current; magnetic; deep brain.

RP-5 Psychological or biomedical therapies attempt to relieve people's suffering from psychological disorders. Preventive mental health attempts to prevent suffering by identifying and eliminating the conditions that cause disorders, as well as by building resilience.

Module Test Answers

1. c.
2. antianxiety.
3. lithium.
4. b.
5. d.

Appendix C Psychology at Work

Work and Life Satisfaction

Retrieval Practice Answers

RP-1 We become more likely to view our work as socially useful, and we experience higher self-esteem, feelings of competence, and overall well-being.

RP-2 (1) Interviewers may presume people are what they seem to be in interviews. (2) Interviewers' preconceptions and moods color how they perceive interviewees' responses. (3) Interviewers judge people relative to other recent interviewees. (4) Interviewers tend to track the successful careers of those they hire, not the successful careers of those they reject. (5) Interviews tend to disclose prospective workers' good intentions, not their habitual behaviors.

RP-3 *Transformational leaders* are able to inspire others to share a vision and commit themselves to a group's mission. They tend to be naturally extraverted and set high standards.

RP-4 To develop safer machines and work environments, human factors psychologists stay mindful of the curse of knowledge—the tendency for experts to mistakenly assume that others share their knowledge.

Module Test Answers

1. flow.

2. Personnel; human factors.

3. a.

4. d.

5. Focusing on SMART goals—goals that are *s*pecific, *m*easurable, *a*ctionable, *r*ealistic, and *t*ime-bound (such as maintaining a regular study schedule)—will be more helpful than focusing on more distant general goals (such as earning a good grade in this class).

6. transformational.

7. c.

8. d.

Glossary

absolute threshold
the minimum stimulus energy needed to detect a particular stimulus 50 percent of the time.

accommodation
(1) adapting our current schemas (understandings) to incorporate new information. (2) the process by which the eye's lens changes shape to focus near or far objects on the retina.

achievement motivation
the desire for significant accomplishment, for mastery of skills or ideas, for control, and for attaining a high standard.

achievement test
a test designed to assess what a person has learned.

acquisition
in classical conditioning, the initial stage—when one links a neutral stimulus and an unconditioned stimulus so that the neutral stimulus begins triggering the conditioned response. (In operant conditioning, the strengthening of a reinforced response.)

action potential
a neural impulse; a brief electrical charge that travels down an axon.

active listening

empathic listening in which the listener echoes, restates, and seeks clarification. A feature of Rogers' person-centered therapy.

acute schizophrenia
(also called *reactive schizophrenia*) a form of schizophrenia that can begin at any age, frequently occurs in response to a traumatic event, and from which recovery is much more likely.

adaptation-level phenomenon
our tendency to form judgments (of sounds, of lights, of income) relative to a neutral level defined by our prior experience.

addiction
an everyday term for compulsive substance use (and sometimes for dysfunctional behavior patterns, such as out-of-control gambling) that continues despite harmful consequences. (See also *substance use disorder.*)

adolescence
the transition period from childhood to young adulthood, extending from puberty to independence.

adrenal [ah-DREEN-el] glands
a pair of endocrine glands that sits just above the kidneys and secretes hormones (epinephrine and norepinephrine) that help arouse the body in times of stress.

aerobic exercise
sustained exercise that increases heart and lung fitness; also helps alleviate depression and anxiety.

affiliation need
the need to build and maintain relationships and to feel connected to a group.

aggression

any physical or verbal behavior intended to harm someone physically or emotionally.

agonist
a molecule that increases a neurotransmitter's action.

AIDS (acquired immune deficiency syndrome)
a life-threatening condition caused by the *human immunodeficiency virus (HIV)*, a sexually transmitted infection. AIDS depletes the immune system, leaving the person vulnerable to infections.

alcohol use disorder
(commonly known as *alcoholism*) alcohol use marked by a combination of symptoms that may include tolerance, withdrawal, and a drive to continue problematic use.

algorithm
a methodical, logical rule, or procedure that guarantees solving a particular problem. Contrasts with the usually speedier—but also more error-prone—use of *heuristics*.

all-or-none response
a neuron's reaction of either firing (with a full-strength response) or not firing.

alpha waves
the relatively slow brain waves of a relaxed, awake state.

altruism
unselfish regard for the welfare of others.

Alzheimer's disease
a neurocognitive disorder marked by neural plaques, often with onset after age 80, and entailing a progressive decline in memory and other cognitive abilities.

amphetamines
drugs (such as *methamphetamine*) that stimulate neural activity, causing accelerated body functions and associated energy and mood changes.

amygdala [uh-MIG-duh-la]
two almond-shaped neural clusters in the limbic system; linked to emotion.

androgyny
blending traditionally masculine and traditionally feminine psychological characteristics.

anorexia nervosa
an eating disorder in which a person (most often an adolescent female) maintains a starvation diet despite being significantly underweight, and has an inaccurate self-perception; sometimes accompanied by excessive exercise.

antagonist
a molecule that inhibits or blocks a neurotransmitter's action.

anterograde amnesia
an inability to form new memories.

antianxiety drugs
drugs used to control anxiety and agitation.

antidepressant drugs
drugs used to treat depressive disorders, anxiety disorders, obsessive-compulsive and related disorders, and posttraumatic stress disorder. (Several widely used antidepressant drugs are *selective serotonin reuptake inhibitors—SSRIs.*)

antipsychotic drugs
drugs used to treat schizophrenia and other psychotic disorders.

antisocial behavior

negative, destructive, harmful behavior. The opposite of prosocial behavior.

antisocial personality disorder
a personality disorder in which a person (usually a man) exhibits a lack of conscience for wrongdoing, even toward friends and family members; may be aggressive and ruthless or a clever con artist.

anxiety disorders
a group of disorders characterized by excessive fear and anxiety and related maladaptive behaviors.

aphasia
impairment of language, usually caused by left hemisphere damage either to Broca's area (impairing speaking) or to Wernicke's area (impairing understanding).

applied research
a scientific study that aims to solve practical problems.

approach and avoidance motives
the drive to move toward (approach) or away from (avoid) a stimulus.

aptitude test
a test designed to predict a person's future performance; *aptitude* is the capacity to learn.

asexual
having no sexual attraction toward others.

assimilation
interpreting our new experiences in terms of our existing schemas.

association areas

areas of the cerebral cortex that are not involved in primary motor or sensory functions; rather, they are involved in higher mental functions such as learning, remembering, thinking, and speaking.

associative learning
learning that certain events occur together. The events may be two stimuli (as in classical conditioning) or a response and its consequence (as in operant conditioning).

attachment
an emotional tie with others; shown in young children by their seeking closeness to caregivers and showing distress on separation.

attention-deficit/hyperactivity disorder (ADHD)
a psychological disorder marked by extreme inattention and/or hyperactivity and impulsivity.

attitude
feelings, often influenced by our beliefs, that predispose us to respond in a particular way to objects, people, and events.

attribution theory
the theory that we explain someone's behavior by crediting either the situation or the person's disposition.

audition
the sense or act of hearing.

autism spectrum disorder (ASD)
a disorder that appears in childhood and is marked by limitations in communication and social interaction, and by rigidly fixated interests and repetitive behaviors.

automatic processing

unconscious encoding of incidental information, such as space, time, and frequency, and of familiar or well-learned information, such as sounds, smells, and word meanings.

autonomic [aw-tuh-NAHM-ik] nervous system (ANS)
the part of the peripheral nervous system that controls the glands and the muscles of the internal organs (such as the heart). Its *sympathetic* division arouses; its *parasympathetic* division calms.

availability heuristic
judging the likelihood of events based on their availability in memory; if instances come readily to mind (perhaps because of their vividness), we presume such events are common.

aversive conditioning
associates an unpleasant state (such as nausea) with an unwanted behavior (such as drinking alcohol).

axon
the segmented neuron extension that passes messages through its branches to other neurons, muscles, or glands.

babbling stage
the stage in speech development, beginning around 4 months, during which an infant spontaneously utters various sounds that are not all related to the household language.

barbiturates
drugs that depress central nervous system activity, reducing anxiety but impairing memory and judgment.

basal metabolic rate
the body's resting rate of energy output.

basic research
pure science that aims to increase the scientific knowledge base.

basic trust
according to Erik Erikson, a sense that the world is predictable and trustworthy; said to be formed during infancy by appropriate experiences with responsive caregivers.

behavior feedback effect
the tendency of behavior to influence our own and others' thoughts, feelings, and actions.

behavior genetics
the study of the relative power and limits of genetic and environmental influences on behavior.

behavior therapy
therapy that uses learning principles to reduce unwanted behaviors and increase desirable behaviors.

behaviorism
the view that psychology (1) should be an objective science that (2) studies behavior without reference to mental processes. Most research psychologists today agree with (1) but not with (2).

belief perseverance
the persistence of one's initial conceptions after the basis on which they were formed has been discredited.

Big Five factors
researchers identified five factors—*openness, conscientiousness, extraversion, agreeableness,* and *neuroticism*—that describe personality. (Also called the *five-factor model.*)

binge-eating disorder
significant binge-eating episodes, followed by distress, disgust, or guilt, but without the compensatory behavior that marks bulimia nervosa.

binocular cue
a depth cue, such as retinal disparity, that depends on the use of two eyes.

biological psychology
the scientific study of the links between biological (genetic, neural, hormonal) and psychological processes. Some biological psychologists call themselves *neuroscientists, neuropsychologists, behavior geneticists, physiological psychologists,* or *biopsychologists.*

biomedical therapy
prescribed medications or procedures that act directly on the person's physiology.

biopsychosocial approach
an integrated approach that incorporates biological, psychological, and social-cultural levels of analysis.

bipolar disorders
disorders in which a person experiences the overexcited state of mania (or milder hypomania), and usually experiences periods of depression. (Formerly called *manic-depressive disorder.*)

blind spot
the point at which the optic nerve leaves the eye, creating a "blind" spot because no receptor cells are located there.

blindsight
a condition in which a person can respond to a visual stimulus without consciously experiencing it.

bottom-up processing

information processing that begins with the sensory receptors and works up to the brain's integration of sensory information.

brainstem
the central core of the brain, beginning where the spinal cord swells as it enters the skull; the brainstem is responsible for automatic survival functions.

Broca's area
a frontal lobe brain area, usually in the left hemisphere, that helps control language expression by directing the muscle movements involved in speech.

bulimia nervosa
an eating disorder in which a person's binge eating (usually of high-calorie foods) is followed by weight-loss-promoting behavior, such as vomiting, laxative use, fasting, or excessive exercise.

bystander effect
the tendency for any given bystander to be less likely to give aid if other bystanders are present.

Cannon-Bard theory
the theory that an emotion-arousing stimulus simultaneously triggers (1) physiological responses and (2) the subjective experience of emotion.

case study
a descriptive technique in which one individual or group is studied in depth in the hope of revealing universal principles.

Cattell-Horn-Carroll (CHC) theory
the theory that our intelligence is based on general intelligence *(g)* as well as specific abilities, bridged by fluid intelligence *(Gf)* and crystallized intelligence *(Gc)*.

cell body

the part of a neuron that contains the nucleus; the cell's life-support center.

central nervous system (CNS)
the brain and spinal cord.

central route persuasion
occurs when interested people's thinking is influenced by considering evidence and arguments.

cerebellum [sehr-uh-BELL-um]
the hindbrain's "little brain" at the rear of the brainstem; functions include processing sensory input, coordinating movement output and balance, and enabling nonverbal learning and memory.

cerebral [seh-REE-bruhl] cortex
the intricate fabric of interconnected neural cells covering the forebrain's cerebral hemispheres; the body's ultimate control and information-processing center.

change blindness
failing to notice changes in the environment; a form of *inattentional blindness.*

chromosomes
threadlike structures made of DNA molecules that contain the genes.

chronic schizophrenia
(also called *process schizophrenia*) a form of schizophrenia in which symptoms usually appear by late adolescence or early adulthood. As people age, psychotic episodes last longer and recovery periods shorten.

chunking
organizing items into familiar, manageable units; often occurs automatically.

circadian [ser-KAY-dee-an] rhythm

our biological clock; regular bodily rhythms (for example, of temperature and wakefulness) that occur on a 24-hour cycle.

classical conditioning
a type of learning in which we link two or more stimuli; as a result, to illustrate with Pavlov's classic experiment, the first stimulus (a tone) comes to elicit behavior (drooling) in anticipation of the second stimulus (food).

clinical psychology
a branch of psychology that studies, assesses, and treats people with psychological disorders.

cocaine
a powerful and addictive stimulant derived from the coca plant; produces temporarily increased alertness and euphoria.

cochlea [KOHK-lee-uh]
a coiled, bony, fluid-filled tube in the inner ear; sound waves traveling through the cochlear fluid trigger nerve impulses.

cochlear implant
a device for converting sounds into electrical signals and stimulating the auditory nerve through electrodes threaded into the cochlea.

cognition
all the mental activities associated with thinking, knowing, remembering, and communicating.

cognitive dissonance theory
the theory that we act to reduce the discomfort (dissonance) we feel when two of our thoughts (cognitions) are inconsistent. For example, when we become aware that our attitudes and our actions clash, we can reduce the resulting dissonance by changing our attitudes.

cognitive learning
the acquisition of mental information, whether by observing events, by watching others, or through language.

cognitive map
a mental representation of the layout of one's environment. For example, after exploring a maze, rats act as if they have learned a cognitive map of it.

cognitive neuroscience
the interdisciplinary study of the brain activity linked with cognition (perception, thinking, memory, and language).

cognitive psychology
the study of the mental processes involved in perceiving, learning, remembering, thinking, communicating, and solving problems.

cognitive therapy
therapy that teaches people new, more adaptive ways of thinking; based on the assumption that thoughts intervene between events and our emotional reactions.

cognitive-behavioral therapy (CBT)
a popular integrative therapy that combines cognitive therapy (changing self-defeating thinking) with behavior therapy (changing behavior).

cohort
a group of people sharing a common characteristic, such as being from a given time period.

collective unconscious
Carl Jung's concept of a shared, inherited reservoir of memory traces from our species' history.

collectivism

a cultural pattern that prioritizes the goals of important groups (often one's extended family or work group).

community psychology
a branch of psychology that studies how people interact with their social environments and how social institutions (such as schools and neighborhoods) affect individuals and groups.

companionate love
the deep affectionate attachment we feel for someone with whom our life is intertwined.

concept
a mental grouping of similar objects, events, ideas, or people.

concrete operational stage
in Piaget's theory, the stage of cognitive development (from about 7 to 11 years of age) at which children gain the mental operations that enable them to think logically about concrete events.

conditioned reinforcer
a stimulus that gains its reinforcing power through its association with a primary reinforcer. (Also known as a *secondary reinforcer.*)

conditioned response (CR)
in classical conditioning, a learned response to a previously neutral (but now conditioned) stimulus (CS).

conditioned stimulus (CS)
in classical conditioning, an originally neutral stimulus that, after association with an unconditioned stimulus (US), comes to trigger a conditioned response (CR).

conduction hearing loss

a less common form of hearing loss, caused by damage to the mechanical system that conducts sound waves to the cochlea.

cones
retinal receptors that are concentrated near the center of the retina and that function in daylight or in well-lit conditions. Cones detect fine detail and give rise to color sensations.

confirmation bias
a tendency to search for information that supports our preconceptions and to ignore or distort contradictory evidence.

conflict
a perceived incompatibility of actions, goals, or ideas.

conformity
adjusting our behavior or thinking to coincide with a group standard.

confounding variable
in an experiment, a variable other than the variable being studied that might influence a study's results.

consciousness
our subjective awareness of ourselves and our environment.

conservation
the principle (which Piaget believed to be a part of concrete operational reasoning) that properties such as mass, volume, and number remain the same despite changes in the forms of objects.

continuous reinforcement schedule
reinforcing the desired response every time it occurs.

control group

in an experiment, the group *not* exposed to the treatment; contrasts with the experimental group and serves as a comparison for evaluating the effect of the treatment.

convergent thinking
narrowing the available problem solutions to determine the single best solution.

coping
alleviating stress using emotional, cognitive, or behavioral methods.

coronary heart disease
the clogging of the vessels that nourish the heart muscle; a leading cause of death in many developed countries.

corpus callosum [KOR-pus kah-LOW-sum]
the large band of neural fibers connecting the two brain hemispheres and carrying messages between them.

correlation
a measure of the extent to which two factors vary together, and thus of how well either factor *(variable)* predicts the other.

correlation coefficient
a statistical index of the direction and strength of the relationship between two things (from −1.00 to +1.00).

counseling psychology
a branch of psychology that assists people with problems in living (often related to school, work, or relationships) and in achieving greater well-being.

counterconditioning
behavior therapy procedures that use classical conditioning to evoke new responses to stimuli that are triggering unwanted behaviors; include *exposure therapies* and *aversive conditioning*.

creativity
the ability to produce new and valuable ideas.

critical period
an optimal period early in the life of an organism when exposure to certain stimuli or experiences produces typical development.

critical thinking
thinking that does not automatically accept arguments and conclusions. Rather, it examines assumptions, appraises the source, discerns hidden biases, evaluates evidence, and assesses conclusions.

cross-sectional study
research that compares people of different ages at the same point in time.

crystallized intelligence *(Gc)*
our accumulated knowledge and verbal skills; tends to increase with age.

culture
the enduring behaviors, ideas, attitudes, values, and traditions shared by a group of people and transmitted from one generation to the next.

debriefing
the post experimental explanation of a study, including its purpose and any deceptions, to its participants.

deep processing
encoding semantically, based on the meaning of the words; tends to yield the best retention.

defense mechanisms
in psychoanalytic theory, the ego's protective methods of reducing anxiety by unconsciously distorting reality.

deindividuation
the loss of self-awareness and self-restraint occurring in group situations that foster arousal and anonymity.

déjà vu
that eerie sense that "I've experienced this before." Cues from the current situation may unconsciously trigger retrieval of an earlier experience.

delta waves
the large, slow brain waves associated with deep sleep.

delusion
a false belief, often of persecution or grandeur, that may accompany psychotic disorders.

dendrites
a neuron's often bushy, branching extensions that receive and integrate messages from axons, conducting impulses toward the cell body.

dependent variable
in an experiment, the variable that is measured; the variable that may change when the independent variable is manipulated.

depressants
drugs (such as alcohol, barbiturates, and opioids) that reduce neural activity and slow body functions.

depressive disorders
a group of disorders characterized by an enduring sad, empty, or irritable mood, along with physical and cognitive changes that affect a person's ability to function.

depth perception
the ability to see objects in three dimensions, although the images that strike the retina are two-dimensional; allows us to judge distance.

descriptive statistics
using statistical methods to provide a simple summary of data.

developmental psychology
a branch of psychology that studies physical, cognitive, and social development throughout the life span.

difference threshold
the minimum difference between two stimuli required for detection 50 percent of the time. We experience the difference threshold as a *just noticeable difference* (or *jnd*).

diffusion of responsibility
when a person takes less responsibility for something, or is less likely to act in a situation, due to the presence of others.

discrimination
(1) in classical conditioning, the learned ability to distinguish between a conditioned stimulus and similar stimuli that do not signal an unconditioned stimulus. (In operant conditioning, the ability to distinguish responses that are reinforced from similar responses that are not reinforced.) (2) unjustifiable negative behavior toward a group or its members.

dissociation
a split in consciousness, which allows some thoughts and behaviors to occur simultaneously with others.

dissociative disorders
a controversial, rare group of disorders characterized by a disruption of or discontinuity in the normal integration of consciousness, memory, identity, emotion, perception, body representation, motor control, and behavior.

dissociative identity disorder (DID)

a rare dissociative disorder in which a person exhibits two or more distinct and alternating identities. (Formerly called *multiple personality disorder.*)

divergent thinking
expanding the number of possible problem solutions; creative thinking that diverges in different directions.

DNA (deoxyribonucleic acid)
a complex molecule containing the genetic information that makes up the chromosomes.

double-blind procedure
an experimental procedure in which both the research participants and the research staff are uninformed (blind) about whether the research participants have received the treatment or a placebo. Commonly used in drug-evaluation studies.

dream
a sequence of images, emotions, and thoughts passing through a sleeping person's mind.

drive-reduction theory
the idea that a physiological need creates an aroused state (a drive) that motivates an organism to satisfy the need.

DSM–5–TR
the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision;* a widely used categorical system for classifying psychological disorders.

dual processing
the principle that information is often simultaneously processed on separate conscious and unconscious tracks.

echoic memory
a momentary sensory memory of auditory stimuli; if attention is elsewhere, sounds and words can still be recalled within 3 or 4 seconds.

eclectic approach
an approach to psychotherapy that uses techniques from various forms of therapy.

Ecstasy (MDMA)
a synthetic stimulant and mild hallucinogen. Produces euphoria and social intimacy, but with short-term health risks and longer-term harm to serotonin-producing neurons and to mood and cognition.

EEG (electroencephalogram)
an amplified recording of the waves of electrical activity sweeping across the brain's surface. These waves are measured by electrodes placed on the scalp.

effortful processing
encoding that requires attention and conscious effort.

ego
the partly conscious, "executive" part of personality that, according to Freud, mediates among the demands of the id, the superego, and reality. The ego operates on the *reality principle,* satisfying the id's desires in ways that will realistically bring pleasure rather than pain.

egocentrism
in Piaget's theory, the preoperational child's difficulty taking another's point of view.

electroconvulsive therapy (ECT)
a biomedical therapy for severe and treatment-resistant depression in which a brief electric current is sent through the brain of an anesthetized person.

embodied cognition

the influence of bodily sensations, gestures, and other states on cognitive preferences and judgments.

embryo
the developing human organism from about 2 weeks after fertilization through the second month.

emerging adulthood
a period from about age 18 to the mid-twenties, when many in Western cultures are no longer adolescents but have not yet achieved full independence as adults.

emotion
a response of the whole organism, involving (1) physiological arousal, (2) expressive behaviors, and, most importantly, (3) conscious experience resulting from one's interpretations.

emotion regulation
how we manage our emotions, including which emotions we allow ourselves to feel, when we feel them, and how we express those emotions.

emotion-focused coping
attempting to alleviate stress by avoiding or ignoring a stressor and attending to emotional needs related to our stress reaction.

emotional intelligence
the ability to perceive, understand, manage, and use emotions.

empirical approach
an evidence-based method that draws on observation and experimentation.

empirically derived test
a test (such as the MMPI) created by selecting from a pool of items those that discriminate between groups.

encoding
the process of getting information into the memory system—for example, by extracting meaning.

encoding specificity principle
the idea that cues and contexts specific to a particular memory will be most effective in helping us recall it.

endocrine [EN-duh-krin] system
the body's "slow" chemical communication system; glands and fat tissue that secrete hormones into the bloodstream.

endorphins [en-DOR-fins]
"morphine within"—natural, opiate-like neurotransmitters linked to pain control and to pleasure.

environment
every nongenetic influence, from prenatal nutrition to the people and things around us.

epigenetics
"above" or "in addition to" *(epi)* genetics; the study of the molecular mechanisms by which environments can influence genetic expression (without a DNA change).

episodic memory
explicit memory of personally experienced events; one of our two conscious memory systems (the other is *semantic memory*).

equity
a condition in which people receive from a relationship in proportion to what they give to it.

erectile disorder

inability to develop or maintain an erection due to insufficient blood flow to the penis.

estrogens
sex hormones, such as estradiol, that contribute to female sex characteristics and are secreted in greater amounts by females than by males.

evidence-based practice
clinical decision making that integrates the best available research with clinical expertise and client characteristics and preferences.

evolutionary psychology
the study of the evolution of behavior and the mind, using principles of natural selection.

experiment
a research method in which an investigator manipulates one or more variables (independent variables) to observe the effect on some behavior or mental process (the dependent variable). By *random assignment* of participants, the experimenter aims to control other relevant variables that may change the research outcome.

experimental group
in an experiment, the group exposed to the treatment, that is, to one version of the independent variable.

explicit memory
retention of facts and experiences that we can consciously know and "declare." (Also called *declarative memory*.)

exposure therapies
behavioral techniques that treat anxieties by exposing people (in imaginary or actual situations) to the things they fear and avoid.

external locus of control

the perception that outside forces beyond our personal control determine our fate.

extinction
in classical conditioning, the diminishing of a conditioned response—when an unconditioned stimulus does not follow a conditioned stimulus. (In operant conditioning, when a response is no longer reinforced.)

extrasensory perception (ESP)
the controversial claim that perception can occur apart from sensory input; includes telepathy, clairvoyance, and precognition.

extrinsic motivation
the desire to perform a behavior to receive promised rewards or avoid threatened punishment.

facial feedback effect
the tendency of facial muscle activation, alone, to trigger corresponding feelings such as fear, anger, or happiness.

family therapy
therapy that treats people in the context of their family system. Views an individual's unwanted behaviors as influenced by, or directed at, other family members.

feature detectors
nerve cells in the brain's visual cortex that respond to specific features of the stimulus, such as shape, angle, or movement.

feel-good, do-good phenomenon
our tendency to be helpful when in a good mood.

female orgasmic disorder

distress due to weak orgasmic feelings or infrequently or never experiencing orgasm.

fetal alcohol syndrome (FAS)
physical and cognitive function deficits in children caused by their mother's heavy drinking during pregnancy. In severe cases, symptoms include a small, out-of-proportion head and distinct facial features.

fetus
the developing human organism from 9 weeks after conception to birth.

fight-or-flight response
an emergency response, including activation of the sympathetic nervous system, that mobilizes energy and activity for attacking or escaping a threat.

figure-ground
the organization of the visual field into objects (the *figures*) that stand out from their surroundings (the *ground*).

fixation
(1) in cognition, the inability to see a problem from a new perspective; an obstacle to problem solving. (2) in psychoanalytic theory, a lingering focus of pleasure-seeking energies at an earlier psychosexual stage, in which conflicts were unresolved.

fixed-interval schedule
in operant conditioning, a reinforcement schedule that reinforces a response only after a specified time has elapsed.

fixed-ratio schedule
in operant conditioning, a reinforcement schedule that reinforces a response only after a specified number of responses.

flashbulb memory

a clear memory of an emotionally significant moment or event.

flow
a completely involved, focused state, with diminished awareness of self and time; results from fully engaging our skills.

fluid intelligence *(Gf)*
our ability to reason speedily and abstractly; tends to decrease with age, especially during late adulthood.

fMRI (functional MRI)
a technique for revealing blood flow and, therefore, brain activity by comparing successive MRI scans. fMRI scans show brain function as well as structure.

foot-in-the-door phenomenon
the tendency for people who have first agreed to a small request to comply later with a larger request.

forebrain
consists of the cerebral cortex, thalamus, and hypothalamus; manages complex cognitive activities, sensory and associative functions, and voluntary motor activities.

formal operational stage
in Piaget's theory, the stage of cognitive development (usually beginning about age 12) at which people begin to think logically about abstract concepts.

fovea
the central focal point in the retina, around which the eye's cones cluster.

framing
the way an issue is posed; how an issue is framed can significantly affect decisions and judgments.

fraternal (dizygotic) twins
individuals who developed from separate fertilized eggs. They are genetically no closer than ordinary siblings, but shared a prenatal environment.

free association
in psychoanalysis, a method of exploring the unconscious in which the person relaxes and says whatever comes to mind, no matter how trivial or embarrassing.

frequency
the number of complete wavelengths that pass a point in a given time (for example, per second).

frequency theory
in hearing, the theory that the rate of nerve impulses traveling up the auditory nerve matches the frequency of a tone, thus enabling us to sense its pitch. (Also called *temporal coding*.)

frontal lobes
the portion of the cerebral cortex lying just behind the forehead; involved in speaking and muscle movements and in making plans and judgments.

frustration-aggression principle
the principle that frustration—the blocking of an attempt to achieve some goal—creates anger, which can generate aggression.

functionalism
an early school of thought promoted by James and influenced by Darwin; explored how mental and behavioral processes function—how they enable the organism to adapt, survive, and flourish.

fundamental attribution error
the tendency, when analyzing others' behavior, to underestimate the impact of the situation and to overestimate the impact of personal disposition.

gate-control theory
the theory that the spinal cord contains a neurological "gate" that blocks pain signals or allows them to pass on to the brain. The "gate" is opened by the activity of pain signals traveling up small nerve fibers and is closed by activity in larger fibers or by information coming from the brain.

gender
in psychology, the behavioral characteristics that people associate with *boy, girl, man,* and *woman.* (See also *gender identity.*)

gender identity
our personal sense of being male, female, neither, or some combination of male and female.

gender role
a set of expected behaviors, attitudes, and traits for men and for women.

gender typing
the acquisition of a traditional masculine or feminine role.

general adaptation syndrome (GAS)
Selye's concept of the body's adaptive response to stress in three phases—alarm, resistance, exhaustion.

general intelligence *(g)*
according to Spearman and others, underlies all mental abilities and is, therefore, measured by every task on an intelligence test.

generalization
(also called *stimulus generalization*) in classical conditioning, the tendency, once a response has been conditioned, for stimuli similar to the conditioned stimulus to elicit similar responses. (In operant conditioning, when responses learned in one situation occur in other, similar situations.)

generalized anxiety disorder
an anxiety disorder in which a person is continually tense, apprehensive, and in a state of autonomic nervous system arousal.

genes
the biochemical units of heredity that make up the chromosomes; small segments of DNA capable of synthesizing proteins.

genome
the complete instructions for making an organism, consisting of all the genetic material in that organism's chromosomes.

gestalt
an organized whole. Gestalt psychologists emphasized our tendency to integrate pieces of information into meaningful wholes.

glial cells (glia)
cells in the nervous system that support, nourish, and protect neurons; they also play a role in learning, thinking, and memory.

glucose
the form of sugar that circulates in the blood and provides the major source of energy for body tissues. When its level is low, we feel hunger.

grammar
in a language, a system of rules that enables us to communicate with and understand others. *Semantics* is the language's set of rules for deriving meaning from sounds, and *syntax* is its set of rules for combining words into grammatically sensible sentences.

GRIT
(1) in psychology, passion and perseverance in the pursuit of long-term goals. (2) Graduated and Reciprocated Initiatives in Tension-Reduction—a strategy designed to decrease international tensions.

group polarization
the enhancement of a group's prevailing inclinations through discussion within the group.

group therapy
therapy conducted with groups rather than individuals, providing benefits from group interaction.

grouping
the perceptual tendency to organize stimuli into coherent groups.

groupthink
the mode of thinking that occurs when the desire for harmony in a decision-making group overrides a realistic appraisal of alternatives.

growth mindset
a focus on learning and growing rather than viewing abilities as fixed.

gustation
our sense of taste.

habituation
decreasing responsiveness with repeated stimulation. As infants gain familiarity with repeated exposure to a stimulus, their interest wanes and they look away sooner.

hallucinations
sensory experiences without sensory stimulation, such as seeing something in the absence of an external visual stimulus.

hallucinogens
psychedelic ("mind-manifesting") drugs, such as LSD, that distort perceptions and evoke sensory images in the absence of sensory input.

happiness
an enduring prevalence of positive emotions.

health psychology
a subfield of psychology that contributes to behavioral medicine.

heredity
the genetic transfer of characteristics from parents to offspring.

heritability
the proportion of variation among individuals in a group that we can attribute to genes. The heritability of a trait may vary, depending on the range of populations and environments studied.

heuristic
a simple thinking strategy—a mental shortcut—that often allows us to make judgments and solve problems efficiently; usually speedier but also more error-prone than an *algorithm.*

hierarchy of needs
Maslow's five levels of human needs, beginning with physiological needs. Often visualized as a pyramid, with basic needs providing the foundation supporting higher-level needs.

higher-order conditioning
a procedure in which the conditioned stimulus in one conditioning experience is paired with a new neutral stimulus, creating a second (often weaker) conditioned stimulus. For example, an animal that has learned that a tone predicts food might then learn that a light predicts the tone and begin responding to the light alone. (Also called *second-order conditioning.*)

hindbrain
consists of the medulla, pons, and cerebellum; directs essential survival functions, such as breathing, sleeping, and wakefulness, as well as coordination

and balance.

hindsight bias
the tendency to believe, after learning an outcome, that one would have foreseen it. (Also known as the *I-knew-it-all-along phenomenon.*)

hippocampus
a neural center located in the limbic system that helps process explicit (conscious) memories—of facts and events—for storage.

homeostasis
a tendency to maintain a balanced or constant internal state; the regulation of any aspect of body chemistry, such as blood glucose, around a particular level.

hormones
chemical messengers that are manufactured by the endocrine glands, travel through the bloodstream, and affect other tissues.

hue
the dimension of color that is determined by the wavelength of light; what we know as the color names *blue, green,* and so forth.

human factors psychology
a field of psychology allied with I/O psychology that explores how people and machines interact and how machines and physical environments can be made safe and easy to use.

humanistic psychology
a historically significant perspective that emphasized human growth potential.

humanistic theories
theories that view personality with a focus on the potential for healthy personal growth.

hypnosis
a social interaction in which one person (the hypnotist) suggests to another (the subject) that certain perceptions, feelings, thoughts, or behaviors will spontaneously occur.

hypothalamus [hi-po-THAL-uh-muss]
a limbic system neural structure lying below *(hypo)* the thalamus; it directs several maintenance activities (eating, drinking, body temperature), helps govern the endocrine system via the pituitary gland, and is linked to emotion and reward.

hypothesis
a testable prediction, often implied by a theory.

iconic memory
a momentary sensory memory of visual stimuli; a photographic or picture-image memory lasting no more than a few tenths of a second.

id
a reservoir of unconscious psychic energy that, according to Freud, strives to satisfy basic sexual and aggressive drives. The id operates on the *pleasure principle,* demanding immediate gratification.

identical (monozygotic) twins
individuals who developed from a single fertilized egg that split in two, creating two genetically identical organisms.

identification
the process by which, according to Freud, children incorporate their parents' values into their developing superegos.

identity
our sense of self; according to Erikson, the adolescent's task is to solidify a sense of self by testing and integrating various roles.

illness anxiety disorder
a disorder in which a person interprets normal physical sensations as symptoms of a disease. (Formerly called *hypochondriasis*.)

illusory correlation
perceiving a relationship where none exists, or perceiving a stronger-than-actual relationship.

implicit bias
automatic associations that can influence individual judgments of or behavior toward people of a particular race, gender, or other group.

implicit memory
retention of learned skills or classically conditioned associations independent of conscious recollection. (Also called *nondeclarative memory*.)

imprinting
the process by which certain animals form strong attachments during early life.

inattentional blindness
failing to see visible objects when our attention is directed elsewhere.

incentive
a positive or negative environmental stimulus that motivates (or *pulls*) behavior.

independent variable
in an experiment, the variable that is manipulated; the variable whose effect is being studied.

individualism
a cultural pattern that emphasizes people's own goals over group goals and defines identity mainly in terms of unique personal attributes.

industrial-organizational (I/O) psychology

the scientific study of working, and the application of psychological concepts to human behavior in workplaces.

inferential statistics
using statistical methods to interpret data meaningfully.

informational social influence
influence resulting from a person's willingness to accept others' opinions about reality.

informed consent
giving potential participants enough information about a study to enable them to choose whether they wish to participate.

ingroup
"us"—people with whom we share a common identity.

ingroup bias
the tendency to favor our own group.

inner ear
the innermost part of the ear, containing the cochlea, semicircular canals, and vestibular sacs.

insight
a sudden realization of a problem's solution; contrasts with strategy-based solutions.

insight therapies
therapies that aim to improve psychological functioning by increasing a person's awareness of underlying motives and defenses.

insomnia
recurring problems in falling or staying asleep.

instinct
a complex behavior that is rigidly patterned throughout a species and is unlearned.

instinctive drift
the tendency of learned behavior to gradually revert to biologically predisposed patterns.

intellectual developmental disorder
a condition of limited mental ability, indicated by an intelligence test score of 70 or below and difficulty adapting to the demands of life. (May also be referred to as *intellectual disability*.)

intelligence
the ability to learn from experience, solve problems, and use knowledge to adapt to new situations.

intelligence quotient (IQ)
defined originally as the ratio of mental age *(ma)* to chronological age *(ca)* multiplied by 100 (thus, $\text{IQ} = ma/ca \times 100$). On contemporary intelligence tests, the average performance for a given age is assigned a score of 100.

intelligence test
a method for assessing an individual's mental aptitudes and comparing them with those of others, using numerical scores.

intensity
the amount of energy in a light wave or sound wave, which influences what those with typical vision or hearing perceive as brightness or loudness. Intensity is determined by the wave's amplitude (height).

interaction

the interplay that occurs when the effect of one factor (such as environment) depends on another factor (such as heredity).

internal locus of control
the perception that we control our own fate.

interneurons
neurons within the brain and spinal cord; they communicate internally and process information between the sensory inputs and motor outputs.

interpretation
in psychoanalysis, the analyst's noting of dream meanings, resistances, and other significant behaviors and events in order to promote insight and growth.

intersex
possessing male and female biological sexual characteristics at birth.

intimacy
in Erikson's theory, the ability to form close, loving relationships; a primary developmental task in young adulthood.

intrinsic motivation
a desire to perform a behavior effectively for its own sake.

intuition
an effortless, immediate, automatic feeling or thought, as contrasted with explicit, conscious reasoning.

James-Lange theory
the theory that our experience of emotion occurs when we become aware of our physiological responses to an emotion-arousing stimulus.

just-world phenomenon

the tendency for people to believe that the world is just and people therefore get what they deserve and deserve what they get.

kinesthesia [kin-ehs-THEE-zhuh]
our movement sense—our system for sensing the position and movement of individual body parts.

language
our spoken, written, or signed words and the ways we combine them to communicate meaning.

latent content
according to Freud, the underlying meaning of a dream (as distinct from its *manifest content*).

latent learning
learning that occurs but is not apparent until there is an incentive to demonstrate it.

law of effect
Thorndike's principle that behaviors followed by favorable consequences become more likely, and that behaviors followed by unfavorable consequences become less likely.

leadership
an individual's ability to motivate and influence others to contribute to their group's success.

learned helplessness
the hopelessness and passive resignation humans and other animals learn when unable to avoid repeated aversive events.

learning

the process of acquiring through experience new and relatively enduring information or behaviors.

lesion [LEE-zhuhn]
tissue destruction. Brain lesions occur naturally (disease or trauma), in surgery, or experimentally (using electrodes to destroy brain cells).

levels of analysis
the differing complementary views, from biological to psychological to social-cultural, for analyzing any given phenomenon.

limbic system
neural system located mostly in the forebrain—below the cerebral hemispheres—that includes the *amygdala, hypothalamus,* and *hippocampus;* associated with emotions and drives.

linguistic determinism
Whorf's hypothesis that language determines the way we think.

linguistic relativism
the idea that language influences the way we think.

lobotomy
a psychosurgical procedure once used to calm uncontrollably emotional or violent patients. The procedure cut the nerves that connect the frontal lobes to the emotion-controlling centers of the inner brain.

long-term memory
the relatively permanent and limitless archive of the memory system. Includes knowledge, skills, and experiences.

long-term potentiation (LTP)
an increase in a nerve cell's firing potential after brief, rapid stimulation; a neural basis for learning and memory.

longitudinal study
research that follows and retests the same people over time.

loose culture
places with flexible and informal norms.

LSD (lysergic acid diethylamide)
a powerful hallucinogenic drug; also known as *acid.*

magnetoencephalography (MEG)
a brain-imaging technique that measures magnetic fields from the brain's natural electrical activity.

major depressive disorder
a disorder in which a person experiences five or more symptoms lasting 2 or more weeks. In the absence of drug use or a medical condition, at least one symptom must be either (1) depressed mood or (2) loss of interest or pleasure.

mania
an unusually excited and overly ambitious mood state in which people show dangerously poor judgment, less need for sleep, and increased energy (part of bipolar disorders).

manifest content
according to Freud, the symbolic, remembered story line of a dream (as distinct from its *latent,* or hidden, content).

maturation
biological growth processes that enable orderly changes in behavior, relatively uninfluenced by experience.

mean
the arithmetic average of a distribution, obtained by adding the scores and then dividing by the number of scores.

median
the middle score in a distribution; half the scores are above it and half are below it.

medical model
the concept that diseases, in this case psychological disorders, have physical causes that can be *diagnosed, treated,* and, in most cases, *cured,* often through treatment in a *hospital.*

medulla [muh-DUL-uh]
the hindbrain structure that is the brainstem's base; controls heartbeat and breathing.

memory
the persistence of learning over time through the encoding, storage, and retrieval of information.

memory consolidation
the neural storage of a long-term memory.

menarche [meh-NAR-key]
the first menstrual period.

menopause
the time of natural cessation of menstruation; also refers to the biological changes a woman experiences as her ability to reproduce declines.

mental age
a measure of intelligence test performance devised by Binet; the level of performance typically associated with children of a certain chronological age. Thus, a child who does as well as an average 8-year-old is said to have a mental age of 8.

mental set

a tendency to approach a problem in one particular way, often a way that has been successful in the past.

mere exposure effect
the tendency for repeated exposure to novel stimuli to increase our liking of them.

meta-analysis
a statistical procedure for analyzing the results of multiple studies to reach an overall conclusion.

metacognition
cognition about our cognition; keeping track of and evaluating our mental processes.

methamphetamine
a powerfully addictive drug that stimulates the central nervous system, with accelerated body functions and associated energy and mood changes; over time, reduces baseline dopamine levels.

midbrain
found atop the brainstem; connects the *hindbrain* with the *forebrain,* controls some motor movement, and transmits auditory and visual information.

middle ear
the chamber between the eardrum and cochlea containing three tiny bones—hammer (malleus), anvil (incus), and stirrup (stapes)—that concentrate the vibrations of the eardrum on the cochlea's oval window.

mindfulness meditation
a reflective practice in which people attend to current experiences in a nonjudgmental and accepting manner.

Minnesota Multiphasic Personality Inventory (MMPI)

the most widely researched and clinically used of all personality tests. Originally developed to identify emotional disorders (still considered its most appropriate use), this test is now used for many other screening purposes.

mirror neurons
frontal lobe neurons that some scientists believe fire when we perform certain actions or observe another doing so. The brain's mirroring of another's action may enable imitation and empathy.

mirror-image perceptions
mutual views often held by conflicting parties, as when each side sees itself as ethical and peaceful and views the other side as evil and aggressive.

misinformation effect
occurs when a memory has been corrupted by misleading information.

mnemonics [nih-MON-iks]
memory aids, especially those techniques that use vivid imagery and organizational devices.

mode
the most frequently occurring score(s) in a distribution.

modeling
the process of observing and imitating a specific behavior.

molecular behavior genetics
the study of how the structure and function of genes interact with our environment to influence behavior.

molecular genetics
the subfield of biology that studies the molecular structure and function of genes.

monocular cue

a depth cue, such as interposition or linear perspective, available to either eye alone.

mood-congruent memory
the tendency to recall experiences that are consistent with one's current good or bad mood.

morpheme
in a language, the smallest unit that carries meaning; may be a word or a part of a word (such as a prefix).

motivation
a need or desire that energizes and directs (or *pushes*) behavior.

motor (efferent) neurons
neurons that carry outgoing information from the brain and spinal cord to the muscles and glands.

motor cortex
a cerebral cortex area at the rear of the frontal lobes that controls voluntary movements.

MRI (magnetic resonance imaging)
a technique that uses magnetic fields and radio waves to produce computer-generated images of soft tissue. MRI scans show brain anatomy.

mutation
a random error in gene replication that leads to a change.

myelin [MY-uh-lin] sheath
a fatty tissue layer segmentally encasing the axons of some neurons; enables vastly greater transmission speed as neural impulses hop from one node to the next.

narcissism
excessive self-love and self-absorption.

narcolepsy
a sleep disorder characterized by uncontrollable sleep attacks. The sufferer may lapse directly into REM sleep, often at inopportune times.

natural selection
the principle that inherited traits that better enable an organism to survive and reproduce in a particular environment will (in competition with other trait variations) most likely be passed on to succeeding generations.

naturalistic observation
a descriptive technique of observing and recording behavior in naturally occurring situations without changing or controlling the situation.

nature–nurture issue
the longstanding controversy over the relative contributions that genes and experience make to the development of psychological traits and behaviors. Today's science sees traits and behaviors arising from the interaction of nature and nurture.

near-death experience
an altered state of consciousness reported after a close brush with death (such as cardiac arrest); often similar to drug-induced hallucinations.

negative punishment
an event that decreases behavior by removing a rewarding stimulus.

negative reinforcement
increasing behaviors by stopping or reducing an aversive stimulus. A negative reinforcer is any stimulus that, when *removed* after a response, strengthens the response. (*Note:* Negative reinforcement is not punishment.)

nerves
bundled axons that form neural cables connecting the central nervous system with muscles, glands, and sensory organs.

nervous system
the body's speedy, electrochemical communication network, consisting of all the nerve cells of the peripheral and central nervous systems.

neurocognitive disorders (NCDs)
acquired (not lifelong) disorders marked by cognitive deficits; often related to Alzheimer's disease, brain injury or disease, or substance abuse. Also called *dementia* in older adults.

neurodevelopmental disorder
central nervous system developmental differences (usually in the brain) that start in childhood and alter thinking and behavior (as in intellectual limitations or a psychological disorder).

neurogenesis
the formation of new neurons.

neuron
a nerve cell; the basic building block of the nervous system.

neuroplasticity
the brain's ability to change, especially during childhood, by reorganizing after damage or by building new pathways based on experience.

neurotransmitters
chemical messengers that cross the synaptic gap between neurons. When released by the sending neuron, neurotransmitters travel across the synapse and bind to receptor sites on the receiving neuron, thereby influencing whether that neuron will generate a neural impulse.

neutral stimulus (NS)
in classical conditioning, a stimulus that elicits no response before conditioning.

nicotine
a stimulating and highly addictive psychoactive drug in tobacco products.

night terrors
a sleep disorder characterized by high arousal and an appearance of being terrified; unlike nightmares, night terrors occur during N3 sleep, within 2 or 3 hours of falling asleep, and are seldom remembered.

normal curve
a symmetrical, bell-shaped curve that describes the distribution of many types of data; most scores fall near the mean (about 68 percent fall within one standard deviation of it) and fewer and fewer near the extremes. (Also called a *normal distribution.*)

normative social influence
influence resulting from a person's desire to gain approval or avoid disapproval.

norms
understood rules for accepted and expected behavior. Norms prescribe "proper" behavior.

nudge
framing choices in a way that encourages people to make beneficial decisions.

obesity
defined as a body mass index (BMI) measurement of 30 or higher, which is calculated from our weight-to-height ratio. (Individuals who are *overweight* have a BMI of 25 or higher.)

object permanence
the awareness that things continue to exist even when not perceived.

observational learning
learning by observing others. (Also called *social learning*.)

obsessive-compulsive disorder (OCD)
a disorder characterized by unwanted and repetitive thoughts (obsessions), actions (compulsions), or both.

occipital [ahk-SIP-uh-tuhl] lobes
the portion of the cerebral cortex lying at the back of the head; includes areas that receive information from the visual fields.

Oedipus [ED-uh-puss] complex
according to Freud, a boy's sexual desires toward his mother and feelings of jealousy and hatred for the rival father.

olfaction
our sense of smell.

one-word stage
the stage in speech development, from about age 1 to 2, during which a child speaks mostly in single words.

operant behavior
behavior that operates on the environment, producing a consequence.

operant chamber
in operant conditioning research, a chamber (also known as a *Skinner box*) containing a bar or key that an animal can manipulate to obtain a food or water reinforcer; attached devices record the animal's rate of bar pressing or key pecking.

operant conditioning
a type of learning in which a behavior becomes more likely to recur if followed by a reinforcer or less likely to recur if followed by a punisher.

operational definition
a carefully worded statement of the exact procedures (operations) used in a research study. For example, *human intelligence* may be operationally defined as what an intelligence test measures. (Also known as *operationalization.*)

opioids
opium and its derivatives, such as morphine and heroin; depress neural activity, temporarily lessening pain and anxiety.

opponent-process theory
the theory that opposing retinal processes (red-green, blue-yellow, white-black) enable color vision. For example, some cells are stimulated by green and inhibited by red; others are stimulated by red and inhibited by green.

optic nerve
the nerve that carries neural impulses from the eye to the brain.

organizational psychology
an I/O psychology subfield that examines organizational influences on worker satisfaction and productivity and facilitates organizational change.

ostracism
deliberate social exclusion of individuals or groups.

other-race effect
the tendency to recall faces of one's own race more accurately than faces of other races. Also called the *cross-race effect* and the *own-race bias*.

outgroup
"them"—those perceived as different or apart from our ingroup.

overconfidence
the tendency to be more confident than correct—to overestimate the accuracy of our beliefs and judgments.

panic disorder
an anxiety disorder marked by unpredictable, minutes-long episodes of intense dread in which a person may experience terror and accompanying chest pain, choking, or other frightening sensations; often followed by worry over a possible next attack.

parallel processing
processing multiple aspects of a stimulus or problem simultaneously.

paraphilias
sexual arousal from fantasies, behaviors, or urges involving nonhuman objects, the suffering of self or others, and/or nonconsenting persons.

parapsychology
the study of paranormal phenomena, including ESP and psychokinesis (also called *telekinesis*).

parasympathetic nervous system
the division of the autonomic nervous system that calms the body, conserving its energy.

parietal [puh-RYE-uh-tuhl] lobes
the portion of the cerebral cortex lying at the top of the head and toward the rear; receives sensory input for touch and body position.

partial (intermittent) reinforcement schedule
reinforcing a response only part of the time; results in slower acquisition of a response but much greater resistance to extinction than does continuous reinforcement.

passionate love
an aroused state of intense positive absorption in another, usually present at the beginning of a romantic relationship.

peer reviewers
scientific experts who evaluate a research article's theory, originality, and accuracy.

perception
the process by which our brain organizes and interprets sensory information, enabling us to recognize objects and events as meaningful.

perceptual adaptation
the ability to adjust to changed sensory input, including an artificially displaced or even inverted visual field.

perceptual constancy
perceiving objects as unchanging (having consistent color, brightness, shape, and size) even as illumination and retinal images change.

perceptual set
a mental predisposition to perceive one thing and not another.

peripheral nervous system (PNS)
the sensory and motor neurons that connect the central nervous system (CNS) to the rest of the body.

peripheral route persuasion
occurs when people are influenced by attention-getting cues, such as a speaker's attractiveness.

person-centered therapy
a humanistic therapy, developed by Carl Rogers, in which the client directs the discussion and the therapist uses techniques such as *active listening* within an accepting, genuine, empathic environment to facilitate clients' growth. (Also called *client-centered therapy*.)

personal control

our sense of being in charge of our environment rather than feeling helpless.

personality
an individual's characteristic pattern of thinking, feeling, and acting.

personality disorders
a group of disorders characterized by enduring inner experiences or behavior patterns that differ from the person's cultural norms and expectations, are pervasive and inflexible, begin in adolescence or early adulthood, are stable over time, and cause distress or impairment.

personality inventory
a questionnaire (often with *true-false* or *agree-disagree* items) on which people respond to items designed to gauge a wide range of feelings and behaviors; used to assess selected personality traits.

personnel psychology
an I/O psychology subfield that helps with job seeking, and with employee recruitment, selection, placement, training, appraisal, and development.

PET (positron emission tomography)
a technique for detecting brain activity that displays where a radioactive form of glucose goes while the brain performs a given task.

phi phenomenon
an illusion of movement created when two or more adjacent lights blink on and off in quick succession.

phoneme
in a language, the smallest distinctive sound unit.

physiological need
a basic bodily requirement.

pitch
a tone's experienced highness or lowness; depends on frequency.

pituitary gland
the endocrine system's most influential gland. Under the influence of the hypothalamus, the pituitary regulates growth and controls other endocrine glands.

place theory
in hearing, the theory that links the pitch we hear with the place where the cochlea's membrane is stimulated. (Also called *place coding*.)

placebo [pluh-SEE-bo; Latin for "I shall please"] effect
experimental results caused by expectations alone; any effect on behavior caused by the administration of an inert substance or condition, which the recipient assumes is an active agent.

polygraph
a machine used in attempts to detect lies; measures emotion-linked changes in perspiration, heart rate, and breathing.

population
all those in a group being studied, from which random samples may be drawn. (*Note:* Except for national studies, this does *not* refer to a country's whole population.)

positive psychology
the scientific study of human flourishing, with the goals of discovering and promoting strengths and virtues that help individuals and communities to thrive.

positive punishment
an event that decreases a behavior by administering a negative stimulus.

positive reinforcement

increasing behaviors by presenting a pleasurable stimulus. A positive reinforcer is any stimulus that, when *presented* after a response, strengthens the response.

posthypnotic suggestion
a suggestion, made during a hypnosis session, to be carried out after the subject is no longer hypnotized; used by some clinicians to help control undesired symptoms and behaviors.

posttraumatic growth
positive psychological changes following a struggle with extremely challenging circumstances and life crises.

posttraumatic stress disorder (PTSD)
a disorder characterized by haunting memories, nightmares, hypervigilance, avoidance of trauma-related stimuli, social withdrawal, jumpy anxiety, numbness of feeling, and/or insomnia that lingers for 4 weeks or more after a traumatic experience.

predictive validity
the success with which a test predicts the behavior it is designed to predict; it is assessed by computing the correlation between test scores and the criterion behavior. (Also called *criterion-related validity.*)

prejudice
an unjustifiable and usually negative attitude toward a group and its members. Prejudice generally involves stereotyped beliefs, negative feelings, and a predisposition to discriminatory action.

preoperational stage
in Piaget's theory, the stage (from about 2 to 6 or 7 years of age) at which a child learns to use language but does not yet comprehend the mental operations of concrete logic.

preparedness

a biological predisposition to learn associations, such as between taste and nausea, that have survival value.

preregistration
publicly communicating planned study design, hypotheses, data collection, and analyses.

primary reinforcer
an innately reinforcing stimulus, such as one that satisfies a biological need.

primary sex characteristics
the body structures (ovaries, testes, and external genitalia) that make sexual reproduction possible.

priming
the activation, often unconsciously, of certain associations, thus predisposing one's perception, memory, or response.

proactive interference
the forward-acting disruptive effect of older learning on the recall of *new* information.

problem-focused coping
attempting to alleviate stress directly—by changing the stressor or the way we interact with that stressor.

projective test
a personality test, such as the TAT or Rorschach, that provides ambiguous images designed to trigger projection of people's inner dynamics.

prosocial behavior
positive, constructive, helpful behavior. The opposite of antisocial behavior.

prototype

a mental image or best example of a category. Matching new items to a prototype provides a quick and easy method for sorting items into categories (as when comparing feathered creatures to a prototypical bird, such as a crow).

psychedelic drugs
hallucinogenic drugs used to treat depressive disorders, anxiety disorders, posttraumatic stress disorder, and substance use disorders. These drugs cause temporary visual, psychological, and auditory changes, and an altered state of consciousness (often called a psychedelic experience or "trip").

psychiatry
a branch of medicine dealing with psychological disorders; practiced by physicians who provide medical (for example, drug) treatments as well as psychological therapy.

psychoactive drug
a chemical substance that alters the brain, causing changes in perceptions and moods.

psychoanalysis
(1) Freud's theory of personality that attributes thoughts and actions to unconscious motives and conflicts. (2) Freud's therapeutic technique. Freud believed the patient's free associations, resistances, and dreams—and the analyst's interpretations of them—released previously repressed feelings, allowing the patient to gain self-insight.

psychodynamic theories
theories that view personality with a focus on the unconscious mind and the importance of childhood experiences.

psychodynamic therapy
therapy deriving from the psychoanalytic tradition; views individuals as responding to unconscious forces and childhood experiences, and seeks to

enhance self-insight.

psychological disorder
a disturbance in people's thoughts, emotions, or behaviors that causes distress or suffering and impairs their daily lives.

psychology
the science of behavior and mental processes.

psychoneuroimmunology
the study of how psychological, neural, and endocrine processes together affect our immune system and resulting health.

psychopharmacology
the study of the effects of drugs on the mind and behavior.

psychophysics
the study of relationships between the physical characteristics of stimuli, such as their intensity, and our psychological experience of them.

psychosexual stages
the childhood stages of development (oral, anal, phallic, latency, genital) during which, according to Freud, the id's pleasure-seeking energies focus on distinct *erogenous zones.*

psychosurgery
surgery that removes or destroys brain tissue to change behavior.

psychotherapy
treatment involving psychological techniques; consists of interactions between a trained therapist and someone seeking to address psychological difficulties or achieve personal growth.

psychotic disorders

a group of disorders marked by irrational ideas, distorted perceptions, and a loss of contact with reality.

puberty
the period of sexual maturation, during which a person usually becomes capable of reproducing.

random assignment
assigning participants to experimental and control groups by chance, thus minimizing preexisting differences between the different groups.

random sample
a sample that fairly represents a population because each member has an equal chance of inclusion.

range
the difference between the highest and lowest scores in a distribution.

recall
a measure of memory in which the person must retrieve information learned earlier, as on a fill-in-the-blank test.

reciprocal determinism
the interacting influences of behavior, internal cognition, and environment.

reciprocity norm
an expectation that people will help, not hurt, those who have helped them.

recognition
a measure of memory in which the person identifies items previously learned, as on a multiple-choice test.

reconsolidation

a process in which previously stored memories, when retrieved, are potentially altered before being stored again.

reflex
a simple, automatic response to a sensory stimulus, such as the knee-jerk reflex.

refractory period
(1) in neural processing, a brief resting pause that occurs after a neuron has fired; subsequent action potentials cannot occur until the axon returns to its resting state. (2) in human sexuality, a resting period that occurs after orgasm, during which a person cannot achieve another orgasm.

regression toward the mean
the tendency for extreme or unusual scores or events to fall back (regress) toward the average.

reinforcement
in operant conditioning, any event that *strengthens* the behavior it follows.

reinforcement schedule
a pattern that defines how often a desired response will be reinforced.

relational aggression
an act of aggression (physical or verbal) intended to harm a person's relationship or social standing.

relative deprivation
the perception that we are worse off relative to those with whom we compare ourselves.

relearning
a measure of memory that assesses the amount of time saved when learning material again.

reliability
the extent to which a test yields consistent results, as assessed by the consistency of scores on two halves of the test, on alternative forms of the test, or on retesting.

REM rebound
the tendency for REM sleep to increase following REM sleep deprivation.

REM sleep
rapid eye movement sleep; a recurring sleep stage during which vivid dreams commonly occur. Also known as *paradoxical sleep,* because the muscles are relaxed (except for minor twitches) but other body and brain systems are active. (Sometimes called *R sleep.*)

REM sleep behavior disorder
a sleep disorder characterized by acting out dreams while sleeping, through physical movements (such as kicking or striking out) and vocal behaviors (such as talking or yelling).

replication
repeating the essence of a research study, usually with different participants in different situations, to see whether the basic finding can be reproduced.

representativeness heuristic
judging the likelihood of events in terms of how well they seem to represent, or match, particular prototypes; may lead us to ignore other relevant information.

repression
in psychoanalytic theory, the basic defense mechanism that banishes from consciousness anxiety-arousing thoughts, feelings, and memories.

resilience
the personal strength that helps people cope with stress and recover from adversity and even trauma.

resistance
in psychoanalysis, the blocking from consciousness of unpleasant or anxiety-laden material.

respondent behavior
behavior that occurs as an automatic response to some stimulus.

reticular formation
a nerve network that travels through the brainstem into the thalamus; filters information and plays an important role in controlling arousal.

retina
the light-sensitive back inner surface of the eye, containing the receptor rods and cones plus layers of neurons that begin the processing of visual information.

retinal disparity
a binocular cue for perceiving depth. By comparing retinal images from the two eyes, the brain computes distance—the greater the disparity (difference) between the two images, the closer the object.

retrieval
the process of getting information out of memory storage.

retroactive interference
the backward-acting disruptive effect of newer learning on the recall of *old* information.

retrograde amnesia
an inability to remember information from one's past.

reuptake
a neurotransmitter's reabsorption by the sending neuron.

rods

retinal receptors that detect black, white, and gray, and are sensitive to movement. Rods are necessary for peripheral and twilight vision, when cones don't respond.

role
a set of expectations *(norms)* about a social position, defining how those in the position ought to behave.

Rorschach inkblot test
a projective test designed by Hermann Rorschach; seeks to identify people's inner feelings by analyzing how they interpret 10 inkblots.

rumination
compulsive fretting; *overthinking* our problems and their causes.

savant syndrome
a condition in which a person otherwise limited in mental ability has an exceptional specific skill, such as in computation or drawing.

scaffold
in Vygotsky's theory, a framework that offers children temporary support as they develop higher levels of thinking.

scapegoat theory
the theory that prejudice offers an outlet for anger by providing someone to blame.

scatterplot
a graphed cluster of dots, each of which represents the values of two variables. The slope of the points suggests the direction of the relationship between the two variables. The amount of scatter suggests the strength of the correlation (little scatter indicates high correlation).

schema

a concept or framework that organizes and interprets information.

schizophrenia
a disorder characterized by delusions, hallucinations, disorganized speech, and/or diminished, inappropriate emotional expression.

secondary sex characteristics
nonreproductive sexual traits, such as female breasts and hips, male voice quality, and body hair.

selective attention
focusing conscious awareness on a particular stimulus.

self
in contemporary psychology, assumed to be the center of personality, the organizer of our thoughts, feelings, and actions.

self-actualization
according to Maslow, one of the ultimate psychological needs that arises after basic physical and psychological needs are met and self-esteem is achieved; the motivation to fulfill one's potential.

self-concept
all our thoughts and feelings about ourselves, in answer to the question, "Who am I?"

self-control
the ability to control impulses and delay short-term gratification for greater long-term rewards.

self-determination theory
the theory that we feel motivated to satisfy our needs for competence, autonomy, and relatedness.

self-disclosure
the act of revealing intimate aspects of ourselves to others.

self-efficacy
our sense of competence and effectiveness.

self-esteem
our feelings of high or low self-worth.

self-fulfilling prophecy
a belief that leads to its own fulfillment.

self-report
a method of recording participants' descriptions of their personality traits, often using surveys, questionnaires, or tests.

self-serving bias
a readiness to perceive ourselves favorably.

self-transcendence
according to Maslow, the striving for identity, meaning, and purpose beyond the self.

semantic memory
explicit memory of facts and general knowledge; one of our two conscious memory systems (the other is *episodic memory*).

sensation
the process by which our sensory receptors and nervous system receive and represent stimulus energies from our environment.

sensorimotor stage
in Piaget's theory, the stage (from birth to nearly 2 years of age) at which infants know the world mostly in terms of their sensory impressions and motor activities.

sensorineural hearing loss
the most common form of hearing loss, caused by damage to the cochlea's receptor cells or to the auditory nerve; also called *nerve deafness*.

sensory (afferent) neurons
neurons that carry incoming information from the body's tissues and sensory receptors to the brain and spinal cord.

sensory adaptation
diminished sensitivity as a consequence of constant stimulation.

sensory interaction
the principle that one sense can influence another, as when the smell of food influences its taste.

sensory memory
the immediate, very brief recording of sensory information in the memory system.

sensory receptors
sensory nerve endings that respond to stimuli.

sequential processing
processing one aspect of a stimulus or problem at a time; generally used to process new information or to solve difficult problems.

serial position effect
our tendency to recall best the last *(recency effect)* and first *(primacy effect)* items in a list.

set point
the point at which the "weight thermostat" may be set. When the body falls below this weight, increased hunger and a lowered metabolic rate may combine to restore lost weight.

sex
in psychology, the biologically influenced characteristics by which people define *male, female,* and *intersex.*

sexual aggression
any physical or verbal behavior of a sexual nature that is unwanted or intended to harm someone physically or emotionally. Can be expressed as either *sexual harassment* or *sexual assault.*

sexual dysfunction
a problem that consistently impairs sexual arousal or functioning at any point in the sexual response cycle.

sexual orientation
the direction of our sexual attractions, as reflected in our longings and fantasies.

sexual response cycle
the four stages of sexual responding described by Masters and Johnson—excitement, plateau, orgasm, and resolution.

sexuality
our thoughts, feelings, and actions related to our physical attraction to another.

shallow processing
encoding on a basic level, based on the structure or appearance of words.

shaping
an operant conditioning procedure in which reinforcers guide behavior toward closer and closer approximations of the desired behavior.

short-term memory
briefly activated memory of a few items (such as digits of a phone number while calling) that is later stored or forgotten.

signal detection theory
a theory predicting how and when we detect the presence of a faint stimulus *(signal)* amid background stimulation *(noise)*. Assumes there is no single absolute threshold and that detection depends partly on a person's experience, expectations, motivation, and alertness.

sleep
a periodic, natural loss of consciousness—as distinct from unconsciousness resulting from a coma, general anesthesia, or hibernation. (Information from Dement, 1999.)

sleep apnea
a sleep disorder characterized by temporary cessations of breathing during sleep and repeated momentary awakenings.

social anxiety disorder
intense fear and avoidance of social situations.

social clock
the culturally preferred timing of social events such as marriage, parenthood, and retirement.

social exchange theory
the theory that our social behavior is an exchange process, the aim of which is to maximize benefits and minimize costs.

social facilitation
in the presence of others, improved performance on simple or well-learned tasks, and worsened performance on difficult tasks.

social identity
the "we" aspect of our self-concept; the part of our answer to "Who am I?" that comes from our group memberships.

social leadership
group-oriented leadership that builds teamwork, mediates conflict, and offers support.

social learning theory
the theory that we learn social behavior by observing and imitating and by being rewarded or punished.

social loafing
the tendency for people in a group to exert less effort when pooling their efforts toward attaining a common goal than when individually accountable.

social psychology
the scientific study of how we think about, influence, and relate to one another.

social script
a culturally modeled guide for how to act in various situations.

social trap
a situation in which two parties, by each pursuing their self-interest rather than the good of the group, become caught in mutually destructive behavior.

social-cognitive perspective
a view of behavior as influenced by the interaction between people's traits (including their thinking) and their social context.

social-responsibility norm
an expectation that people will help those needing their help.

somatic nervous system
the division of the peripheral nervous system that controls the body's skeletal muscles. Also called the *skeletal nervous system.*

somatic symptom disorder

a psychological disorder in which the symptoms take a somatic (bodily) form without apparent physical cause.

somatosensory cortex
a cerebral cortex area at the front of the parietal lobes that registers and processes body touch and movement sensations.

source amnesia
faulty memory for how, when, or where information was learned or imagined. (Also called *source misattribution.*) Source amnesia, along with the misinformation effect, is at the heart of many false memories.

spacing effect
the tendency for distributed study or practice to yield better long-term retention than is achieved through massed study or practice.

specific phobia
an anxiety disorder marked by a persistent, irrational fear and avoidance of a specific object, activity, or situation.

spermarche [sper-MAR-key]
the first ejaculation.

split brain
a condition resulting from surgery that separates the brain's two hemispheres by cutting the fibers (mainly those of the corpus callosum) connecting them.

spontaneous recovery
the reappearance, after a pause, of a weakened conditioned response.

spotlight effect
overestimating others' noticing and evaluating our appearance, performance, and blunders (as if we presume a spotlight shines on us).

SQ3R
a study method incorporating five steps: *S*urvey, *Q*uestion, *R*ead, *R*etrieve, *R*eview.

standard deviation
a computed measure of how much scores vary around the mean score.

standardization
defining uniform testing procedures and meaningful scores by comparison with the performance of a pretested group.

Stanford-Binet
the widely used U.S. revision (by Terman at Stanford University) of Binet's original intelligence test.

statistical significance
a statistical statement of how likely it is that an obtained result (such as a difference between samples) occurred by chance, assuming there is no difference between the populations being studied.

statistics
using mathematical methods to understand numerical information *(data)*.

stereotype
a generalized (sometimes accurate but often overgeneralized) belief about a group of people.

stereotype threat
a self-confirming concern that one will be evaluated based on a negative stereotype.

stimulants
drugs (such as caffeine, nicotine, and the more powerful cocaine, amphetamines, methamphetamine, and Ecstasy) that excite neural activity and speed up body functions.

stimulus
any event or situation that evokes a response.

storage
the process of retaining encoded information over time.

stranger anxiety
the fear of strangers that infants commonly display, beginning by about 8 months of age.

stress
the process by which we perceive and respond to certain events, called *stressors,* that we appraise as threatening or challenging.

structuralism
an early school of thought promoted by Wundt and Titchener; used introspection to reveal the structure of the human mind.

structured interviews
an interview process that asks the same job-relevant questions of all applicants, each of whom is rated on established scales.

subjective well-being
self-perceived satisfaction with life. Used along with measures of objective well-being (for example, physical and economic indicators) to judge our quality of life.

subliminal stimulation
presenting something below one's absolute threshold for conscious awareness.

substance use disorder
a disorder characterized by continued substance use despite significant life disruption.

superego

the partly conscious part of personality that, according to Freud, represents internalized ideals and provides standards for judgment (the conscience) and for future aspirations.

superordinate goals
shared goals that override differences among people and require their cooperation.

suprachiasmatic nucleus (SCN)
a pair of cell clusters in the hypothalamus that controls circadian rhythm. In response to light, the SCN causes the pineal gland to adjust melatonin production, thus modifying our feelings of sleepiness.

survey
a descriptive technique for obtaining the self-reported attitudes or behaviors of a particular group, usually by questioning a representative, *random sample* of the group.

sympathetic nervous system
the division of the autonomic nervous system that arouses the body, mobilizing its energy.

synapse [SIN-aps]
the junction between the axon tip of the sending neuron and the dendrite or cell body of the receiving neuron. The tiny gap at this junction is called the *synaptic gap* (or *synaptic cleft*).

syntax
the correct way to string words together to form sentences for a given language.

systematic desensitization
a type of exposure therapy that associates a pleasant relaxed state with gradually increasing anxiety-triggering stimuli. Commonly used to treat specific phobias.

task leadership
goal-oriented leadership that sets standards, organizes work, and focuses attention on goals.

telegraphic speech
the early speech stage in which a child speaks like a telegram—"go car"—using mostly nouns and verbs.

temperament
a person's characteristic emotional reactivity and intensity.

temporal lobes
the portion of the cerebral cortex lying roughly above the ears; includes the auditory areas, each receiving information primarily from the opposite ear.

tend-and-befriend response
under stress, people (especially women) often provide support to others *(tend)* and bond with and seek support from others *(befriend).*

teratogens
agents, such as chemicals and viruses, that can reach the embryo or fetus during prenatal development and cause harm.

terror-management theory
a theory of death-related anxiety; explores people's emotional and behavioral responses to reminders of their impending death.

testing effect
enhanced memory after retrieving, rather than simply rereading, information. Also referred to as a *retrieval practice effect* or *test-enhanced learning.*

testosterone
the most important male sex hormone. Males and females have it, but the additional testosterone in males stimulates the growth of the male sex organs

during the fetal period, and the development of the male sex characteristics during puberty.

thalamus [THAL-uh-muss]
the forebrain's sensory control center, located on top of the brainstem; it directs messages to the sensory receiving areas in the cortex and transmits replies to the cerebellum and medulla.

THC (delta-9-tetrahydrocannabinol)
the major mind-altering ingredient in marijuana.

Thematic Apperception Test (TAT)
a projective test in which people express their inner feelings and interests through the stories they make up about ambiguous scenes.

theory
an explanation using an integrated set of principles that organizes observations and predicts behaviors or events.

theory of mind
people's ideas about their own and others' mental states—about their feelings, perceptions, and thoughts, and the behaviors these might predict.

therapeutic alliance
a bond of trust and mutual understanding between a therapist and client, who work together constructively to overcome the client's problem.

threshold
the level of stimulation required to trigger a neural impulse.

tight culture
places with clearly defined and reliably imposed norms.

token economy

an operant conditioning procedure in which people earn a token for exhibiting a desired behavior and can later exchange tokens for privileges or treats.

tolerance
the diminishing effect with regular use of the same dose of a drug, requiring the user to take larger and larger doses before experiencing the drug's effect.

top-down processing
information processing guided by higher-level mental processes, as when we construct perceptions drawing on our experience and expectations.

trait
a characteristic pattern of behavior or a disposition to feel and act in certain ways, as assessed by self-report inventories and peer reports.

transcranial magnetic stimulation (TMS)
the application of repeated pulses of magnetic energy to the brain; used to stimulate or suppress brain activity.

transduction
conversion of one form of energy into another. In sensation, the transforming of physical energy, such as sights, sounds, and smells, into neural impulses our brain can interpret.

transference
in psychoanalysis, the patient's transfer to the analyst of emotions linked with other relationships (such as love or hatred for a parent).

transgender
an umbrella term describing people whose gender identity differs from that associated with their sex assigned at birth.

trauma- and stressor-related disorders

a group of disorders in which exposure to a traumatic or stressful event is followed by psychological distress.

two-factor theory
the Schachter-Singer theory that to experience emotion one must (1) be physically aroused and (2) cognitively label the arousal.

two-word stage
the stage in speech development, beginning about age 2, during which a child speaks mostly in two-word sentences.

Type A
Friedman and Rosenman's term for competitive, hard-driving, impatient, verbally aggressive, and anger-prone people.

Type B
Friedman and Rosenman's term for easygoing, relaxed people.

unconditional positive regard
a caring, accepting, and nonjudgmental attitude, which Carl Rogers believed would help clients develop self-awareness and self-acceptance.

unconditioned response (UR)
in classical conditioning, an unlearned, naturally occurring response (such as salivation) to an unconditioned stimulus (US) (such as food in the mouth).

unconditioned stimulus (US)
in classical conditioning, a stimulus that unconditionally—naturally and automatically—triggers an unconditioned response (UR).

unconscious
according to Freud, a reservoir of mostly unacceptable thoughts, wishes, feelings, and memories. According to contemporary psychologists, information processing of which we are unaware.

validity
the extent to which a test measures or predicts what it is supposed to. (See also *predictive validity.*)

variable
anything that can vary and is practical and ethical to measure.

variable-interval schedule
in operant conditioning, a reinforcement schedule that reinforces a response at unpredictable time intervals.

variable-ratio schedule
in operant conditioning, a reinforcement schedule that reinforces a response after an unpredictable number of responses.

vestibular sense
our balance sense—our sense of body movement and position that enables our sense of balance.

virtual reality exposure therapy
a counterconditioning technique that treats anxiety through creative electronic simulations in which people can safely face specific fears, such as flying, spiders, or public speaking.

visual cliff
a laboratory device for testing depth perception in infants and young animals.

wavelength
the distance from the peak of one light or sound wave to the peak of the next. Electromagnetic wavelengths vary from the short blips of gamma rays to the long pulses of radio transmission.

Weber's law

the principle that, to be perceived as different, two stimuli must differ by a constant minimum percentage (rather than a constant amount).

Wechsler Adult Intelligence Scale (WAIS)
the WAIS and its companion versions for children are the most widely used intelligence tests; they contain verbal and performance (nonverbal) subtests.

Wernicke's area
a brain area, usually in the left temporal lobe, involved in language comprehension and expression.

withdrawal
the discomfort and distress that follow discontinuing an addictive drug or behavior.

working memory
a newer understanding of short-term memory; conscious, active processing of both (1) incoming sensory information and (2) information retrieved from long-term memory.

X chromosome
the sex chromosome found in females and males. Females typically have two X chromosomes; males typically have one. An X chromosome from each parent produces a female child.

Y chromosome
the sex chromosome typically found only in males. When paired with an X chromosome from the mother, it produces a male child.

Yerkes-Dodson law
the principle that performance increases with arousal only up to a point, beyond which performance decreases.

Young-Helmholtz trichromatic (three-color) theory

the theory that the retina contains three different types of color receptors—one most sensitive to red, one to green, one to blue—which, when stimulated in combination, can produce the perception of any color.

zygote
the fertilized egg; it enters a 2-week period of rapid cell division and develops into an embryo.

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Note: As your authors, we aim to report psychology's current state, including each sub-discipline's latest research insights. We've incorporated over 1200 citations dated 2019–2022, highlighted here in blue.

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Notes

Chapter 1: Thinking Critically With Psychological Science (Modules 1–3)

[1]Confession: I [DM] wrote the last part of this sentence on April Fool's Day.

[2]Also sometimes called "*R*ecite."

[3]Boston is south of Paris.

[4]The anagram solution: CHAOS.

[5]The independent variable, which the researchers manipulated, was the implied ethnicity of the applicants' names. The dependent variable, which researchers measured, was the rate of positive responses from the landlords.

[6]The example is inspired by ourworldindata.org/covid-deaths-by-vaccination, which also documented that the U.S. Covid-19 death rate, as of October 2, 2021, was 13 times greater among the unvaccinated than the vaccinated.

[7]The actual standard deviation formula is:

$$\sqrt{\frac{Sum\ \ of\ (deviations\ from\ \ mean)^2}{Number\ of\ scores - 1}}$$

Chapter 3: Consciousness and the Two-Track Mind (Modules 8–10)

[1]So, would the reverse damage lead to the opposite symptoms? Indeed, there are a few such patients—who can see and recognize objects but have difficulty pointing toward or grasping them.

[2]This analogy, adapted here with world-based numbers, was suggested by mathematician Sam Saunders, as reported by K. C. Cole (1998).

Chapter 4: Nature, Nurture, and Human Diversity (Modules 11–13)

[1]Actually, this description of the two Jims errs in one respect: Jim Lewis named his son James Alan. Jim Springer named his James Allan.

Chapter 7: Learning (Modules 21–23)

[1]The “buzzer” (English translation) was perhaps the bell people commonly associate with Pavlov (Tully, 2003). Pavlov used various stimuli, but some have questioned whether he used a bell.

Chapter 8: Memory (Modules 24–26)

[1]The words were bicycle, void, cigarette, inherent, fire, and process.

[2]It was this astronaut's prospective memory that failed.

[3]One of my cookie-scarfing sons, on reading this in his father's textbook years later, confessed he had fibbed "a little."

Chapter 9: Thinking and Language (Modules 27–28)

[1]Answer to SPLOYOCHYG anagram: PSYCHOLOGY

[2]The word is *apple*: pineapple, crabapple, applesauce.

[3]The first answer is 5 cents. The bat would then cost $1.05, for a $1.10 total. If the ball cost the *intuitive* answer of 10 cents, the bat would then have to cost $1.10 (for a bat-and-ball total of $1.20, not $1.10). The second answer is Emily. If you answered incorrectly, don't fret—so do many others (Frederick, 2005; Thomson & Oppenheimer, 2016).

Chapter 10: Intelligence (Modules 29–31)

[1]The correct answer is c.

Chapter 11: What Drives Us: Hunger, Sex, Belongingness, and Achievement (Modules 32–35)

[1]Answer: Figure (c).

[2]The researchers later *debriefed* and reassured the participants.

Chapter 12: Emotions, Stress, and Health (Modules 36–40)

[1](a) happiness, (b) surprise, (c) fear, (d) sadness, (e) anger, (f) disgust.

[2]Credit: Nebraska Nurses Association

Chapter 14: Personality (Modules 45–47)

[1]Some of the late Hans Eysenck's views have been deemed racist and some of his other research has been judged untrustworthy, but his personality concepts remain accepted (O'Grady, 2020).

[2]We couldn't resist throwing that in. But don't worry, you won't be tested on *floccinaucinihilipilification,* which is the act of estimating something as worthless (and was the longest nontechnical word in the first edition of the *Oxford English Dictionary*).

Chapter 15: Psychological Disorders (Modules 48–53)

[1]Also called the *diathesis-stress model*. ("Diathesis"—meaning "predisposed vulnerability"—derives from a Greek word for "predisposition".)

[2]Many examples in the psychological disorders modules were drawn from case studies in a previous DSM edition.

Chapter 16: Therapy (Modules 54–56)

[1]Rogers made this statement at a time when the generic pronoun *he* was meant to describe people of all genders.

Appendix B: Career Fields in Psychology

[1]Although this text covers the world of psychology for students in many countries, this appendix draws primarily from available U.S. data. These descriptions of career fields in psychology do, however, apply to many other countries as well.

Extended Descriptions

The scientific attitude

FIGURE 1.1 Biopsychosocial approach

Psychology's subfields

Psychology: A science and a profession

Post-truth world

FIGURE 2.2 The scientific method

FIGURE 2.3 Twitter message moods, by time and by day

FIGURE 2.4 Scatterplots, showing patterns of correlation

FIGURE 2.5 Scatter plot for fear and disgust felt toward 24 animals

Correlation and causation

Procedures and placebo effect

FIGURE 2.6 Experimentation

FIGURE 3.1 Statistical literacy for vaccines

FIGURE 3.2 Read the scale labels

FIGURE 3.3 A skewed distribution

FIGURE 3.4 The normal curve

Significant differences

FIGURE 4.1 A wrongheaded theory

FIGURE 4.2 A motor neuron

FIGURE 4.4 Action potential

FIGURE 4.5 How neurons communicate

FIGURE 4.6 Biology of antidepressants
FIGURE 4.7 The functional divisions of the human nervous system
FIGURE 4.8 The dual functions of the autonomic nervous system
FIGURE 4.9 A simple reflex
FIGURE 4.10 The endocrine system
FIGURE 6.1 Brain divisions: forebrain, midbrain, hindbrain
FIGURE 6.6 Brain structures and their functions
FIGURE 6.7 The cortex and its basic subdivisions
FIGURE 6.8 Motor cortex and somatosensory cortex tissue devoted to each body part
FIGURE 6.9 Brain-machine interaction
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FIGURE 6.12 A blast from the past
FIGURE 7.3 The information highway from eye to brain
FIGURE 7.4 One skull, two minds
FIGURE 8.1 Altered states of consciousness
FIGURE 8.2 Evidence of awareness
Sustaining focus
FIGURE 8.4 Change blindness
FIGURE 9.1 Measuring sleep activity
FIGURE 9.2 Brain waves and sleep stages
FIGURE 9.4 The stages in a typical night's sleep
FIGURE 9.5 The biological clock
FIGURE 9.7 Less sleep equals more accidents
FIGURE 9.8 How sleep deprivation affects us
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FIGURE 9.10 Sleep across the life span
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FIGURE 10.2 Physiological effects of nicotine
FIGURE 10.3 Cocaine euphoria and crash
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FIGURE 10.6 Peer influence
FIGURE 11.1 The life code
FIGURE 11.2 Same fertilized egg, same genes; different eggs, different genes
FIGURE 11.3 Epigenetic expression
FIGURE 13.1 Experience affects brain development
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FIGURE 13.2 Deadly individualism
Culture and the self
FIGURE 13.3 A child like no other
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FIGURE 13.4 From hormones to behavior
FIGURE 13.5 Body changes at puberty
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FIGURE 13.6 The biopsychosocial approach to development
Stages of the life cycle
FIGURE 14.1 Comparing the stage theories
As adults grow older, there is continuity of self
FIGURE 14.3 Prenatal development
FIGURE 15.4 Baby math
FIGURE 15.5 Piaget's test of conservation
FIGURE 15.6 Testing children's theory of mind

FIGURE 15.9 Infants’ distress over separation
Parenting styles
Figure 16.1 Riding on the edge
FIGURE 16.2 The changing parent-child relationship
Aging
FIGURE 17.1 Life expectancy since 17 70, by world regions
FIGURE 17.2 Age and driver fatalities
FIGURE 17.3 Tests of recall
FIGURE 17.4 Recall and recognition in adulthood
FIGURE 17.6 We are social creatures
FIGURE 17.7 Biopsychosocial influences on successful aging
FIGURE 18.2 Threshold detected
Subliminal stimulation
The difference threshold
FIGURE 18.3 The jumpy eye
FIGURE 18.4 Sensory adaptation: Now you see it, now you don't!
FIGURE 18.5 Two examples of perceptual set
FIGURE 19.1 The wavelengths we see
FIGURE 19.2 The physical properties of waves
FIGURE 19.3 The eye
FIGURE 19.4 The retina's reaction to light
FIGURE 19.7 Pathway from the eyes to the visual cortex
FIGURE 19.11 A simplified summary of visual information processing
FIGURE 19.16 Gibson and Walk's visual cliff
FIGURE 19.18 Monocular depth cues
FIGURE 19.21 Relative luminance

FIGURE 20.1 The physical properties of waves
FIGURE 20.2 Hear here: How we transform sound waves into nerve impulses that our brain interprets
FIGURE 20.3 The intensity of some common sounds
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FIGURE 20.7 The pain circuit
FIGURE 20.8 The sense of smell
FIGURE 20.11 Synesthesia's symphony
FIGURE 21.1 Classical conditioning
FIGURE 21.2 Operant conditioning
FIGURE 21.4 Pavlov’s classic experiment
Cartoon depicting unconditioned response
FIGURE 21.5 An unexpected C S
FIGURE 21.6 Idealized curve of acquisition, extinction, and spontaneous recovery
FIGURE 21.7 Generalization
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FIGURE 22.1 Cat in a puzzle box
Cartoon depicting operant conditioning
FIGURE 22.3 Intermittent reinforcement schedules
FIGURE 23.1 Biopsychosocial influences on learning
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Cartoon depicting latent learning
FIGURE 23.3 The famous Bobo doll experiment
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Effects of viewing media violence

FIGURE 24.3 Ebbinghaus' retention curve
FIGURE 24.4 A modified three-stage information-processing model of memory
FIGURE 24.6 Short-term memory decay
FIGURE 24.7 Chunking effects
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FIGURE 25.4 Our two memory systems
FIGURE 25.6 The serial position effect
FIGURE 26.1 When do we forget?
FIGURE 26.2 Forgetting as encoding failure
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FIGURE 26.4 Retrieval failure
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FIGURE 26.6 Memory construction
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FIGURE 27.1 Categorizing faces influences recollection
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FIGURE 28.3 Language and perception
FIGURE 29.1 Gardner's eight intelligences
FIGURE 29.2 Smart and rich?
FIGURE 30.1 Close cousins: Aptitude and intelligence test scores
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FIGURE 30.2 The normal curve

FIGURE 30.3 Diminishing predictive power
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FIGURE 30.4 Intelligence endures
FIGURE 30.5 Cross-sectional versus longitudinal testing of intelligence at various ages
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FIGURE 31.1 Intelligence: Nature and nurture
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FIGURE 31.3 A mental rotation test
FIGURE 32.2 Maslow's hierarchy of needs
FIGURE 33.1 Monitoring stomach contractions
FIGURE 33.3 The appetite hormones
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FIGURE 34.1 Biopsychosocial influences on sexual motivation
FIGURE 34.2 Spatial abilities and sexual orientation
FIGURE 34.3 The older-brother effect
FIGURE 35.1 Inclusion of other in self (I O S) scale
FIGURE 35.2 Rise in depression coincides with rise of smartphones
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FIGURE 36.1 The brain's pathways for emotions
FIGURE 36.2 Emotional arousal
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FIGURE 37.3 Culture-specific or culturally universal expressions?
FIGURE 37.4 Cultural consensus in question
FIGURE 37.5 Anger expressed

FIGURE 37.7 How to make people smile without telling them to smile
FIGURE 38.1 Some naturally occurring infant emotions
FIGURE 38.2 A tale of two emotional dimensions
FIGURE 38.3 Emotion notification
FIGURE 38.4 Money didn't buy happiness
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FIGURE 39.1 Stress appraisal
FIGURE 39.2 Perceived Stress Scale
FIGURE 39.3 Studying stress
Stress response system
FIGURE 39.4 Selye's general adaptation syndrome
FIGURE 39.5 A simplified view of immune responses
FIGURE 39.6 Stress and colds
FIGURE 39.7 Pessimism and heart disease
Stress and health
FIGURE 40.1 How do we change our feelings?
Social support
FIGURE 40.2 Aerobic exercise reduces mild depression
FIGURE 40.3 Recurrent heart attacks and lifestyle modification
FIGURE 40.4 Predictors of longer life
FIGURE 40.5 Correlation between religious involvement and health
FIGURE 41.1 Attitudes follow behavior
Foot-in-the-door phenomenon
How to be persuasive
Non-Sequitur cartoon
FIGURE 42.1 Asch's conformity experiments

FIGURE 42.2 Milgram's follow-up obedience experiment
The power of one
FIGURE 42.3 Group polarization
Technology's a mixed bag
Internet as social amplifier
FIGURE 43.2 Boy bias
Just-world phenomenon
FIGURE 43.3 Categorizing mixed-race people
FIGURE 43.5 Gun ownership and murder rates
FIGURE 43.6 Temperature, tempers, and retaliation
FIGURE 43.7 Biopsychosocial understanding of aggression
FIGURE 44.1 The changing way we meet our partners
Similarity
FIGURE 44.2 The decision-making process for bystander intervention
FIGURE 44.3 Responses to a simulated emergency
Conciliation
FIGURE 45.1 Freud's idea of the mind's structure
FIGURE 46.1 Characteristics of Self-Actualization Scale (C S A S)
FIGURE 46.2 Two personality dimensions
Stigma of introversion
Big five personality factors
FIGURE 46.3 The Big Five self-assessment
FIGURE 46.4 Personality stability
FIGURE 47.1 Reciprocal determinism
FIGURE 47.2 The biopsychosocial approach to the study of personality

Peanuts cartoon
FIGURE 48.1 The biopsychosocial approach to psychological disorders
FIGURE 48.2 Suicide death rates, 2000 to 2019
FIGURE 48.3 Rates of U.S. nonsuicidal self-injury emergency room visits
FIGURE 48.4 Highest and lowest rates of selected disorders worldwide
FIGURE 49.1 Panic disorder
FIGURE 49.2 Some common specific fears
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FIGURE 50.1 Mood fluctuation in bipolar disorders, compared with major depressive disorder
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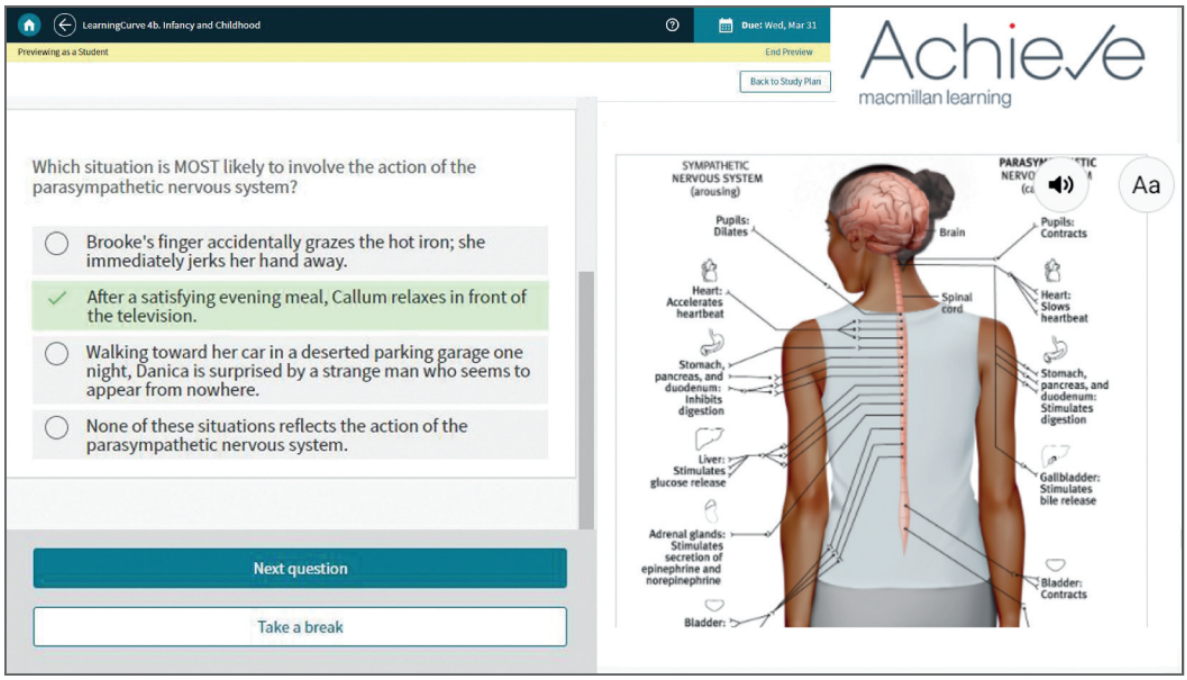
FIGURE 50.2 Worldwide gender gap in depression
FIGURE 50.3 The heritability of various psychological disorders
FIGURE 50.4 The ups and downs of a bipolar disorder
Rumination runs wild
FIGURE 50.5 Explanatory style and depression
FIGURE 50.6 The vicious cycle of depressed thinking
FIGURE 51.1 Risk of developing schizophrenia
FIGURE 51.2 Schizophrenia in only one identical twin
FIGURE 52.1 Cold-blooded arousability and risk of crime
Attention-deficit slash hyperactivity disorder
The history of treatment
Cartoon depicting behavior therapy
FIGURE 54.1 Scary spider

FIGURE 54.2 Aversion therapy for alcohol use disorder
FIGURE 54.3 A cognitive perspective on psychological disorders
Cartoon depicting cognitive therapy
Cartoon depicting psychotherapy
FIGURE 55.1 Treatment worked, as shown by the outcomes of treated versus untreated clients
FIGURE 55.2 Evidence-based practice
Therapeutic lifestyle change
FIGURE 56.1 A stimulating experience
Disability and resilience
History of psychology
History of psychology
History of psychology
History of psychology
History of psychology
History of psychology
Collaboration across the miles
FIGURE C.1 Personnel psychologists at work
Cartoon depicting effective leadership
FIGURE C.3 Designing products that fit people
FIGURE C.4 The human factor in accidents

Extended description for Learning Curve Adaptive Quizzing



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The illustration present on the right depicts the back view of a woman with the brain and spinal cord highlighted within.

The parts aroused by the SYMPATHETIC NERVOUS SYSTEM are labeled as follows: Pupils: Dilates; Heart: Accelerates heartbeat; Stomach, pancreas, and duodenum: Inhibits digestion; Liver: Stimulates glucose release; Adrenal glands: Stimulates secretion of epinephrine and norepinephrine; Bladder.

The PARASYMPATHETIC NERVOUS SYSTEM text is partially covered by a sound icon and the uppercase letter A and small letter A, enclosed in circles. The parts calmed by the parasympathetic nervous system are labeled as follows: Pupils: Contracts; Heart: Slows heartbeat; Stomach, pancreas, and duodenum: Stimulates digestion; Gallbladder: Stimulates bile release; Bladder: Contracts.

On the left, a question reads, Which situation is MOST likely to involve the action of the parasympathetic nervous system? followed by four options represented by radio button choices:

- Brooke's finger accidentally grazes the hot iron: she immediately jerks her hand away.
- After a satisfying evening meal, Callum relaxes in front of the television.
- Walking toward her car in a deserted parking garage one night, Danica is surprised by a strange man who seems to appear from nowhere.
- None of these situations reflects the action of the parasympathetic nervous system.

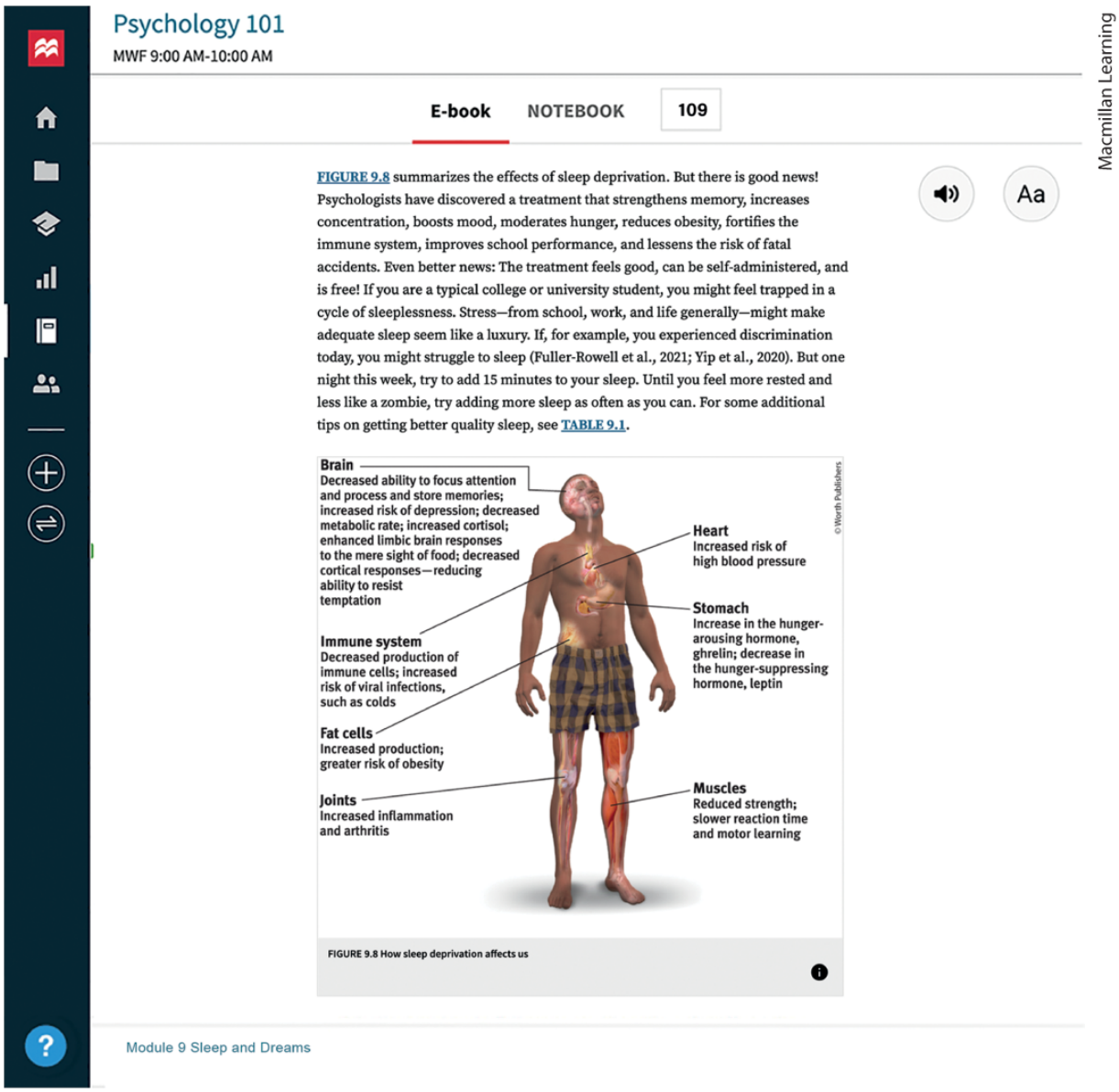
Among the above options, After a satisfying evening meal, Callum relaxes in front of the television option is marked correct.

Below the options, there are two horizontal bars, one above the other, with the labels Next Question and Take a Break, respectively.

At the top of the screenshot, there are two horizontal bars, with the first bar containing the home icon, the arrow icon enclosed in a circle, and the text LearningCurve 4 b. Infancy and Childhood in the left corner and the question mark enclosed in a circle, Calendar symbol, and text Due: Wed, Mar 31 in the right corner. The second bar contains the text Previewing as a Student in the left corner and End Preview in the right corner. Below the bar, there is the Back to Study button and the Logo: Achieve. Macmillan Learning is written in the top right corner covering the bars.

Return to Learning Curve Adaptive Quizzing

Extended description for E-book page



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The descriptions pointing to the different parts read as follows:

- **Brain:** decreased ability to focus attention and process and store memories; increased risk of depression; decreased metabolic rate; increased cortisol; enhanced limbic brain responses to the mere sight of food; decreased cortical responses dash reducing the ability to resist temptation
- **Immune system:** decreased production of immune cells; increased risk of viral infections, such as colds
- **Fat cells:** increased production; greater risk of obesity
- **Joints:** increased inflammation and arthritis; Heart: increased risk of high blood pressure
- **Stomach:** increase in the hunger arousing hormone, ghrelin; decrease in the hunger-suppressing hormone, leptin
- **Muscles:** reduced strength; slower reaction time and motor learning.

Below the illustration is written: FIGURE 9.8 How sleep deprivation affects us on the left and a small letter i enclosed in a circle on the right. At the bottom of the screenshot, Module 9 Sleep and Dreams is written in the extreme left corner.

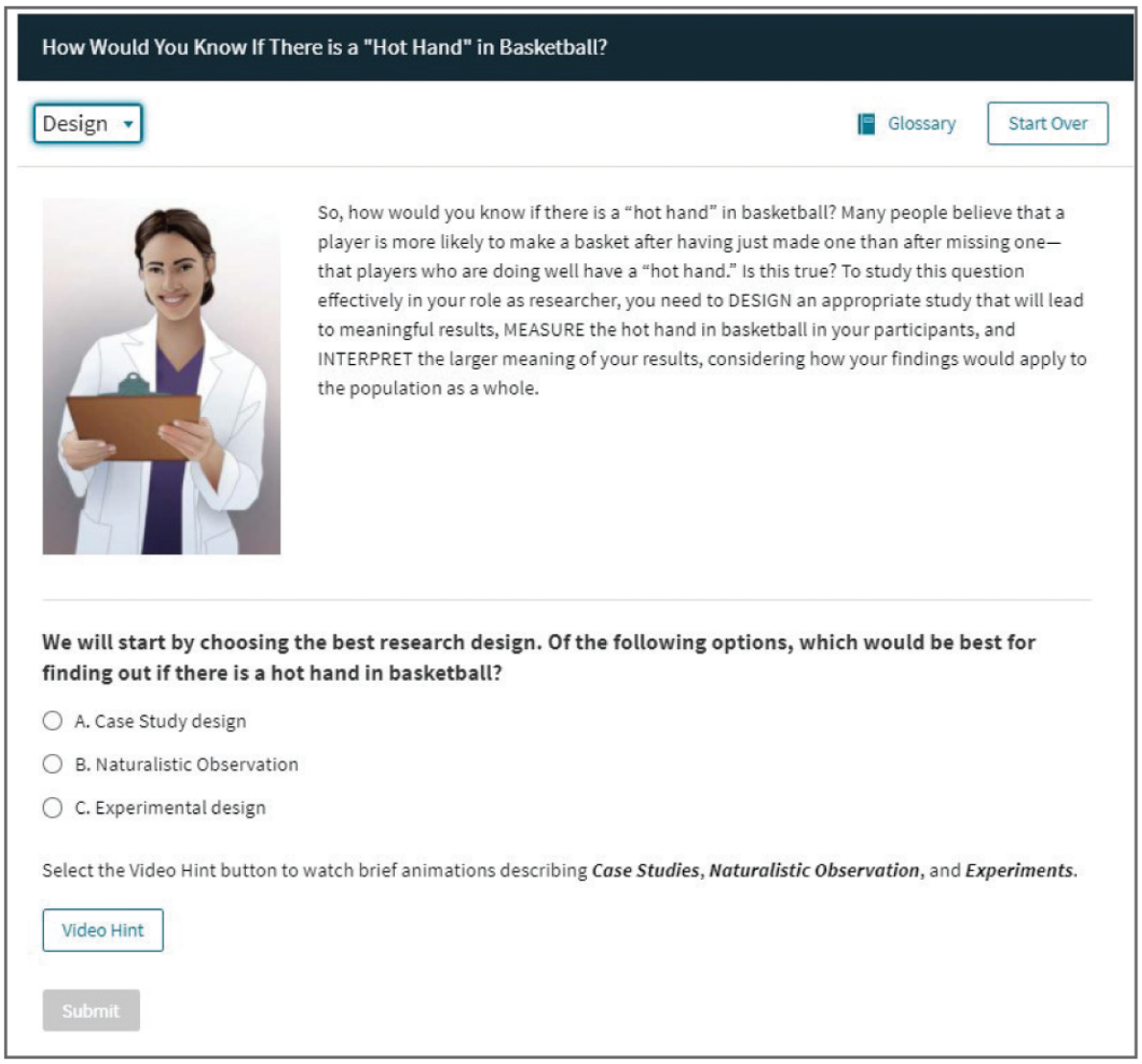
Above the illustration is written: FIGURE 9.8 summarizes the effects of sleep deprivation. But there is good news. Psychologists have discovered a treatment that strengthens memory, increases concentration, boosts mood, moderates hunger, reduces obesity, fortifies the immune system, improves school performance, and lessens the risk of fatal accidents. Even better news: The treatment feels good, can be self-administered, and is free. If you are a typical

college or university student, you might feel trapped in a cycle of sleeplessness. Stress from school, work, and life generally might make adequate sleep seem like a luxury. If, for example, you experienced discrimination today, you might struggle to sleep (Fuller-Rowell e t a l., 2021; Yip e t a l., 2020). But one night this week, try to add 15 minutes to your sleep. Until you feel more rested and less like a zombie, try adding more sleep as often as you can. For some additional tips on getting better quality sleep, see Table 9.1.

The heading of the screenshot reads Psychology 101 and M W F 9:00 A.M. - 10:00 A.M. parallel to each other. Below the heading, E-book, NOTEBOOK, and 109 enclosed in a rectangular box are written. Below it, a sound icon and an upper letter A small letter a, enclosed in circles, are present. On the extreme left, a vertical bar is present with the following icons: two wavy lines enclosed in a rectangle, a home icon, a folder icon, an icon looking like a square box tilted in the left direction, an icon with three lines increasing in size from left to right, an icon looking like a book, two people icon, a small horizontal line, a plus sign enclosed in a circle, two half arrows parallel in opposite direction and enclosed in a circle, and a question mark enclosed in a circle.

Return to E-book page

Extended description for Test question



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An illustration at the top left shows a woman in a lab coat holding a clipboard. To the right is a paragraph reading, So, how would you know if there is a “hot hand” in basketball? Many people believe that a player is more likely to make a basket after having just made one

than after missing one dash that players who are doing well have a "hot hand." Is this true? To study this question effectively in your role as a researcher, you need to DESIGN an appropriate study that will lead to meaningful results, MEASURE the hot hand in basketball in your participants, and INTERPRET the larger meaning of your results, considering how your findings would apply to the population as a whole.

A question follows the reading, **We will start by choosing the best research design. Of the following options which would be best for finding out if there is a hot hand in basketball?** Three radio button choices read:

A. Case Study design

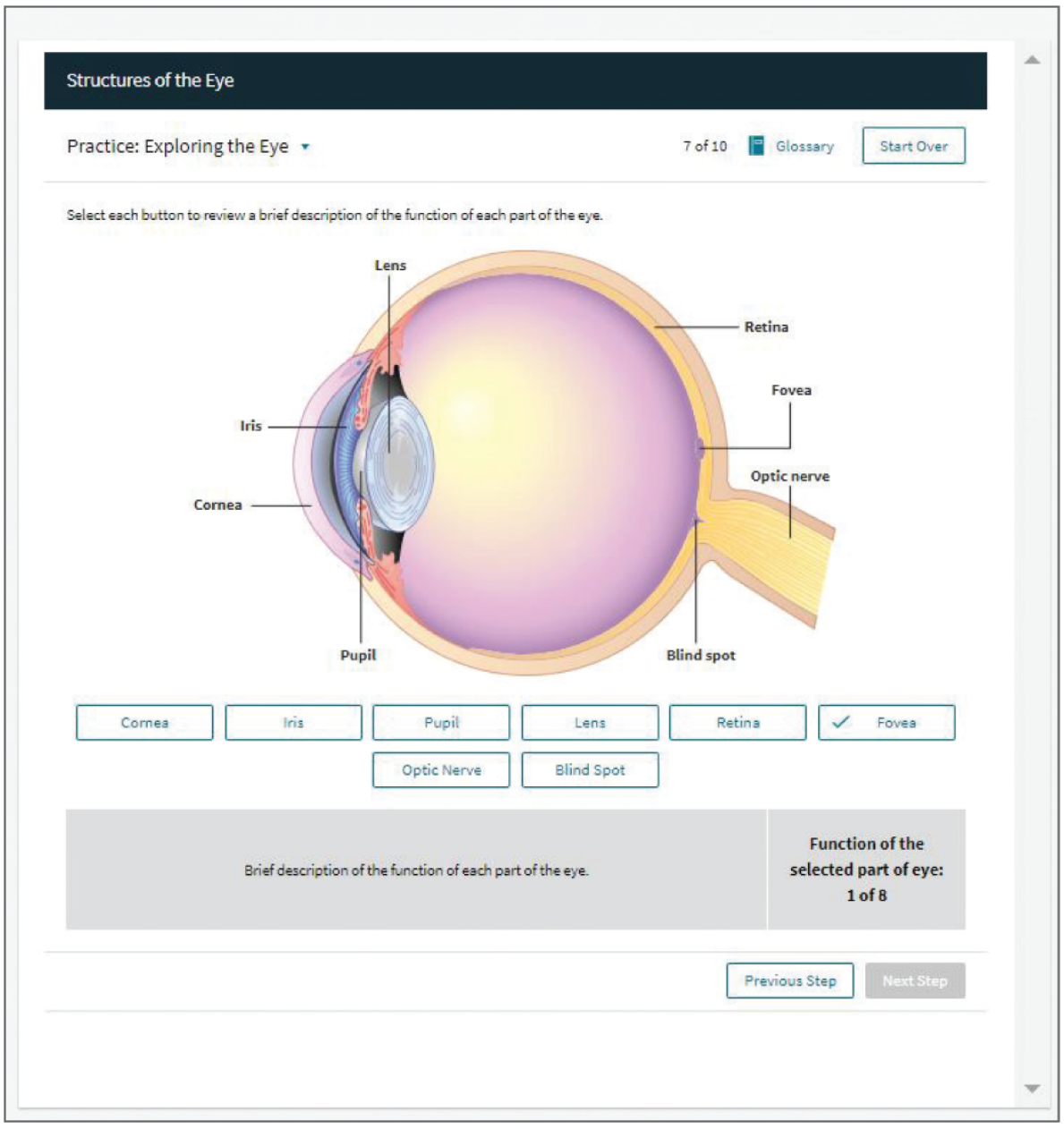
B. Naturalistic observation

C. Experimental design.

Text reads, Select the Video Hint button to watch brief animations describing Case Studies, Naturalistic Observation, and Experiments. A button labeled, Video Hint is at the bottom followed by a Submit button.

Return to Test question

Extended description for Exploring the eye



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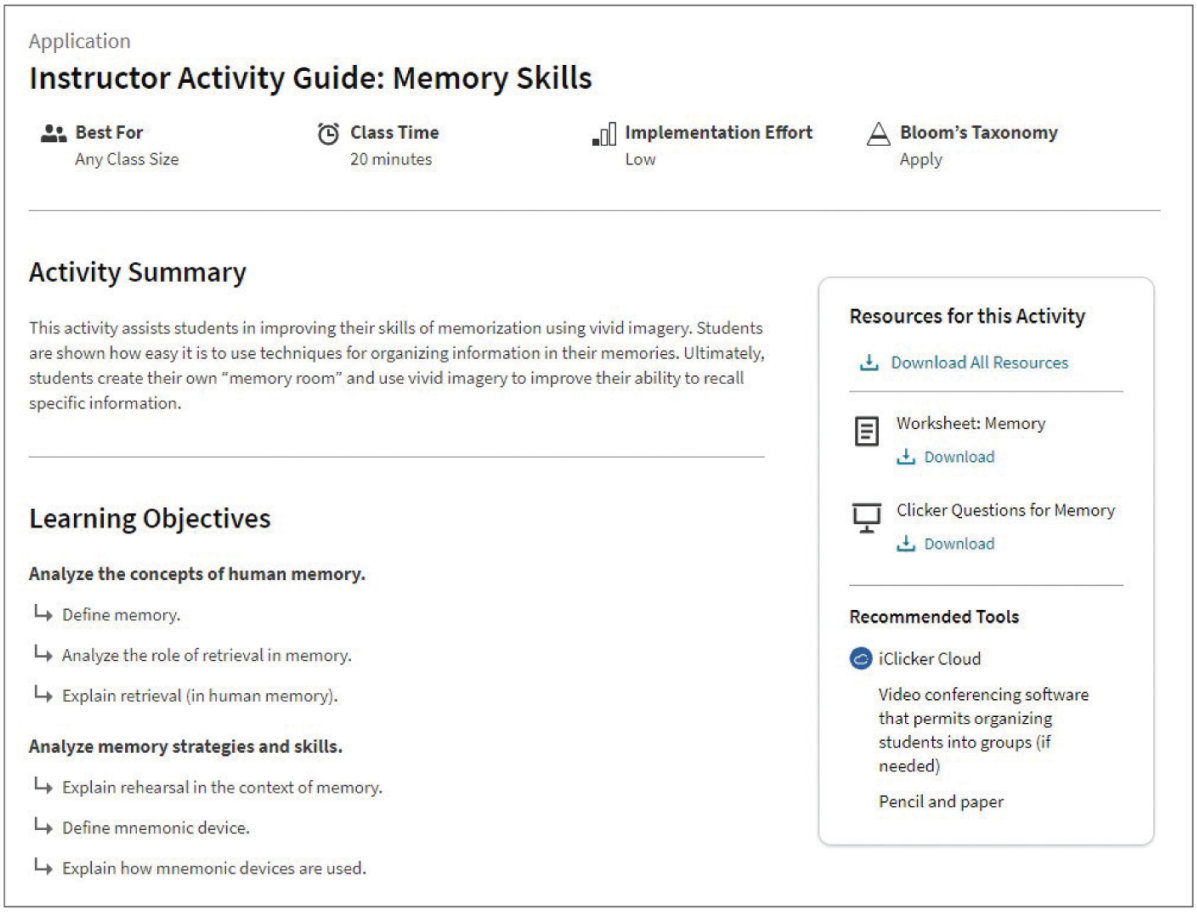
The heading reads Structures of the Eye. The text below the heading reads, **Practice: Exploring the Eye**. The text on the right reads 7 of

10 and shows a glossary icon and an option to start over. The text above the illustration reads, Select each button to review a brief description of the function of each part of the eye. There are rectangular buttons below the illustration naming the parts of the eye. The buttons read: Cornea, Iris, Pupil, Lens, Retina, Fovea, Optic Nerve, Blind Spot. The bottom left of the screenshot reads, Brief description of the function of each part of the eye. The bottom right reads, Function of the selected part of the eye: 1 of 8. Below are the options to go to the Previous Step or Next Step.

Return to Exploring the eye

Extended description for Instructor Activity Guide



Macmillan Learning

The remainder of the screen is divided into two sections. Text dominating the left side of the screen reads, **Activity Summary** followed by a paragraph which reads, This activity assists students in improving their skills of memorization using vivid imagery. Students are shown how easy it is to use techniques for organizing information in their memories. Ultimately, students create their

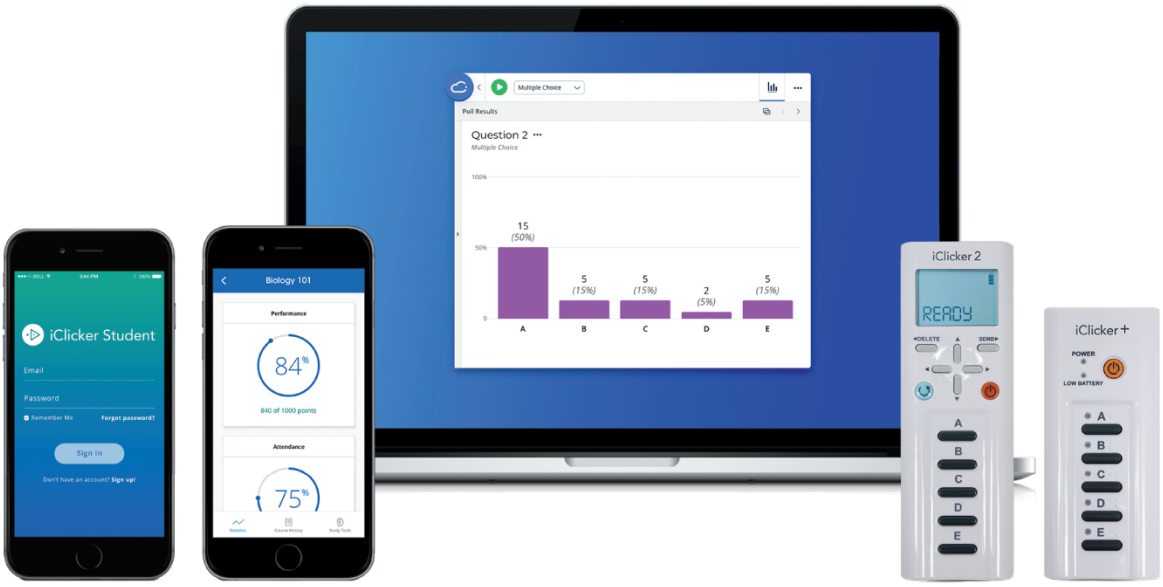
own “memory room” and use vivid imagery to improve their ability to recall specific information.

Following the paragraph are **Learning Objectives** with two parts: **Analyze the concepts of human memory** followed by three arrows pointing to text reading, Define memory; Analyze the role of retrieval in memory; and Explain retrieval (in human memory). **Analyze memory strategies and skills** followed by three arrows pointing to text reading, Explain rehearsal in the context of memory; Define mnemonic device; and Explain how mnemonic devices are used.

A sidebar at the right shows **Resources for this Activity** as Worksheet: Memory and Clicker Questions for Memory. Each has the option to download. At the bottom of the sidebar are Recommended Tools, and the text reads i Clicker Cloud. Video conferencing software that permits organizing students into groups (if needed). Pencil and paper.

Return to Instructor Activity Guide

Extended description for Electronics



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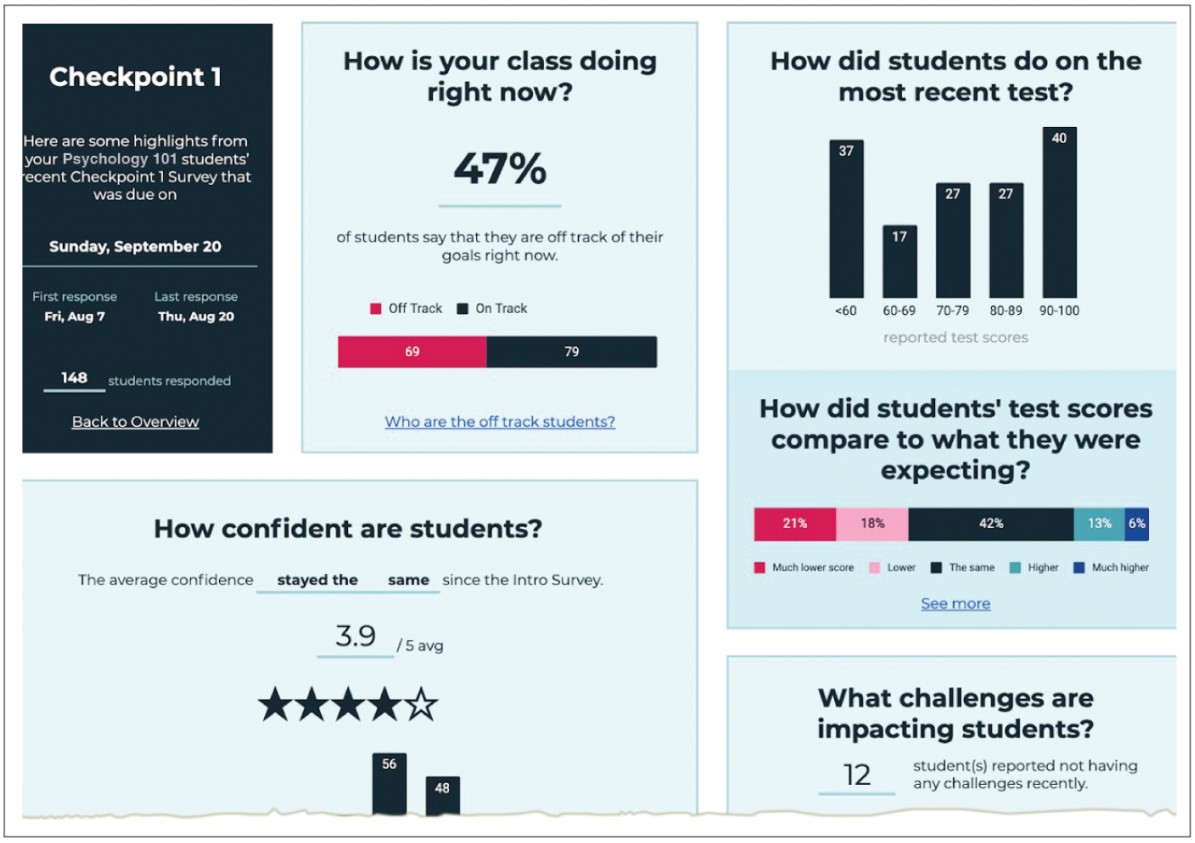
The left cell phone shows a screen reading BELL, Wifi icon, 3:44 PM, and 100 percent battery at the top, followed by i Clicker Student and a sign-in button with Email, password, remember me, and forgot password? options. The text at the bottom reads, Don't have an account? Sign up. The right cell phone reads, Biology 101 at the top followed by two circles. The top circle shows 84 percent performance, representing 840 of 1000 points, and the bottom one shows 75 percent attendance. The bottom of the screen reads Statistics, Create History, and Study tools. The monitor shows a heading that reads, Multiple Choice. Below it, the text reads, Poll results followed by Question 2, multiple choice, and a bar graph. The vertical axis of the graph is as follows: 0, 50 percent, and 100

percent. The horizontal axis is as follows: A, B, C, D, and E. The data in the bar graph is as follows: A, 15 (50 percent); B, 5 (15 percent); C, 5 (15 percent); D, 2 (5 percent), and E, 5 (15 percent). The two remotes are labeled i Clicker 2 and i Clicker Plus. The i Clicker 2 has a screen reading, Ready with arrow buttons at the top, and 2 buttons among them are labeled delete and send. The five buttons below are marked A, B, C, D, and E. The i Clicker Plus contains power and low battery light and also five buttons below marked A, B, C, D, and E.

Return to Electronics

Extended description for Learning Objectives, Reports, and Insights



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The panel at the top left is titled **Checkpoint 1.** The text below reads. Here are some highlights from your Psychology 101 students' recent Checkpoint 1 Survey that was due on Sunday, September 20. First response Fri, August 7; Last response Thursday, August 20. 148 students responded. Back to Overview.

The next panel shows a title that reads, **How is your class doing right now? 47 percent** of students say that they are off track of their goals right now. A two-colored bar shows data as follows. Off Track, 69; On Track, 79. The text below reads, Who are the off track students?

Another panel below reads as follows. **How confident are students?** The average confidence stayed the same since the Intro Survey. **3.9** out of 5 avg. This text is followed by five stars for rating. Out of five stars, four stars are shaded. Below the stars are three vertical bars. The left bar is smaller in size, followed by the middle larger bar labeled 56, and the right bar labeled 48.

A panel on the right shows the text, **How did students do on the most recent test?** This is followed by a bar graph. The horizontal axis of the graph shows reported test scores. The data are as follows.

- Less than 60, 37
- 60 to 69, 17
- 70 to 79, 27
- 80 to 89, 27
- 90 to 100, 40.

Another panel below reads, How did students' test scores compare to what they were expecting? A horizontal bar shows the data, as follows.

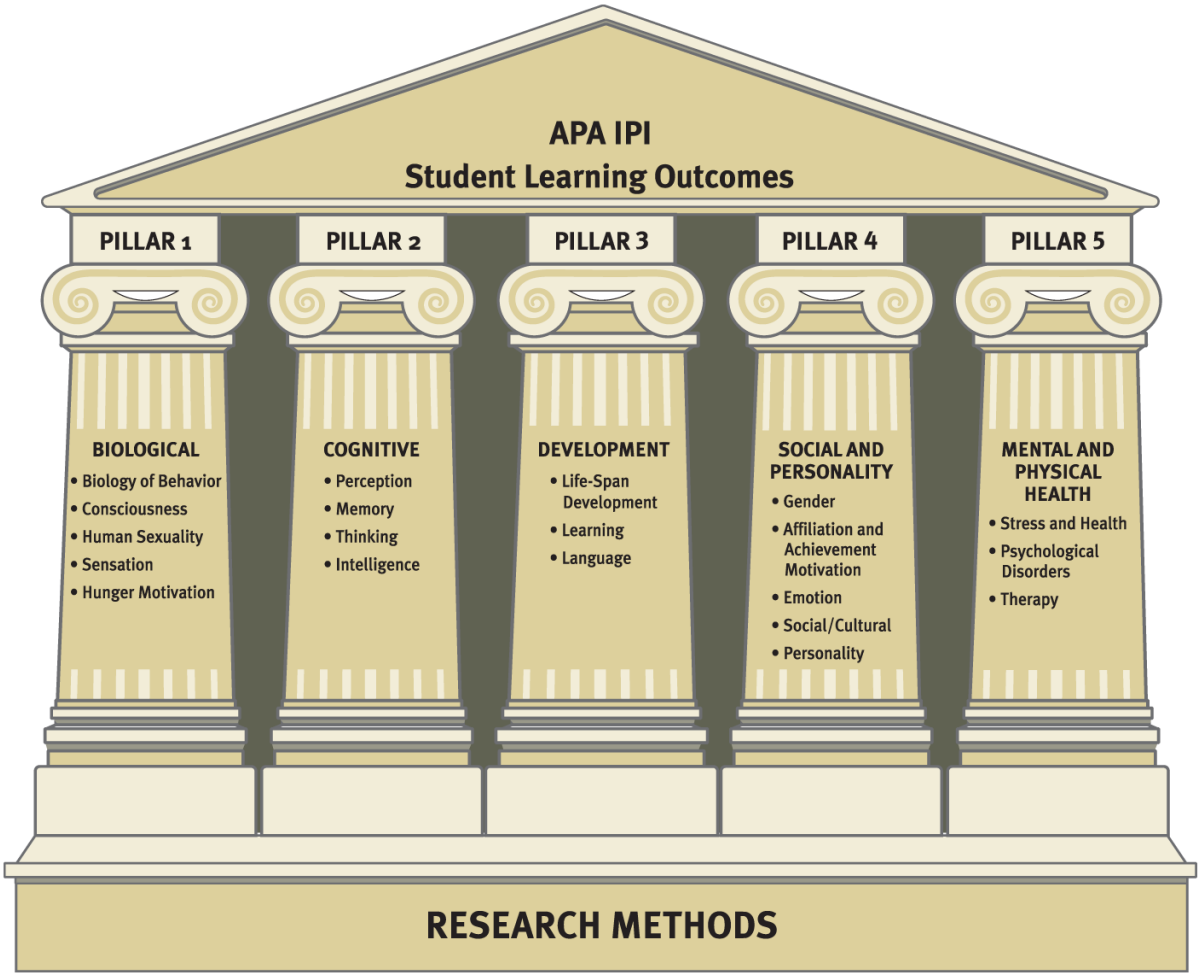
- A much lower score, 21 percent

- Lower, 18 percent
- The same, 42 percent
- Higher, 13 percent
- Much higher, 6 percent. See more.

The last panel on the bottom right shows the text as follows. **What challenges are impacting students?** 12 student (s) reported not having any challenges recently.

Return to Learning Objectives, Reports, and Insights

Extended description for FIGURE 1 Student pillars for introductory psychology



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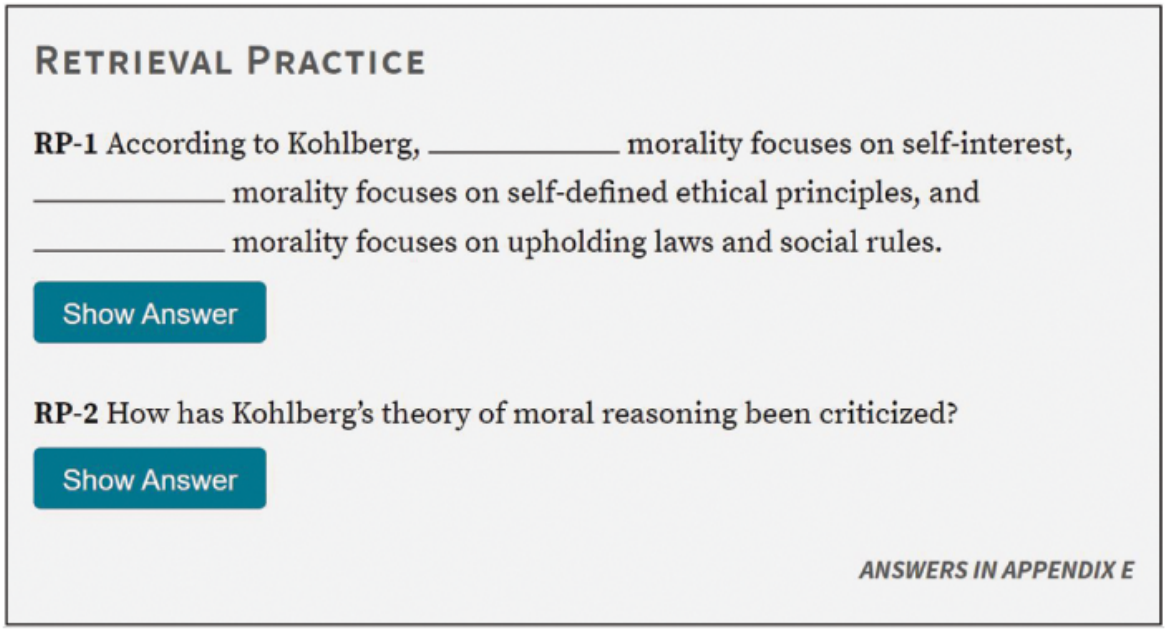
The pillars have titles and bulleted text. **Pillar 1** reads, **Biological.** The bullets read, Biology of Behavior, Consciousness, Human Sexuality, Sensation, Hunger Motivation. **Pillar 2** reads, **Cognitive.**

The bullets read Perception, Memory, Thinking, Intelligence. **Pillar 3** is **Development,** and bullets read, Life-span Development, Learning, Language. **Pillar 4** is **Social and Personality**, and bullets read, Gender, Affiliation and Achievement Motivation, Emotion, Social slash Cultural, Personality. **Pillar 5** is **Mental and Physical Health.** The bullets read Stress and Health, Psychological Disorders, and Therapy.

Return to FIGURE 1 Student pillars for introductory psychology

Extended description for FIGURE 3 Sample Retrieval Practice feature



The text reads, **R P-1** According to Kohlberg, blank space, morality focuses on self-interest, blank space, morality focuses on self-defined ethical principles, and, blank space, morality focuses on upholding laws and social rules. A button reads, Show Answer.

R P-2 How has Kohlberg's theory of moral reasoning been criticized? A button reads, Show Answer.

Text in the bottom right corner reads, ***Answers in Appendix E.***

Return to FIGURE 3 Sample Retrieval Practice feature

Extended description for The scientific attitude



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Text at the top reads, **Thinking Critically About: The Scientific Attitude**. Three basic attitudes helped make modern science possible.

The three sections are as follows:

1. Curiosity: Does it work? When put to the test, can its predictions be confirmed? An illustration shows a woman wearing a lab coat with a clipboard in her hand. Two thought bubbles are depicted from her head. The top bubble shows an illustration of a woman touching her head with one hand and a man's head with another hand. Text reads, Can some people read minds? The corresponding text under the image of the scientist reads, No one has yet been able to demonstrate extrasensory mind-reading. The lower bubble shows an illustration of a stressed-out boy with his hands on his head. Text reads, Are stress levels related to health and well-being? The corresponding text under the image of the scientist reads, Many studies have found that higher stress relates to poorer health.

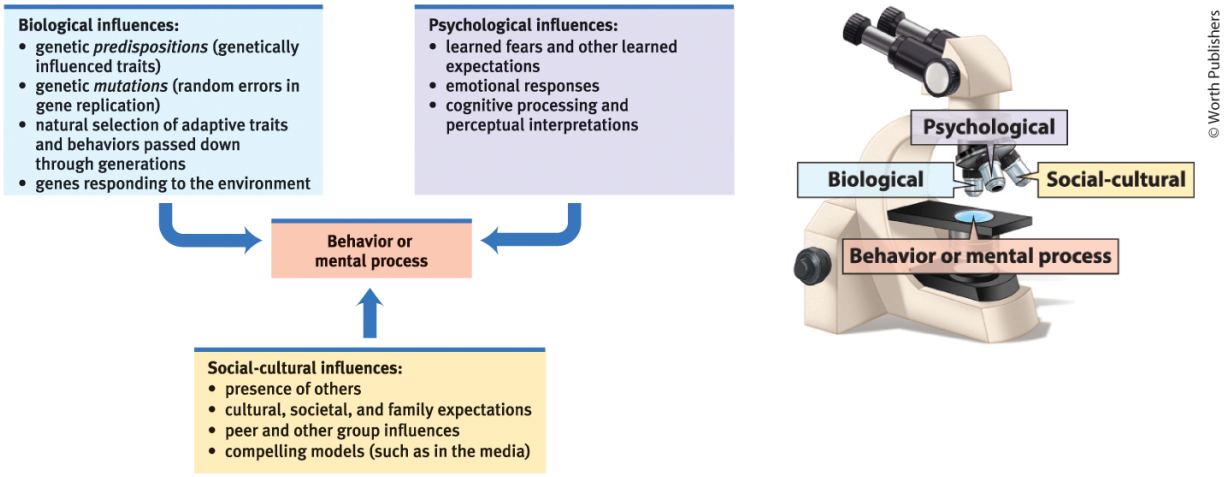
2. Skepticism: What do you mean? How do you know? Sifting reality from fantasy requires a healthy skepticism dash an attitude that is not cynical (doubting everything), but also not gullible (believing everything). An illustration shows a man standing with his shoulders slumped forward. Text reads, Do our facial expressions and body postures affect how we actually feel? The corresponding text at the bottom of the section reads, Our facial

expressions and body postures can affect how we feel. Another illustration shows a woman pushing a child on a swing. Text reads, Do parental behaviors determine children's sexual orientation? The corresponding text at the bottom of the section reads, Module 34 explains that there is not a relationship between parental behaviors and children's sexual orientation.

3. Humility: That was unexpected! Let's explore further. Researchers must be willing to be surprised and follow new ideas. People and other animals don't always behave as our ideas and beliefs would predict. An illustration shows a woman in a lab coat looking at her clipboard. Another illustration shows a rat in a conditioning chamber, pressing a lever, with an object emerging out from a window above the lever. Text reads, The rat is always right.

Return to The scientific attitude

Extended description for FIGURE 1.1 Biopsychosocial approach



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A text box in the center reads, Behavior or mental process. A text box at the top left reads, **Biological influences**: Genetic *predispositions* (genetically influenced traits); genetic *mutations* (random errors in gene replication); natural selection of adaptive traits and behaviors passed down through generations; and genes responding to the environment. A text box at the top right reads, **Psychological influences**: Learned fears and other learned expectations; emotional responses; and cognitive processing and perceptual interpretation. A text box at the bottom reads, **Social-cultural influences**: Presence of others; cultural, societal, and family expectations; peer and other group influences; and

compelling models (such as in the media). All three boxes have arrows pointing to the central box.

An image beside the chart shows a microscope, with its three lenses labeled Biological, Psychological, and Social-cultural, and the platform labeled Behavior or mental process.

Return to FIGURE 1.1 Biopsychosocial approach

Extended description for Psychology’s

subfields



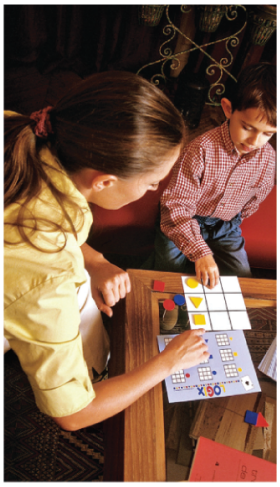
J.B. Handelsman/Cartoon Stock

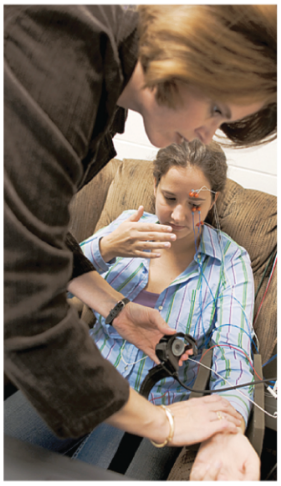
"I'm a social scientist, Michael. That means I can't explain electricity or anything like that, but if you ever want to know about people I'm your man."

The man says, “I’m a social scientist, Michael. That means I can’t explain electricity or anything like that, but if you want to know about people, I’m your man.”

Return to Psychology’s subfields

Extended description for Psychology: A science and a profession







Left: LAURENT/GLUCK/AGE Fotostock; center: Hope College Public Relations; right: Scott J. Ferrell/Getty Images

In the first photo, a psychologist is interacting with a small boy with colorful playing cards on the table. In the second photo, a psychologist is connecting a wired device to the arm of a woman seated on a reclining chair. In the third photo, a group of three people is actively engaged in a conversation.

Return to Psychology: A science and a profession

Extended description for Post-truth world

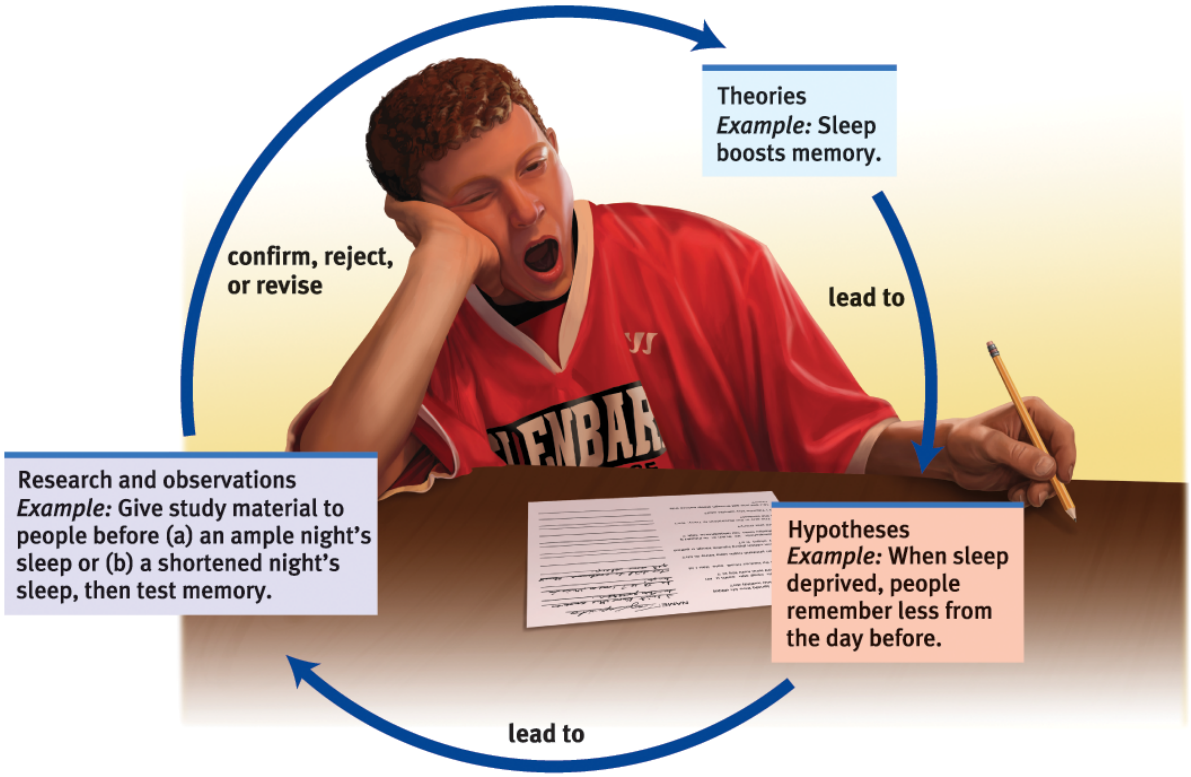


Marty Bucella/Cartoon Stock

The monitor screen shows several boxes and the words, “Confirm My Biases dot com.” A text below reads, “We have ellipsis become sloppier than ever: Tweet first, research later. Post first, rescind later. Guess first, confirm later.” By Luvvie Ajayi, *I’m Judging You: The Do-Better Manual*, 2016.

Return to Post-truth world

Extended description for FIGURE 2.2 The scientific method



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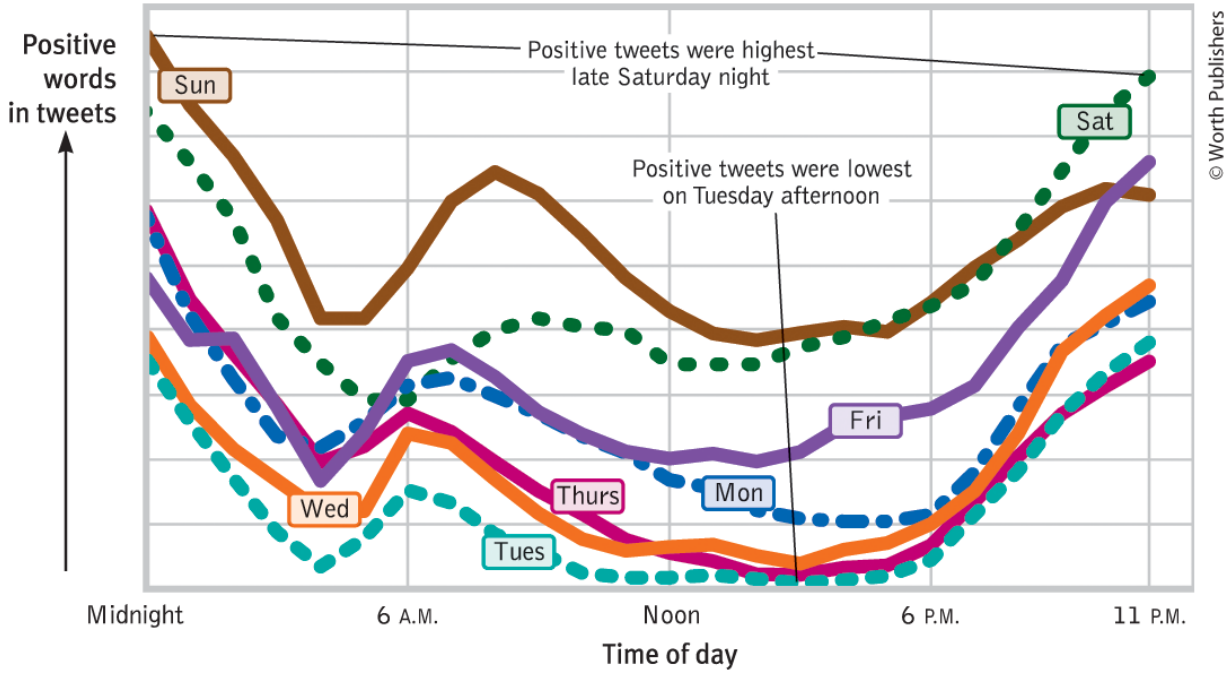
The scientific method is depicted by three boxes connected by clockwise arrows. The top box reads, Theories. *Example*: Sleep boosts memory. An arrow labeled, lead to, points to a box on the right that reads, Hypotheses. *Example*: When sleep deprived, people remember less from the day before. An arrow labeled, lead to, points to a box on the left, that reads, Research and observations. *Example*: Give study material to people before (a) an ample night's

sleep or (b) a shortened night's sleep, then test memory. An arrow labeled, confirm, reject, or revise, points back to the top box.

Return to FIGURE 2.2 The scientific method

Extended description for FIGURE 2.3 Twitter message moods, by time and by day

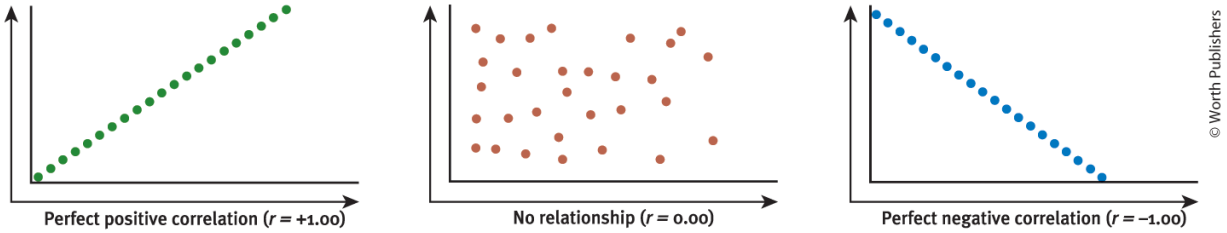


The horizontal axis represents time of day and ranges from midnight to 11 P.M. The vertical axis represents positive words in tweets and increases from bottom to top. Six curves are plotted on the graph with each corresponding to one day of the week. In general, Sunday and Saturday have the most positive words, with text stating that positive tweets were highest late Saturday night. Tuesday and Wednesday have the fewest positive words, with text stating that positive tweets were lowest on Tuesday afternoon. With

regard to time of day, in general, each day shows the most positive tweets around 11 P.M. and midnight, and the fewest positive tweets between noon and 6 P.M.

Return to FIGURE 2.3 Twitter message moods, by time and by day

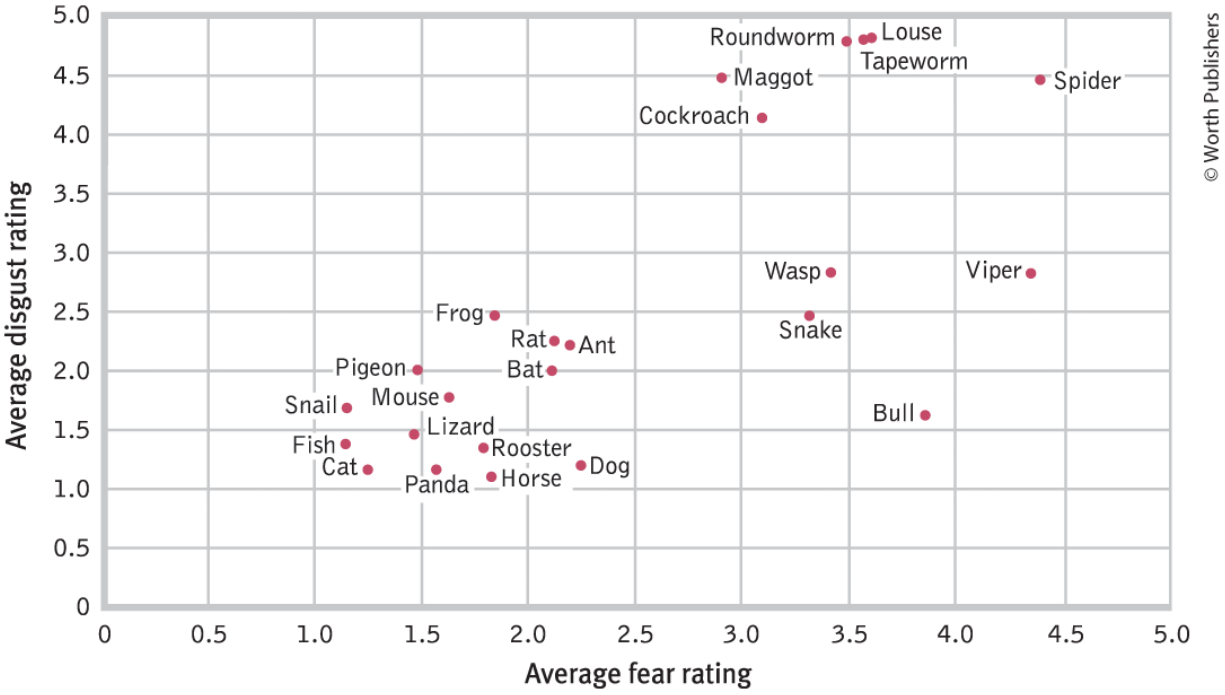
Extended description for FIGURE 2.4 Scatterplots, showing patterns of correlation



(a) The horizontal axis is labeled Perfect positive correlation (*r* equals positive 1.00) and shows a linear positive slope from the lower left to the upper right marked with dots. (b) The horizontal axis is labeled No relationship (*r* equals 0.00) and shows dots scattered throughout. (c) The horizontal axis is labeled Perfect negative correlation (*r* equals negative 1.00) and shows a linear negative slope marked with dots from the upper left to the lower right.

Return to FIGURE 2.4 Scatterplots, showing patterns of correlation

Extended description for FIGURE 2.5 Scatter plot for fear and disgust felt toward 24 animals

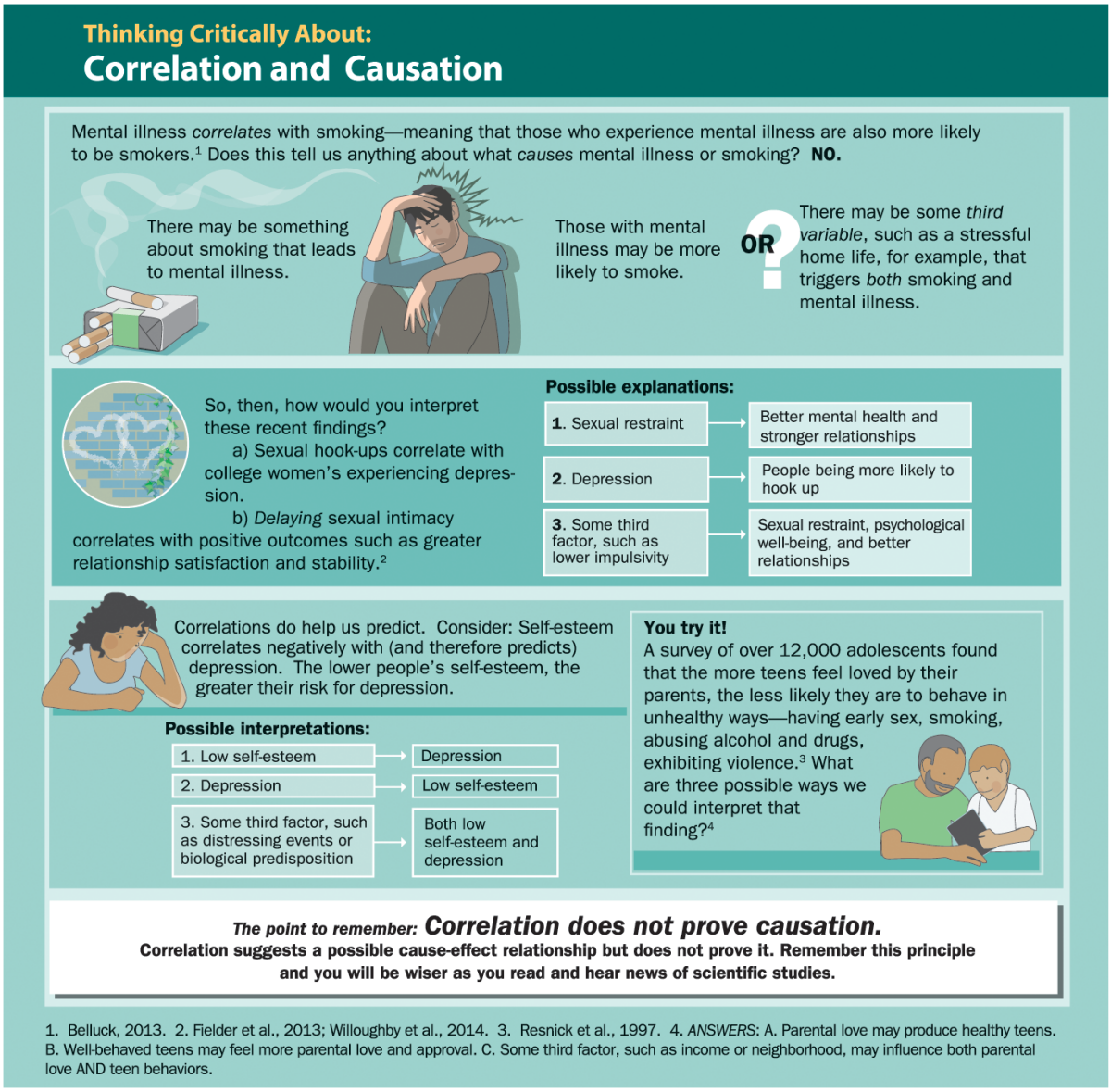


The horizontal axis represents average fear rating and ranges from 0 to 5.0, in increments of 0.5. The vertical axis represents average disgust rating and ranges from 0 to 5.0, in increments of 0.5. The plots on the graphs are labeled as follows: Snail (1.1, 1.7); Fish (1.1, 1.4); Cat (1.25, 1.2); Pigeon (1.5, 2.0); Lizard (1.5, 1.5); Panda (1.6, 1.2); Mouse (1.6, 1.7); Rooster (1.7, 1.4); Horse (1.8, 1.1); Frog (1.7, 2.5); Bat (2.1, 2.0); Rat (2.1, 2.3); Ant (2.2, 2.25); Dog (2.25, 1.25); Maggot (2.9, 4.5); Cockroach (3.1, 4.1); Snake (3.3, 2.5); Wasp (3.4,

2.9); Roundworm (3.5, 4.75); Tapeworm (3.6, 4.75); Louse (3.62, 4.74); Bull (3.8, 1.6); Viper (4.3, 2.85); and Spider (4.4, 4.5). All data are approximate.

Return to FIGURE 2.5 Scatter plot for fear and disgust felt toward 24 animals

Extended description for Correlation and causation



© Worth Publishers

Text at the top reads, **Thinking critically about: Correlation and Causation**. The infographic shows three sections as follows:

Section 1: Mental illness *correlates* with smoking dash meaning that those who experience mental illness are also more likely to be smokers (Belluck, 2013). Does this tell us anything about what causes mental illness or smoking? **NO**. An illustration shows a pack of cigarettes. Text above reads, There may be something about smoking that leads to mental illness. Another illustration shows a distressed man sitting on the floor with hands on his head. Corresponding text reads, Those with mental illness may be more likely to smoke. The word **OR** is presented over a question mark. Corresponding text reads, There may be some *third variable*, such as a stressful home life, for example, that triggers *both* smoking and mental illness.

Section 2: An illustration shows two overlapping heart shapes inside a circle. Corresponding text reads, So, then, how would you interpret these recent findings? a) Sexual hook-ups correlate with college women's experiencing depression. b) *Delaying* sexual intimacy correlates with positive outcomes such as greater relationship satisfaction and stability (Fielder et al., 2013; Willoughby et al., 2014). **Possible explanations:** 1. Sexual restraint leading to better mental health and stronger relationships. 2. Depression leading to people being more likely to hook up. 3. Some third factor, such as lower impulsivity leading to sexual restraint, psychological well-being, and better relationships.

Section 3: An illustration shows a young woman seated at a table looking sad and resting her head on her hand. Corresponding text reads, Correlations do help us predict. Consider: Self-esteem correlates negatively with (and therefore predicts) depression. The lower people's self-esteem, the greater their risk for depression. **Possible interpretations**: 1. Low self-esteem leads to depression. 2. Depression leads to low self-esteem. 3. Some third factor, such as distressing events or biological predisposition, leads both low self-esteem and depression. An illustration shows a man and a boy looking at a book together. Text reads, **You try it!** A survey of over 12,000 adolescents found that the more teens feel loved by their parents, the less likely they are to behave in unhealthy ways dash having early sex, smoking, abusing alcohol and drugs, exhibiting violence (Resnick et al., 19 97). What are three possible ways we could interpret that finding? Answers: A. Parental love may produce healthy teens. B. Well-behaved teens may feel more parental love and approval. C. Some third factor, such as income or neighborhood, may influence both parental love AND teen behaviors.

A textbox at the bottom of the infographic reads, The point to remember: **Correlation does not prove causation**. Correlation suggests a possible cause-effect relationship but does not prove it. Remember this principle and you will be wiser as you read and hear news of scientific studies.

Return to Correlation and causation

Extended description for Procedures and placebo effect



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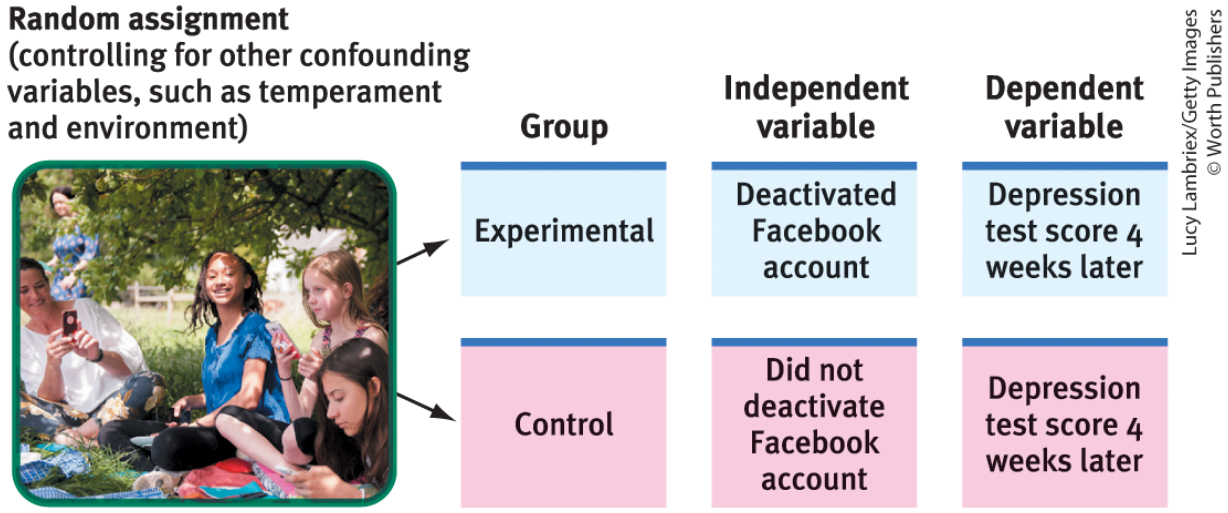
The pills are large and have faces. A round pill (the lawyer) points to another pill that is sitting at the defendant's table and addresses the jury. A capsule pill (the judge) looks on. The lawyer pill says, "How do I know my client didn't do it? Because he's a placebo! He's never done anything!"

Return to Procedures and placebo effect

Extended description for FIGURE 2.6 Experimentation

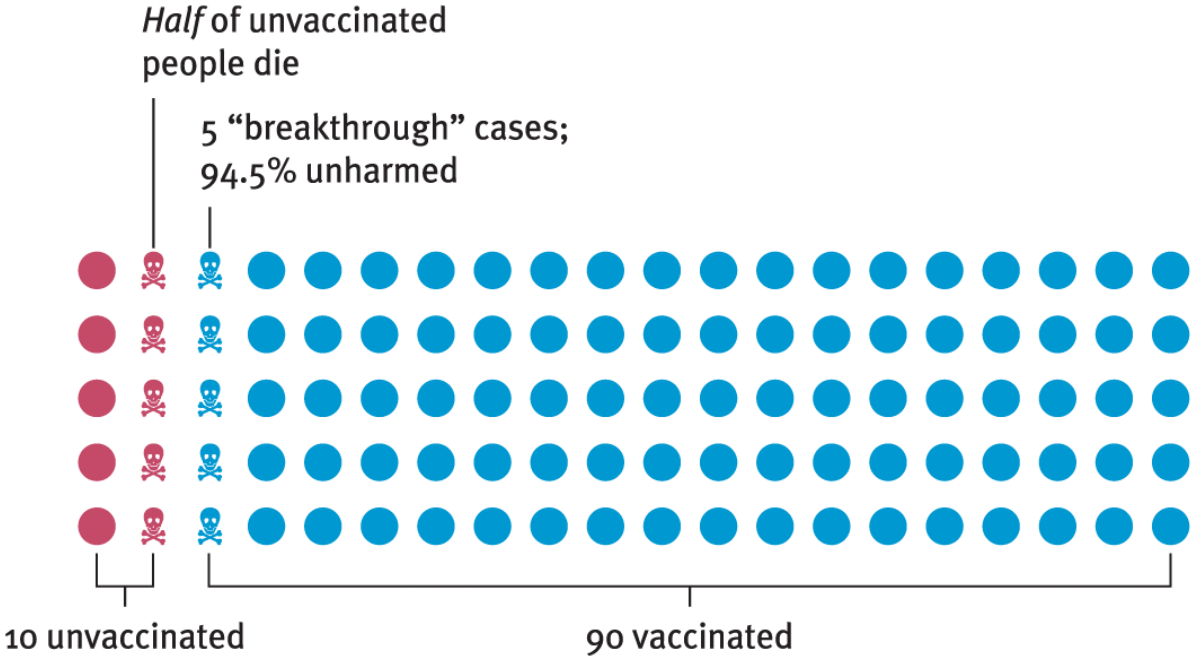


Lucy Lambriex/Getty Images
© Worth Publishers

To the left is the photo of a woman and three adolescent girls having a picnic. The woman is taking a photo of the girls with her smartphone and two girls are looking down at their phones. Above the photo, a text reads, Random assignment (controlling for other confounding variables, such as temperament and environment). Two arrows from the photo point to two groups on the right: Experimental and Control. For the experimental group, the independent variable is Deactivated Facebook account and the dependent variable is Depression test score 4 weeks later. For the control group, the independent variable is Did not deactivate Facebook account and the dependent variable is Depression test score 4 weeks later.

Return to FIGURE 2.6 Experimentation

Extended description for FIGURE 3.1 Statistical literacy for vaccines



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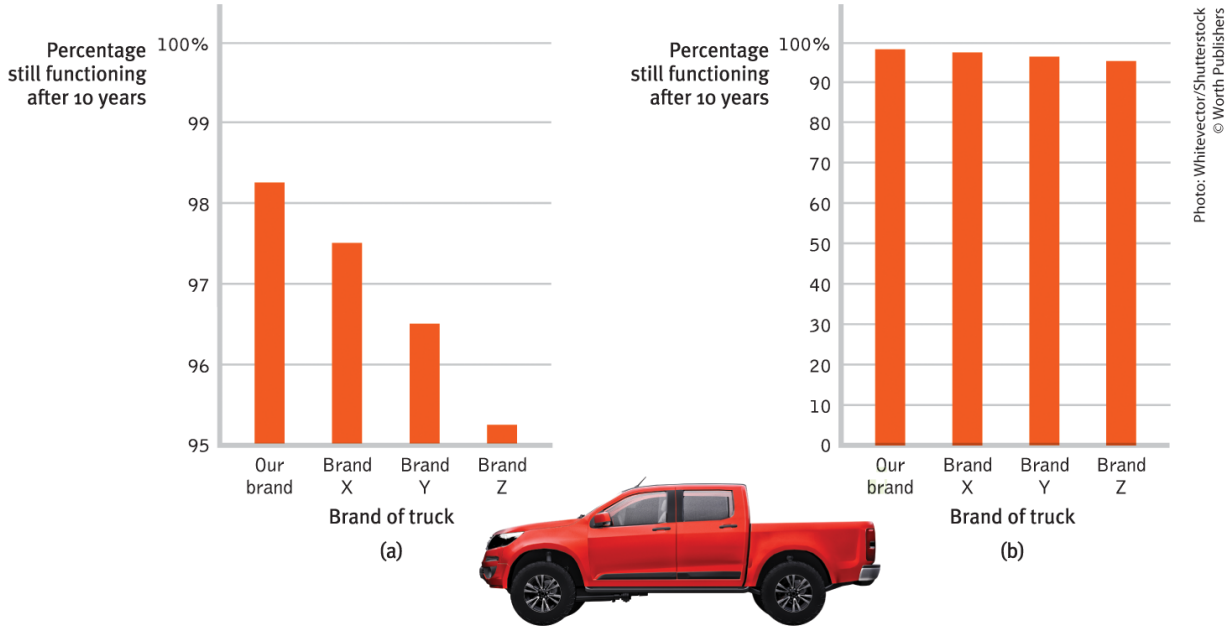
The illustration shows five rows, with each constituting a red dot, a red skull with crossbones, a blue skull with crossbones, and 17 blue dots. The five red dots along with five red skulls with crossbones are labeled, 10 unvaccinated. The five red skulls with crossbones are labeled, *half* of unvaccinated people die. The five blue skulls with crossbones along with 85 blue dots are labeled, 90 vaccinated. The five red skulls with crossbones are labeled, Half of unvaccinated people die. The five blue skulls with crossbones are labeled, 5 "breakthrough" cases; 94.5 percent unharmed.

Return to FIGURE 3.1 Statistical literacy for vaccines

Extended description for FIGURE 3.2 Read the scale labels

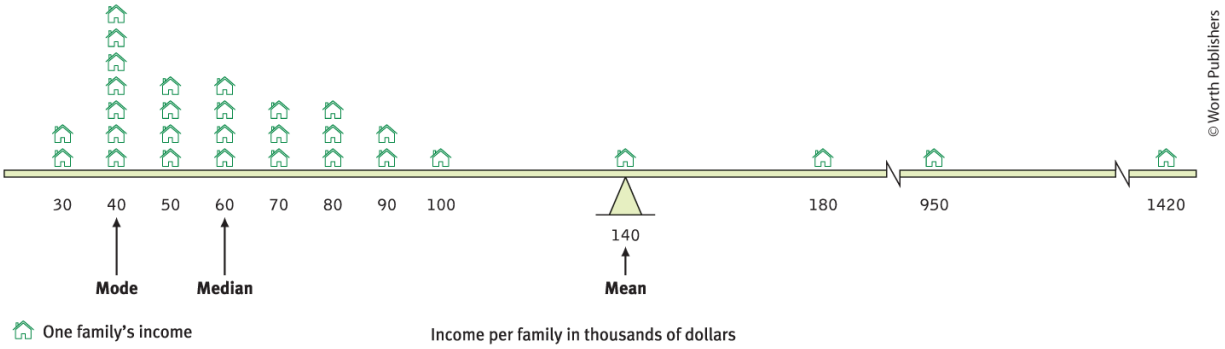


The horizontal axis of both graphs represents the brand of truck and is labeled Our brand, Brand X, Brand Y, and Brand Z. Graph (a): The vertical axis represents the percentage still functioning after 10 years and ranges from 95 to 100 percent, in increments of 1. The vertical bars descend markedly from one brand of truck to the next as follows: Our brand, 98.2 percent; Brand X, 97.5 percent; Brand Y, 96.5; and Brand Z, 95.2 percent. Graph (b): The vertical axis represents the percentage still functioning after 10 years and ranges from 0 to 100, in increments of 10. The data is similar, but the vertical bars appear to be roughly equivalent from one brand of

truck to the next, with minimal difference between them. All data are approximate.

Return to FIGURE 3.2 Read the scale labels

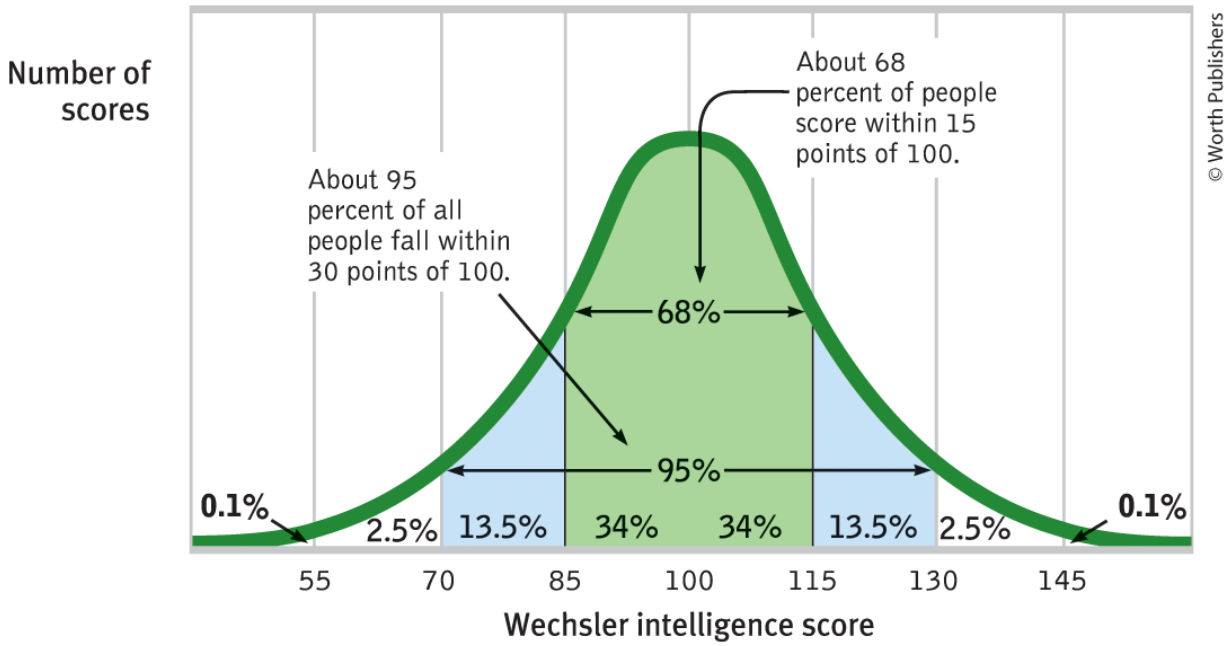
Extended description for FIGURE 3.3 A skewed distribution



The horizontal axis is labeled as Income per family in thousands of dollars. Points marked on the line are 30, 40 (Mode), 50, 60 (Median), 70, 80, 90, 100, 140 (Mean), 180, 950, and 1420. Point 140 (mean) lies on the fulcrum of the balance scale. Illustration of houses plotted above the values on the horizontal axis each represents one family's income. The data are as follows: 30 has 2 houses, 40 (Mode) has 7 houses, 50 has 4 houses, 60 (Median) has 4 houses, 70 has 3 houses, 80 has 3 houses, 90 has 2 houses, 100 has 1 house, 140 (Mean) has 1 house, 180 has 1 house, 950 has 1 house, and 1420 has 1 house.

Return to FIGURE 3.3 A skewed distribution

Extended description for FIGURE 3.4 The normal curve



The graph shows a bell-shaped curve with different areas indicated with colors and percentages. The horizontal axis depicts the Wechsler intelligence score and ranges from 40 to 160, in increments of 15. The vertical axis represents the number of scores. The percentages of people who fall within different score ranges are presented as follows: Below 55 score, 0.1 percent; 55 to 70 score, 2.5 percent; 70 to 85 score, 13.5 percent; 85 to 100 score, 34 percent; 100 to 115 score, 34 percent; 115 to 130 score, 13.5 percent; 130 to 145 score, 2.5 percent; and above 145 score, 0.1 percent. A text pointing to the area under the curve from 85 to 115 score reads, About 68

percent of all people fall within 15 points of 100. Text pointing to the area under the curve from 70 to 130 score reads, About 95 percent of all people fall within 30 points of 100.

Return to FIGURE 3.4 The normal curve

Extended description for Significant differences



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Panel 1: A ball hits Lucy in the head as she reaches to catch it.

Panel 2: Charlie Brown stands on the pitcher's mound and says, Lucy, you're the worst player in the history of the game!

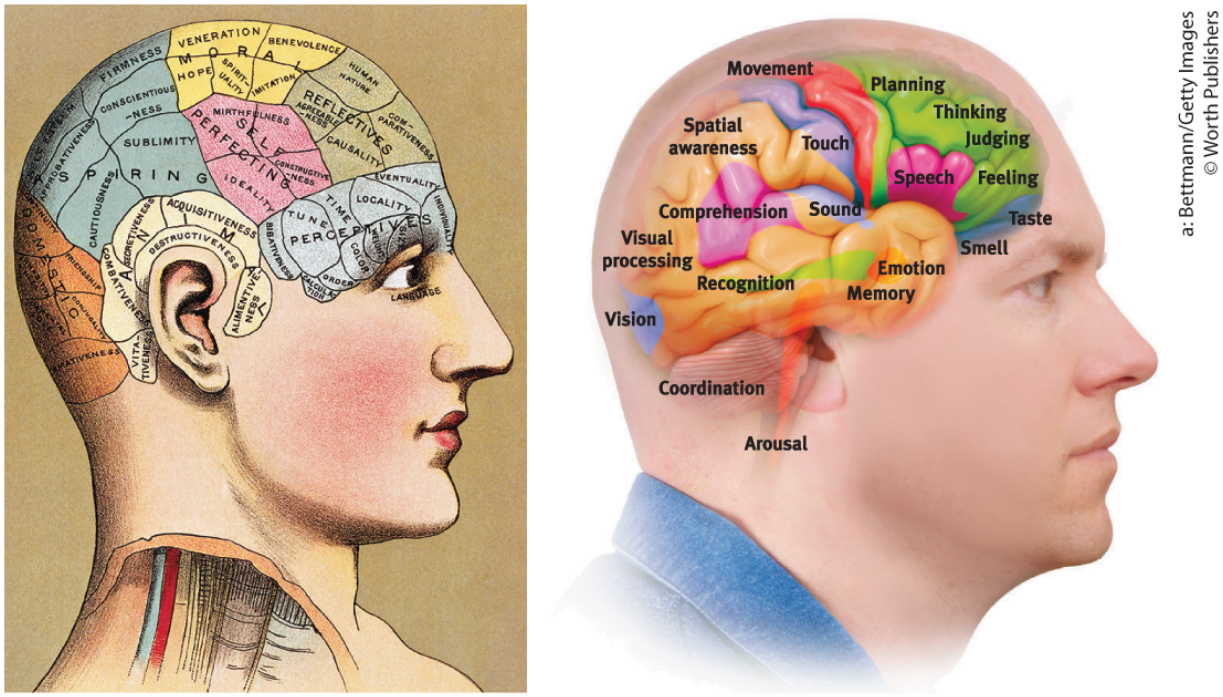
Panel 3: Lucy responds, You can't prove that! You should never say things that you can't prove!

Panel 4: Charlie Brown says, In all probability, you are the worst player in the history of the game!

Panel 5: Lucy says, I can accept that.

Return to Significant differences

Extended description for FIGURE 4.1 A wrongheaded theory



a: Bettmann/Getty Images
© Worth Publishers

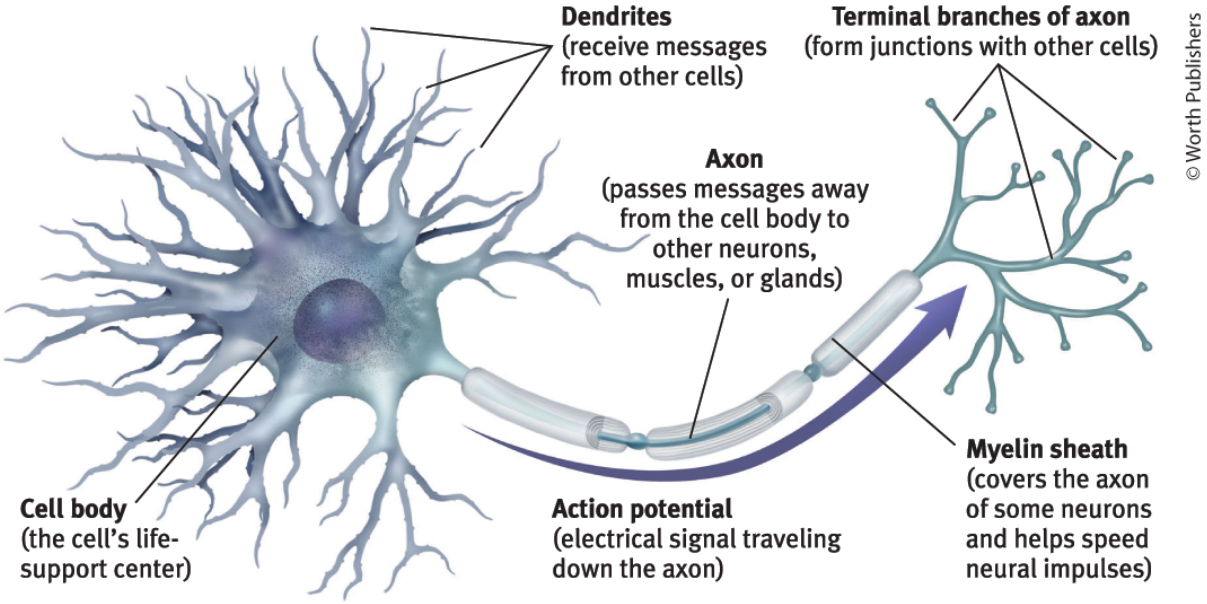
(a) Franz Gall's speculations on what the functions of the brain are based on the bumps in the head. The illustration shows a rear area marked Domestic and above it an area labeled Aspiring. Surrounding the ear is a section labeled Animal, and directly above this, the side of the head, is marked Self Perfecting. The top of the head is an area marked Moral, in front of this is a region called Reflectives, and at the front is a section called Perceptives. Within each section are a variety of other terms related to the title of that

section. For example, the section marked Moral has smaller areas with terms like benevolence and veneration. Each larger section has several such smaller areas.

(b) The illustration shows which part of the brain control which function. The bottom is an area marked arousal, and to the left and slightly higher is a section marked coordination. To the left of that is vision, and above that is a section called visual processing. Above that to the lower right is recognition, and to the upper right is comprehension. Above that, near the top back of the brain, is spatial awareness, and above this is movement. In the center of the brain is sound, and just above this is touch. In the front top of the brain are several sections, which start with planning and moving, clockwise go to thinking, judging, feeling, and taste. Just behind the eyes is smell, and above that to the left is speech. Near the ears are two areas marked emotion and memory.

Return to FIGURE 4.1 A wrongheaded theory

Extended description for FIGURE 4.2 A motor neuron

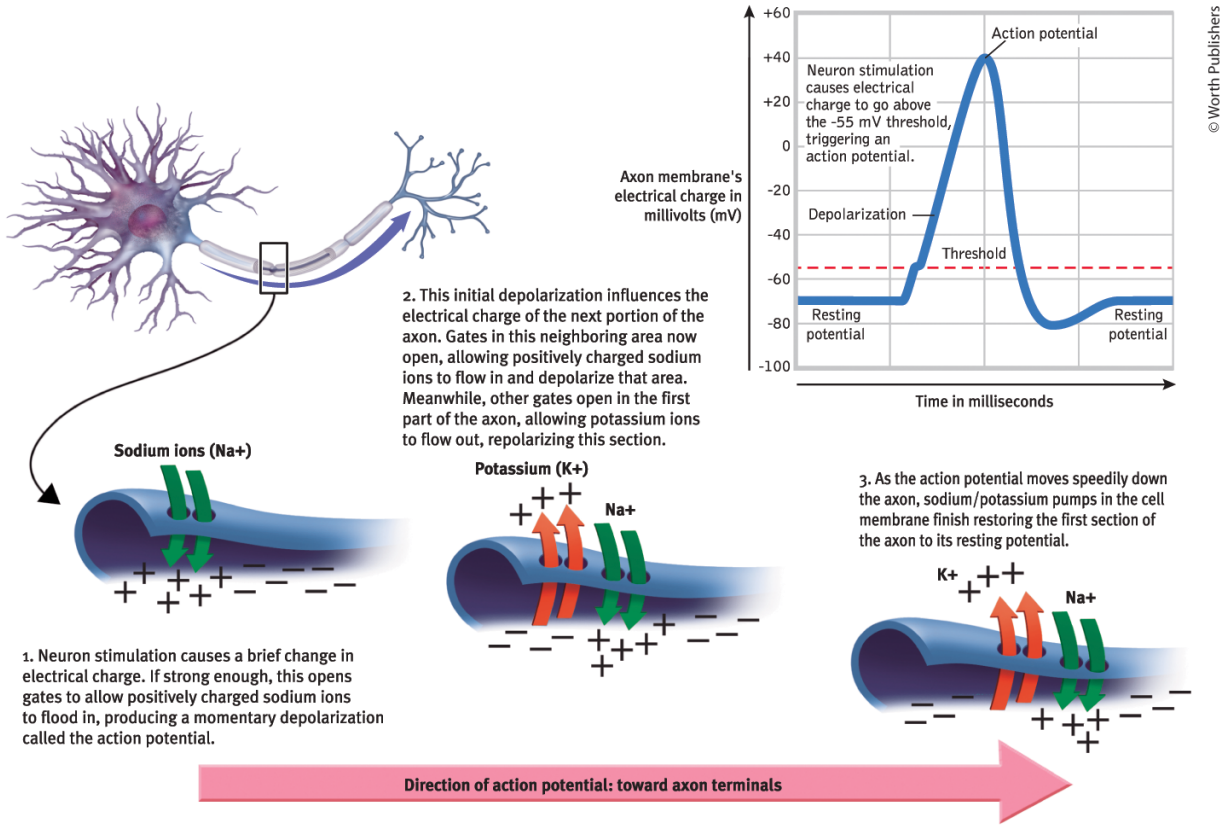


The illustration shows the cell body on the left and identifies it as the cell's life-support center. Bushy fibers branching from the cell body are labeled dendrites that receive messages from other cells. A single lengthy fiber from the cell body is identified as the axon that passes messages away from the cell body to other neurons, muscles, or glands. A fatty tissue insulating the axon is labeled myelin sheath. It covers the axon of some neurons and helps speed neural impulses. Fibers branching at the end of the axons are labeled terminal branches of axon that form junctions with other cells. An arrow pointing from the cell body to the terminal branches of axon

indicates the direction of action potential (electrical signal traveling down the axon).

Return to FIGURE 4.2 A motor neuron

Extended description for FIGURE 4.4 Action potential



The illustration depicts the direction of the action potential toward axon terminals in three sections. A diagrammatic representation of a neuron, with three magnified sectional views of the junction between two axons, is depicted below; the first cylindrical section highlights the entry of **sodium ions**. Accompanying text reads, 1. Neuron stimulation causes a brief change in electrical charge. If strong enough, this opens gates to allow positively charged sodium

ions to flood in, producing a momentary depolarization called the action potential.

The second section shows the entry of **sodium ions** and exit of **potassium ions**. Accompanying text reads, 2. This initial depolarization influences the electrical charge of the next portion of the axon. Gates in this neighboring area now open, allowing positively charged sodium ions to flow in and depolarize that area. Meanwhile, other gates open in the first part of the axon, allowing potassium ions to flow out, repolarizing this section.

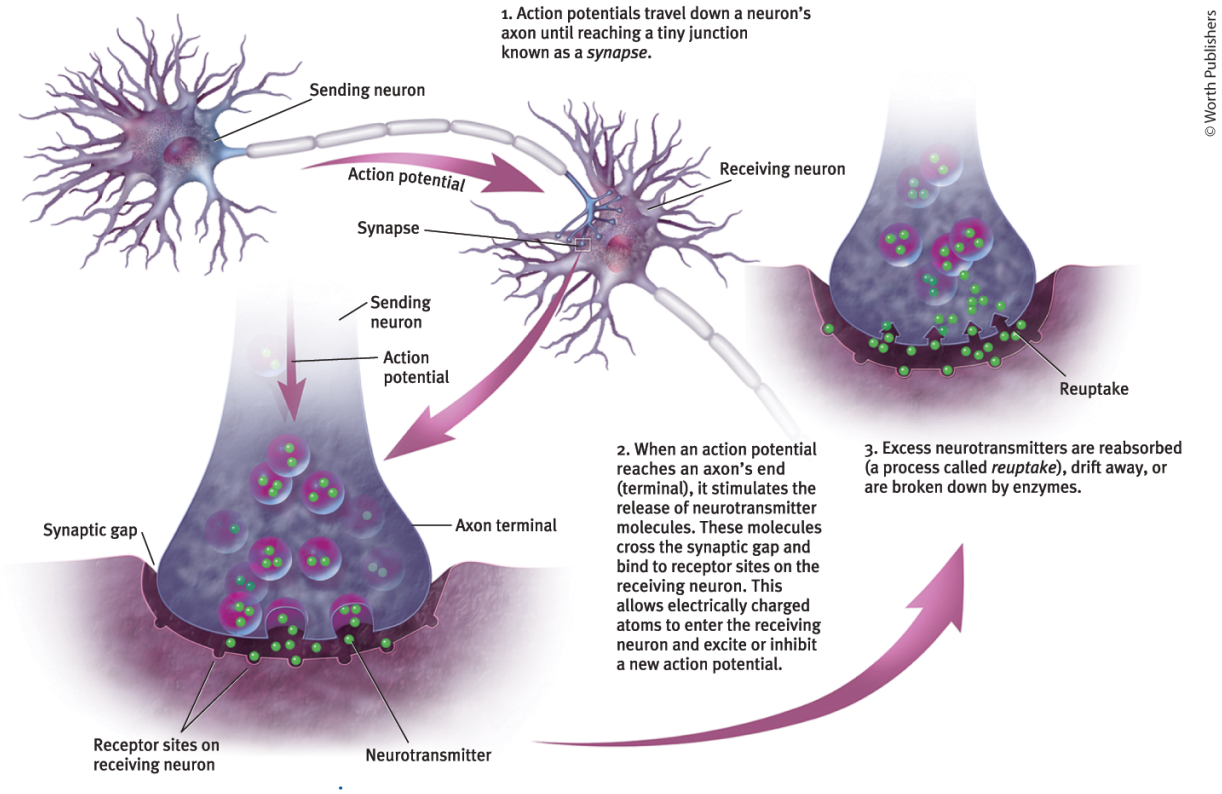
The third section shows the entry of **sodium ions** and exit of **potassium ions**. Accompanying text reads, 3. As the action potential moves speedily down the axon, sodium/potassium pumps in the cell membrane finish restoring the first section of the axon to its resting potential.

The graph plots Axon membrane's electrical charge in millivolts (m V) ranging from negative 100 to positive 60 on the vertical axis against Time in milliseconds on the horizontal axis. The graph shows a short horizontal line beginning at negative 70 (Resting potential), which suddenly increases to positive 40 (Action potential). Text reads, Neuron stimulation causes electrical charge to go above the negative 55 millivolts threshold, triggering an action potential. The curve next declines to negative 80 and then increases slightly to negative 70 (Resting potential). A horizontal straight

dashed line beginning slightly above negative 55 is labeled as “Threshold.” All data are approximate.

Return to FIGURE 4.4 Action potential

Extended description for FIGURE 4.5 How neurons communicate

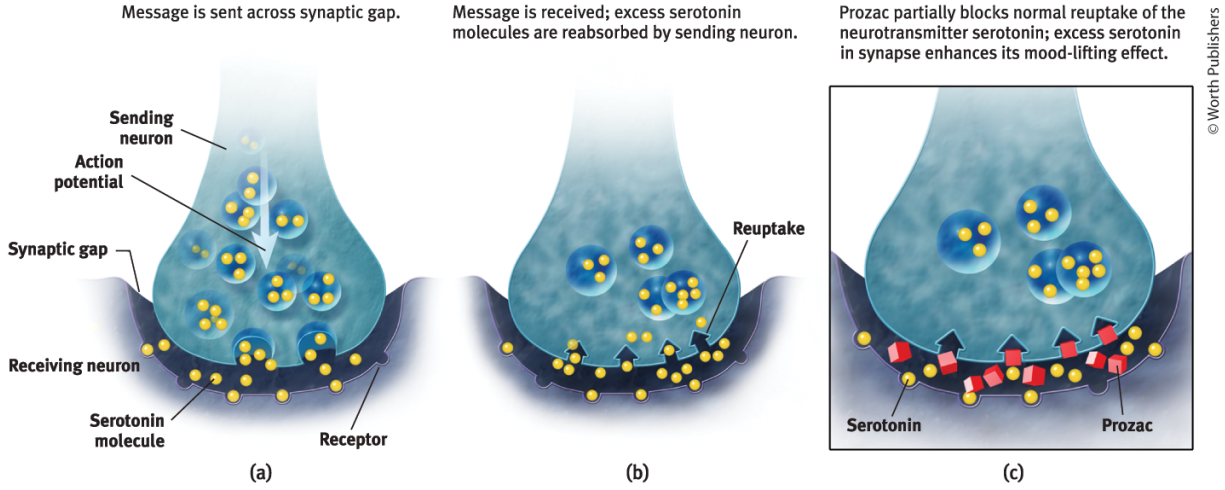


The illustration shows a sending neuron delivering an action potential to a receiving neuron. Accompanying text reads, 1. Action potentials travel down a neuron's axon until reaching a tiny junction known as a *synapse*. A zoomed-in image of the synapse shows the action potential reaching the axon terminal of the sending neuron. A synaptic gap is identified between the axon terminal of the sending neuron and the cell body of the receiving neuron. Synaptic

vesicles with neurotransmitters inside are present in the axon terminal. Neurotransmitters pass from the axon terminal of the sending neuron, through the synaptic gap, to the receptor sites on the receiving neuron. Accompanying text reads, 2. When an action potential reaches an axon's end (terminal), it stimulates the release of neurotransmitter molecules. These molecules cross the synaptic gap and bind to receptor sites on the receiving neuron. This allows electrically charged atoms to enter the receiving neuron and excite or inhibit a new action potential. A second zoomed-in image of the synapse illustrates the reuptake of the neurotransmitters. It shows the neurotransmitters in the synaptic gap being reabsorbed by the axon terminal from which they were just released. Accompanying text reads, 3. Excess neurotransmitters are reabsorbed (a process called *reuptake*), drift away, or are broken down by enzymes.

Return to FIGURE 4.5 How neurons communicate

Extended description for FIGURE 4.6 Biology of antidepressants



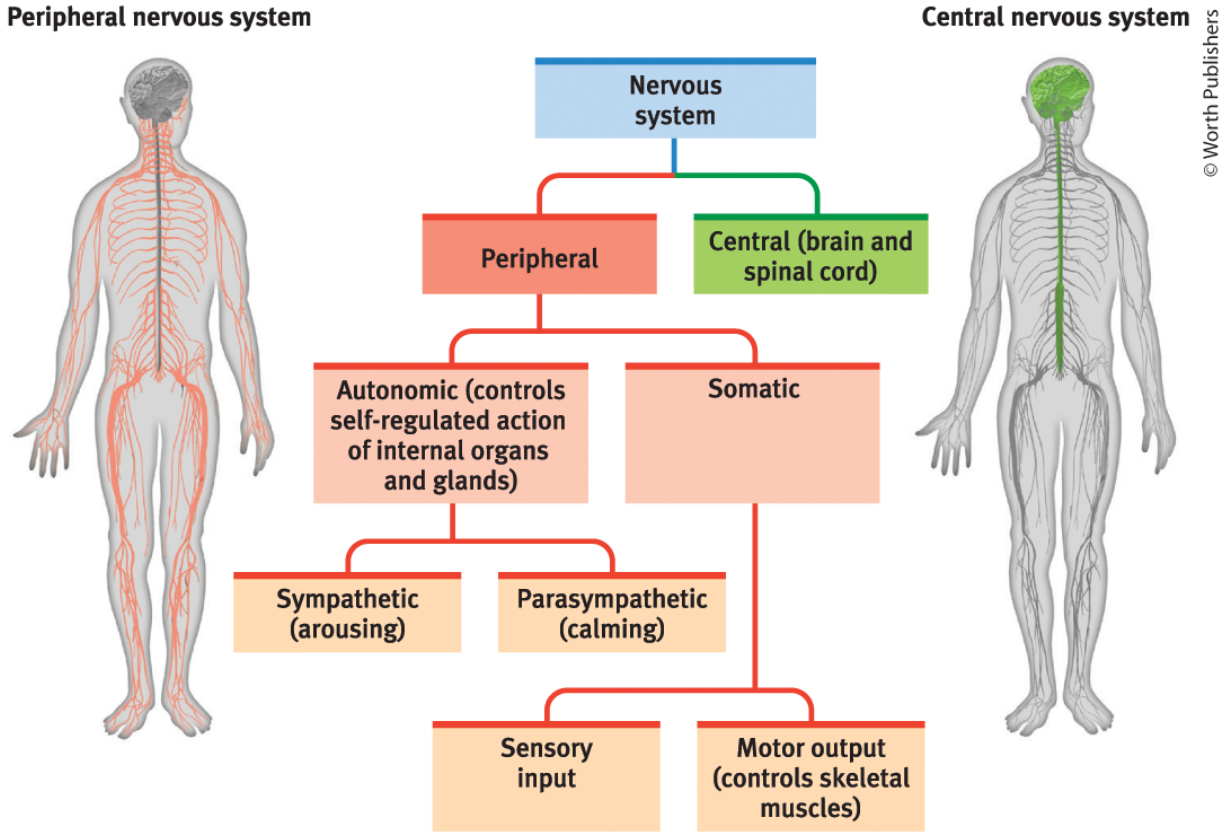
(a) An action potential from the sending neuron delivers serotonin molecules through the synaptic gap to the receptors on the receiving neuron. The following parts are labeled: sending neuron, action potential, synaptic gap, receiving neuron, serotonin molecule, and receptor. Accompanying text reads, Message is sent across synaptic gap.

(b) Serotonin molecules are absorbed by the axon terminal. The area where the molecules are reabsorbed by the sending neuron is labeled reuptake. Accompanying text reads, Message is received; excess serotonin molecules are reabsorbed by sending neuron.

(c) Prozac molecules block the reuptake sites at the axon terminal. Prozac and serotonin molecules are labeled. Accompanying text reads, Prozac partially blocks normal reuptake of the neurotransmitter serotonin, excess serotonin in synapse enhances its mood-lifting effect.

Return to FIGURE 4.6 Biology of antidepressants

Extended description for FIGURE 4.7 The functional divisions of the human nervous system



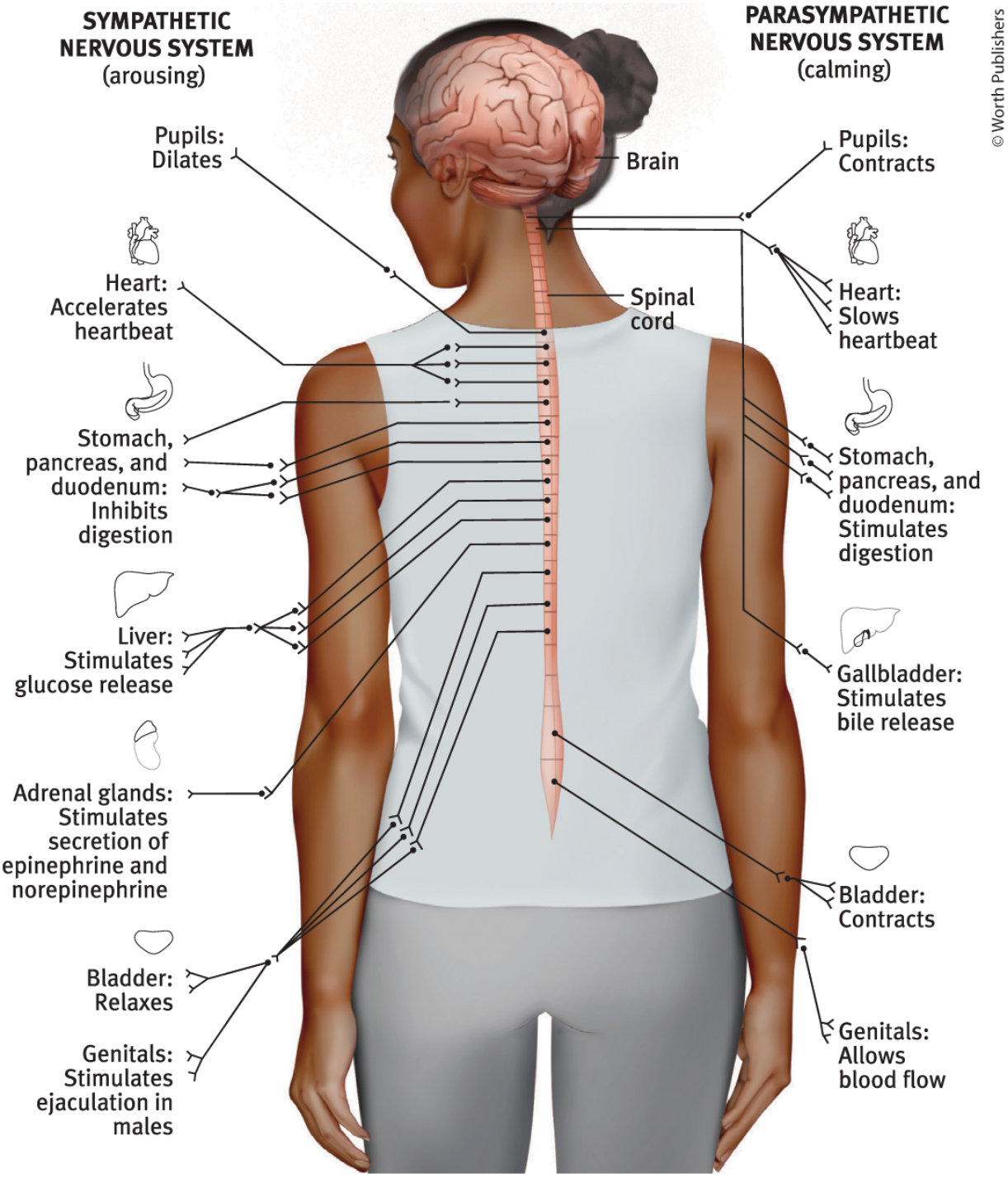
The peripheral nervous system, highlighted in red on the human figure to the left, includes nerves in the whole body except the brain and the spinal cord. The central nervous system, highlighted in green on the human figure to the right, includes the brain and the spinal cord only. The tree diagram in the middle of both human figures is as follows: The top box labeled Nervous System connects

to two boxes below, the Peripheral and the Central (brain and spinal cord). The Peripheral box connects to two boxes below, the Autonomic (controls self-regulated actions of internal organs and glands) and the Somatic. The autonomic box connects to two boxes below, the Sympathetic (arousing) and the Parasympathetic (calming). The somatic box also connects to two boxes below, the Sensory input and the Motor output (controls skeletal muscles).

Return to FIGURE 4.7 The functional divisions of the human nervous system

Extended description for FIGURE 4.8 The dual functions of the autonomic nervous

system


SYMPATHETIC NERVOUS SYSTEM (arousing)
PARASYMPATHETIC NERVOUS SYSTEM (calming)
Pupils: Dilates
Brain
Pupils: Contracts
Heart: Accelerates heartbeat
Spinal cord
Heart: Slows heartbeat
Stomach, pancreas, and duodenum: Inhibits digestion
Stomach, pancreas, and duodenum: Stimulates digestion
Liver: Stimulates glucose release
Gallbladder: Stimulates bile release
Adrenal glands: Stimulates secretion of epinephrine and norepinephrine
Bladder: Contracts
Bladder: Relaxes
Genitals: Stimulates ejaculation in males
Genitals: Allows blood flow
© Worth Publishers

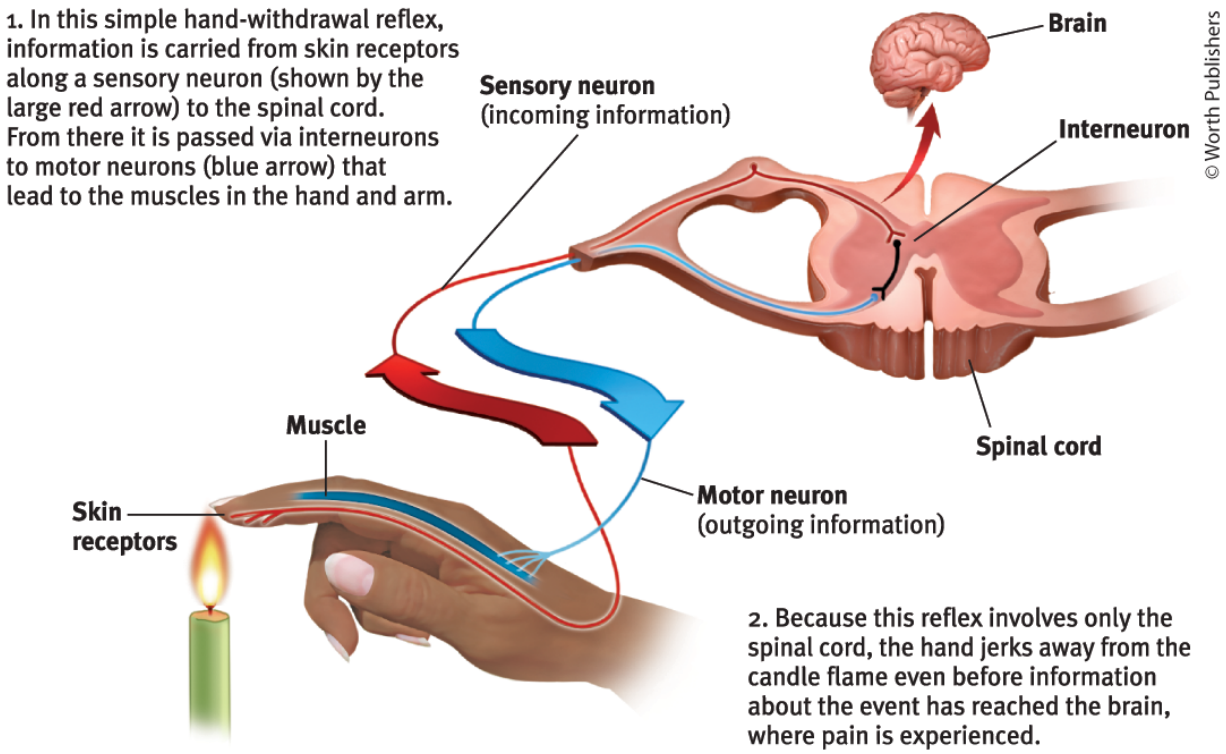
The illustration shows the posterior view of a woman with her brain and spine highlighted. To the left is the sympathetic nervous system (arousing) and to the right is the parasympathetic nervous system (calming). The functions of each type of system are depicted by pointing at the area of the spine where they are controlled. Each function is accompanied by a rudimentary diagram of the body part controlled.

The functions of the sympathetic nervous system are as follows. Pupils: Dilate (single vertebra near shoulders); Heart: Accelerates heartbeat (next 3 vertebrae); Stomach, Pancreas, and Duodenum: inhibit digestion (next 4 vertebrae); Liver: stimulates glucose release (next 3 vertebrae); Adrenal glands: stimulate secretion of epinephrine and norepinephrine (next vertebra down); and Bladder: Relaxes and Genitals: stimulates ejaculation in males (next 3 vertebrae).

The functions of the parasympathetic nervous system are as follows. Pupils: contract (near top of spinal cord); Next functions all occur just below the top of the spinal cord: Heart, slows heartbeat; stomach, pancreas, and duodenum, stimulate digestion; gallbladder, stimulates bile release; Next functions both occur near the bottom of the spinal cord: Bladder, contracts; and genitals, allows blood flow.

Return to FIGURE 4.8 The dual functions of the autonomic nervous system

Extended description for FIGURE 4.9 A simple reflex

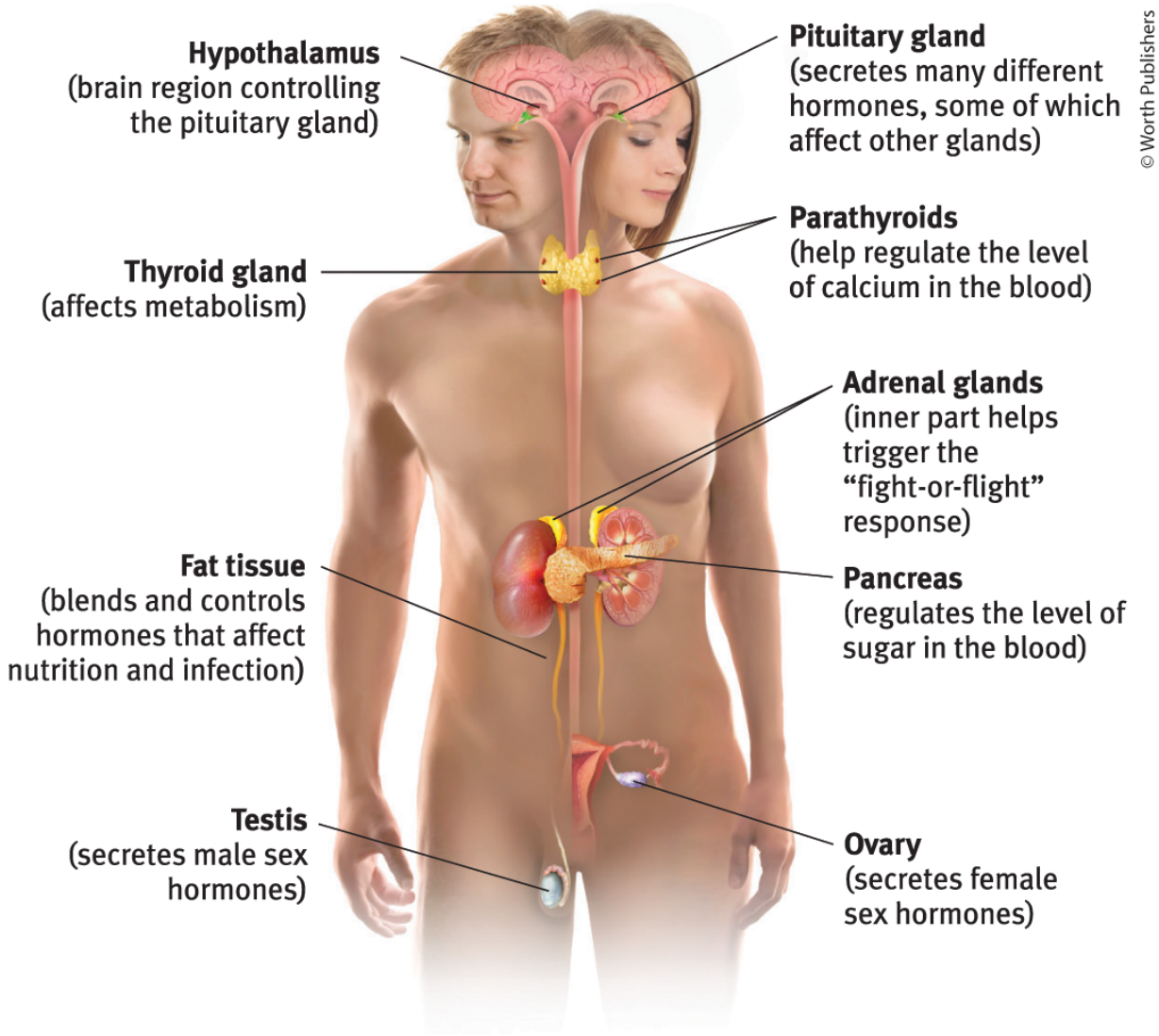


The illustration shows a finger almost touching a flame, a cross-section of the spinal cord, and a lateral view of the brain. A red arrow labeled, sensory neuron (incoming information), connects skin receptors on the finger to the spinal cord. An interneuron connects the sensory neuron to the motor neuron in the spinal cord. The information is passed from the spinal cord to the brain. A blue arrow labeled motor neuron (outgoing information) connects the spinal cord to the muscles in the finger. Text reads, 1. In this simple

hand-withdrawal reflex, information is carried from skin receptors along a sensory neuron (shown by the large red arrow) to the spinal cord. From there it is passed via interneurons to motor neurons (blue arrow) that lead to the muscles in the hand and arm. 2. Because this reflex involves only the spinal cord, the hand jerks away from the candle flame even before information about the event has reached the brain, where pain is experienced.

Return to FIGURE 4.9 A simple reflex

Extended description for FIGURE 4.10 The endocrine system

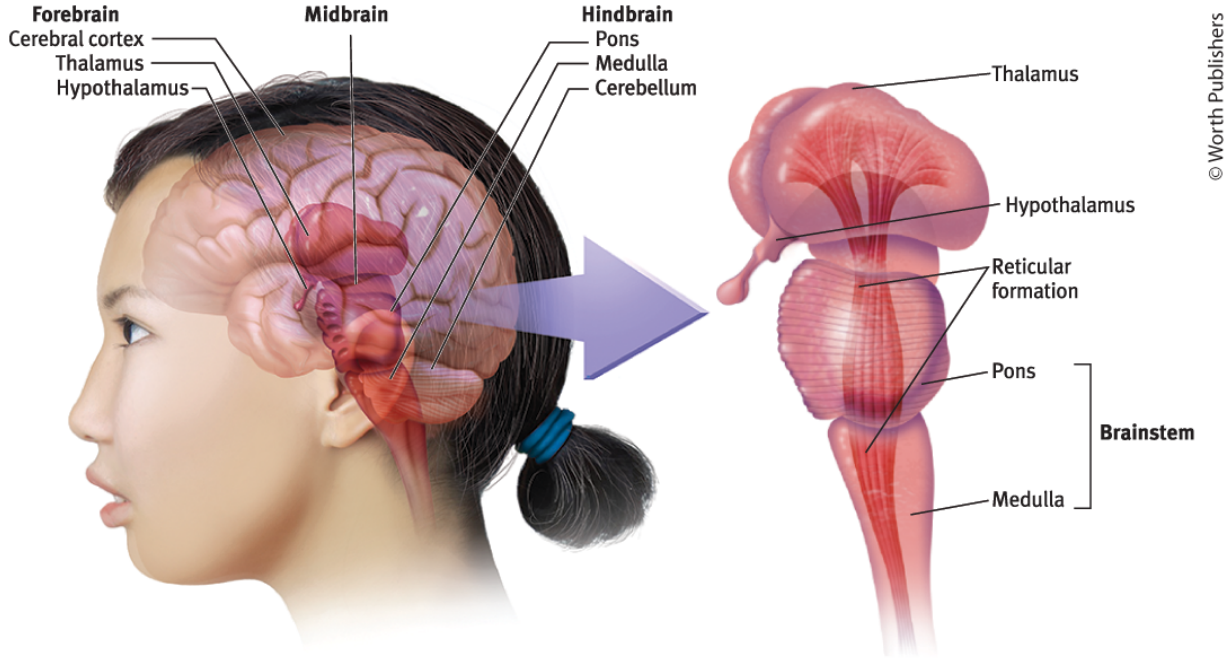


The **hypothalamus** (brain region controlling the pituitary gland) and the **pituitary gland** (secretes many different hormones, some of

which affect other glands) are labeled in the brain. The **thyroid gland** (affects metabolism) and the **parathyroids** (help regulate the level of calcium in the blood) are labeled on the lower neck. The **adrenal glands** (inner part helps trigger the "fight-or-flight" response) and the **pancreas** (regulates the level of sugar in the blood) are labeled in the upper abdomen. **Fat tissue** (blends and controls hormones that affect nutrition and infection) are labeled in the lower abdomen. The **testis** (secretes male sex hormones) is labeled on the male body, and the **ovary** (secretes female sex hormones) is labeled on the female body.

Return to FIGURE 4.10 The endocrine system

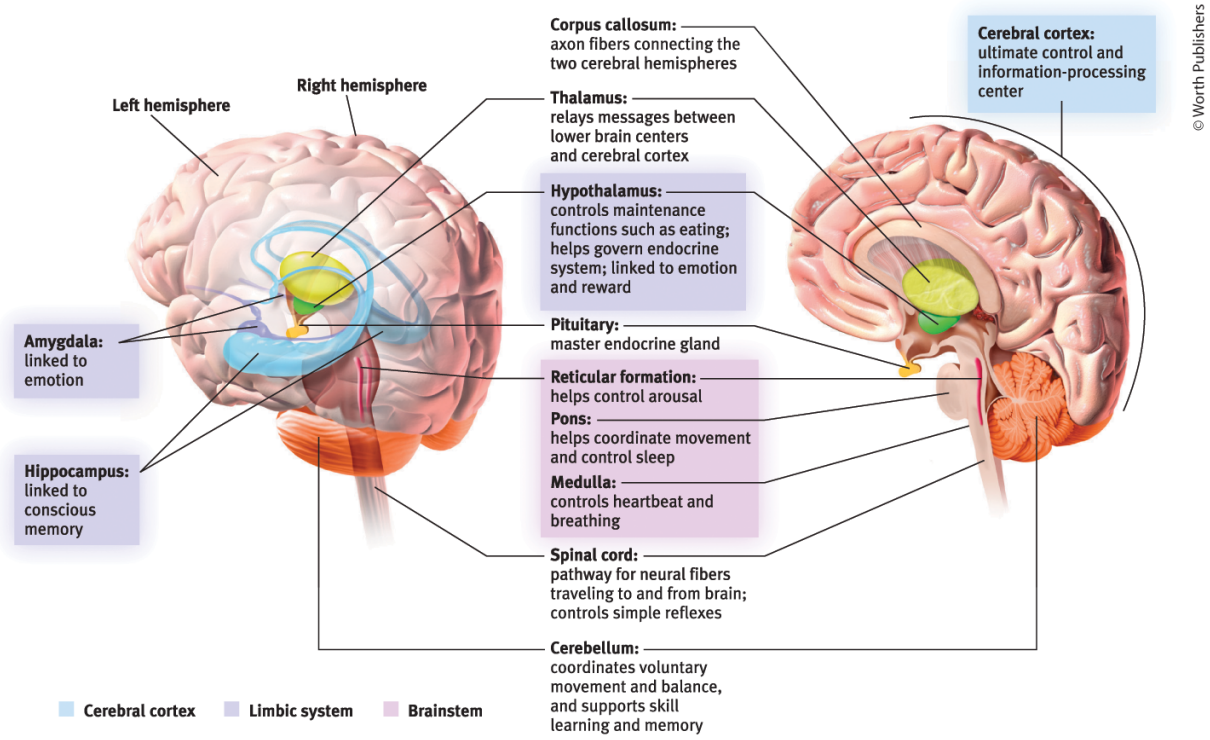
Extended description for FIGURE 6.1 Brain divisions: forebrain, midbrain, hindbrain



The illustration shows the side profile of a human head highlighting the brain. In the brain, the anterior region is labeled forebrain and includes cerebral cortex, thalamus, and hypothalamus; the middle region is labeled midbrain; and the posterior region is labeled hindbrain and includes pons, medulla, and cerebellum. An enlarged view shows a brainstem with pons situated above the medulla. The thalamus lies above the brainstem and has hypothalamus extending from it. The reticular formation is present in the pons and medulla.

Return to FIGURE 6.1 Brain divisions: forebrain, midbrain, hindbrain

Extended description for FIGURE 6.6 Brain structures and their functions



The illustration on the left shows the lateral view of a brain constituting the left and right hemispheres. The illustration on the right shows the inner lateral view of the right hemisphere. The common structures labeled are as follows along with their functions.

Thalamus: relays messages between lower brain centers and cerebral cortex.

Hypothalamus (Limbic system): controls maintenance functions such as eating; helps govern endocrine system; linked to emotion and reward.

Pituitary: master endocrine gland.

Reticular formation (Brainstem): helps control arousal.

Pons (Brainstem): helps coordinate movement and control sleep.

Medulla (Brainstem): controls heartbeat and breathing.

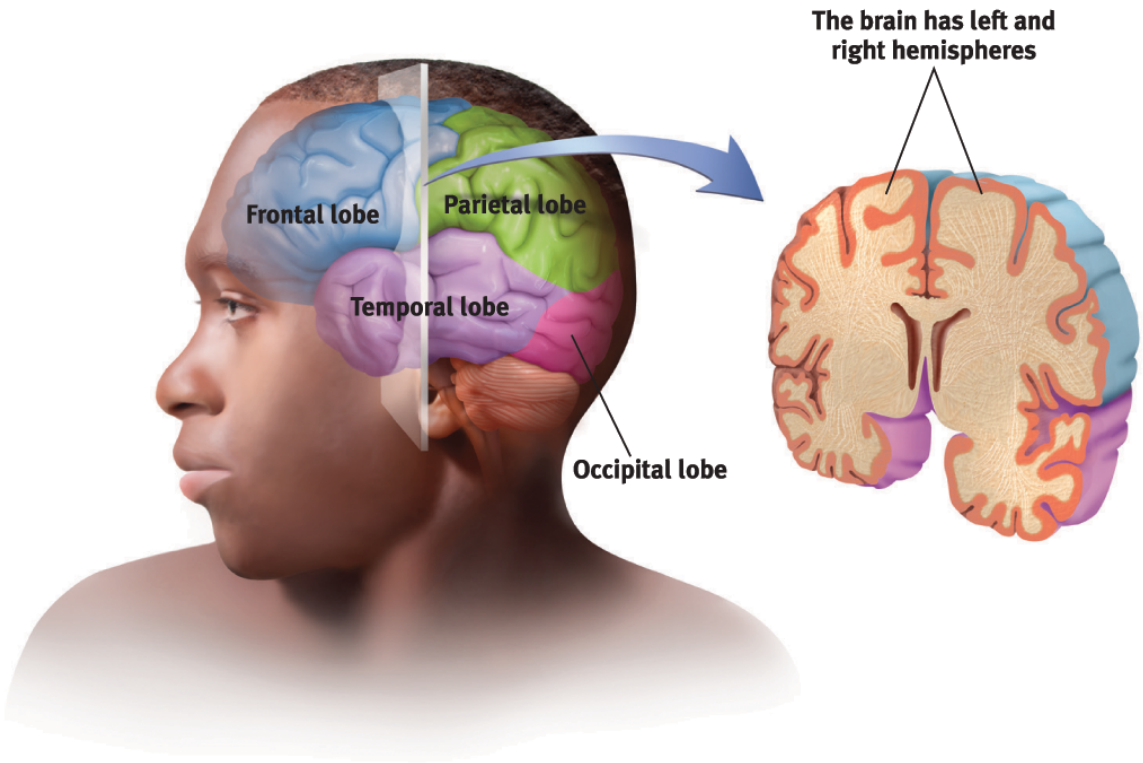
Spinal cord: pathway for neural fibers traveling to and from the brain; controls simple reflexes.

Cerebellum: coordinates voluntary movement and balance, and supports skill learning and memories.

The parts labeled in left illustration also include Amygdala (Limbic system): linked to emotion; and Hippocampus (Limbic system): linked to conscious memory. The parts labeled in left illustration also include Corpus callosum: axon fibers connecting the two cerebral hemispheres; and Cerebral cortex: Ultimate control and information-processing center.

Return to FIGURE 6.6 Brain structures and their functions

Extended description for FIGURE 6.7 The cortex and its basic subdivisions



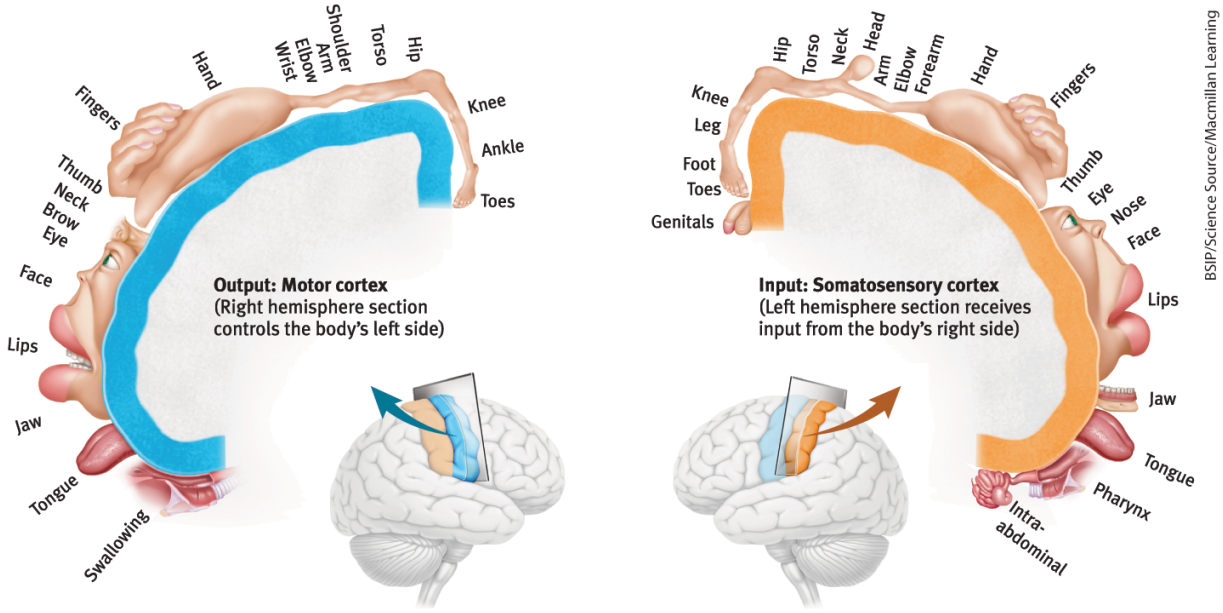
© Worth Publishers

The frontal lobe is highlighted in blue and is located at the front of the brain behind the forehead. The parietal lobe is highlighted in green and located at the top back of the brain. The temporal lobe is highlighted in purple and located below the two regions previously mentioned and centered behind the ear. The occipital lobe is highlighted in pink and located at the bottom rear of the brain. An enlarged view shows a cross-section of the brain, through the

middle, from top to bottom. This cross-section shows that the brain has largely symmetric left and right hemispheres.

Return to FIGURE 6.7 The cortex and its basic subdivisions

Extended description for FIGURE 6.8 Motor cortex and somatosensory cortex tissue devoted to each body part

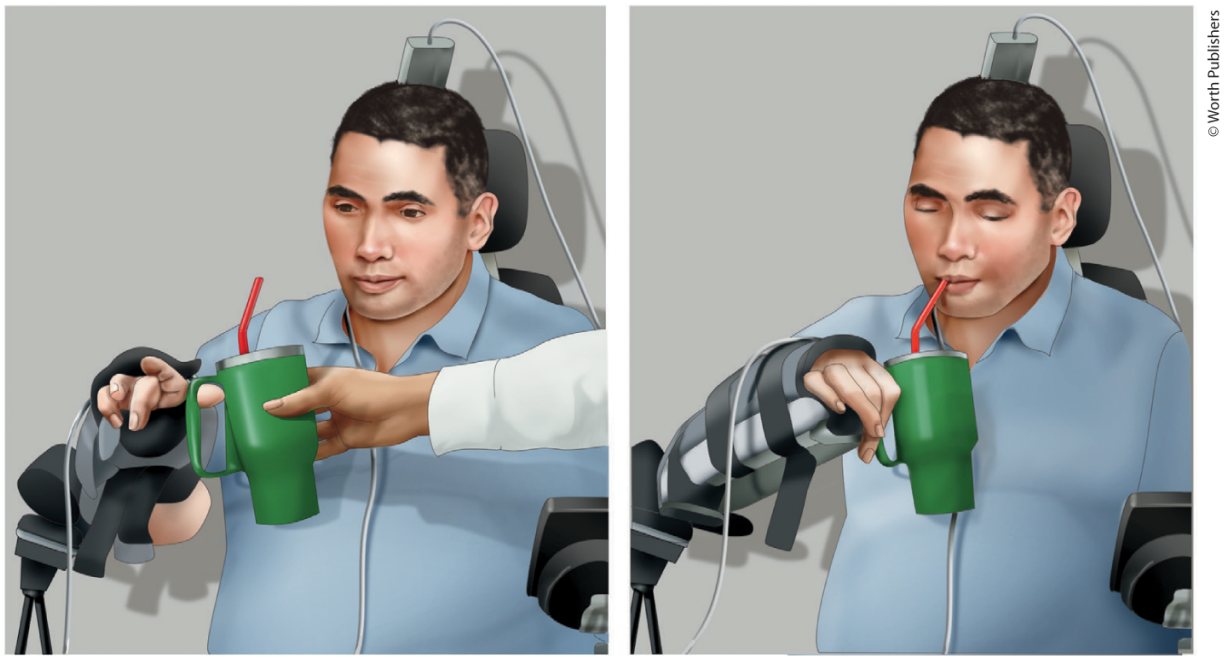


The illustration on the left depicts the lateral view of brain with the motor cortex and coronal plane dividing the cortex of the frontal lobe highlighted. Text above the illustration reads, Output: motor cortex (right hemisphere section controls the body's left side). The parts controlled by the motor cortex are labeled as follows: swallowing, tongue, jaw, lips, face, eyebrow, neck, thumb, fingers, hand, wrist, elbow, arm, shoulder, torso, hip, knee, ankle, and toes.

The illustration on the right depicts the lateral view of brain with the somatosensory cortex and a coronal plane dividing the cortex of the frontal lobe highlighted. Text above the illustration reads, Input: somatosensory cortex (left hemisphere section receives input from the body's right side). The parts controlled by the somatosensory cortex are labeled as follows: intra-abdominal, pharynx, tongue, jaw, lips, face, nose, eye, thumb, fingers, hand, forearm, elbow, arm, head, neck, torso, hip, knee, leg, foot, toes, and genitals.

Return to FIGURE 6.8 Motor cortex and somatosensory cortex tissue devoted to each body part

Extended description for FIGURE 6.9 Brain-machine interaction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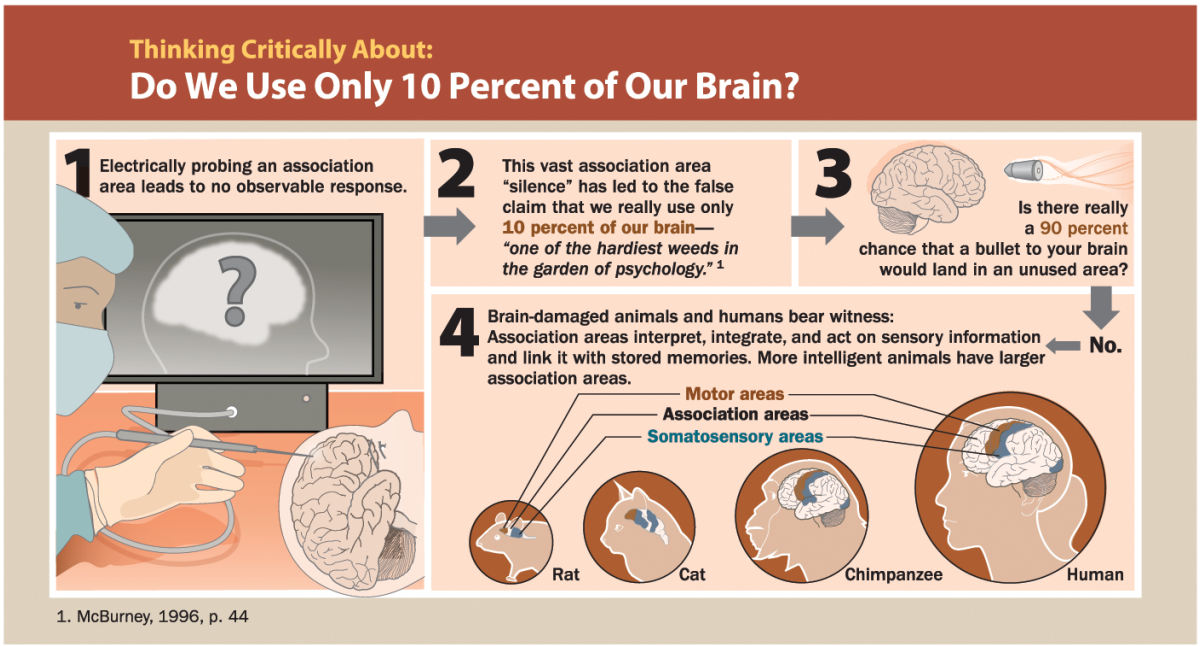
The first illustration shows the man with the electronic device implanted into his head, and his right arm is in a control device. A person's hand is handing the man a coffee tumbler with a straw in it. The second illustration shows the man drinking from the straw as his hand has slowed around the handle of the coffee tumbler and moved it closer to his face.

Return to FIGURE 6.9 Brain-machine interaction

Extended description for Do we use only 10 percent of our brain?



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Text on the top reads, **Thinking Critically About: Do We Use Only 10 Percent of Our Brain?**

The four steps of the infographic are as follows:

1: Electrically probing an association area leads to no observable response. The illustration shows a human brain being probed and monitored. A computer screen has an image of the brain with a question mark overlaid on it.

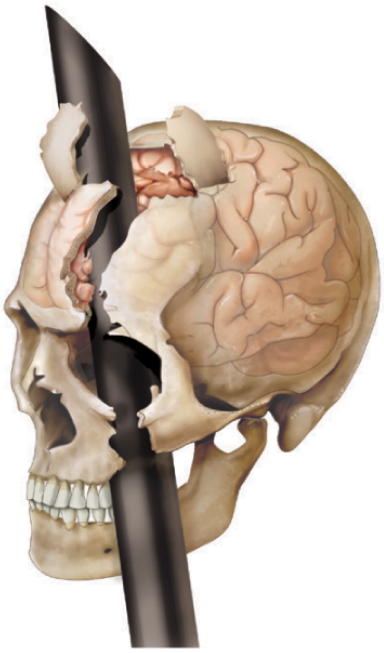
2. This vast association area “silence” has led to the false claims that we really use only **10 percent of our brain** dash “one of the hardiest weeds in the garden of psychology.“ (McBurney, 19 96, p. 44)

3. Is there really a **90 percent** chance that a bullet to your brain would land in an unused area? The illustration shows a bullet shot toward a brain. The answer is no.

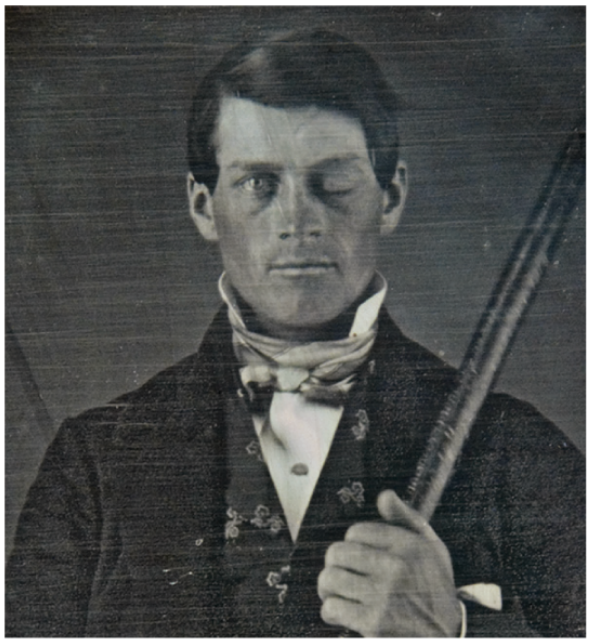
4. Brain-damaged animals and humans bear witness: Association areas interpret, integrate, and act on sensory information and link it with stored memories. More intelligent animals have larger association areas. The illustration shows the motor areas, association areas, and somatosensory areas in the brains of a rat, a cat, a chimpanzee, and a human.

Return to Do we use only 10 percent of our brain?

Extended description for FIGURE 6.12 A blast from the past



(a)



(b)

b: Warren Anatomical Museum in the Francis A. Countway Library of Medicine. Gift of Jack and Beverly Wilgus.
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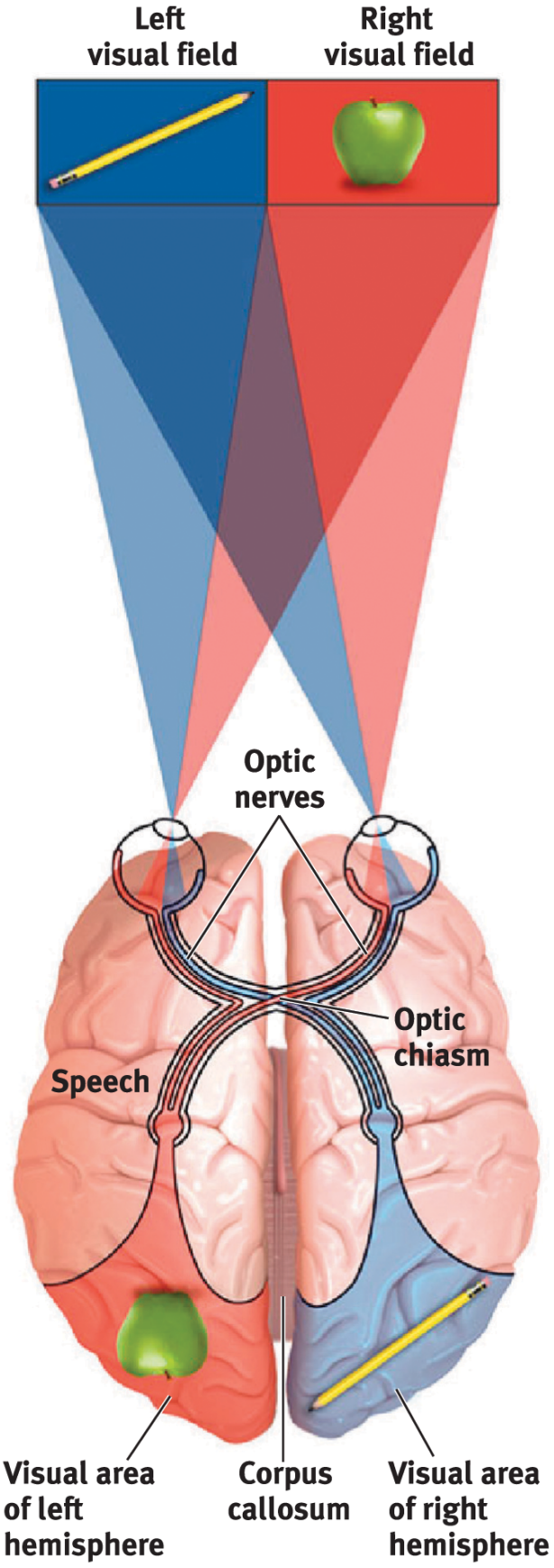
The digital reconstruction shows the rod shattering the skull on the left side of the face, through the cheek and cheekbone, behind the eye socket, through the forehead, and shattering and emerging at the top of the head, where the fracture appears to be most severe. The photo shows Phineas Gage holding the rod that pierced through his head. His left eye is closed, and he has a scar across his forehead and left cheek.

Return to FIGURE 6.12 A blast from the past

Extended description for FIGURE 7.3 The

information highway from eye to brain

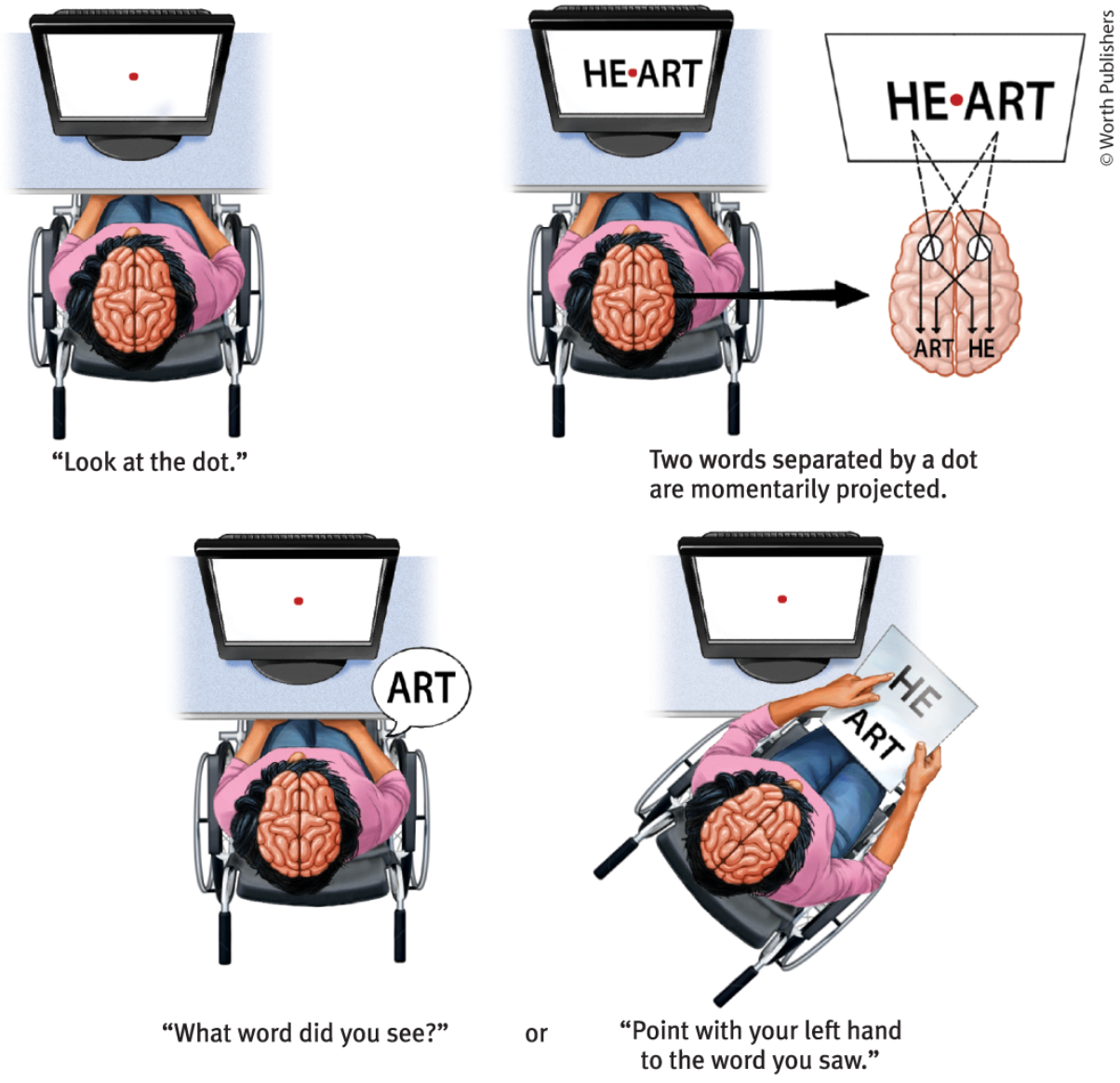


© Worth Publishers

The illustration shows a pencil in the left visual field and an apple in the right visual field. The information highways traveling to the brain are highlighted in blue, for the left visual field, and red, for the right visual field. Each eye receives information from both fields. Half of the information each eye receives comes from the left visual field, and half from the right. When the optic nerves meet, called the optic chiasm, information from the left visual field is regrouped and travels to the visual area of the right hemisphere, while the information from the right visual field regroups and travels to the visual area of the left hemisphere. As a result, the apple which was in the right visual field is reproduced in the left hemisphere, and the pencil which was initially in the left visual field is represented in the right hemisphere. The diagram also highlights that speech is on the left side of the brain. The corpus callosum joins the two hemispheres of the brain.

Return to FIGURE 7.3 The information highway from eye to brain

Extended description for FIGURE 7.4 One skull, two minds



The illustration for an experiment on the divided brain shows the top view of a woman with both hemispheres of her brain

highlighted. Part a: The screen in front of her has a dot at the center. Accompanying text reads, Look at the dot. Part b: The image is similar to part a but instead of a dot the word HEART appears on the screen with the dot between the letters H E and A R T. Accompanying text reads, Two words separated by a dot are momentarily projected. The diagram of the brain shows the same image on the screen with arrows going into the brain. H E, displayed on the left visual field, is reflected on the visual area of the right hemisphere, while A R T, displayed on the right visual field, is reflected on the left visual hemisphere of the brain. Part c shows two sections with the word, Or, in between. The left section shows the image similar to part a. A question reads, What word did you see? The woman replies, A R T. The right section is also similar except the woman is now sitting slightly sideways and holding a paper with the word H E on the top half and A R T on the bottom half. A question reads, Point with your left hand to the word you saw. The woman points to the word H E.

Return to FIGURE 7.4 One skull, two minds

Extended description for FIGURE 8.1 Altered states of consciousness

Some states occur spontaneously	Daydreaming and drowsiness	Flow	Dreaming
Some are physiologically induced	Hallucinations	Orgasm	Food or oxygen starvation
Some are psychologically induced	Sensory deprivation	Hypnosis	Meditation



Photo: INSADCO Photography/Alamy Stock Photo
© Worth Publishers

The chart shows three states of consciousness.

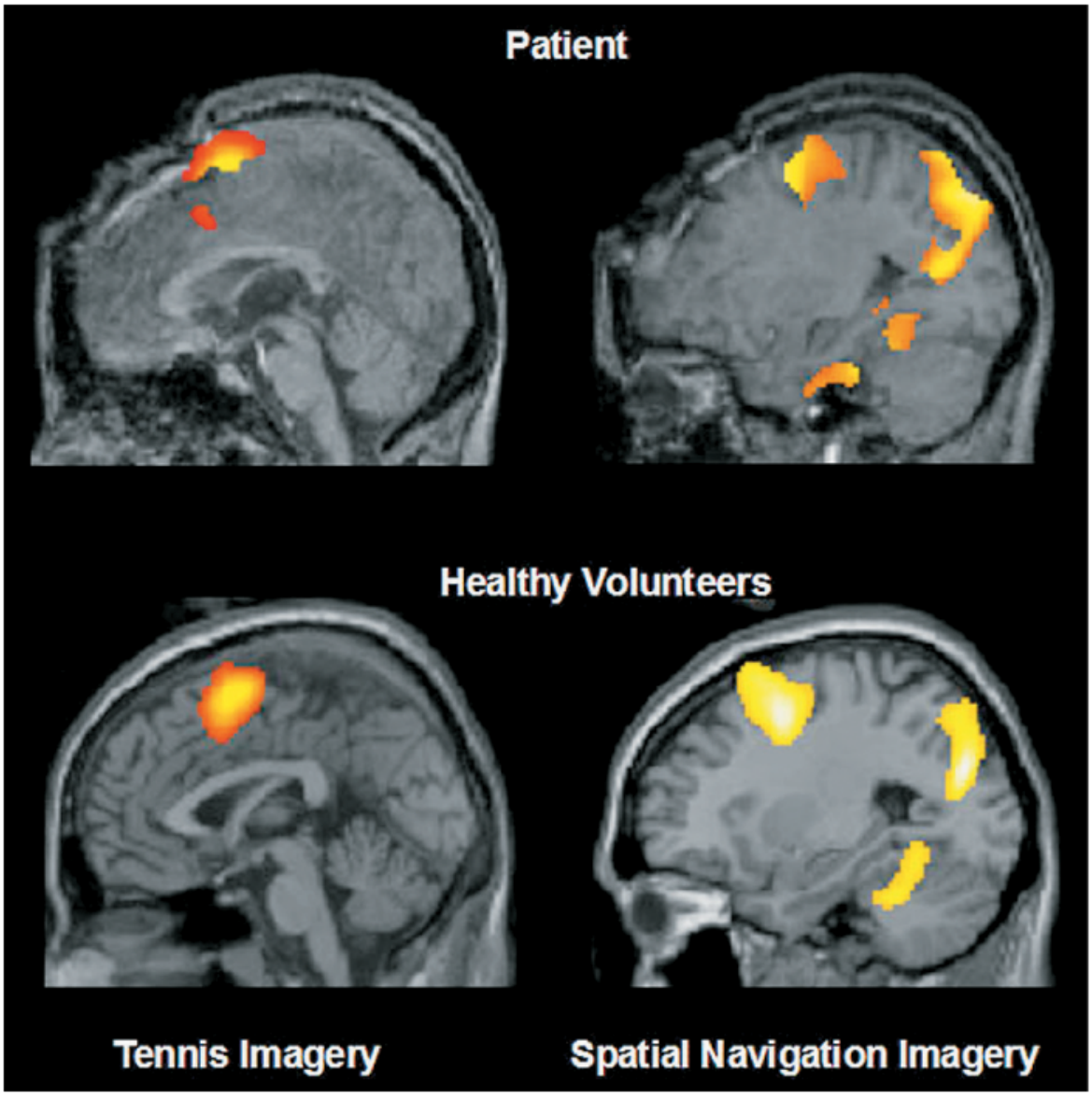
1. Some states occur spontaneously: daydreaming and drowsiness; flow; and dreaming

2. Some are physiologically induced: hallucinations; orgasm; and food or oxygen starvation.

3. Some are psychologically induced: sensory deprivation; hypnosis; and meditation.

Return to FIGURE 8.1 Altered states of consciousness

Extended description for FIGURE 8.2 Evidence of awareness



Courtesy of Adrian M. Owen, the Brain and Mind Institute, Western University

The patient's brain scan in response to tennis imagery shows a bright orange spot at the top of the head with a small yellow dot

below it. The patient's brain scan in response to spatial navigation imagery shows three additional orange and yellow spots in the posterior half. The healthy volunteers brain scan in response to tennis imagery is almost similar to the patient scan. The healthy volunteers brain scan in response to spatial navigation imagery shows three yellow spots instead of orange spots.

Return to FIGURE 8.2 Evidence of awareness

Extended description for Sustaining focus



"Are you O.K.? You're barely paying attention to your book, phone, show, laptop and the crossword you started ten minutes ago."

An open laptop and a newspaper are placed on the table in front of them. The man says, "Are you OK? You're barely paying attention to your book, phone, show, laptop and the crossword you started ten minutes ago."

Return to Sustaining focus

Extended description for FIGURE 8.4 Change blindness

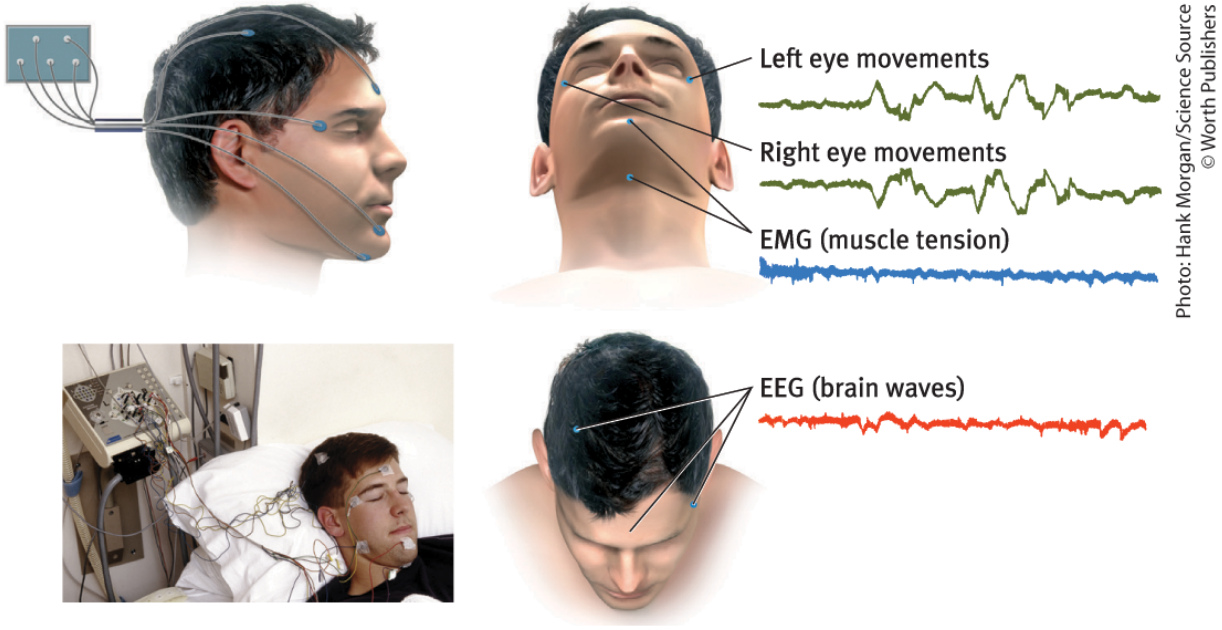


© Worth Publishers

In the first panel, an elderly man gives directions to a younger man. In the second panel, construction workers, carrying a huge board, walk between these two men so that the men cannot see each other temporarily. In the third panel, the elderly man continues giving directions to a younger man who is now dressed in a differently colored jacket.

Return to FIGURE 8.4 Change blindness

Extended description for FIGURE 9.1 Measuring sleep activity

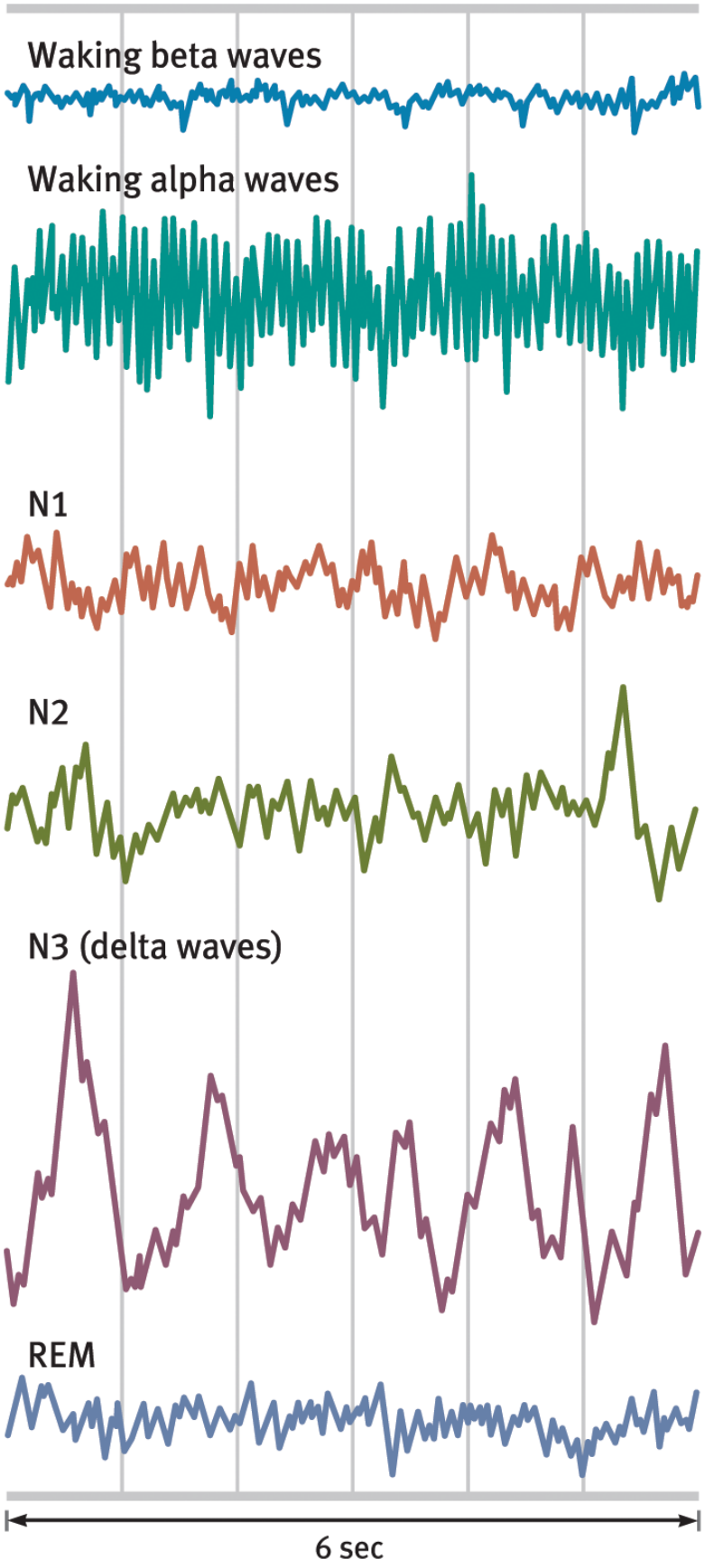


A top left illustration shows the profile of a person's head with electrodes placed on the back of the head, the outer corner of the eye, under the lower lip, and below the chin. An inferior view of the head shows the left and right eye movements, measured by placing two electrodes on the left and right temples. E M G (muscle tension) is picked up by electrodes above and below the chin. A superior view of the head shows E E G (brain waves) measured by electrodes placed on the forehead and the right temple. A photo shows a person asleep in a hospital bed with electrodes attached and monitored by a machine.

Return to FIGURE 9.1 Measuring sleep activity

Extended description for FIGURE 9.2 Brain

waves and sleep stages

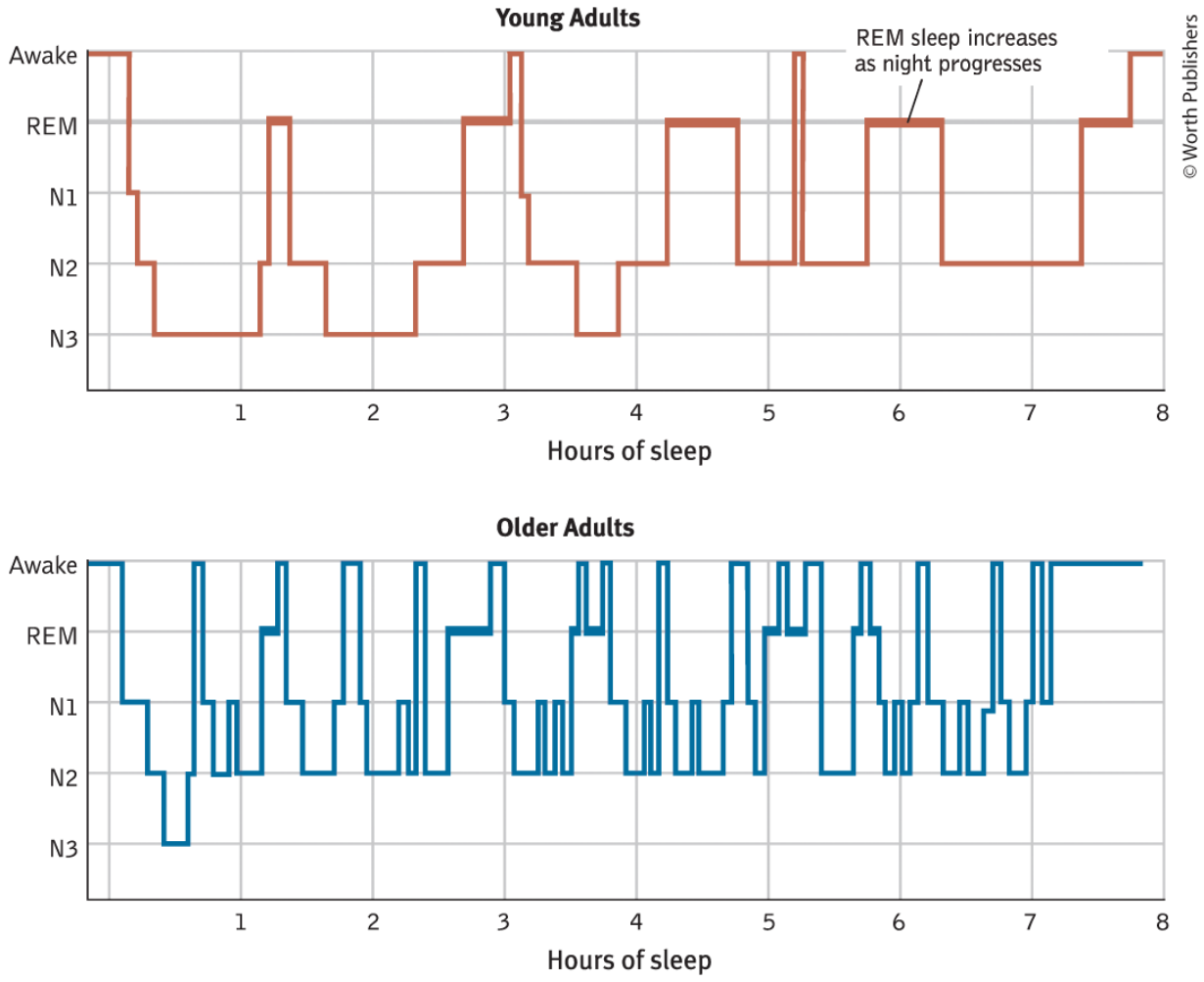


Rebecca Spencer, University of Massachusetts, assisted with this illustration.
© Worth Publishers

The six waves are depicted on the graph with time on the horizontal scale, which spans six seconds. The waking beta and waking alpha waves are regular, which differ from the slower, larger delta waves of N 3. R E M and N 1 are nearly identical. N 2 and N 3 have much higher amplitudes than do either N 1 or R E M. Similarly, the amplitude of waking alpha waves is significantly larger than that of waking beta waves.

Return to FIGURE 9.2 Brain waves and sleep stages

Extended description for FIGURE 9.4 The stages in a typical night's sleep

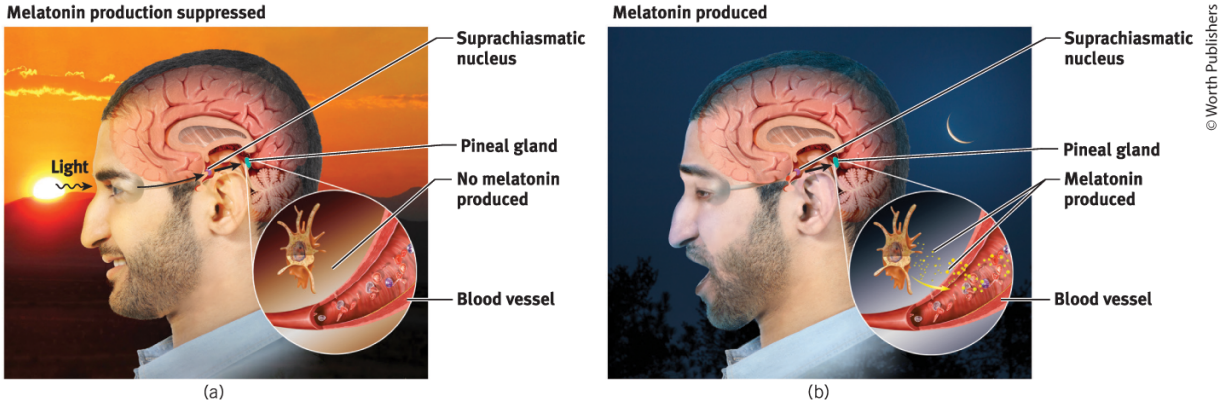


In both graphs, the horizontal axis represents hours of sleep and ranges from 0 to 8, in increments of 1; and the vertical axis is labeled N 3, N 2, N 1, R E M, and awake from bottom to top. For young adults, the graph shows that people pass through the sleep cycle

several times each night. R E M increases as the night progresses. In the first four hours of sleep, people cycle between awake and N 3, while after the fourth hour the cycle only spans between awake and N 2. For older adults, the graph reaches N 3 in the first hour of sleep and awakenings are more common. While young adults only awaken every three hours, older adults awaken as often as twice per hour. Further, each stage becomes shorter with increasing hours of sleep.

Return to FIGURE 9.4 The stages in a typical night's sleep

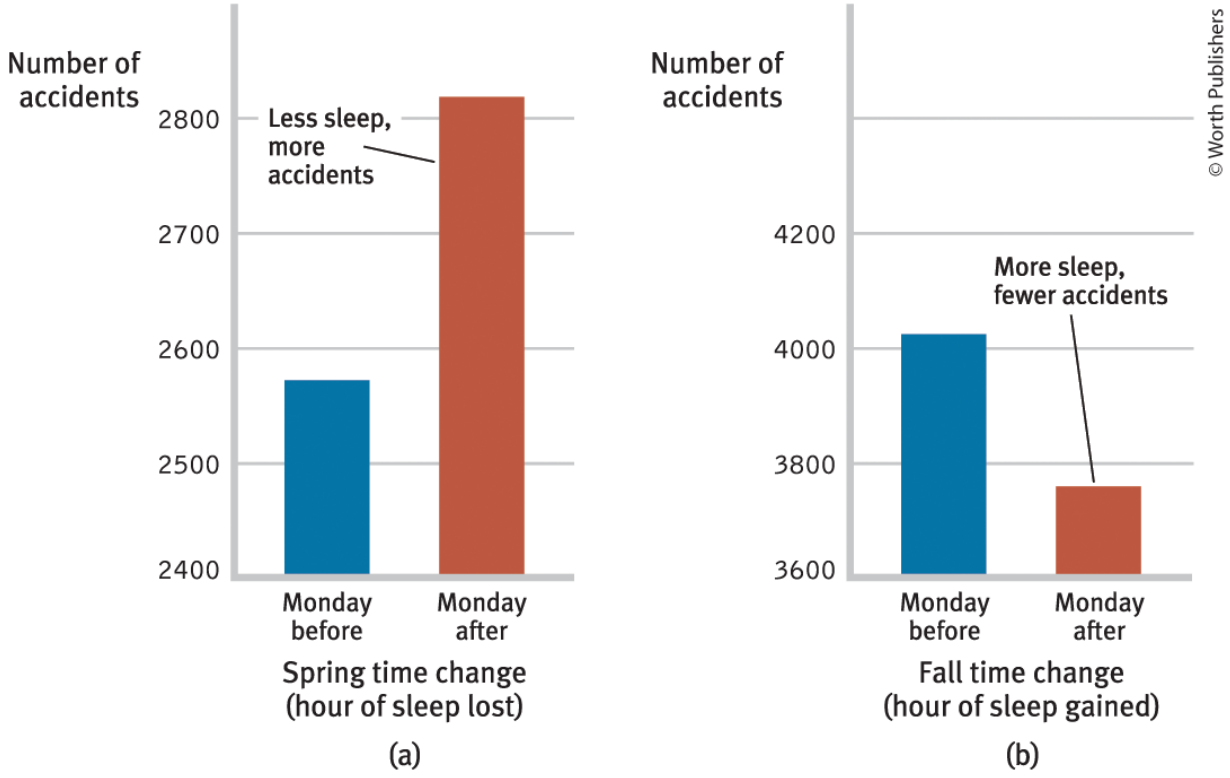
Extended description for FIGURE 9.5 The biological clock



Both parts show the lateral view of a human's head with the brain highlighted. Part a shows the man next to a setting sun. Light enters the eyes, reaches the suprachiasmatic nucleus, and then to the pineal gland. A close-up image shows the pineal gland and a nearby blood vessel. In the pineal gland, no melatonin is produced. Part b shows the man in the dark with the moon in the background. The close-up image shows the pineal gland releasing melatonin into the nearby blood vessel.

Return to FIGURE 9.5 The biological clock

Extended description for FIGURE 9.7 Less sleep equals more accidents

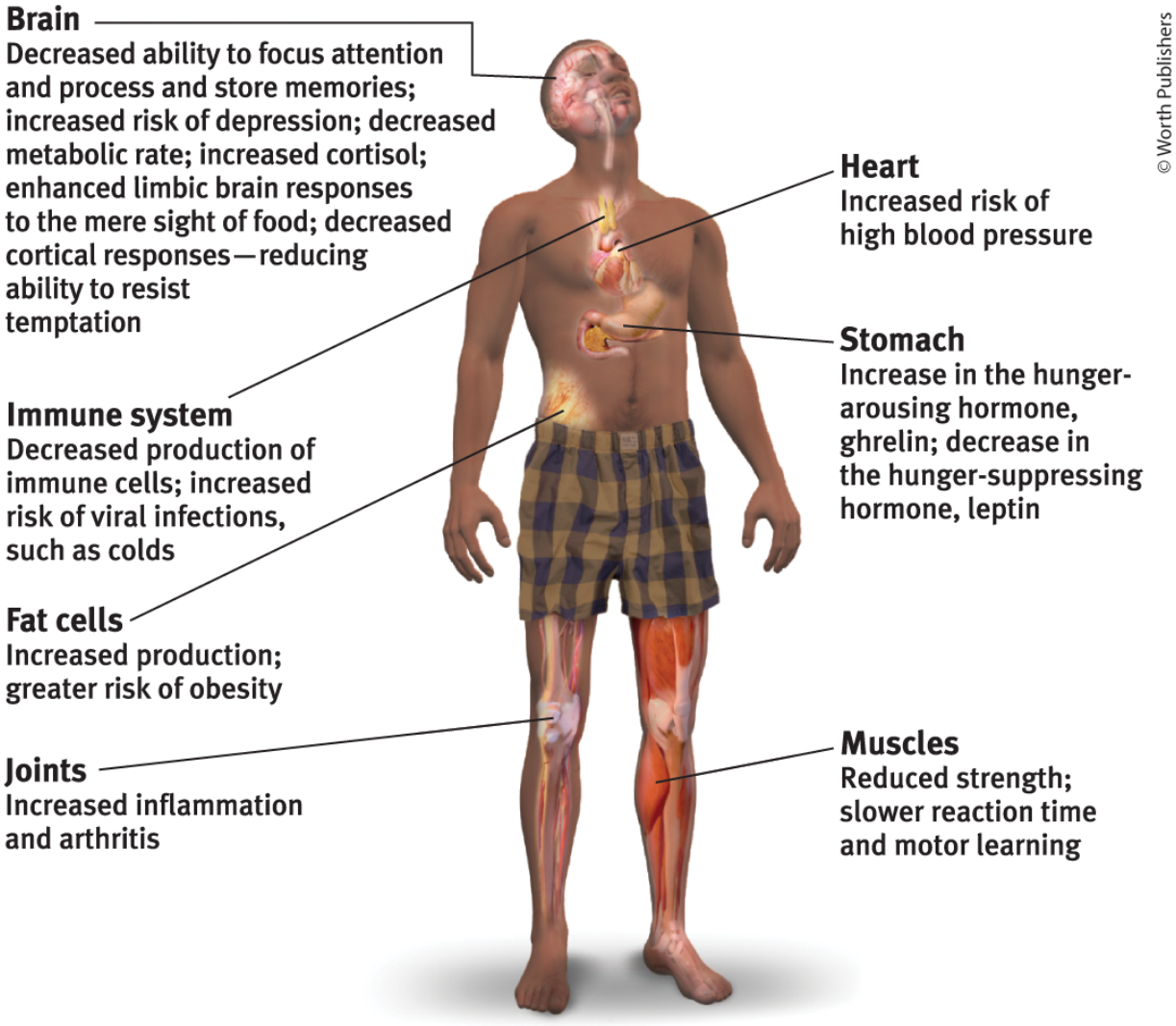


Graph A: The vertical axis shows the number of traffic accidents ranging from 2400 to 2800, in increments of 100. The horizontal axis shows the spring time change (hour of sleep lost). The data shows that on Monday before the spring time change, there were 2580 accidents; and on Monday after spring time change, there were 2820 accidents. The bar for Monday after the spring time change is labeled, Less sleep, more accidents.

Graph B: The vertical axis shows the number of traffic accidents ranging from 3600 to 4200, in increments of 200. The horizontal axis shows the fall time change (hour of sleep gained). The data shows that on Monday before the fall time change, there were 4050 accidents; and on the Monday after the fall time change, there were 3750 accidents. The bar for Monday after the fall time change is labeled, More sleep, fewer accidents. All data are approximate.

Return to FIGURE 9.7 Less sleep equals more accidents

Extended description for FIGURE 9.8 How sleep deprivation affects us

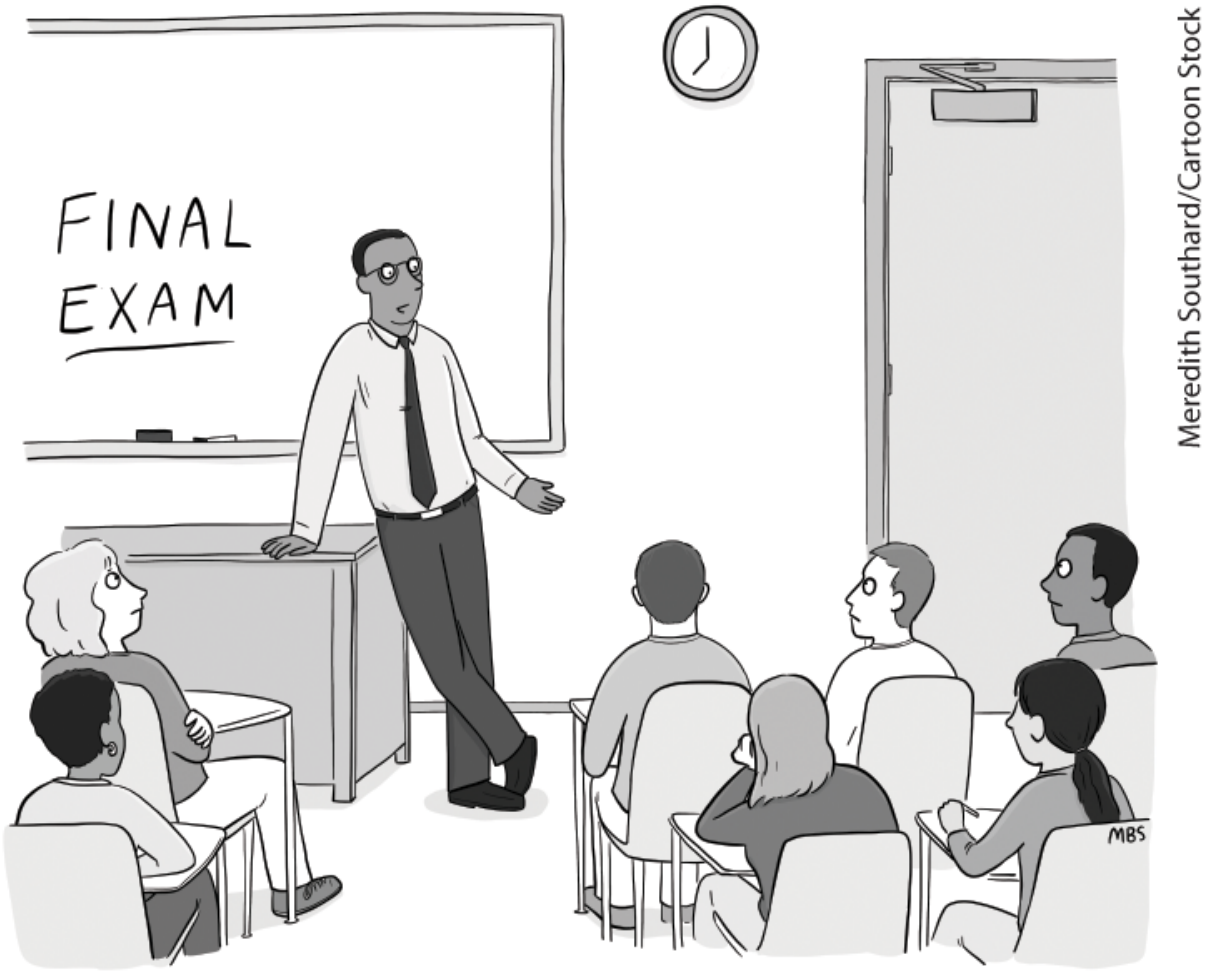


The parts labeled are as follows. **Brain:** Decreased ability to focus attention and process and store memories; increased risk of depression; decreased metabolic rate; increased cortisol; enhanced

limbic brain responses to the mere sight of food; decreased cortical responses—reducing ability to resist temptation. **Immune system:** Decreased production of immune cells; increased risk of viral infections, such as colds. **Fat cells:** Increased production; greater risk of obesity. **Joints:** Increased inflammation and arthritis. **Heart:** Increased risk of high blood pressure. **Stomach:** Increase in the hunger-arousing hormone, ghrelin, decrease in the hunger-suppressing hormone, leptin. **Muscles:** Reduced strength; slower reaction time and motor learning. Each body part and description points to the associated area on the illustration of the human.

Return to FIGURE 9.8 How sleep deprivation affects us

Extended description for Test anxiety



Meredith Southard/Cartoon Stock

"I'd like to extend a special welcome to those of you who are joining us for the first time, as part of a nightmare you're having."

A text, Final Exam, is written on the chalkboard behind the teacher. The teacher says, "I'd like to extend a special welcome to those of

you who are joining us for the first time, as part of a nightmare you're having."

Return to Test anxiety

Extended description for FIGURE 9.9 A sleeping brain is a working brain



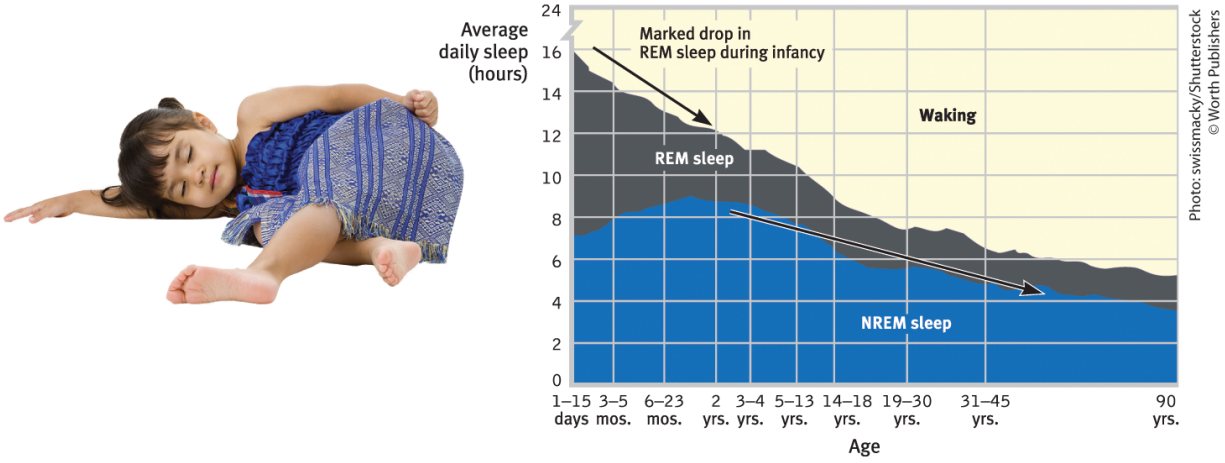
(a) Learning. (b) Sleep consolidates our learning into long-term memory. (c) Learning is retained.

© Worth Publishers

Part A, Learning: The illustration shows the woman writing in a notebook while an open laptop is kept in front. Part B, Sleep consolidates our learning into long-term memory: The illustration shows the woman sleeping. Part C, Learning is retained: The illustration shows the woman raising her hand in a classroom.

Return to FIGURE 9.9 A sleeping brain is a working brain

Extended description for FIGURE 9.10 Sleep across the life span



The vertical axis shows the average daily sleep in hours from 0 to 24, and the horizontal axis shows the age and is labeled 1 to 15 days, 3 to 5 months, 6 to 23 months, 2 years, 3 to 4 years, 5 to 13 years, 14 to 18 years, 19 to 30 years, 31 to 45 years, and 90 years. There is a marked drop in R E M during infancy, making waking hours longer and longer. R E M sleep declines steadily from 16 hours a day in infancy to fewer than six at 90 years. N R E M sleep increases from 7 hours in early infancy to 9 at 23 months, and then declines steadily, reaching under 4 hours at 90 years old. All data are approximate.

Return to FIGURE 9.10 Sleep across the life span

Extended description for Tolerance and

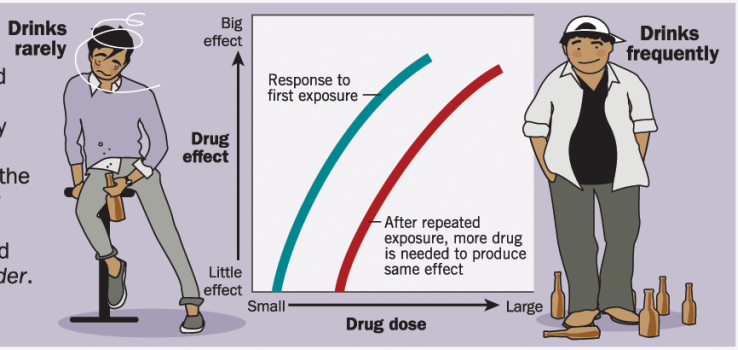
addiction

© Worth Publishers

Thinking Critically About:
Tolerance and Addiction

Tolerance

With continued use of alcohol and some other drugs, users develop **tolerance** as their brain chemistry adapts to offset the drug effect (*neuroadaptation*). To experience the same effect, users require larger and larger doses, which increase the risk of becoming **addicted** and developing a *substance use disorder*.



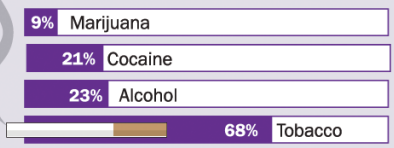
Addiction

Caused by ever-increasing doses of most psychoactive drugs (including prescription painkillers). Prompts user to crave the drug, to continue use despite adverse consequences, and to struggle when attempting to **withdraw** from it. These behaviors suggest a substance use disorder. Once in the grip of addiction, people *want* the drug more than they *like* the drug.[1]

4% of the world's people have an alcohol use disorder.[2]



The lifetime odds of getting hooked after using various drugs:



Source: National Epidemiologic Survey on Alcohol and Related Conditions [3]

Therapy or group support, such as from Alcoholics Anonymous, may help. It also helps to believe that addictions are controllable and that people can change. Many people do voluntarily stop using addictive drugs without any treatment. "Most people who successfully quit smoking kicked the habit on their own."[4]



Behavior Addictions

Psychologists try to avoid using "addiction" to label driven, excessive behaviors such as eating, work, sex, and accumulating wealth.



Yet some behaviors can become compulsive and dysfunctional—similar to problematic alcohol and drug use.[5] Behavior addictions include *gambling disorder. Internet gaming disorder* is also now a diagnosable condition.[6] Such gamers display a consistent inability to resist logging on and staying on, even when this excessive use impairs their work and relationships. One international study of 19,000 gamers found that 1 in 3 had at least one symptom of the disorder. But fewer than 1 percent met criteria for a diagnosis.[7]

Psychological and drug therapies may be "highly effective" for problematic internet use.[8]



1. Berridge et al., 2009; Robinson & Berridge, 2003. 2. WHO, 2014. 3. Lopez-Quintero et al., 2011. 4. Newport, 2013. 5. Gentile, 2009; Griffiths, 2001; Hoeft et al., 2008. 6. WHO, 2018. 7. Przybylski et al., 2017. 8. Winkler et al., 2013.

Text on the top reads, **Thinking Critically About: Tolerance and Addiction**. L O Q 3-10 What roles do tolerance and addiction play in substance use disorders, and how has the concept of addiction changed?

The three sections are as follows:

The top section labeled, **Tolerance**, shows the following text on the left: With continued use of alcohol and some other drugs, users develop **tolerance** as their brain chemistry adapts to offset the drug effect (*neuroadaptation*). To experience the same effect, users require larger and larger doses, which increase the risk of becoming **addicted** and developing a *substance use disorder*. On the right, two illustrations are depicted on either side of a graph. The vertical axis of the graph represents drug effect increasing from Little effect at the bottom to Big effect at the top. The horizontal axis represents drug dose increasing from small on the left to large on the right. A curved line representing response to first exposure starts from small dose and little effect and gradually increases to big effect as dose increases. A curved line labeled, after repeated exposure, more drug is needed to produce same effect, starts from more drug dose and little effect and gradually rises to large dose with big effect. The illustration on the left of the graph shows an intoxicated man balancing himself on a bar stool, and a text reads, **Drinks rarely**. The illustration on the right of the graph shows a man casually walking with steady feet with many bottles lying at his feet, and a text reads, **Drinks frequently**.

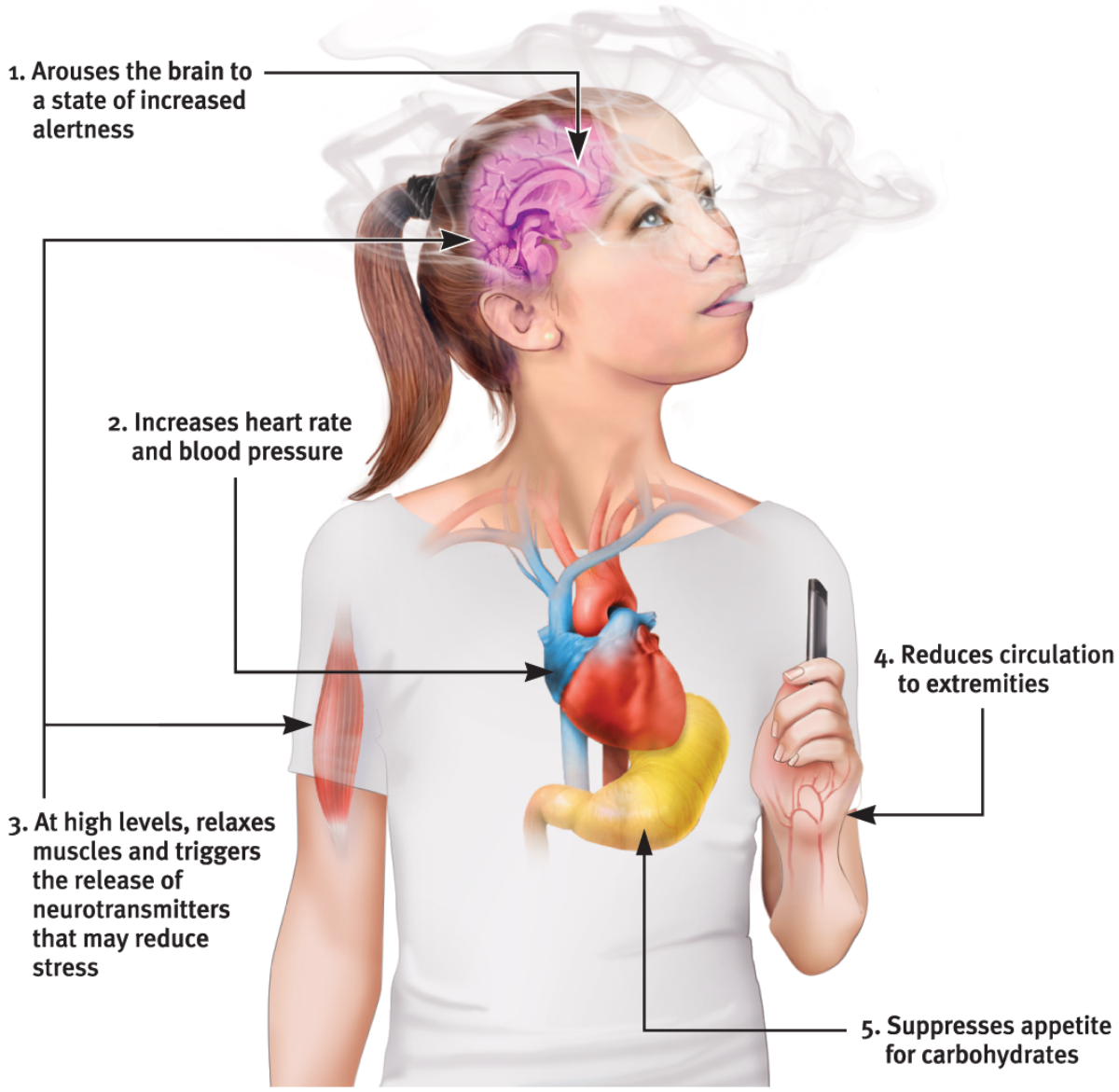
The middle section labeled, **Addiction**, shows the following text on the left: Caused by ever-increasing doses of most psychoactive drugs (including prescription painkillers). Prompts user to crave the drug, to continue use despite adverse consequences, and to struggle when attempting to **withdraw** from it. These behaviors suggest a substance use disorder. Once in the grip of addiction, people want the drug more than they *like* the drug (Berridge, et al., 2009; Robinson and Berridge, 2003). In the middle of the section, a globe is depicted with a wedge labeled 4 percent and a callout reads, 4 percent of the world's people have an alcohol use disorder (W H O, 2014 b). A horizontal bar graph shows the lifetime odds of getting hooked after using various drugs: marijuana, 9 percent; cocaine, 21 percent; alcohol, 23 percent; and tobacco, 68 percent. Source: National Epidemiologic Survey on Alcohol and Related Conditions (Lopez-Quintero et al., 2011). A text on the right of the section reads, Therapy or group support, such as from Alcoholics Anonymous, may help. It also helps to believe that addictions are controllable and that people can change. Many people do voluntarily stop using addictive drugs, without any treatment. "Most people who successfully quit smoking kicked the habit on their own." (Newport, 2013 b). An illustration shows a cigarette tied into a knot.

The bottom section labeled, **Behavior Addictions**, shows the following text on the left: Psychologists try to avoid using "addiction" to label driven, excessive behaviors such as eating, work, sex, and accumulating wealth. An illustration shows a person with a round face eating a tall stack of cheeseburgers, and a speech bubble reads,

I’m ADDICTED to cheeseburgers. The middle of the section shows a person behind a textbox. The text reads, Yet some behaviors can become compulsive and dysfunctional—similar to problematic alcohol and drug use (Gentile, 2009; Grifths, 2001; Hoeft et al., 2008). Behavior addictions include *gambling disorder*. *Internet gaming disorder* is also now a diagnosable condition. (W H O, 2018 b). Such gamers display a consistent inability to resist logging on and staying on, even when this excessive use impairs their work and relationships. One international study of 19,000 gamers found that 1 in 3 had at least one symptom of the disorder. But fewer than 1 percent met criteria for a diagnosis. (Przbylski et al., 2017). A text on the right of the section reads, Psychological and drug therapies may be “highly effective” for problematic internet use (Winkler et al, 2013). An illustration shows a tablet and a capsule.

Return to Tolerance and addiction

Extended description for FIGURE 10.2 Physiological effects of nicotine



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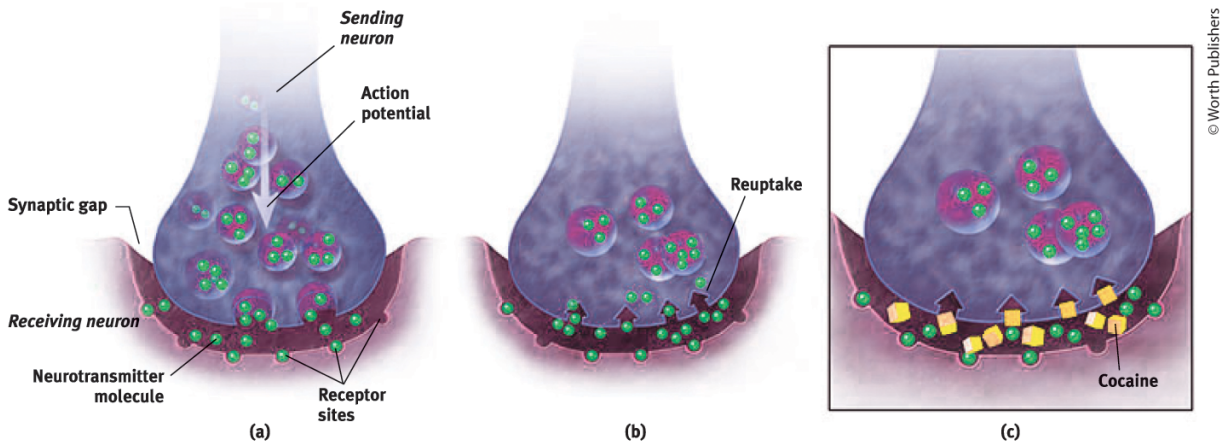
The illustration shows a young woman exhaling smoke from her mouth. Different body organs are highlighted. The effects of

nicotine are listed as follows: 1. Arouses the brain to a state of increased alertness (an arrow points to her brain); 2. Increases heart rate and blood pressure (an arrow points to her heart as well as the major veins and arteries leading from and to her heart); 3. At high levels, relaxes muscles and triggers the release of neurotransmitters that may reduce stress (an arrow points to the bicep in her arm); 4. Reduces circulation to extremities (an arrow points to her wrist, and small blood vessels can be seen from the wrist to her hand); 5. Suppresses appetite for carbohydrates (an arrow points to her stomach).

Return to FIGURE 10.2 Physiological effects of nicotine

Extended description for FIGURE 10.3 Cocaine euphoria and crash



© Worth Publishers

Neurotransmitters carry a message from a sending neuron across a synapse to receptor sites on a receiving neuron.

The sending neuron normally reabsorbs excess neurotransmitter molecules, a process called *reuptake*.

By binding to the sites that normally reabsorb neurotransmitter molecules, cocaine blocks reuptake of dopamine, norepinephrine, and serotonin (Ray & Ksir, 1990). The extra neurotransmitter molecules therefore remain in the synapse, intensifying their normal mood-altering effects and producing a euphoric rush. When the cocaine level drops, the absence of these neurotransmitters produces a crash.

(a) Neurotransmitters carry a message from a sending neuron across a synapse to receptor sites on a receiving neuron. The illustration shows the intersection between the axon terminal of a sending neuron and the dendrite of a receiving neuron. Neurotransmitter molecules are visible in the synaptic gap and are received by receptor sites on the receiving neuron's dendrite surface.

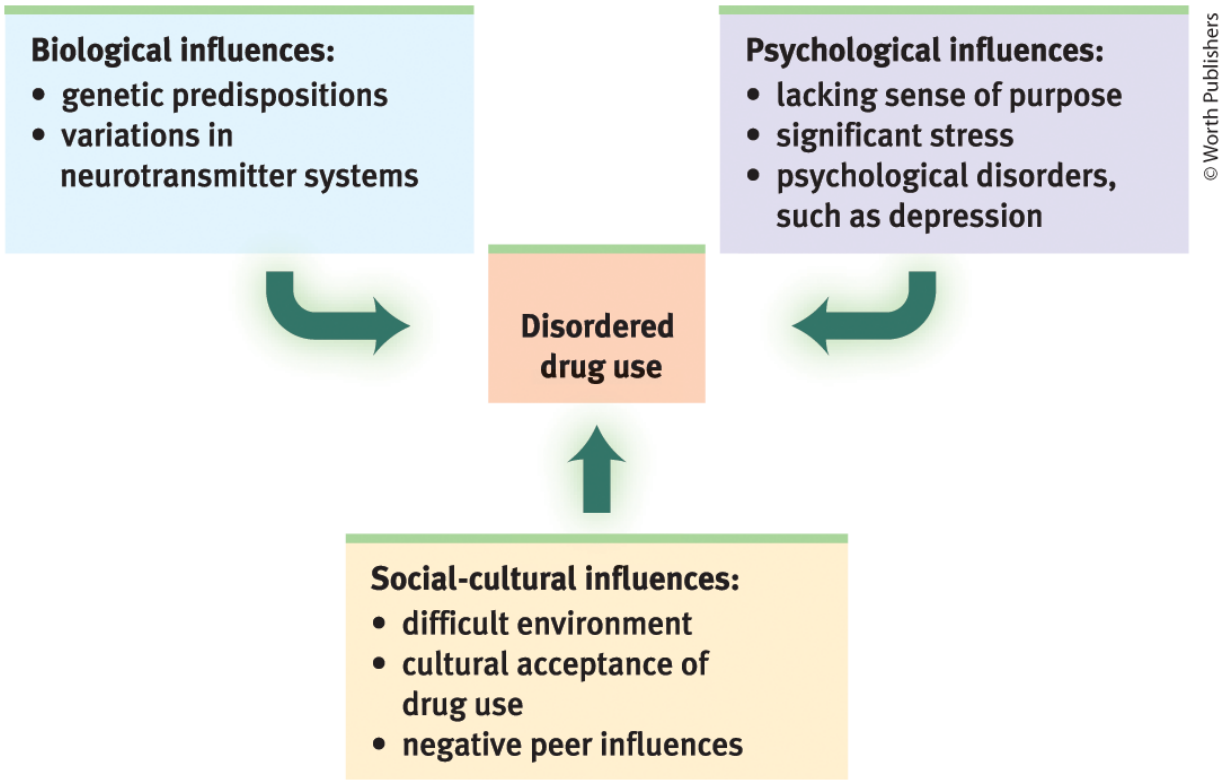
(b) The sending neuron normally reabsorbs excess neurotransmitter molecules, a process called *reuptake*. The illustration shows

neurotransmitters in the synaptic gap being absorbed back up into the axon terminal of the sending neuron and labeled reuptake.

(c) By binding to the sites that normally reabsorb neurotransmitter molecules, cocaine blocks reuptake of dopamine, norepinephrine, and serotonin (Ray and Ksir, 19 90). The extra neurotransmitter molecules, therefore, remain in the synapse, intensifying their normal mood-altering effects and producing a euphoric rush. When the cocaine level drops, the absence of these neurotransmitters produces a crash. The illustration shows cocaine molecules, depicted as yellow cubes, blocking the axon terminal from taking the neurotransmitters back up. The neurotransmitters remain in the synaptic gap and are therefore more likely to fill receptor sites on the receiving neuron's dendrite surface.

Return to FIGURE 10.3 Cocaine euphoria and crash

Extended description for FIGURE 10.5 Levels of analysis for disordered drug use

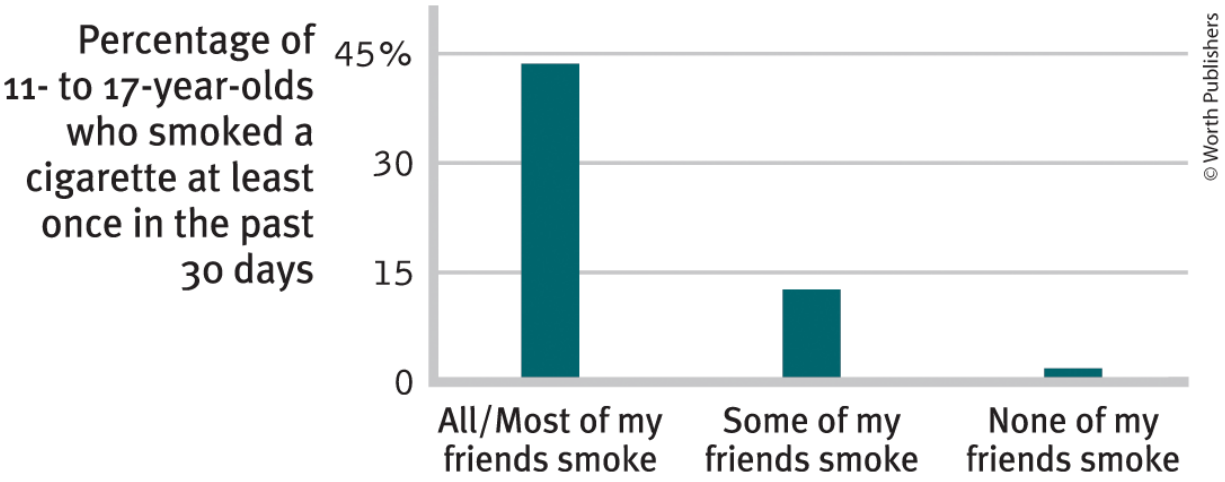


The flowchart has three text boxes that surround and point to a center text box labeled, **Disordered drug use**. The box on the top left labeled, **Biological Influences**, shows the following bulleted list: genetic predispositions; and variations in neurotransmitter systems. The box on the top right labeled, **Psychological Influences**, shows the following bulleted list: lacking sense of purpose; significant stress; and psychological disorders, such as depression. The box at the bottom labeled, **Social-cultural Influences**, shows the following

bulleted list: difficult environment; cultural acceptance of drug use; and negative peer influences.

Return to FIGURE 10.5 Levels of analysis for disordered drug use

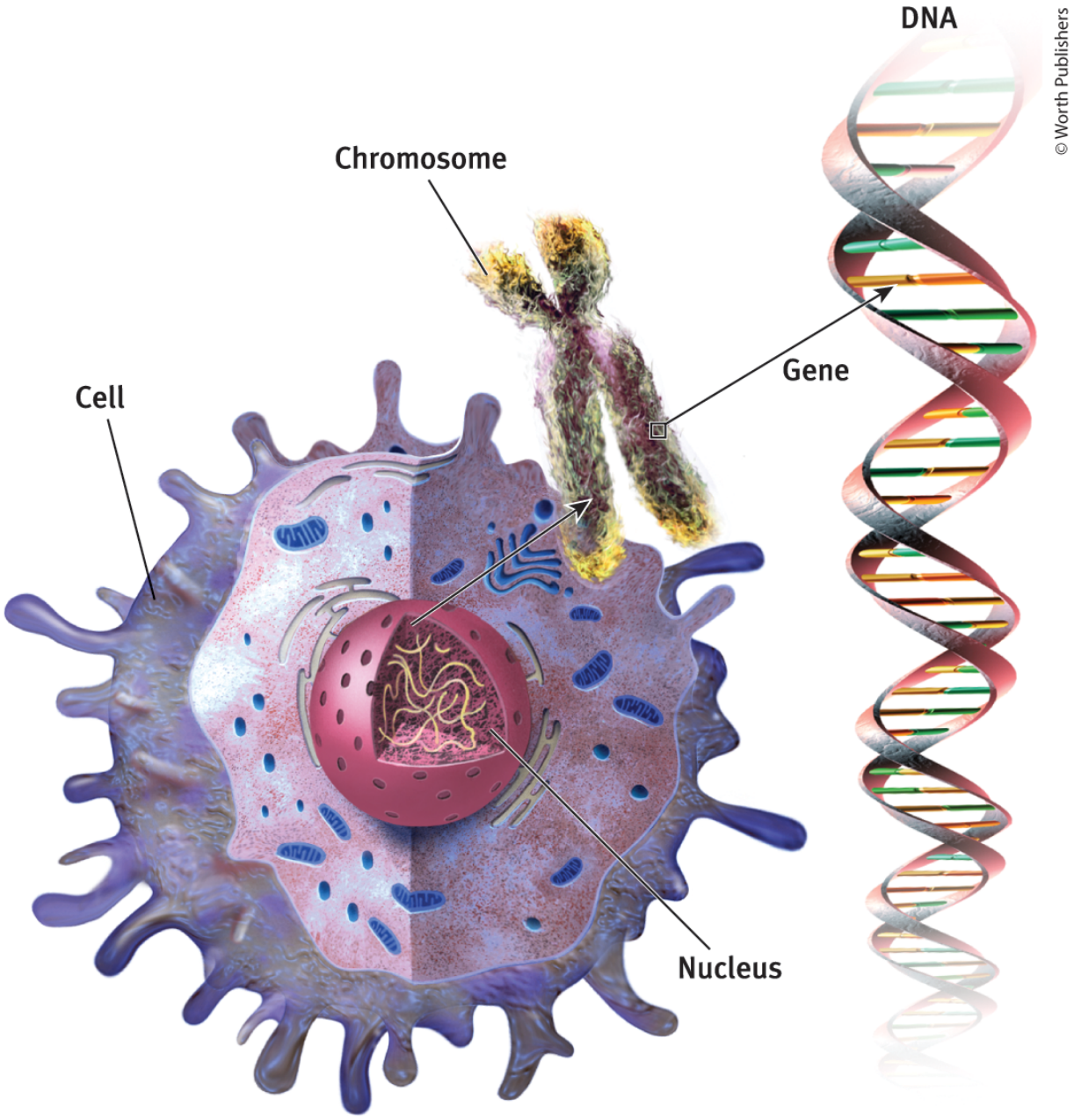
Extended description for FIGURE 10.6 Peer influence



The vertical axis represents percentage of 11- to 17-year-olds who smoked a cigarette at least once in the past 30 days and ranges from 0 to 45 percent, in increments of 15. The data from the graph are as follows: All slash most of my friends smoke, 44 percent; Some of my friends smoke, 13 percent; and None of my friends smoke, 2 percent. All data are approximate.

Return to FIGURE 10.6 Peer influence

Extended description for FIGURE 11.1 The life code

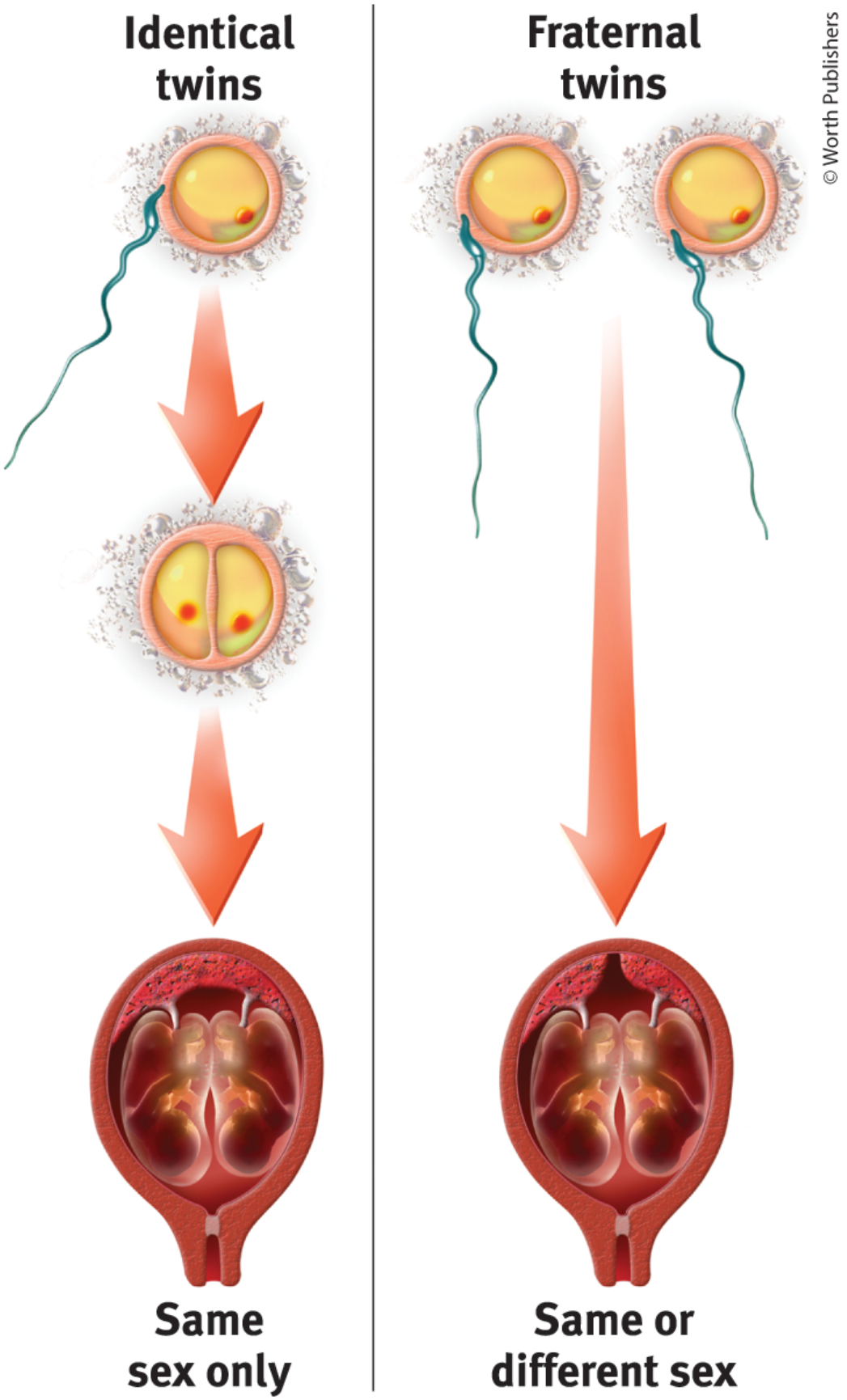


The cell is round-shaped with extensions all around. The nucleus in the middle of the cell is labeled. The nucleus is cut away to show a twisted thread-like structure inside. A chromosome shaped like an oblong X, and a twisted double-helix D N A strand are depicted in an enlarged view from a small part of the chromosome. The word gene is labeled and points to both, an area of the chromosome and an area of the D N A strand. The D N A strand is depicted in the twisted double helix and the “rungs” of the ladder are depicted in different colors to represent the base pairings

Return to FIGURE 11.1 The life code

Extended description for FIGURE 11.2 Same fertilized egg, same genes; different

eggs, different genes

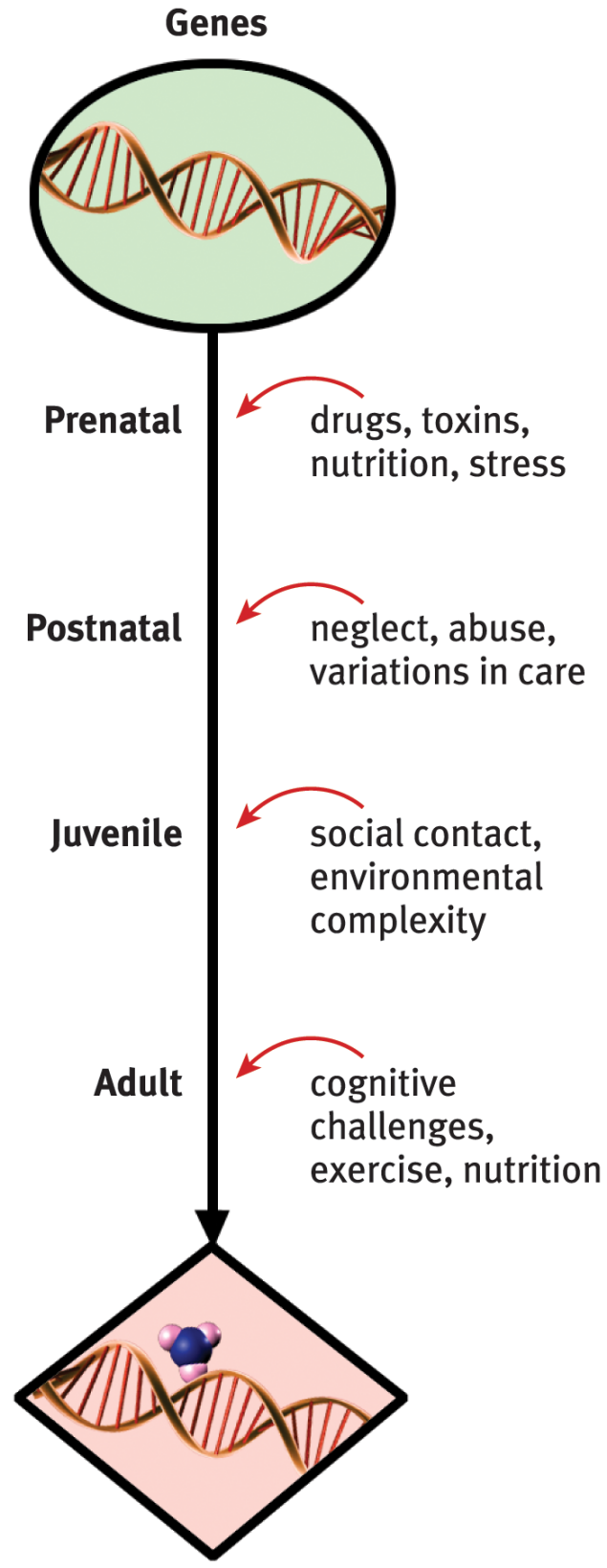

Identical twins
Fraternal twins
Same sex only
Same or different sex
© Worth Publishers

The left side is labeled Identical twins. A sperm cell is depicted fertilizing a single ovum. From there an arrow points to two different zygotes that formed from the single fertilized ovum. Another arrow points to two fetuses in a womb, and it is labeled same sex only. The right side is labeled fraternal twins and shows two sperm cells fertilizing two different ova. An arrow points to two fetuses in a womb, and it is labeled same or different sex.

Return to FIGURE 11.2 Same fertilized egg, same genes; different eggs, different genes

Extended description for FIGURE 11.3

Epigenetic expression



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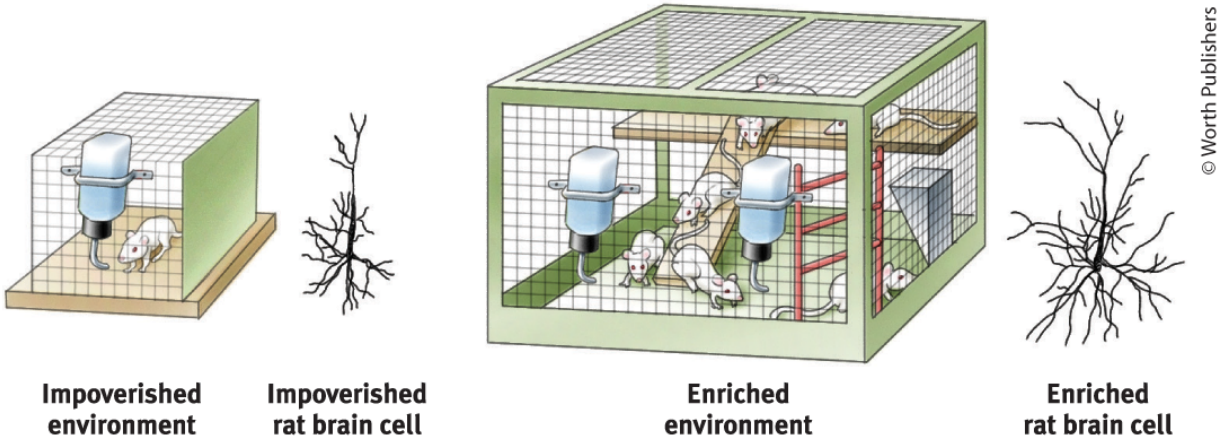
The illustration shows an oval surrounding a double-helix strand of D N A and labeled genes. Below, an arrow points to a diamond with the same D N A strand and the addition of an epigenetic molecule. It is labeled gene expression affected by epigenetic molecules. To the left of the arrow are several life periods, and to the right are examples of influences during these periods, as follows from top to bottom: Prenatal: drugs, toxins, nutrition, stress; Postnatal: neglect, abuse, variations in care; Juvenile: social contact, environmental complexity; and Adult: cognitive challenges, exercise, nutrition.

Return to FIGURE 11.3 Epigenetic expression

Extended description for FIGURE 13.1 Experience affects brain development



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The illustration shows two scenes of living situations for rats along with corresponding diagrams of their brain cells. The first scene shows a rat inside a cage in an impoverished environment. In the cage is a water bottle for drinking. A corresponding diagram shows an impoverished rat brain cell. It is thin with fewer branches extending from it and less detailed. The second scene shows a few rats in an enriched environment with a climbing ramp and ladder, two water bottles, and other playthings. A corresponding diagram shows an enriched rat brain cell. This cell has far more detail and proliferation, and more branches from the main cell.

Return to FIGURE 13.1 Experience affects brain development

Extended description for How much credit or blame do parents deserve?



Julia Suits/Cartoon Stock

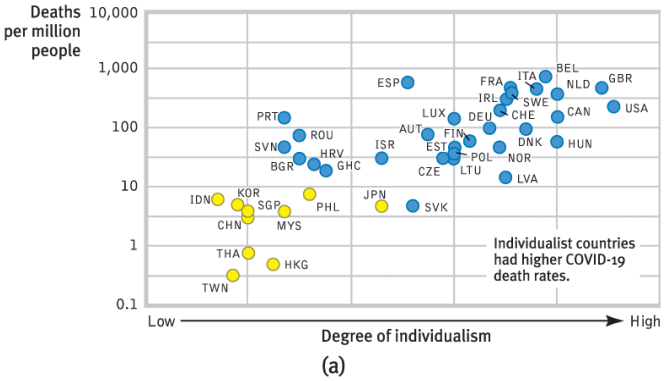
"To be frank, officer, my parents never set boundaries."

The cartoon on the top shows a man in his vehicle being stopped by a police officer. The man says, "To be frank, officer, my parents never set boundaries." The cartoon below shows a mother and her

teenage daughter talking in a living room. The daughter says, “Nature, nurture –– either way it’s still all your fault.”

Return to How much credit or blame do parents deserve?

Extended description for FIGURE 13.2 Deadly individualism



(a)



Photo: Takashi Aoyama/Getty Images
© Worth Publishers

(b)

The countries shaded in yellow including I D N, T W N, K D R, T H A, C H N, S G P, H K G, M Y S, P H L, and J P N lie within one-third of the horizontal axis under low and between 0.1 and 10 of the vertical axis. The countries shaded in blue including P R T, S V N, B G R, R O U, H R V, and G H C lie within one-third of the horizontal axis under low and between 10 and 50 of the vertical axis. The countries shaded in blue including I S R, E S P, S V K, A U T, C Z E, E S T, L T U, P O L, L U X, and F I N lie between one-third and two-third of the horizontal axis under medium and between 5 and 1,000 of the vertical axis. The countries shaded in blue including D E U, N O R, C H E, L V A, I R L, S W E, F R A, D N K, I T A, B E L , H U N, C A N, N L D, G B R, and U S A lie beyond two-third of the horizontal axis under high and between 10 and 1,000 of the vertical axis. Accompanying text reads,

Individualist countries had higher COVID- 19 death rates. All data are approximate.

Return to FIGURE 13.2 Deadly individualism

Extended description for Culture and the

self

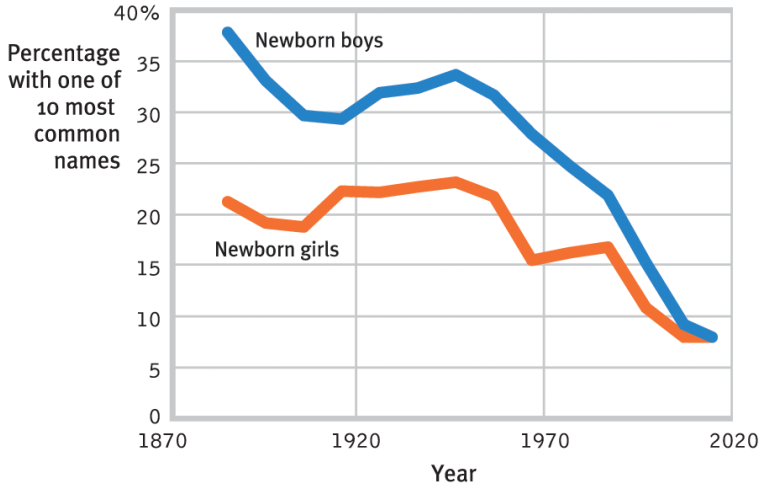


Cartoon by Buddy Hickerson

The man says to the barista, “I’d like a decaffacinno frappa chappa dappa dingo ice blended last of the mocca hicane vanilla ice ice better latte’ than never smoothie with a shot of self-expresso.” The text below reads, The tolerance of a Starbucks barista is severely tested.

Return to Culture and the self

Extended description for FIGURE 13.3 A child like no other



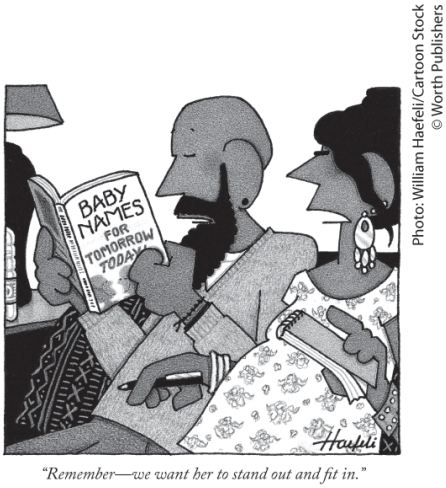


Photo: William Haefeli/Cartoon Stock
© Worth Publishers

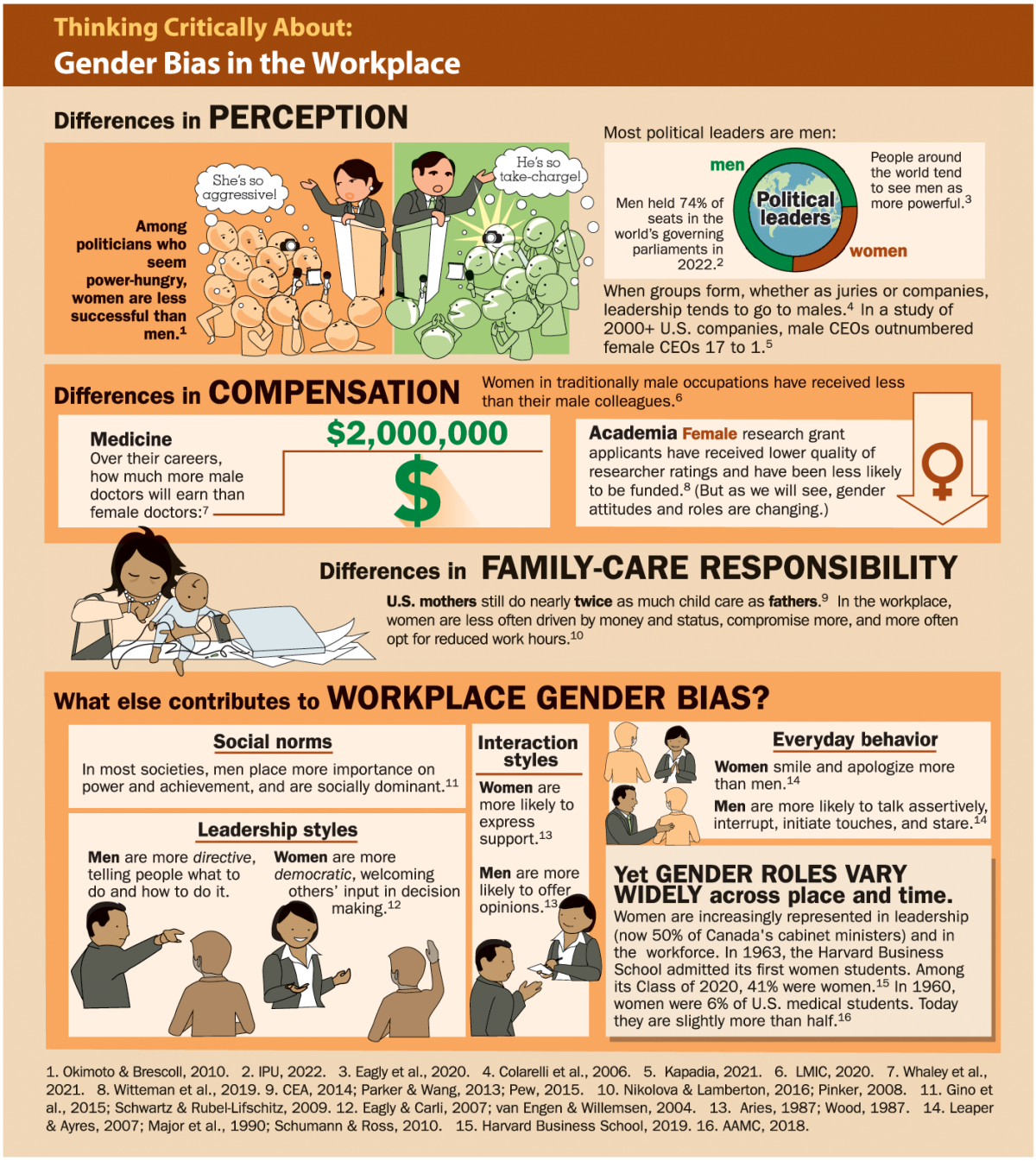
"Remember—we want her to stand out and fit in."

The line graph plots years with values ranging from 18 70 to 20 20, in increments of 50 on the horizontal axis. The vertical axis represents percentage with one of 10 most common names with values ranging from 0 to 40 percent, in increments of 5. The curve representing newborn boys begins at (18 85, 38), gradually decreases to (19 18, 29), gradually increases to (19 47, 34), and finally reaches to end at (2015, 8). The curve representing newborn girls begins at (18 85, 21), reduces to (18 95, 19), gradually increases to (19 47, 23.5), gradually decreases to (19 69, 15), increases to (19 90, 17), and finally reaches to end at (2015, 8). All data are approximate.

The cartoon shows a man sitting and reading a book titled Baby names for tomorrow today. A pregnant woman is sitting beside him with a pen and a notepad. The woman tells the man, “Remember – we want her to stand out and fit in.”

Return to FIGURE 13.3 A child like no other

Extended description for Gender bias in the workplace



© Worth Publishers

The first panel is titled, **Differences in PERCEPTION**. An illustration shows a woman standing behind a podium addressing a group of people holding cameras, notepads, and microphones. The audience members are all giving her a skeptical look. A thought bubble above their heads reads, “She’s so aggressive!” On the right is another illustration of a man standing behind a podium addressing a group of people holding cameras, notepads, and microphones. The audience members are all smiling at him. A text bubble above their heads reads, “He’s so take-charge!” The text accompanying the illustrations reads, “Among politicians who seem power-hungry, women are less successful than men (Okimoto and Brescoll, 2010).” To the right, the text reads, “Most political leaders are men.” Under this is a circular graph depicting the globe with text in the middle that reads, “Political leaders.” The graph shows that 74 percent of the circle represents men, who held 74 percent of seats in the world’s governing parliaments in 2022 (I P U, 20 22). It also shows that the remaining 26 percent represents women political leaders. The text reads, “People around the world tend to see men as more powerful (Eagly et al., 20 20).” The text below reads, “When groups form, whether as juries or companies, leadership tends to go to males (Colarelli et al., 2006). In a study of 2000 plus U.S. companies, male C E Os outnumbered female C E Os 17 to 1 (Kapadia, 20 21).”

The second panel is titled, **Differences in COMPENSATION**. Women in traditionally male occupations have received less than their male colleagues (L M I C, 20 20). Text below in the left half of the panel reads, “**Medicine**. Over their careers, how much more male doctors

will earn than female doctors (Whaley et al., 20 21)," with an illustration showing 2,000,000 dollars above a line and a large dollar sign below it. On the right side of the panel, text reads, "**Academia. Female** research grant applicants have received lower quality of researcher ratings and have been less likely to be funded. (Witteman et al., 2019) (But as we will see, gender attitudes and roles are changing)." Beside this text is the female symbol inside a downward-facing arrow.

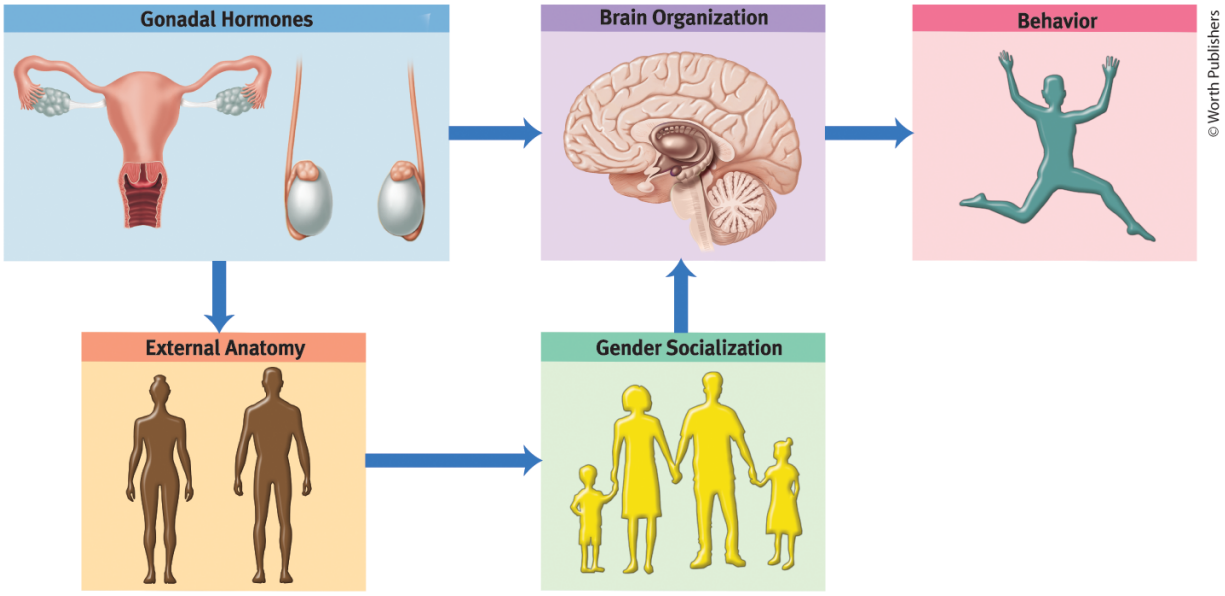
The third panel is titled, **Differences in FAMILY-CARE RESPONSIBILITY**. The illustration shows a woman entangled in the wires of a laptop and phone, seated at a desk strewn with papers. One arm is holding a baby and on the other arm is a handbag. She is checking her watch. Text reads, "**U.S. mothers** still do nearly **twice** as much child care as **fathers** (C E A, 2014; Parker and Wang, 2013; Pew, 2015). In the workplace, women are less often driven by money and status, compromise more, and more often opt for reduced work hours (Nikolova and Lamberton, 2016; Pinker, 2008)."

The fourth panel is titled, **What else contributes to WORKPLACE GENDER BIAS?** The first box in this panel has a heading that reads, "**Social norms**." Under the heading, the text reads, "In most societies, men place more importance on power and achievement, and are socially dominant (Gino et al., 2015; Schwartz and Rubel-Lifschitz, 2009)." The second box in this panel has a heading that reads, "**Leadership styles**." Under this heading, the text reads, "**Men** are more *directive*, telling people what to do and how to do it." An

illustration shows a man in a suit instructing an employee. "**Women** are more *democratic*, welcoming others' input in decision making (Eagly and Carli, 2007; van Engen and Willemsen, 2004)." An illustration shows a woman in a suit smiling, listening to an employee. The third box in this panel has a heading that reads, "**Interaction styles**." Text under the heading reads, "**Women** are more likely to express support (Aries, 19 87; Wood, 19 87). **Men** are more likely to offer opinions (Aries, 19 87; Wood, 19 87)." The illustration shows a smiling woman taking notes while listening to a man. The fourth box in this panel has a heading that reads, "**Everyday behavior**." Text under the heading reads, "**Women** smile and apologize more than men (Leaper and Ayres , 2007; Major et al., 19 90; Schumann and Ross, 2010). **Men** are more likely to talk assertively, interrupt, initiate touches, and stare (Leaper and Ayres, 2007; Major et al., 19 90; Schumann and Ross, 2010)." An illustration shows a woman in a suit and folded hands listening to a man. Another illustration shows a man in a suit with his hand on another man's shoulder. The fifth box in this panel has a heading that reads, "**Yet GENDER ROLES VARY WIDELY across place and time**." Text under the heading reads, "Women are increasingly represented in leadership (now 50 percent of Canada's cabinet ministers) and in the workforce. In 19 63, the Harvard Business School admitted its first women students. Among its Class of 20 20, 41 percent were women (Harvard Business School, 2019). In 19 60, women were 6 percent of U.S. medical students. Today, they are slightly more than half (A A M C, 2018)."

Return to Gender bias in the workplace

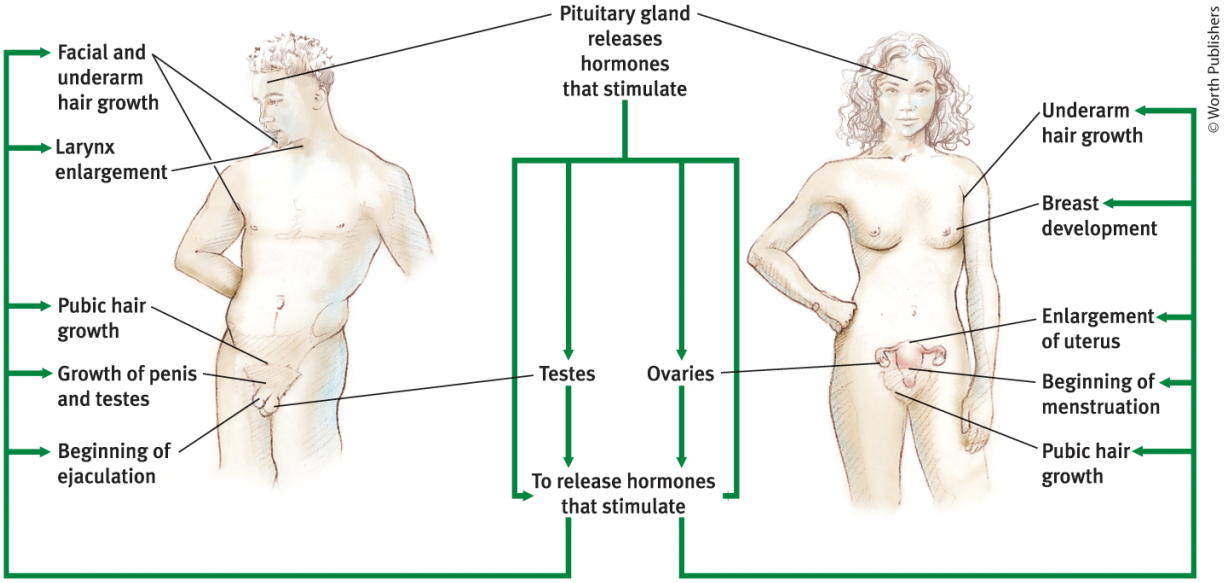
Extended description for FIGURE 13.4 From hormones to behavior



The illustration shows five boxes. The first box has male and female reproductive systems labeled gonadal hormones with one right arrow and one down arrow. The down arrow points to a box that has images of a man and a woman labeled external anatomy, and the right arrow points to a box that has a lateral view of the brain labeled brain organization. A right arrow from external anatomy points to a box that has an icon of a family of four members labeled gender socialization that has an up arrow pointing to the brain organization. A right arrow from brain organization points to a box that has an icon of a person jumping labeled behavior.

Return to FIGURE 13.4 From hormones to behavior

Extended description for FIGURE 13.5 Body changes at puberty



Two figures highlight male and female anatomy, with labels for the organs and lines to show the hormonal relationships. Text pointing to pituitary glands in both foreheads reads, Pituitary gland releases hormones that stimulate the ovaries in females and the testes in males. For females, they further release hormones that stimulate underarm hair growth, breast development, enlargement of the uterus, beginning of menstruation, and pubic hair growth. For males, the glands release hormones that stimulate facial and underarm hair growth, larynx enlargement, pubic hair growth, growth of penis and testes, and beginning of ejaculation.

Return to FIGURE 13.5 Body changes at puberty

Extended description for Sexual

aggression

Thinking Critically About:
Sexual Aggression

Definition of Sexual Aggression

Sexual harassment involves making unwanted sexual advances, obscene remarks, or requests for sexual favors.[1]



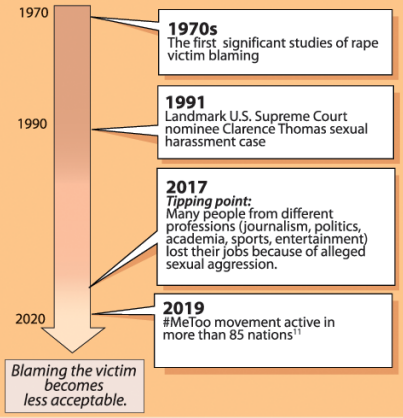
Sexual assault is "any type of sexual contact or behavior that occurs without the explicit consent of the recipient," such as unwanted touching, molestation, and attempted or completed rape.[2]



Cultural Effects on Our Views

By Place:
Some cultures view victims of sexual aggression as guilty of disgracing their families. In India and Pakistan, male family members kill an unknown number of women—one source estimates 1000 annually in each country[10]—for dishonoring their families.

Over Time:
Changes in global norms have made it less acceptable to blame victims of sexual aggression.



Victims

In the U.S., **81%** of women and **43%** of men report having experienced sexual aggression in their lifetime.[3]

Sexual aggression affects people of *all ethnic groups*.[4]

Nearly **70%** of rape victims are between the ages of 11 and 24.4.[4]

In a National School Climate survey, **8** out of **10** gay or lesbian adolescents reported experiencing sex-related harassment in the prior year.[5]

Effects on Well-Being

Thanks to human resilience, victims of sexual aggression often recover and lead healthy and meaningful lives. Yet many also suffer serious setbacks, including:

- Greater anxiety, depression, and risk for posttraumatic stress disorder[6]
- Disrupted sleep[7]
- Poor physical health[8]
- Difficulty trusting new relationship partners[9]



How to Reduce Sexual Aggression

Therapy to treat sexual aggressors has not been very effective.[12] However, other, broader-based strategies do work:

Encourage victims to report their experiences to authority figures (parents, supervisors, law enforcement officials) and to share their experiences publicly.[13]

Empower victims to take control of their situation and refuse to let their perpetrators dominate or manipulate them. Adjust social norms so that victims feel safe reporting their experiences.

Educate people about preventive bystander intervention strategies, such as "Green Dot," which has reduced sexual aggression in communities by as much as 20%.[14]



1. McDonald, 2012; U.S.E.E.O.C., 2018. 2. U.S.D.O.J., 2018. 3. Stop Street Harassment, 2018. 4. Black et al., 2011. 5. GLSEN, 2012. 6. Choudhary et al., 2012; Krahé & Berger, 2017; Snipes et al., 2017; Zanarini et al., 1997. 7. Krakow et al., 2001, 2002. 8. Schuyler et al., 2017; Zinzow et al., 2011. 9. Muldoon et al., 2016; Starzynski et al., 2017. 10. HBVA, 2018. 11. Stone & Vogelstein, 2019. 12. Grønnerød et al., 2015; Klapilová et al., 2019. 13. Holland et al., 2020. 14. Coker et al., 2017. 15. Jesse, 2019.

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A heading in the top right reads, **Definition of Sexual Aggression.** Under this heading are two boxes side by side. The box on the left has the text, **Sexual harassment** involves making unwanted sexual advances, obscene remarks, or requests for sexual favors (McDonald, 2012; U S E E O C, 2018). Under the text is an illustration showing two young men hooting at and ogling two young women, who clearly look uncomfortable. The box on the right has the text, **Sexual assault** is any type of sexual contact or behavior that occurs without the explicit consent of the recipient," such as unwanted touching, molestation, and attempted or completed rape (U S D O J, 2018). The illustration shows a man touching a girl's leg against her will as they sit at a work table.

In the lower left quadrant are two boxes. At the top is a box entitled, **Victims**. The text reads, In the U.S., **81 percent** of women and **43 percent** of men report having experienced sexual aggression in their lifetime (Stop Street Harassment, 2018). Sexual aggression affects people of *all ethnic groups* (Black et al., 2011). Nearly **70 percent** of rape victims are between the ages of 11 and 24.4 (Black et al., 2011). In a National School Climate survey, **8** out of **10** gay or lesbian adolescents reported experiencing sex-related harassment in the prior year (G L S E N, 2012).

The lower box is titled, **Effects on Well-Being**. The text reads, Thanks to human resilience, victims of sexual aggression often recover and lead healthy and meaningful lives. Yet many also suffer serious setbacks, including: bullet 1, Greater anxiety and

depression, and risk for posttraumatic stress disorder (Choudhary et al., 2012; Krahé and Berger, 2017; Snipes et al., 2017; Zanarini et al., 19 97); bullet 2, Disrupted sleep (Krakow et al., 2001, 2002); bullet 3, Poor physical health (Schuyler et al., 2017; Zinzow et al., 2011); and bullet 4, difficulty trusting new relationship partners (Muldoon et al., 2016; Starzynski et al., 2017). An illustration shows a young woman's face showing severe emotional distress.

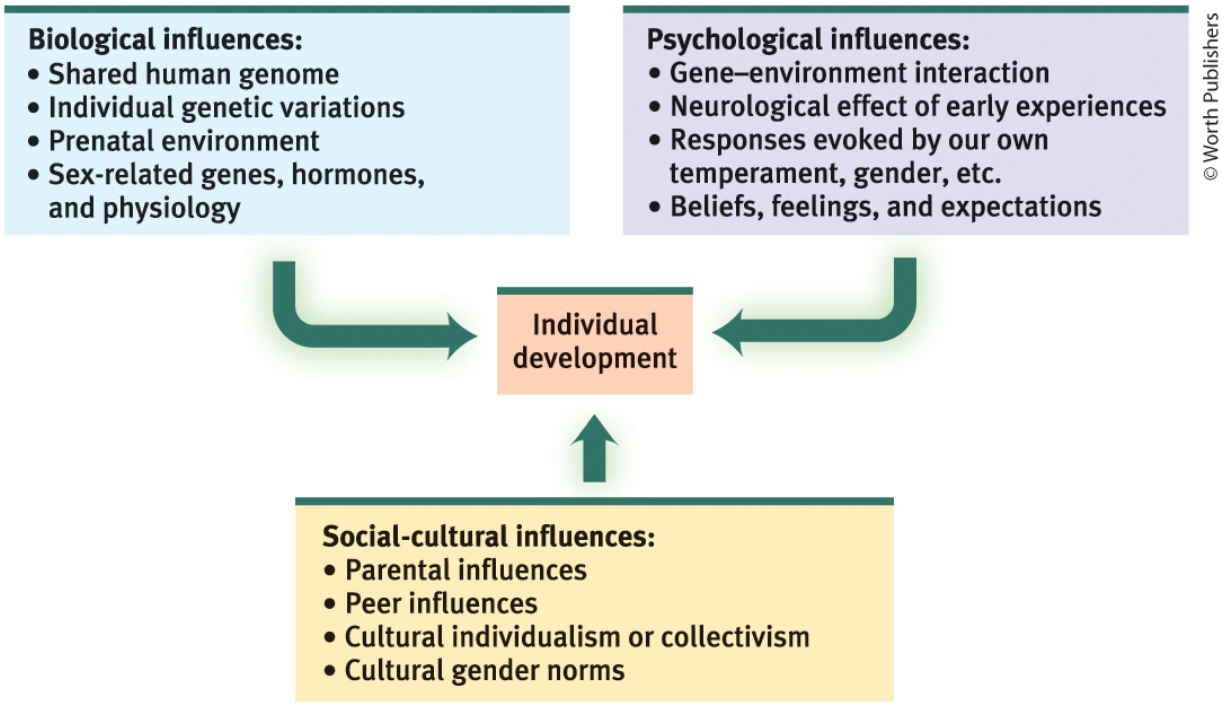
The heading in the upper right quadrant reads **Cultural Effects on Our Views**. There are two boxes side-by-side under this column heading. The box on the left has the text, **By Place:** Some cultures view victims of sexual aggression as guilty of disgracing their families. In India or Pakistan, male family members kill an unknown number of women—one source estimates 1000 annually in each country (H B V A, 2018)—for dishonoring their families. The box on the right has the text, **Over Time**: Changes in global norms have made it less acceptable to blame victims of sexual aggression. Below the text is an illustration of a large downward-facing arrow with the label 19 70 at the top, the label 19 90 near the middle, and the label 20 20 at the bottom near the arrow point. Directly under the arrow is the text, *Blaming the victim becomes less acceptable*. A textbox pointing to the 19 70 label reads, **19 70s**: The first significant studies of rape victim blaming. Another box points below the 19 90 label, with the text, **19 91**: Landmark U.S. Supreme court nominee Clarence Thomas sexual harassment case. A third box points above the 20 20 label and reads, **2017**: Tipping point: Many people from different professions (Journalism, politics, academia, sports,

entertainment) lost their jobs because of alleged sexual aggression. A fourth textbox points to the 20 20 label and reads, **2019:** hashtag MeToo movement active in more than 85 nations (Stone and Vogelstein, 2019).

The box in the lower right quadrant is titled, **How to Reduce Sexual Aggression**. The text reads, Therapy to treat sexual aggressors has not been very effective (Grønnerød et al., 2015; Klapilová et al., 2019). However, other, broader-based strategies do work: **Encourage** victims to report their experiences to authority figures (parents, supervisors, law enforcement officials) and to share their experiences publicly (Holland et al., 2020). **Empower** victims to take control of their situation and refuse to let their perpetrators dominate or manipulate them. Adjust social norms so that victims feel safe reporting their experiences. **Educate** people about preventive bystander intervention strategies, such as "Green Dot," which has reduced sexual aggression in communities by as much as 20 percent (Coker et al., 2017). The first illustration in this panel is a Time Magazine Person of the Year cover showing five women of diverse ethnicities and ages. The cover title reads, The Silence Breakers 2017. The second illustration is the Indianapolis Star newspaper showing the face of a bearded, bespectacled man in a prison jumpsuit. The headline reads, Disgraced Dr. Nassar ellipses sexual abuse ellipses 332 victims (Jesse, 2019).

Return to Sexual aggression

Extended description for FIGURE 13.6 The biopsychosocial approach to development



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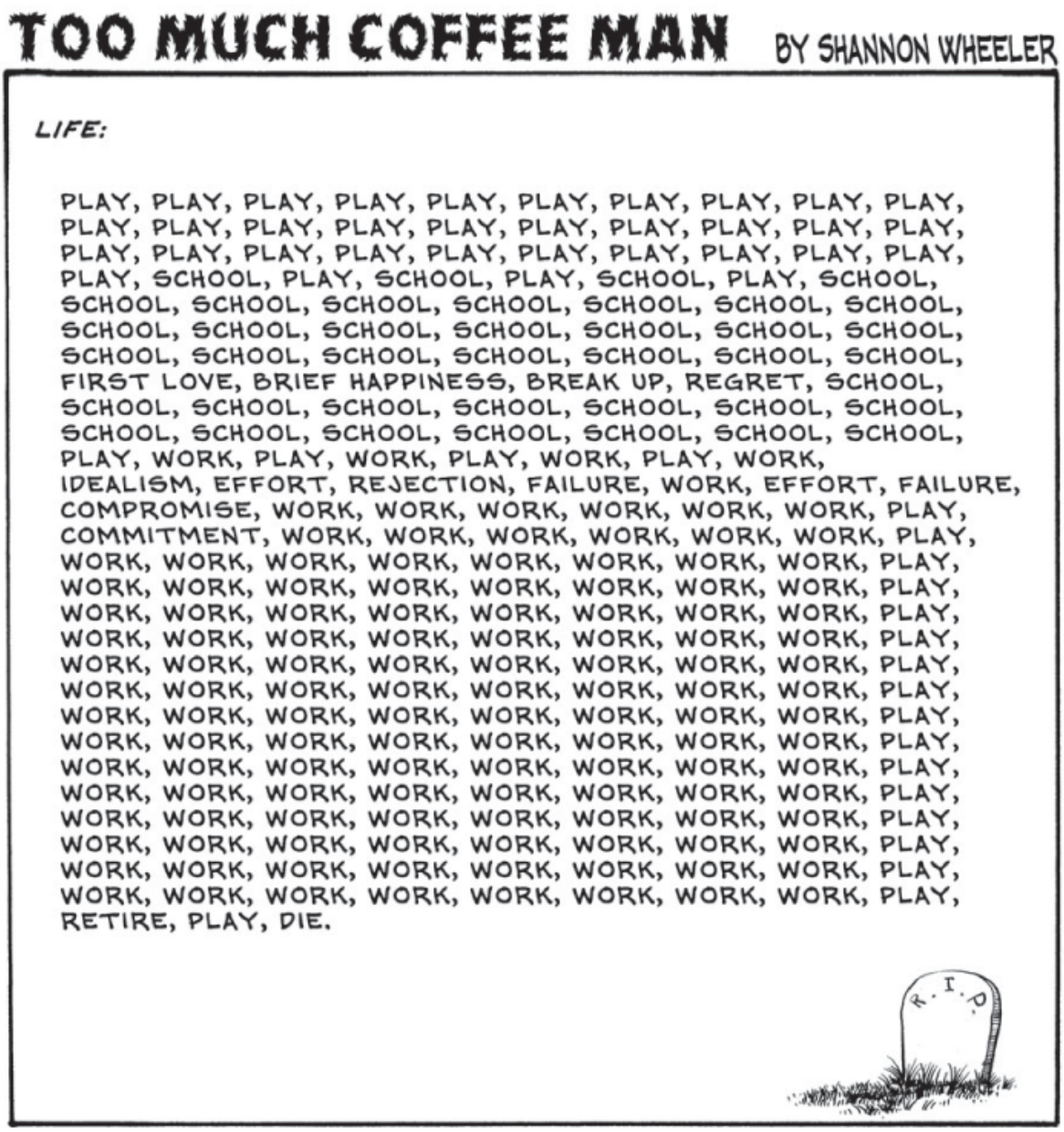
The illustration has four boxes, two boxes at the top, one box in the middle, and one at the bottom. The top left box reads, **Biological influences**: shared human genome, individual genetic variations, prenatal environment, and sex-related genes, hormones, and physiology. The top right box reads, **Psychological influences**: gene-environment interaction, neurological effect of early experiences, responses evoked by our own temperament, gender, etcetera. and beliefs, feelings and expectations. The bottom box reads, **Social-cultural influences**: parental influences, peer influences, cultural

individualism or collectivism, and cultural gender norms. These three boxes point to a box in the middle that reads, **Individual development.**

Return to FIGURE 13.6 The biopsychosocial approach to development

Extended description for Stages of the life cycle

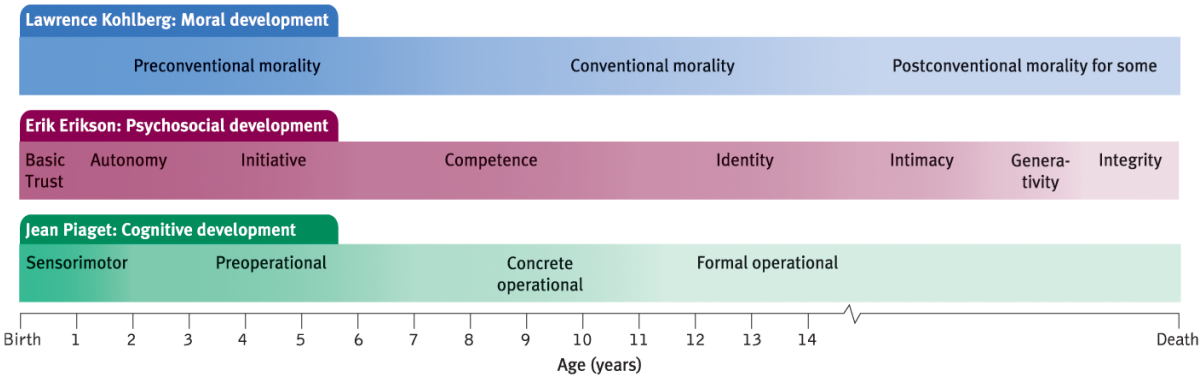


Shannon Wheeler

Text reads, Life: play (repeated thirty times), then school interspersed with play, then school repeated many times, then first love, brief happiness, break up, regret, school repeated many times, play alternating with work, idealism, effort, rejection, failure, work, effort, failure, compromise, work, play, commitment, work repeated several times, play, work repeated several times, play, then fourteen repetitions of “work, work, work, work, work, work, play,” then finally retire, play, and die. In the end, a tombstone is depicted with the words R.I.P. engraved on it.

Return to Stages of the life cycle

Extended description for FIGURE 14.1 Comparing the stage theories



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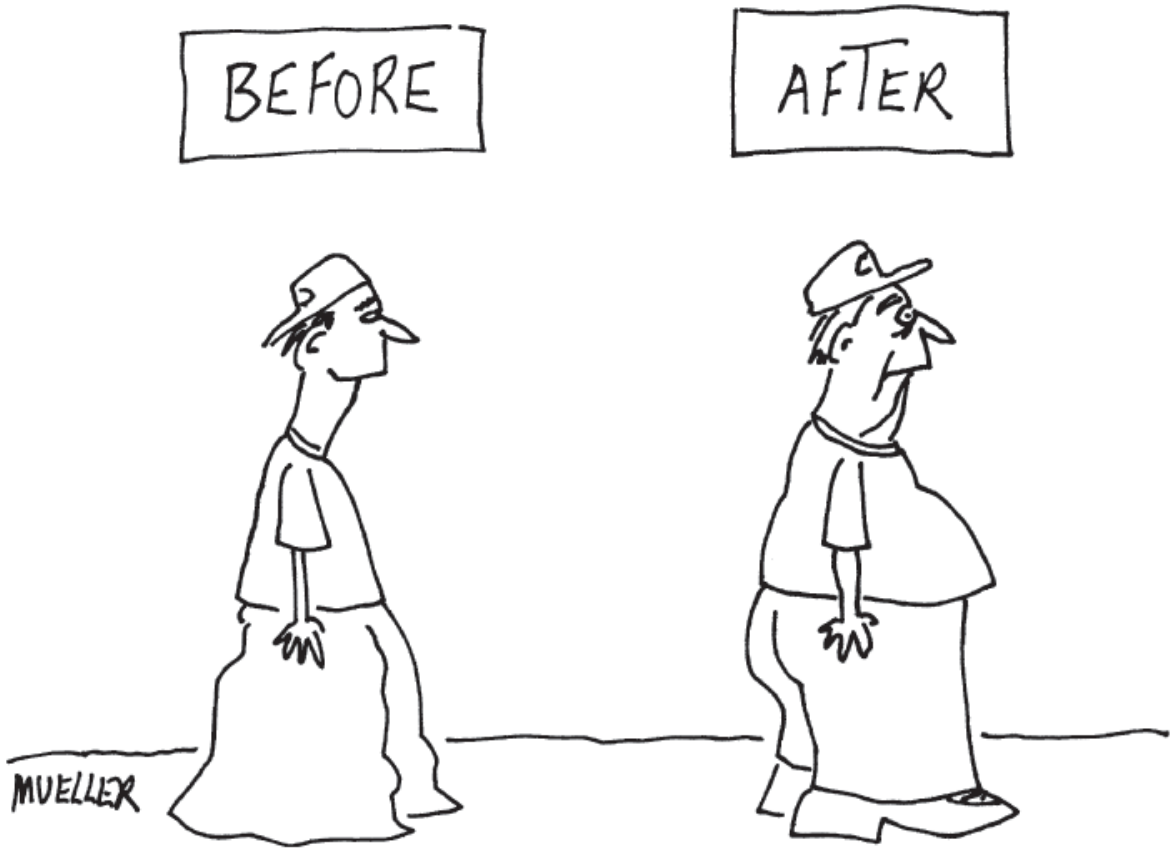
A horizontal scale beneath the illustration plots age from birth to death with the years from 1 to 14 marked in increments of 1. To the right of 14 years is a foreshortened period that covers the rest of life ending with death. The three theories are represented by three horizontal strips above the axis. The first strip is labeled Lawrence Kohlberg: Moral development and is divided into three sections as follows: Preconventional morality, from birth to about 8 years of age; Conventional morality, from age 8 to age 14; and Postconventional morality for some, from age 14 to the rest of the life through death. The second strip is labeled Erik Erikson: Psychosocial development and is divided into eight sections as follows: Basic trust, from birth to age 1; Autonomy, from age 1 to age 3; Initiative, from age 3 to age 6; Competence, from age 6 to about 12; Identity, from age 12 to past age 14 and into early adulthood;

Intimacy, early adulthood; Generativity, middle adulthood; and Integrity, from late adulthood to death. The third strip is labeled Jean Piaget: Cognitive development and is divided into four sections as follows: Sensorimotor, from birth to about 2 years of age; Preoperational, from age 2 to age 7; Concrete operational, from age 7 to age 11; and Formal operational, from age 11 through the remaining lifespan till death. All data are approximate.

Return to FIGURE 14.1 Comparing the stage theories

Extended description for As adults grow older, there is continuity of self



Peter Mueller/Cartoon Stock

The man in the illustration titled before is younger and has his cap on backward. He is wearing pants that are very saggy near the bottom. The man in the illustration labeled after is older and has his cap on forward. His midsection is saggy like the pants were in the before illustration

Return to As adults grow older, there is continuity of self

Extended description for FIGURE 14.3 Prenatal development



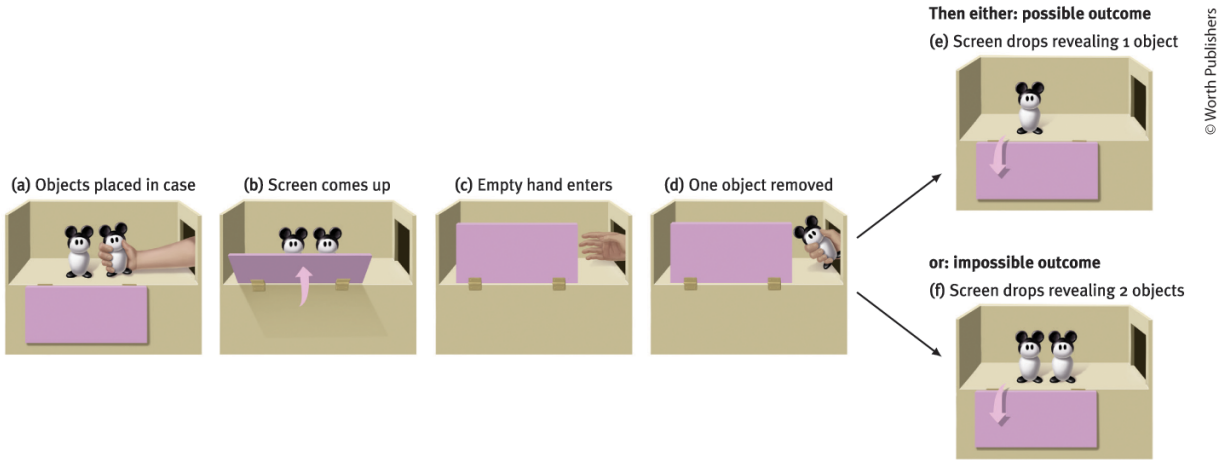
Illustration a: The embryo's spine is visible with developing hands and legs.

Illustration b: The head, hands, and feet of the fetus are fully formed. The head is still oddly shaped and is not clearly distinct from the neck.

Illustration c: The fetus is developed and grown in size as compared to the previous stage and resembles a human baby.

Return to FIGURE 14.3 Prenatal development

Extended description for FIGURE 15.4 Baby math



© Worth Publishers

Part a. Objects placed in case: Two toy mice are placed in a box.

Part b. Screen comes up: A purple screen is raised to obscure the mice.

Part c. Empty hand enters: A hand enters the image from the right side reaching behind the screen.

Part d. One object removed: The hand takes one of the toy mice away.

Two arrows point to two outcomes.

Then either, possible outcome. Part e. Screen drops revealing 1 object: The purple screen is lowered and one toy mouse remains.

or, impossible outcome. Part f. Screen drops revealing 2 objects: The purple screen is lowered and two mice remain.

Return to FIGURE 15.4 Baby math

Extended description for FIGURE 15.5 Piaget's test of conservation



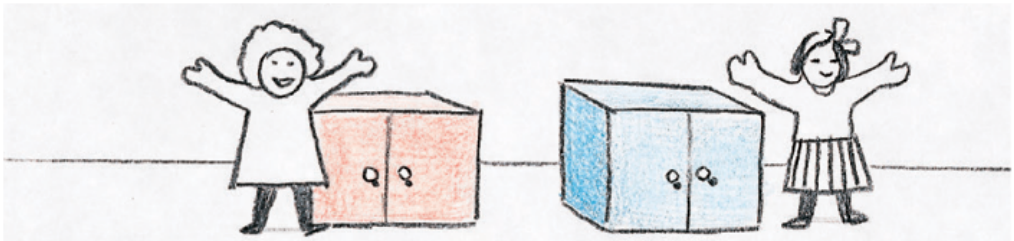
Bianca Moscatelli/Macmillan Learning

The three photos show a young girl sitting behind two glasses of milk. In the first photo, the girl looks at two short, wide glasses of milk. In the second photo, a person pours the milk from one glass into a tall, narrow glass. In the third photo, the girl points to the tall glass of milk.

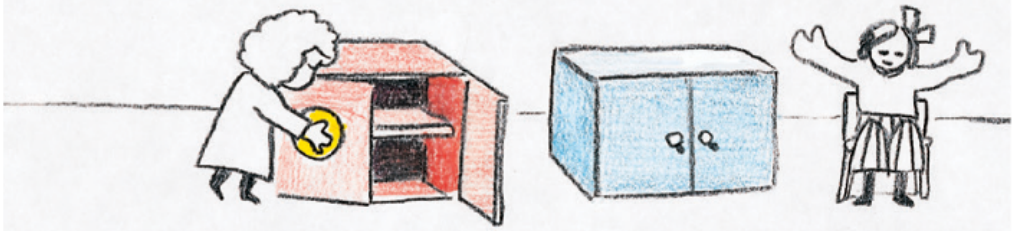
Return to FIGURE 15.5 Piaget's test of conservation

Extended description for FIGURE 15.6

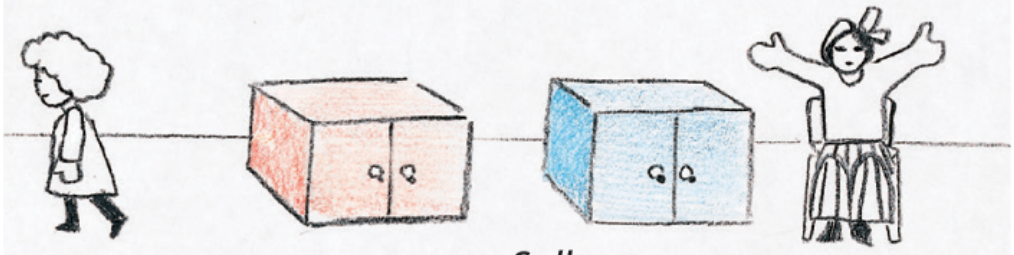
Testing children’s theory of mind



This is Sally. This is Anne.



Sally puts her ball in the red cupboard.



Sally goes away.



Anne moves the ball to the blue cupboard.



Where will Sally look for her ball?

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From top to bottom, the illustrations are as follows.

Section 1 shows a child beside a red cupboard on the left and a child beside a blue cupboard on the right. Text below the red cupboard reads, This is Sally. Text below the blue cupboard reads, This is Anne.

Section 2 shows Sally holding a ball, and the red cupboard is open. Anne is sitting on a chair beside the blue cupboard. Text below the section reads, Sally puts her ball in the red cupboard.

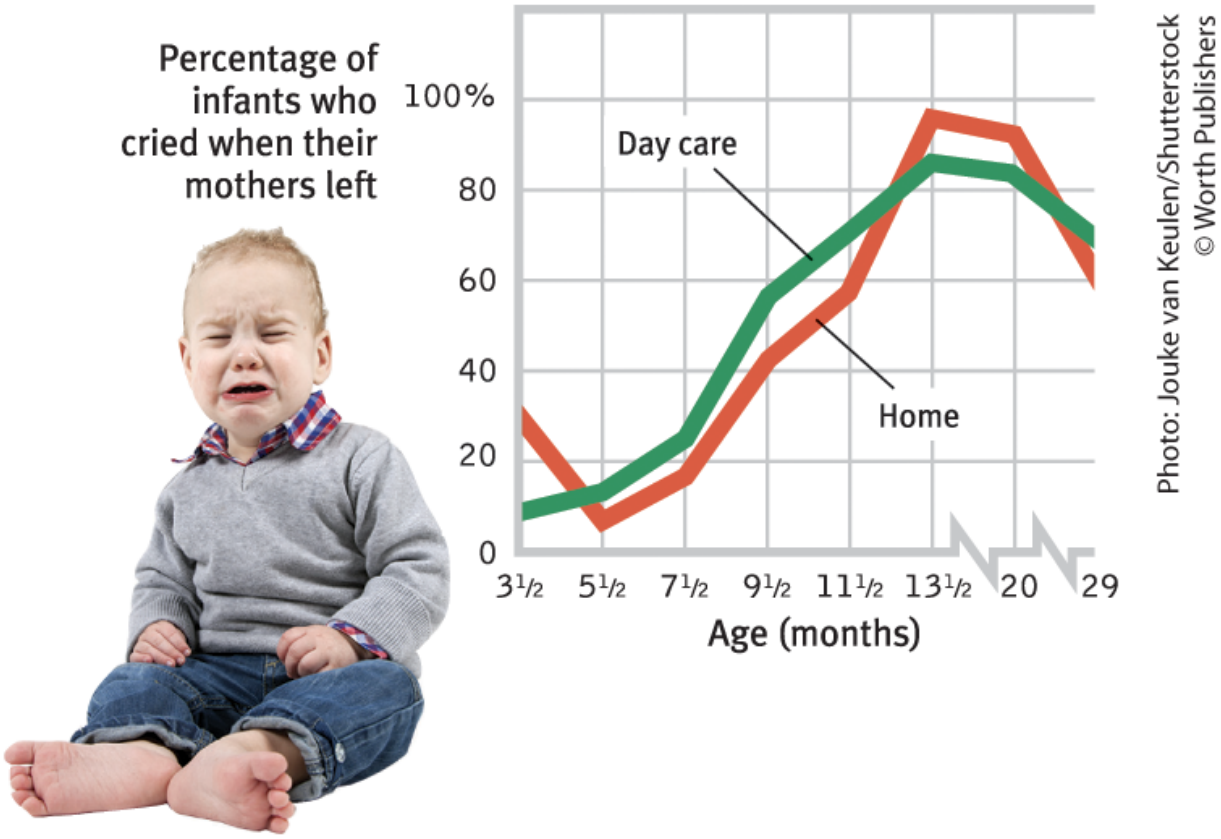
Section 3 shows Sally walking away from the red cupboard. Anne is sitting on the chair beside the blue cupboard. Text below the section reads, Sally goes away.

Section 4 shows the red cupboard is open and the ball is in Anne's hands. The blue cupboard is also open. Text below the section reads, Anne moves the ball to the blue cupboard.

Section 5 shows Anne standing between the red and blue cupboard. Text below the section reads, Where will Sally look for her ball?

Return to FIGURE 15.6 Testing children's theory of mind

Extended description for FIGURE 15.9 Infants' distress over separation

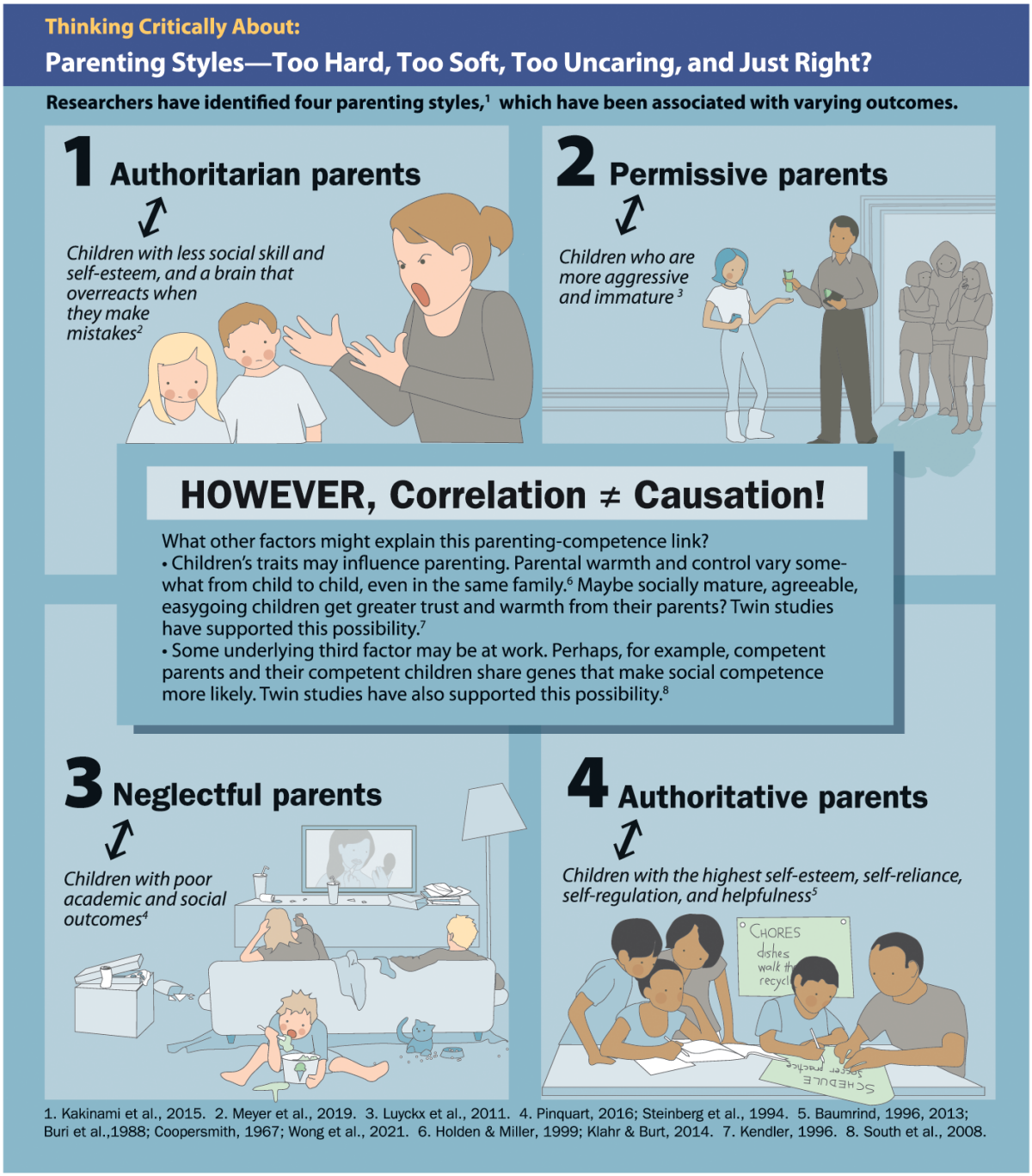


In the graph, the horizontal axis represents age (months) and ranges from 3 and a half to 29. The vertical axis represents percentage of infants who cried when their mother left and ranges from 0 to 100 percent. A curve labeled day care starts from (3 and a half, 10 percent); passes through (9 and a half, 60 percent), (13 and a half, 85 percent), and (20, 82 percent); and ends at (29, 70 percent). A curve labeled home starts from (3 and a half, 30 percent); passes through

(5 and a half, 6 percent), (9 and a half, 40 percent), (13 and a half, 97 percent), and (20, 95 percent); and ends at (29, 60 percent). All data are approximate.

Return to FIGURE 15.9 Infants' distress over separation

Extended description for Parenting styles



© Worth Publishers

The introductory text reads, Researchers have identified four parenting styles (Kakinami et al., 2015), which have been associated with varying outcomes. The infographic is divided into four sections.

The first section's heading reads, **1. Authoritarian Parents.** A two-way arrow indicating a two-way relationship is underneath this title, leading to the text, *Children with less social skill and self-esteem, and a brain that overreacts when they make mistakes* (Meyer et al., 2019). The illustration shows a mother yelling at her two children.

The second section's heading reads, **2. Permissive Parents.** A two-way arrow indicating a two-way relationship is underneath this title, leading to the text, *Children who are more aggressive and immature* (Luyckx et al., 2011). The illustration shows a father giving money to his daughter from his wallet while her friends are waiting by the door. One of the friends is smoking.

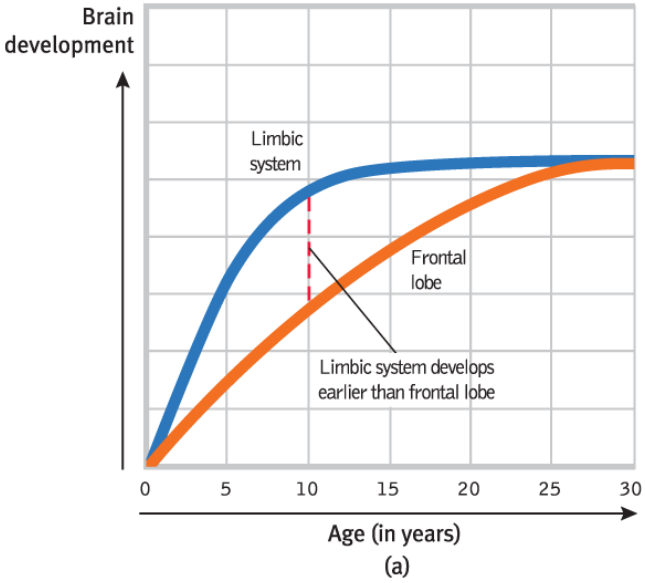
The third section's heading reads, **3. Negligent Parents.** A two-way arrow indicating a two-way relationship is underneath this title, leading to the text, *Children with poor academic and social outcomes* (Pinquart, 2016; Steinberg et al., 19 94). The illustration shows an untidy living room where the mother and the father are watching television on the couch, while their child is sitting on the floor behind the couch, eating ice cream from the tub.

The fourth section's heading reads, **4. Authoritative parents.** A two-way arrow indicating a two-way relationship is underneath this title, leading to the text, *Children with the highest self-esteem, self-reliance, self-regulation, and helpfulness* (Baumrind, 19 96, 2013; Buri et al., 19 88; Coopersmith, 19 67; Wong et al., 2021). The illustration shows a father helping his son create a schedule list, while the mother is helping two other children study. A chart on the wall reads, Chores: dishes, walk the dog, recycle.

The text superimposed in the center over all four illustrations reads, **HOWEVER, Correlation is not equal to Causation!** What other factors might explain this parenting-competence link? A bulleted list begins. Bullet item 1 text reads: Children's traits may influence parenting. Parental warmth and control vary somewhat from child to child, even in the same family. (Holden and Miller, 19 99; Klahr and Burt, 2014). Maybe socially mature, agreeable, and easygoing children evoke greater trust and warmth from their parents? Twin studies have supported this possibility (Kendler, 19 96). Bullet item 2 text reads: Some underlying third factor may be at work. Perhaps, for example, competent parents and their competent children share genes that make social competence more likely. Twin studies have also supported this possibility (South et al., 2008).

Return to Parenting styles

Extended description for Figure 16.1 Riding on the edge





(b)

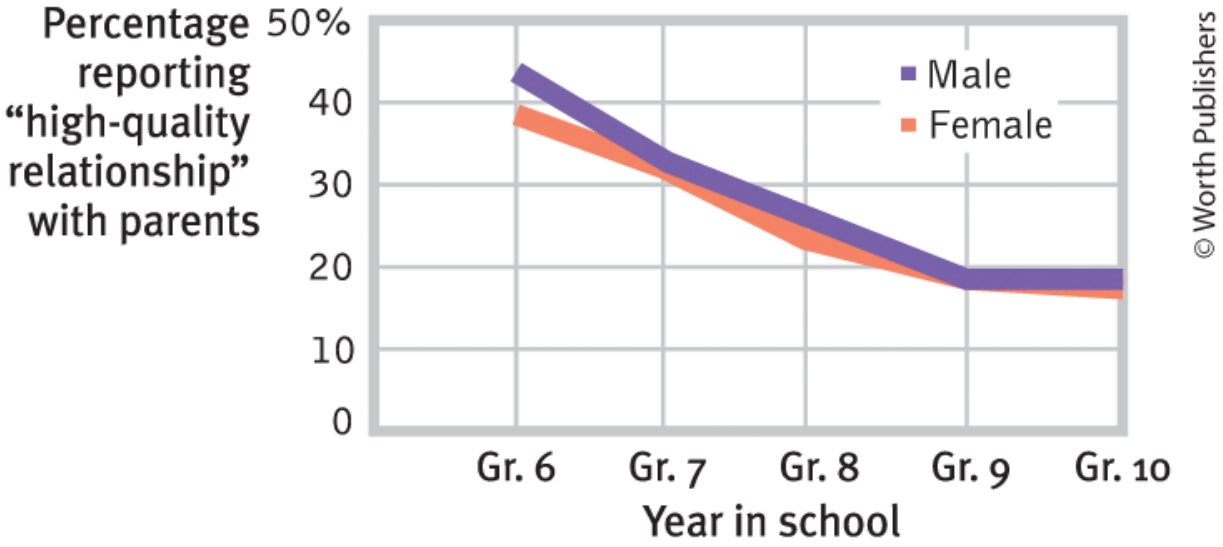
b: ViewStock/Getty Images
© Worth Publishers

The graph plots age in years increasing from left to right on the horizontal axis and ranges from 0 to 30, in increments of 5. The vertical axis represents brain development increasing from bottom to top. The blue line represents the limbic system and the orange line represents the frontal lobe. The data in the graph is as follows: The line for the limbic system starts from (0, 0) gradually reaches (15, six-eighth of the vertical axis), and slightly increases to end beyond six-eighth of the vertical axis by 30 years. The line for the frontal lobe starts from (0, 0) and gradually increases to end beyond six-eighth of the vertical axis by 30 years. There is a dotted line from (10, six-eighth of the vertical axis) of the limbic system line to (10,

two-point eight-eighth of the vertical axis) of the frontal lobe line and the labeled limbic system develops earlier than frontal lobe. The second part shows a photo of a boy pushing two girls seated on a skateboard. All data are approximate.

Return to Figure 16.1 Riding on the edge

Extended description for FIGURE 16.2 The changing parent-child relationship



The horizontal axis represents the year in school with values ranging from grade 6 to grade 10, in increments of 1. The vertical axis represents percentage reporting "high-quality relationship" with parents with values ranging from 0 to 50 percent, in increments of 10. For males, the line starts at the point (grade 6, 43), passes through the points (grade 7, 34), (grade 8, 28), (grade 9, 18), and ends at the point (grade 10, 20). For females, the line starts at the point (grade 6, 38), passes through the points (grade 7, 32), (grade 8, 23), (grade 9, 18), and ends at the point (grade 10, 18). All data are approximate.

Return to FIGURE 16.2 The changing parent-child relationship

Extended description for Aging



"Happy fortieth. I'll take the muscle tone in your upper arms, the girlish timbre of your voice, your amazing tolerance for caffeine, and your ability to digest french fries. The rest of you can stay."

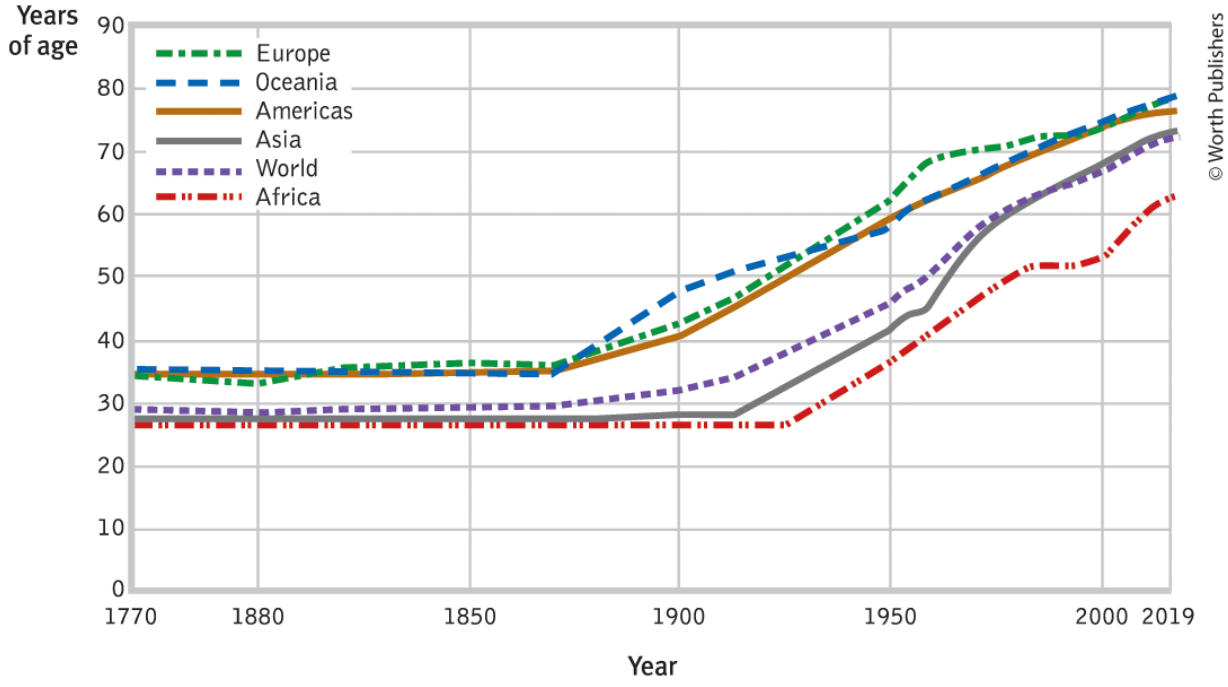
The New Yorker Collection, 1999 Tom Cheney/The Cartoon Bank

The grim reaper with his scythe is standing beside the bed and pointing at her. The grim reaper says, "Happy fortieth. I'll take the muscle tone in your upper arms, the girlish timbre of your voice,

your amazing tolerance for caffeine, and your ability to digest French fries. The rest of you can stay."

Return to Aging

Extended description for FIGURE 17.1 Life expectancy since 17 70, by world regions

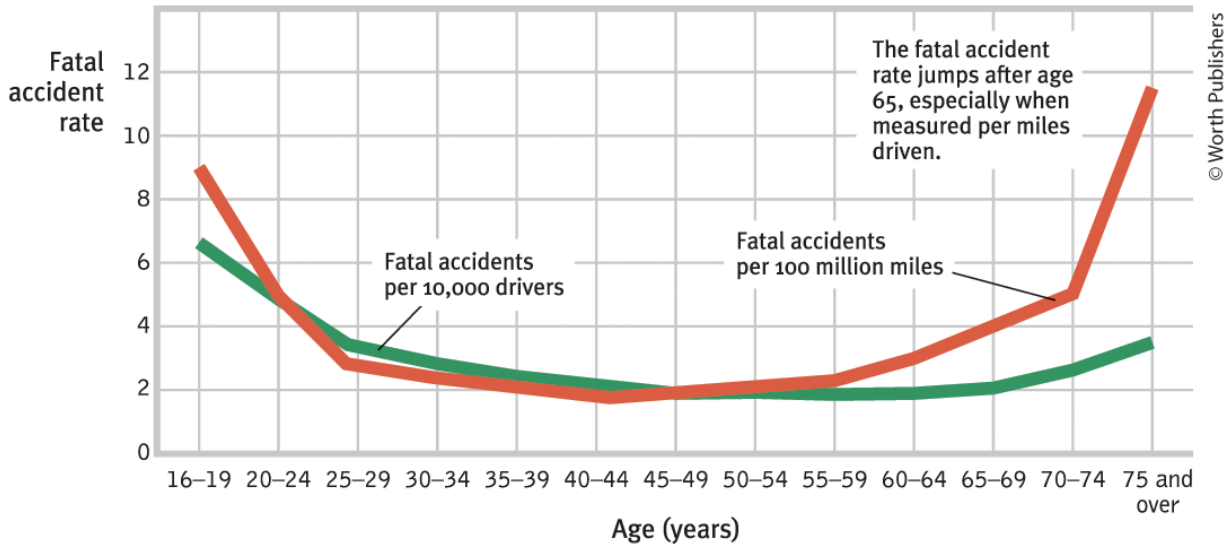


The horizontal axis represents Year and is labeled 17 70, 18 80, 18 50, 1900, 19 50, 2000, and 2019. The vertical axis represents Years of age and ranges from 0 to 90, in increments of 10. The curve for Europe starts at (17 70, 35 years); passes through (18 80, 32 years), (18 50, 38 years), (1900, 42 years), (19 50, 62 years), and (2000, 76 years); and ends at (2019, 79 years). The curve for Oceania starts at (17 70, 37 years); passes through (18 80, 37 years), (18 50, 37 years), (1900, 49 years), (19 50, 59 years), and (2000, 75 years); and ends at (2019, 79 years). The curve for Americas starts at (17 70, 37 years); passes

through (18 80, 37 years), (18 50, 37 years), (1900, 40 years), (19 50, 60 years), and (2000, 75 years); and ends at (2019, 78 years). The curve for Asia starts at (17 70, 29 years); passes through (18 80, 29 years), (18 50, 29 years), (1900, 29 years), (19 50, 42 years), and (2000, 69 years); and ends at (2019, 73 years). The curve for World starts at (17 70, 29 years); passes through (18 80, 29 years), (18 50, 30 years), (1900, 32 years), (19 50, 48 years), and (2000, 68 years); and ends at (2019, 72 years). The curve for Africa starts at (17 70, 28 years); passes through (18 80, 28 years), (18 50, 28 years), (1900, 28 years), (19 50, 38 years), and (2000, 53 years); and ends at (2019, 62 years). All data are approximate.

Return to FIGURE 17.1 Life expectancy since 17 70, by world regions

Extended description for FIGURE 17.2 Age and driver fatalities

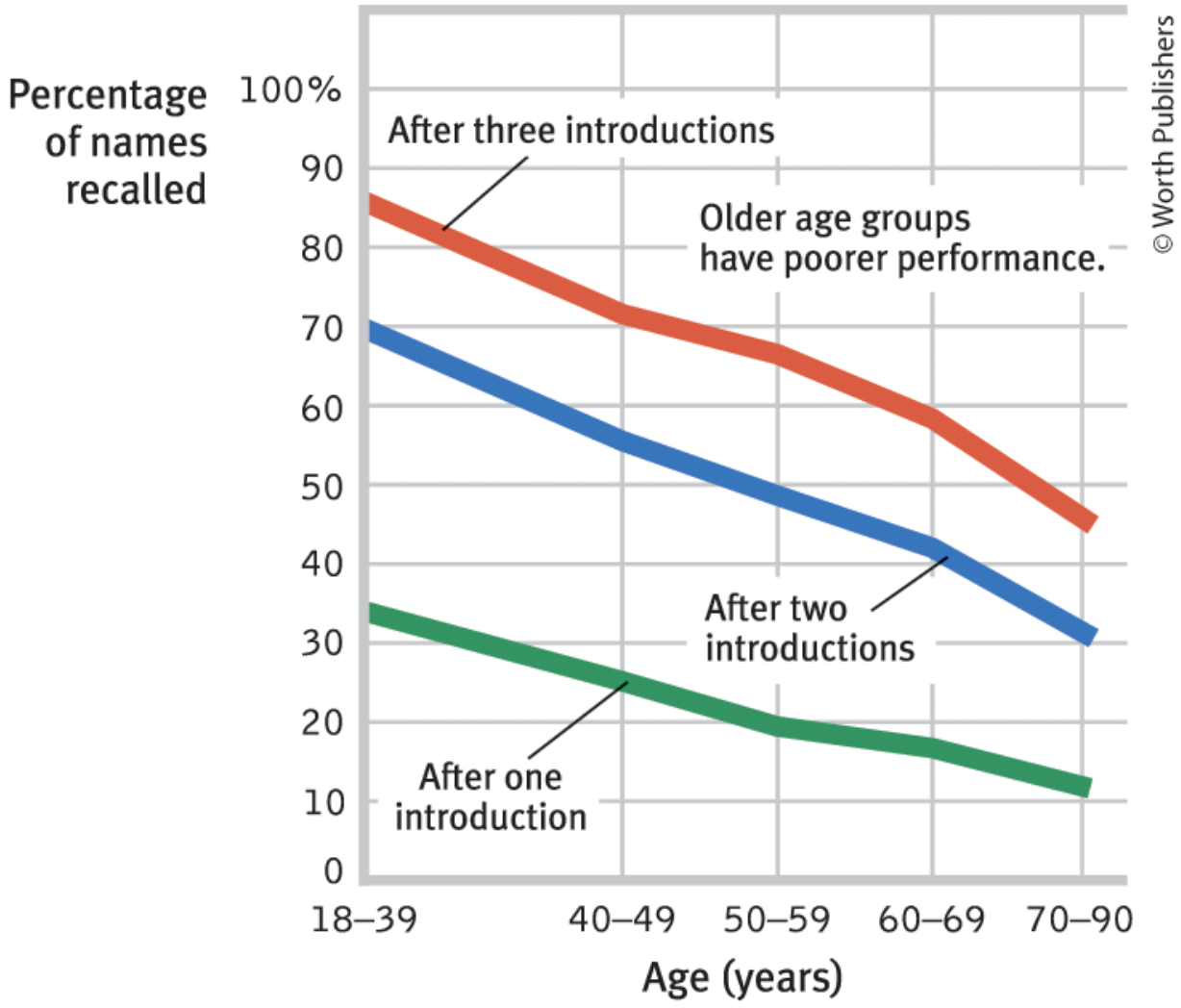


The horizontal axis represents age (years) and ranges from age group 16 to 19 to age 75 and older. The vertical axis represents fatal accident rate and ranges from 0 to 12, in increments of 2. The graph plots two curves for fatal accidents per 10,000 drivers and fatal accidents per 100 million miles. Accidents are approximately 6.5 per 10,000 drivers and 9 per million miles in 16 to 19-year-olds. These numbers decrease steadily until age 25 when both level off and stay at approximately 2 per 10,000 drivers and 2 per 100 million miles from ages 25 to 55. After age 55, fatal accidents per 100 million miles rise sharply. The fatal accident rate jumps after age 65, especially when measured per miles driven. The fatal accidents per 10,000

drivers rate also increase with age, although less dramatically. The curves end at 3.5 for fatal accidents per 10,000 drivers and 11.5 for fatal accidents per 100 million miles at age 75 and older. All data are approximate.

Return to FIGURE 17.2 Age and driver fatalities

Extended description for FIGURE 17.3 Tests of recall

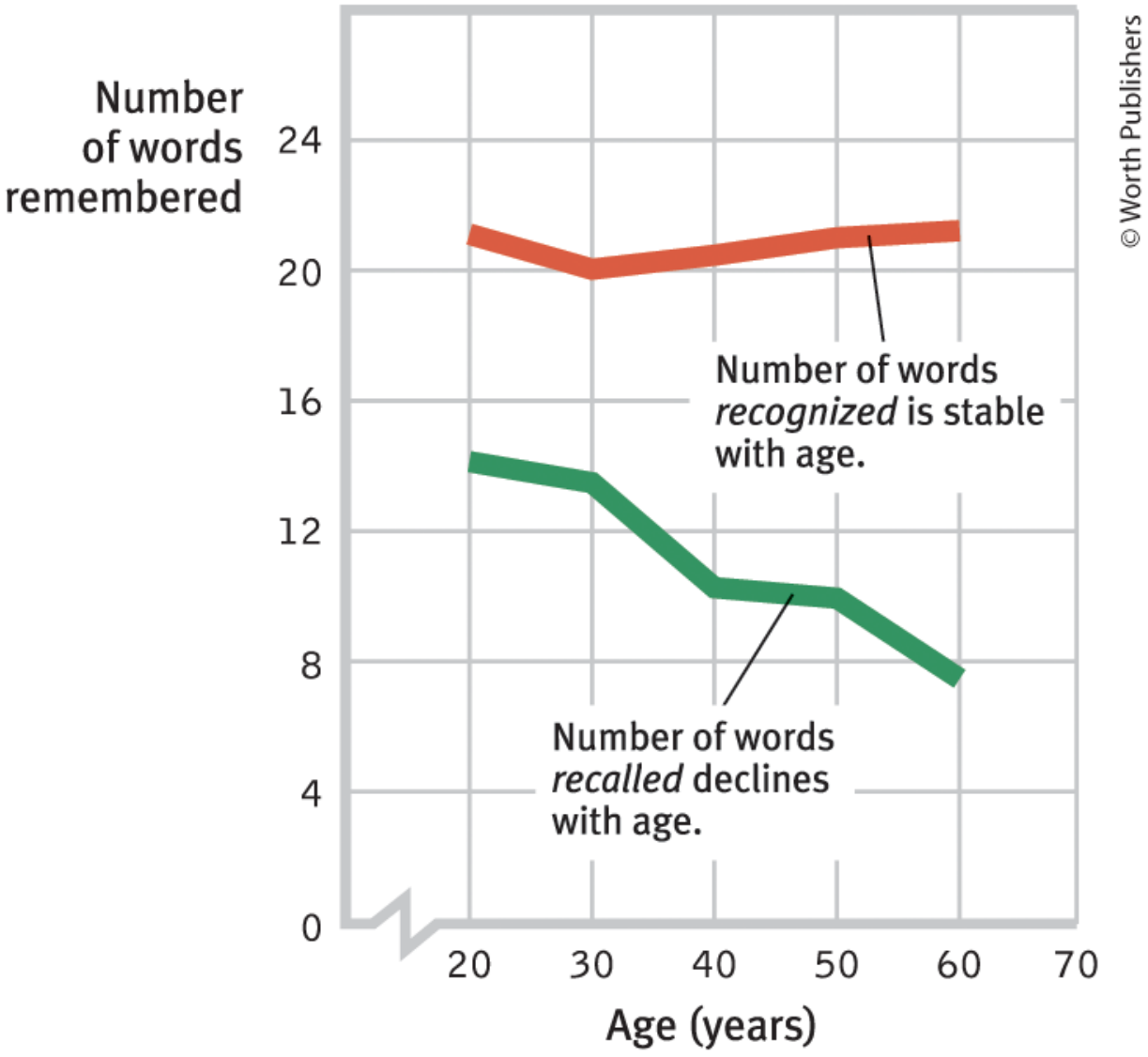


The horizontal axis represents age (years) and is labeled 18 to 39, 40 to 49, 50 to 59, 60 to 69, and 70 to 90. The vertical axis represents percentage of names recalled and ranges from 0 to 100 percent, in increments of 10. The curve labeled After three introductions starts

from (18 to 39 years, 85 percent); passes through (40 to 49 years, 72 percent), (50 to 59 years, 67 percent), and (60 to 69 years, 59 percent); and ends at (70 to 90 years, 45 percent). The curve labeled After two introductions starts from (18 to 39 years, 70 percent); passes through (40 to 49 years, 56 percent), (50 to 59 years, 49 percent), and (60 to 69 years, 42 percent); and ends at (70 to 90 years, 31 percent). The curve labeled After one introduction starts from (18 to 39 years, 34 percent); passes through (40 to 49 years, 25 percent), (50 to 59 years, 20 percent), and (60 to 69 years, 17 percent); and ends at (70 to 90 years, 12 percent). All data are approximate. A text reads, older age groups have poorer performance.

Return to FIGURE 17.3 Tests of recall

Extended description for FIGURE 17.4 Recall and recognition in adulthood

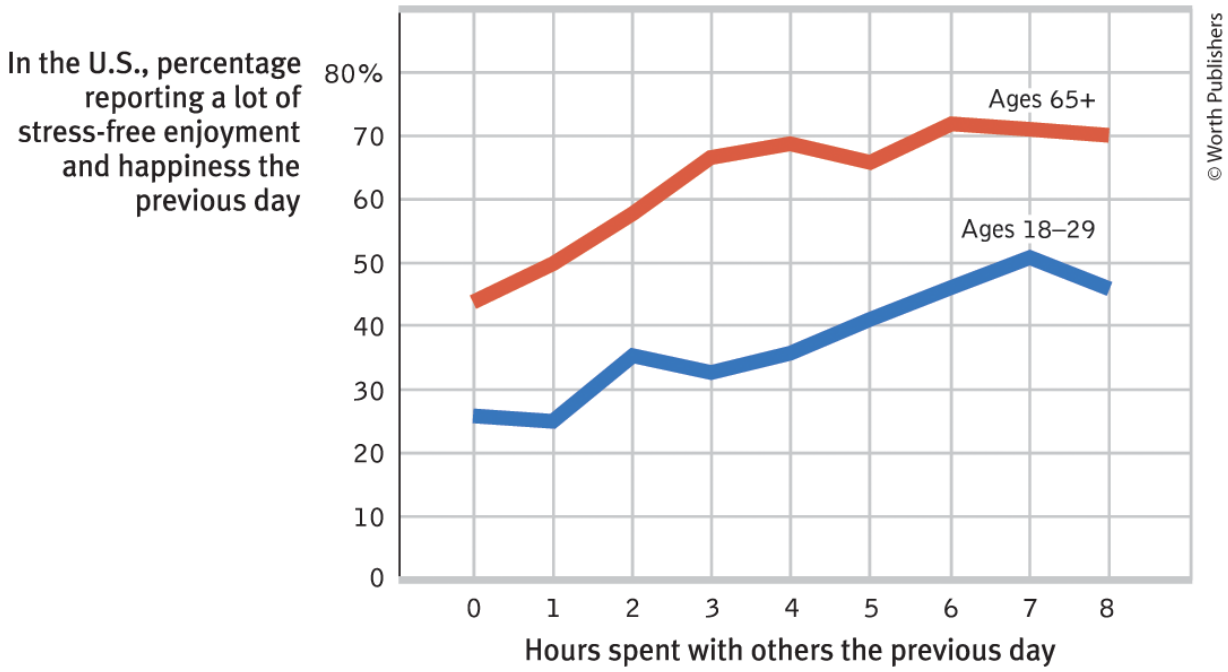


The horizontal axis represents age (years) and ranges from 20 to 70, in increments of 10. The vertical axis represents number of words

remembered and ranges from 0 to 24, in increments of 4. A red curve starts from (20, 21), declines to (30, 20), and rises to end at (60, 21.5). The curve is labeled, number of words *recognized* is stable with age. A green curve starts from (20, 14); passes through (30, 13.5), (40, 11), and (50, 11); and ends at (60, 7.5). The curve is labeled, number of words *recalled* declines with age. All data are approximate.

Return to FIGURE 17.4 Recall and recognition in adulthood

Extended description for FIGURE 17.6 We are social creatures

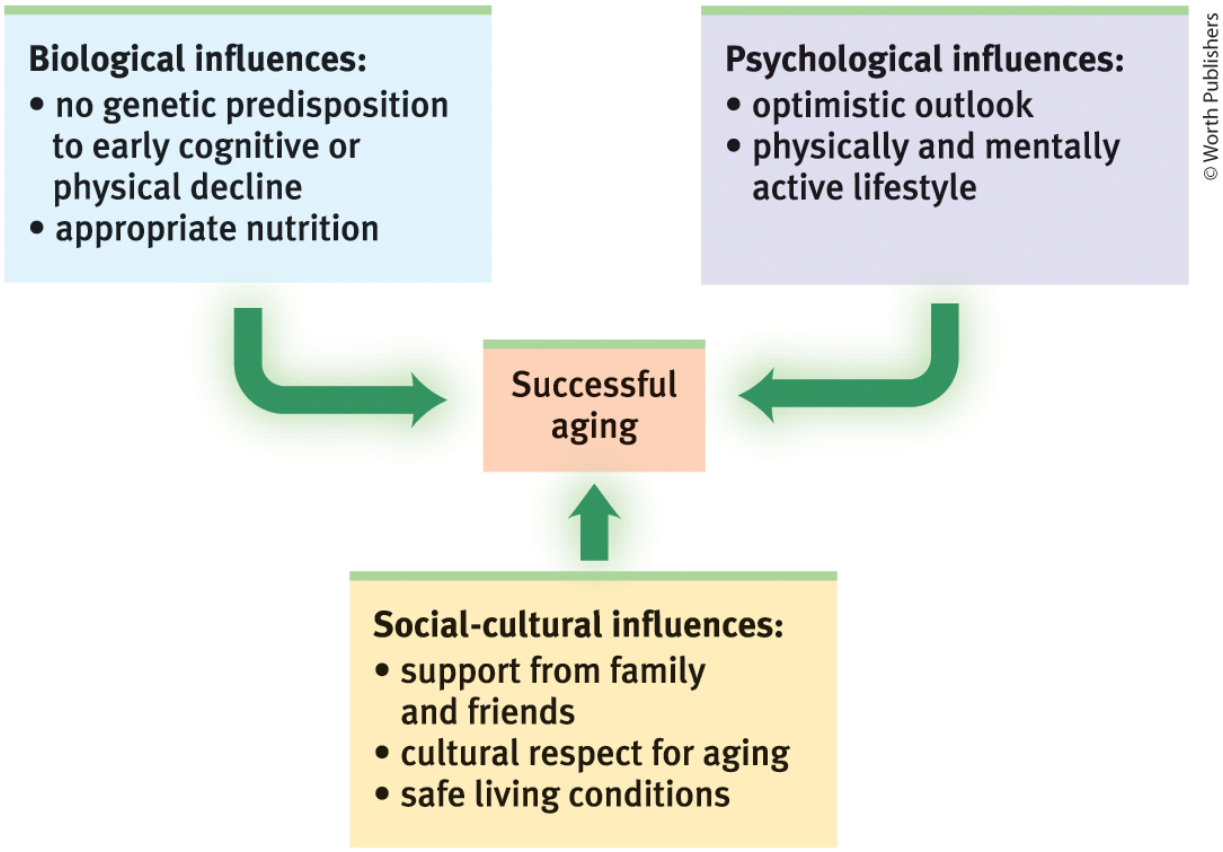


The horizontal axis represents hours spent with others the previous day and ranges from 0 to 8, in increments of 1. The vertical axis represents In the U.S., percentage reporting a lot of stress-free enjoyment and happiness the previous day and ranges from 0 to 80 percent, in increments of 10. A curve for ages 18 to 29 begins at 26 percent at 0 hours; passes through 24 percent at 1 hour, 35 percent at 2 hours, 32 percent at 3 hours, 36 percent at 4 hours, 40 percent at 5 hours, 46 percent at 6 hours, and 50 percent at 7 hours; and end at 46 percent at 8 hours. A curve for ages 65 plus begins at 44 percent at 0

hours; passes through 50 percent at 1 hour, 57 percent at 2 hours, 67 percent at 3 hours, 69 percent at 4 hours, 66 percent at 5 hours, 72 percent at 6 hours, and 71 percent at 7 hours; and ends at 70 percent at 8 hours. All data are approximate.

Return to FIGURE 17.6 We are social creatures

Extended description for FIGURE 17.7 Biopsychosocial influences on successful aging



The information presented is as follows:

Biological influences: No genetic predisposition to early cognitive or physical decline; appropriate nutrition.

Psychological influences: Optimistic outlook; physically and mentally active lifestyle.

Social-cultural influences: Support from family and friends; cultural respect for aging; safe living conditions.

These three boxes all point to a center box labeled, **Successful aging**.

Return to FIGURE 17.7 Biopsychosocial influences on successful aging

Extended description for FIGURE 18.2 Threshold detected

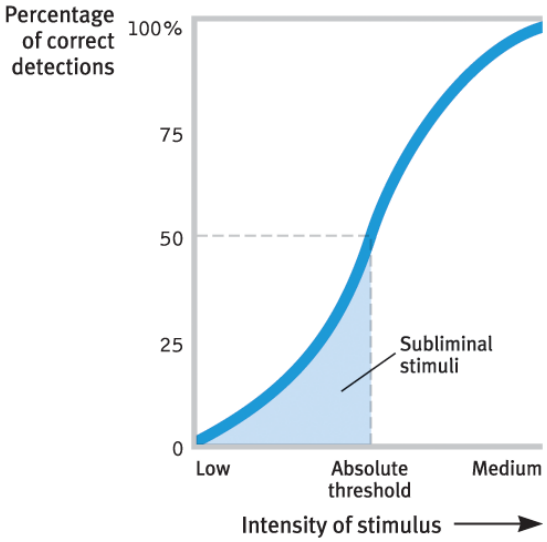


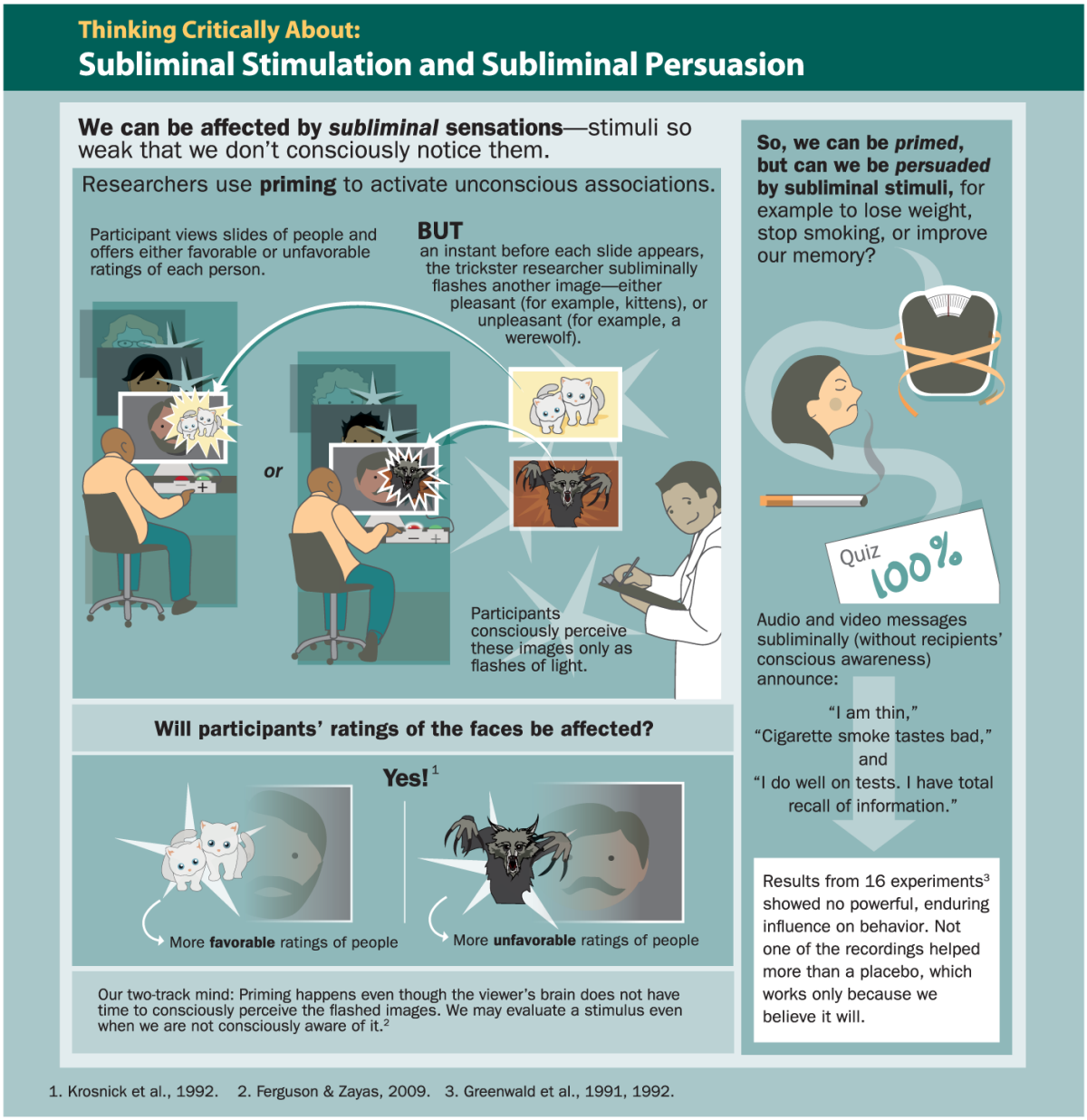


Photo: Dan Dunkley/Science Source
© Worth Publishers

The photo shows a person wearing headphones. A hearing specialist is observing her and sending tones to her ears with a machine. In the graph, the horizontal axis represents intensity of stimulus, and the vertical axis represents percentage of correct detections. A curve starts from 0 and rises steadily to 50 percent achieving absolute threshold. The curve moves forward to reach up to 100 percent. The area from low to absolute threshold is marked as subliminal stimuli.

Return to FIGURE 18.2 Threshold detected

Extended description for Subliminal stimulation



© Worth Publishers

Text reads, Thinking Critically About: **Subliminal Sensation and Subliminal Persuasion. We can be affected by *subliminal* sensations** dash stimuli so weak that we don't consciously notice them.

Text in the top left panel reads, Researchers use **priming** to activate unconscious associations. Participant views slides of people and offers either favorable or unfavorable ratings of each person. **BUT** an instant before each slide appears, the trickster researcher subliminally flashes another image dash either pleasant (for example, kittens) or unpleasant (for example, a werewolf). An illustration shows a man viewing a desktop screen with kittens in the foreground and a man's face in the background. Another illustration after the word *or* shows the man viewing a desktop screen with a werewolf in the foreground and a man's face in the background. An illustration pointing to the first desktop screen shows two kittens, and another illustration pointing to the second desktop screen shows a werewolf. Also, an illustration shows a researcher noting down his observation. Accompanying text reads, Participants consciously perceive these images only as flashes of light.

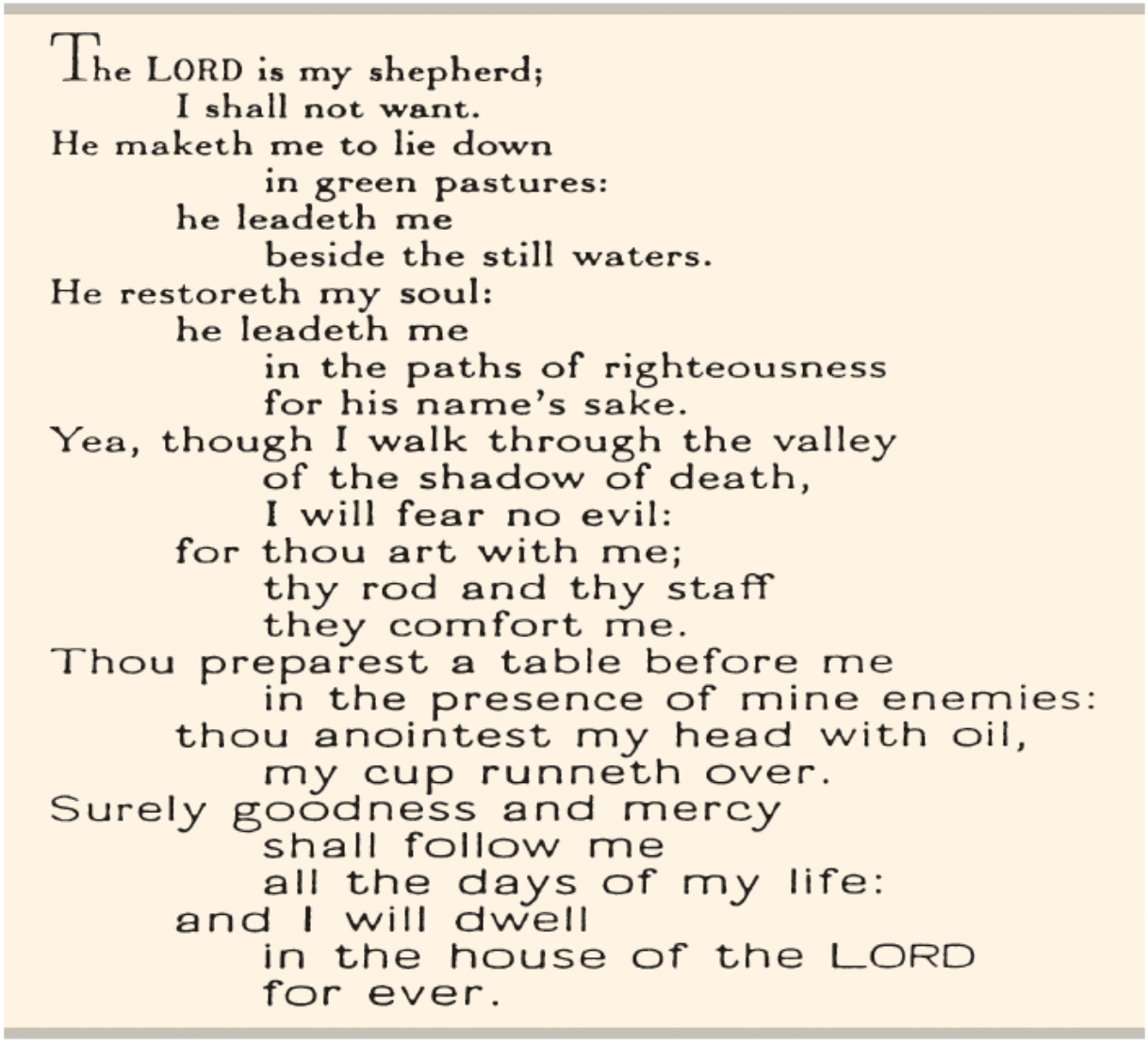
Text in the bottom left panel reads, **Will participants' ratings of the faces be affected? Yes!** (Krosnick et al., 19 92). An arrow from an illustration of two kittens overlaid on a man's face points to text that reads, More **favorable** ratings of people. An arrow from an illustration of a werewolf overlaid on a man's face points to a text

that reads, More **unfavorable** ratings of people. Text at the bottom of the panel reads, Our two-track mind: Priming happens even though the viewer's brain does not have time to consciously perceive the flashed images. We may evaluate a stimulus even when we are not consciously aware of it. (Ferguson and Zayas, 2009).

Text in the right panel reads, **So, we can be *primed*, but can we be *persuaded* by subliminal stimuli,** for example to lose weight, stop smoking, or improve our memory? Three illustrations show a ribbon tied around a bathroom scale; a woman frowning because of the smoke coming from a cigarette; and a quiz paper with a 100 percent mark on it. Text below reads, Audio and video messages subliminally (without recipients' conscious awareness) announce. "I am thin," "Cigarette smoke tastes bad," and "I do well on tests. I have total recall of information." An arrow from this text points to a text box that reads, Results from 16 experiments (Greenwald et al., 19 91, 19 92) showed no powerful, enduring influence on behavior. Not one of the recordings helped more than placebo, which works only because we believe it will.

Return to Subliminal stimulation

Extended description for The difference threshold


The LORD is my shepherd;
I shall not want.
He maketh me to lie down
in green pastures:
he leadeth me
beside the still waters.
He restoreth my soul:
he leadeth me
in the paths of righteousness
for his name's sake.
Yea, though I walk through the valley
of the shadow of death,
I will fear no evil:
for thou art with me;
thy rod and thy staff
they comfort me.
Thou preparest a table before me
in the presence of mine enemies:
thou anointest my head with oil,
my cup runneth over.
Surely goodness and mercy
shall follow me
all the days of my life:
and I will dwell
in the house of the LORD
for ever.

The passage reads as follows:

The LORD is my shepherd;

I shall not want.

He maketh me to lie down

in green pastures:

he leadeth me

beside the still waters.

He restoreth my soul:

he leadeth me

in the paths of righteousness

for his name's sake.

Yea, though I walk through the valley

of the shadow of death,

I will fear no evil:

for thou art with me;

thy rod and thy staff

they comfort me.

Thou preparest a table before me

in the presence of mine enemies:

thou anointest my head with oil,

my cup runneth over.

Surely goodness and mercy

shall follow me

all the days of my life:

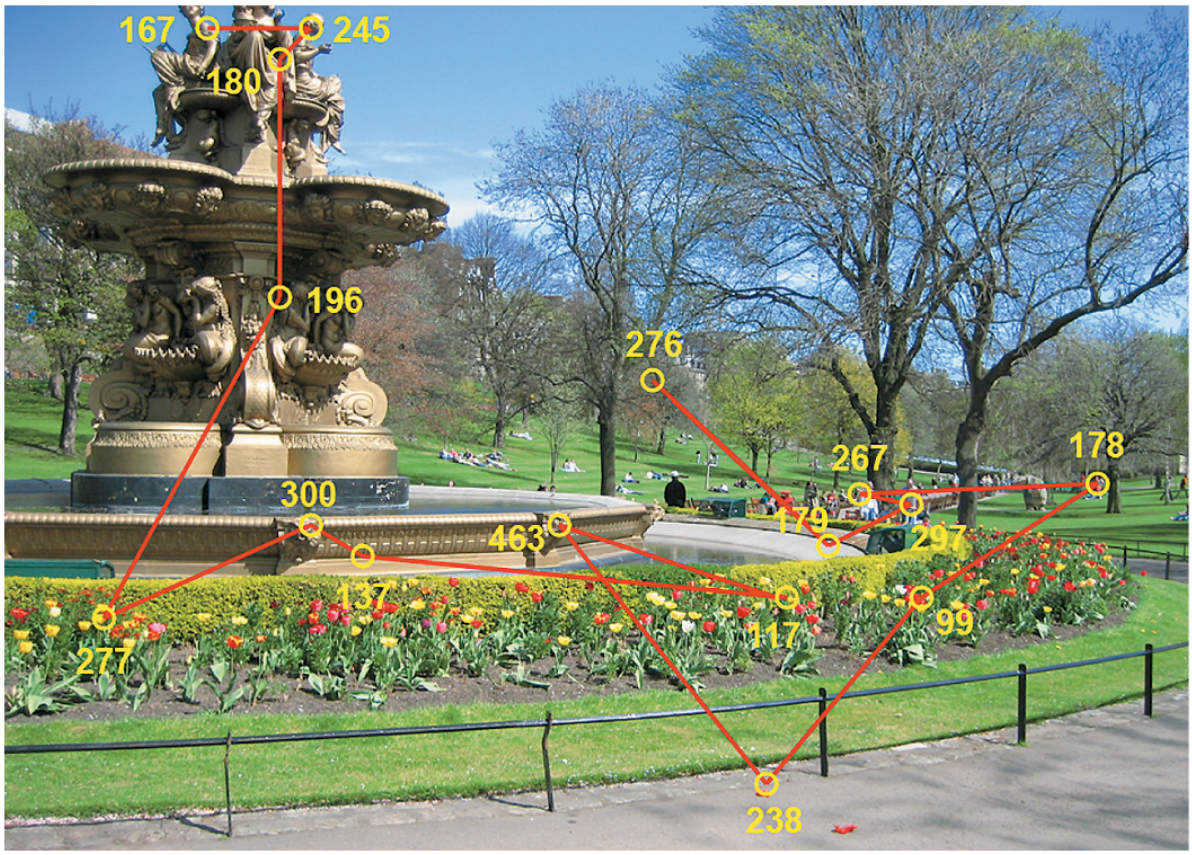
and I will dwell

In the house of the LORD

for ever.

Return to The difference threshold

Extended description for FIGURE 18.3 The jumpy eye

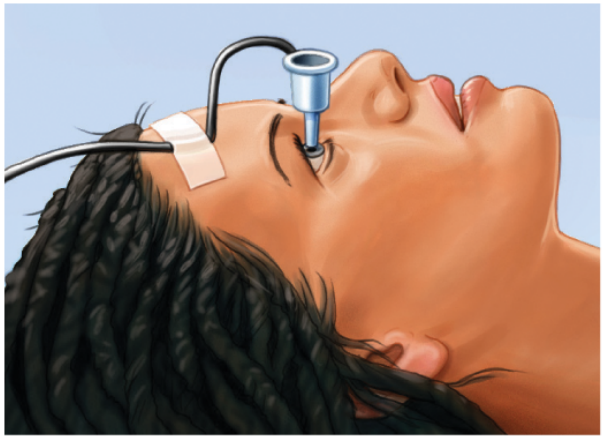


© John M. Henderson

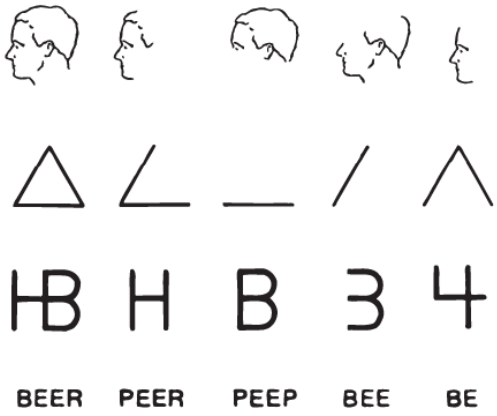
There are several dots marked on the fountain, the flowers, the lawn, and the trees in the distance, which are all connected to each other. The numbers next to each dot read, 167, 245, 180, 196, 277, 300, 137, 117, 463, 238, 99, 178, 267, 297, 179, and 276.

Return to FIGURE 18.3 The jumpy eye

Extended description for FIGURE 18.4 Sensory adaptation: Now you see it, now you don’t!



(a)

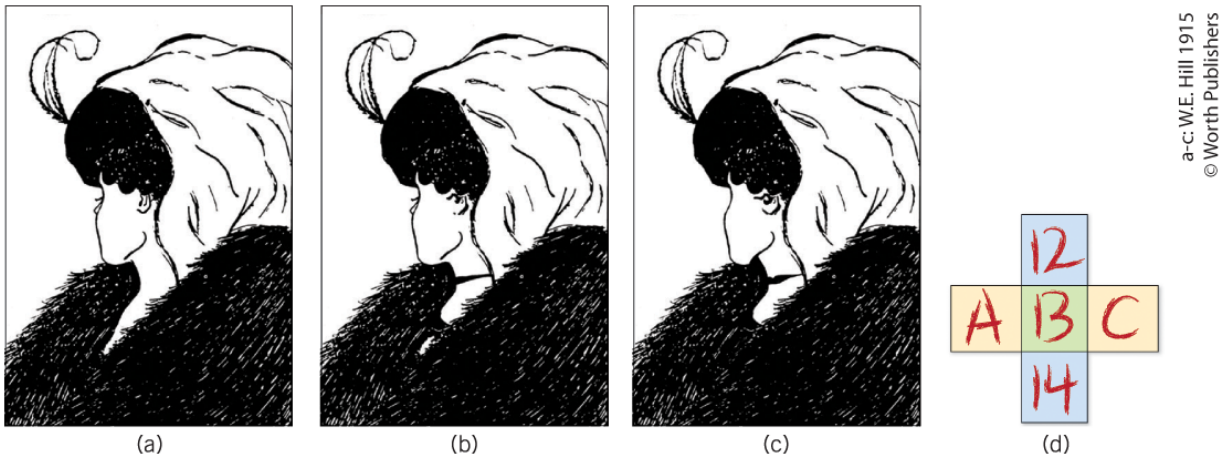


(b)

The illustration labeled (a) shows a woman’s face with a projector attached to a contact lens in her eye. The illustration labeled (b) shows a face in the first row, a triangle in the second row, a text that reads H B in the third row with no space between the letters H and B, and a text that reads BEER in the fourth row. There are fragments of a face next to the full face in the first row, fragments of a triangle next to the full triangle in the second row, fragments of the combined letters H B in the third row, and texts that read, PEER, PEEP, BEE and BE following BEER in the fourth row.

Return to FIGURE 18.4 Sensory adaptation: Now you see it, now you don't!

Extended description for FIGURE 18.5 Two examples of perceptual set

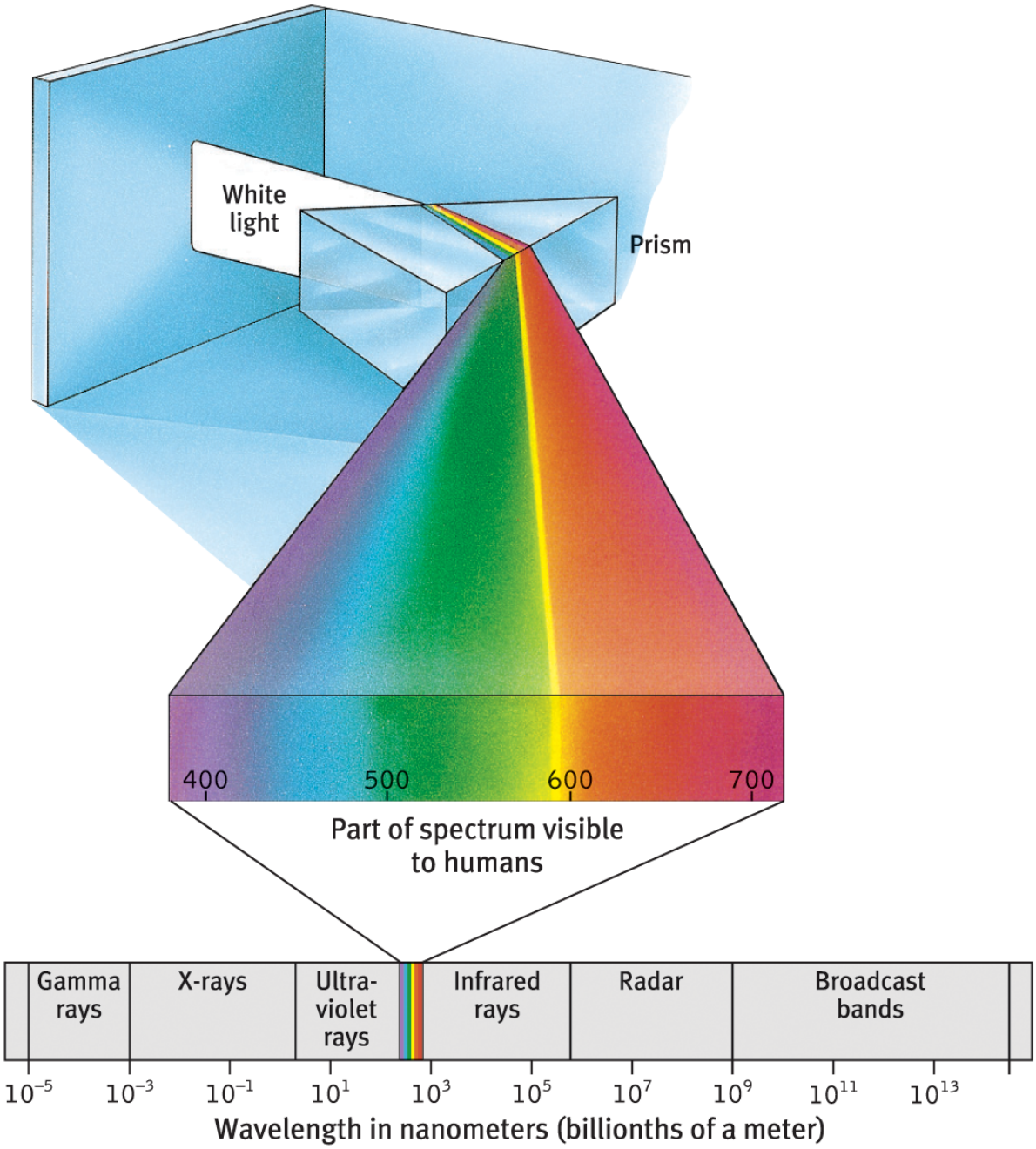


The side profile of a younger woman in a fur coat is more pronounced in illustration (a) while the side profile of an older woman is more pronounced in illustration (c). The illustration (b) can be viewed either as a younger woman or an older woman.

Illustration (d) shows the three horizontal blocks labeled as A, B, C and the three vertical blocks labeled as 12, 13, 14. The letter B and the number 13 are in the same intersecting block and can be perceived as a letter B if it is read from left to right or a number 13 if it is read from top to bottom.

Return to FIGURE 18.5 Two examples of perceptual set

Extended description for FIGURE 19.1 The wavelengths we see

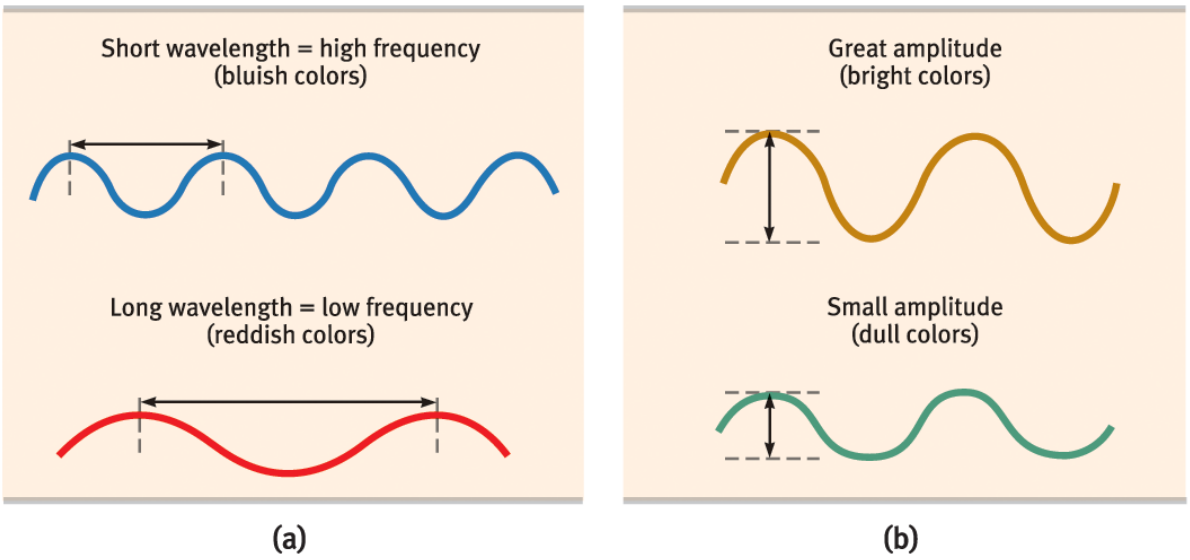


© Worth Publishers

White light reflects through a prism as a spectrum of colors: violet, indigo, blue, green, yellow, orange, and red. The spectrum of colors reflected has a scale below captioned, Part of spectrum visible to humans, and is labeled 400 at violet, 500 at green, 600 at yellow, and 700 at red. This scale leads to a small portion of another scale labeled wavelength in nanometers (billionths of a meter), which has the following values: 10 to the power of negative 5, 10 to the power of negative 3, 10 to the power of negative 1, 10 to the power of 1, 10 to the power of 3, 10 to the power of 5, 10 to the power of 7, 10 to the power of 9, 10 to the power of 11, and 10 to the power of 13. The scale reads as follows: Gamma rays, between 10 to the power of negative 5 and 10 to the power of negative 3; X-rays, between 10 to the power of negative 3 and 10 to the power of 1; Ultraviolet rays, between 10 to the power of 1 and 10 to the power of 3; reflected spectrum falls in this category, occupying approximately one-fourth of the total wavelength of ultraviolet rays; Infrared rays, between 10 to the power of 3 and 10 to the power of 5; Radar, between 10 to the power of 7 and 10 to the power of 9; and Broadcast bands, between 10 to the power of 11 and 10 to the power of 13.

Return to FIGURE 19.1 The wavelengths we see

Extended description for FIGURE 19.2 The physical properties of waves



© Worth Publishers

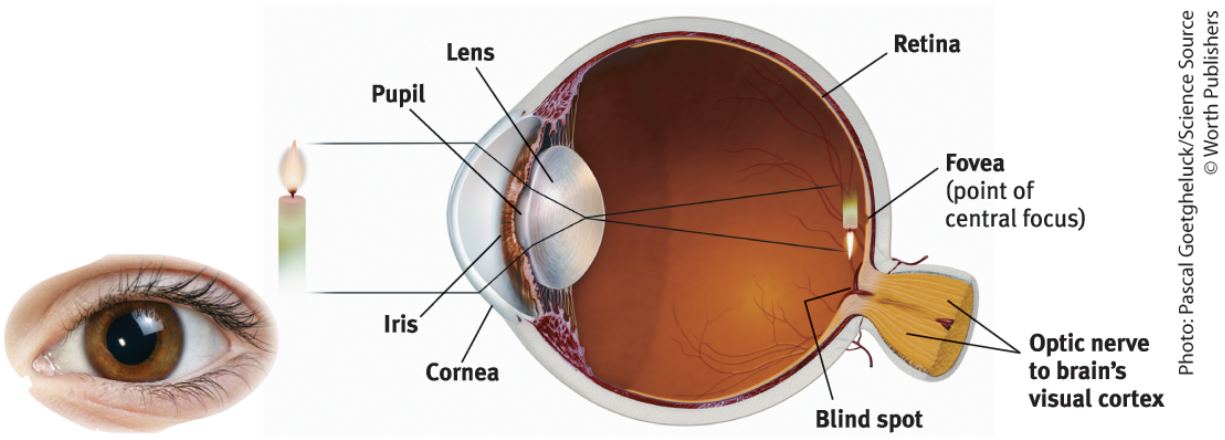
Part (a) shows two waves. The first wave has four peaks, and the distance between the first two peaks is marked with a double-headed arrow. The distance between the peaks is small. A text reads, Short wavelength equals high frequency (bluish colors). The second wave has two peaks, and the distance between the first two peaks is marked with a double-headed arrow. The distance between the two peaks is large and longer compared to the first wave. Text reads, Long wavelength equals low frequency (reddish colors).

Part (b) shows two waves. The first wave has two peaks and two troughs, and the distance between the peak and the trough is

marked with a double-headed arrow. The distance between the peak and the trough is long. Text reads, Great amplitude (bright colors). The second wave also has two peaks and two troughs, and the distance between the peak and the trough is marked with a double-headed arrow. The distance between the peak and the trough is short compared to the first wave. Text reads, Small amplitude (dull colors).

Return to FIGURE 19.2 The physical properties of waves

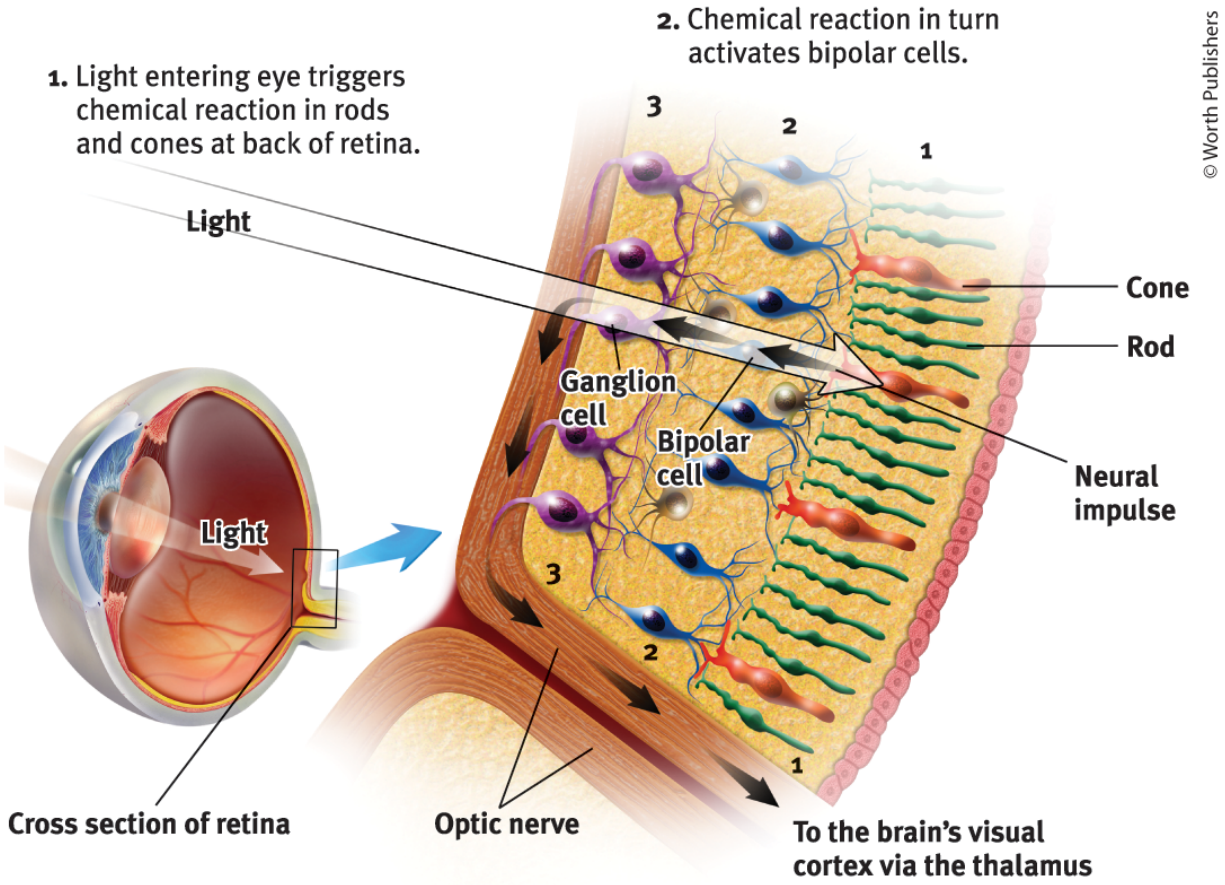
Extended description for FIGURE 19.3 The eye



The illustration shows a lit candle placed in front of a human eye. The light rays reflected from the candle pass through the Cornea, the Iris, and the Pupil, after which the rays hit the Lens in the eye. The lens focuses the light rays to form an inverted image of the candle on the Fovea (point of central focus), marked in the Retina. A Blind spot and the Optic nerve to the brain's visual cortex are labeled below the Fovea.

Return to FIGURE 19.3 The eye

Extended description for FIGURE 19.4 The retina's reaction to light

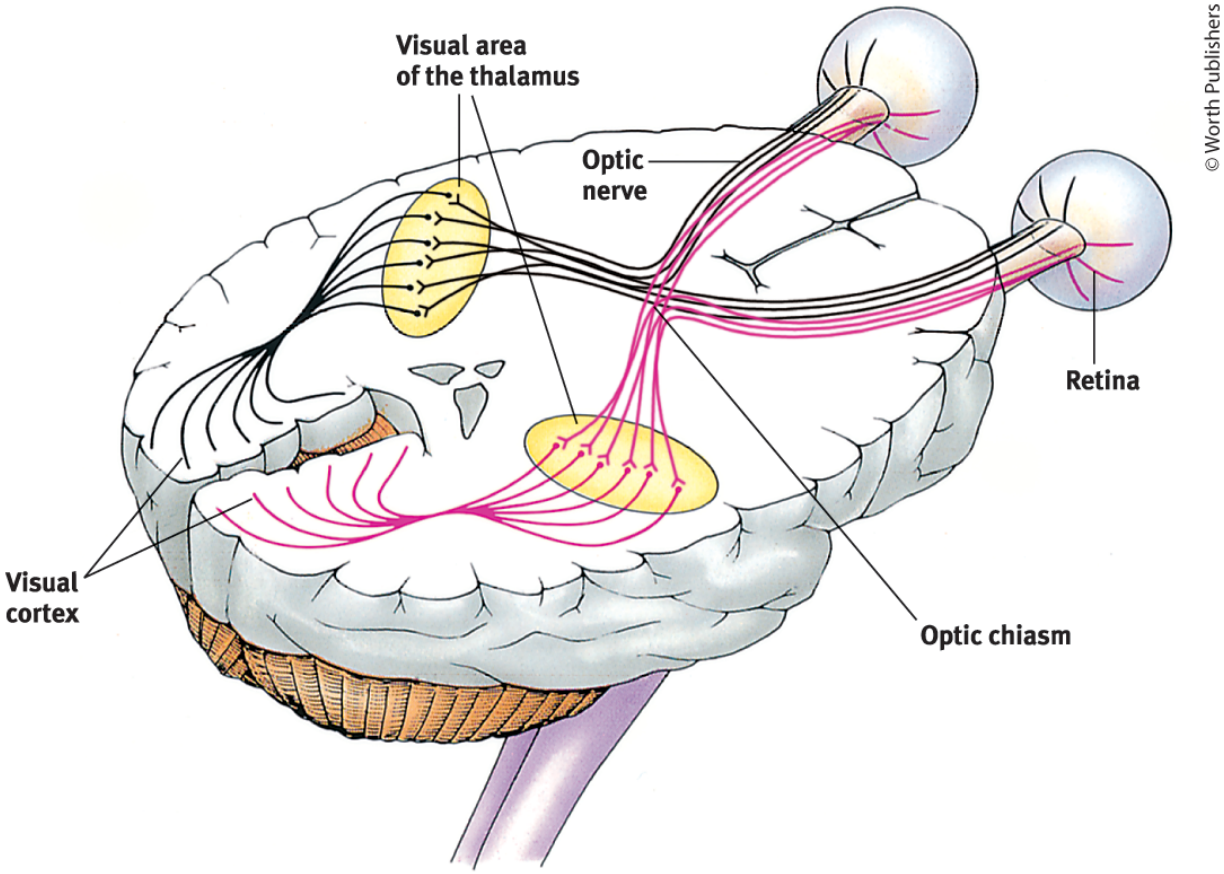


The illustration shows a sectional view of an eye with light hitting the cross-section of the retina. An enlarged view of the cross-section of the retina shows light reaching the rods and cones (1). The neural impulse passes from rods and cones to a Bipolar cell (2) to a

Ganglion cell (3) to an Optic nerve that carries the impulse to the brain's visual cortex via the thalamus. The steps are as follows: 1. Light entering eye triggers chemical reaction in rods and cones at back of retina. 2. Chemical reaction in turn activates bipolar cells. 3. Bipolar cells then activate the ganglion cells, whose combined axons form the optic nerve. This nerve transmits information (via the thalamus) to the brain's visual cortex.

Return to FIGURE 19.4 The retina's reaction to light

Extended description for FIGURE 19.7 Pathway from the eyes to the visual cortex



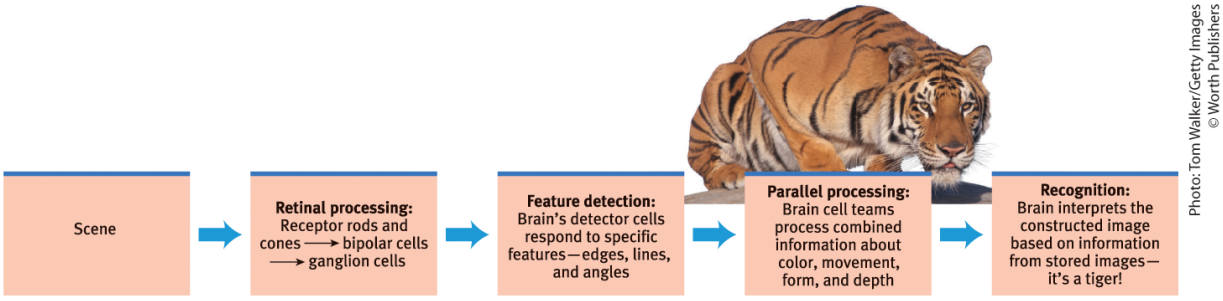
© Worth Publishers

The optic nerves carrying information from the left and right retina to the visual area of the thalamus cross paths at the optic chiasm, at which point the nerves carrying information from the left retina run to the right visual area of the thalamus and the nerves carrying information from the right retina run to the left visual area of the

thalamus. The nerves end at the visual cortex, located at the back of the brain.

Return to FIGURE 19.7 Pathway from the eyes to the visual cortex

Extended description for FIGURE 19.11 A simplified summary of visual information processing



The flowchart shows a series of five stages connected by arrows, which read as follows. Stage 1, **Scene**. Stage 2, **Retinal processing**: From receptor rods and cones to bipolar cells to ganglion cells. Stage 3, **Feature detection**: Brain's detector cells respond to specific features dash edges, lines, and angles. Stage 4, **Parallel processing**: Brain cell teams process combined information about color, movement, form, and depth. Stage 5, **Recognition**: Brain interprets the constructed image based on information from stored images - it's a tiger! In the background, a photo shows a crouching tiger.

Return to FIGURE 19.11 A simplified summary of visual information processing

Extended description for FIGURE 19.16 Gibson and Walk's visual cliff



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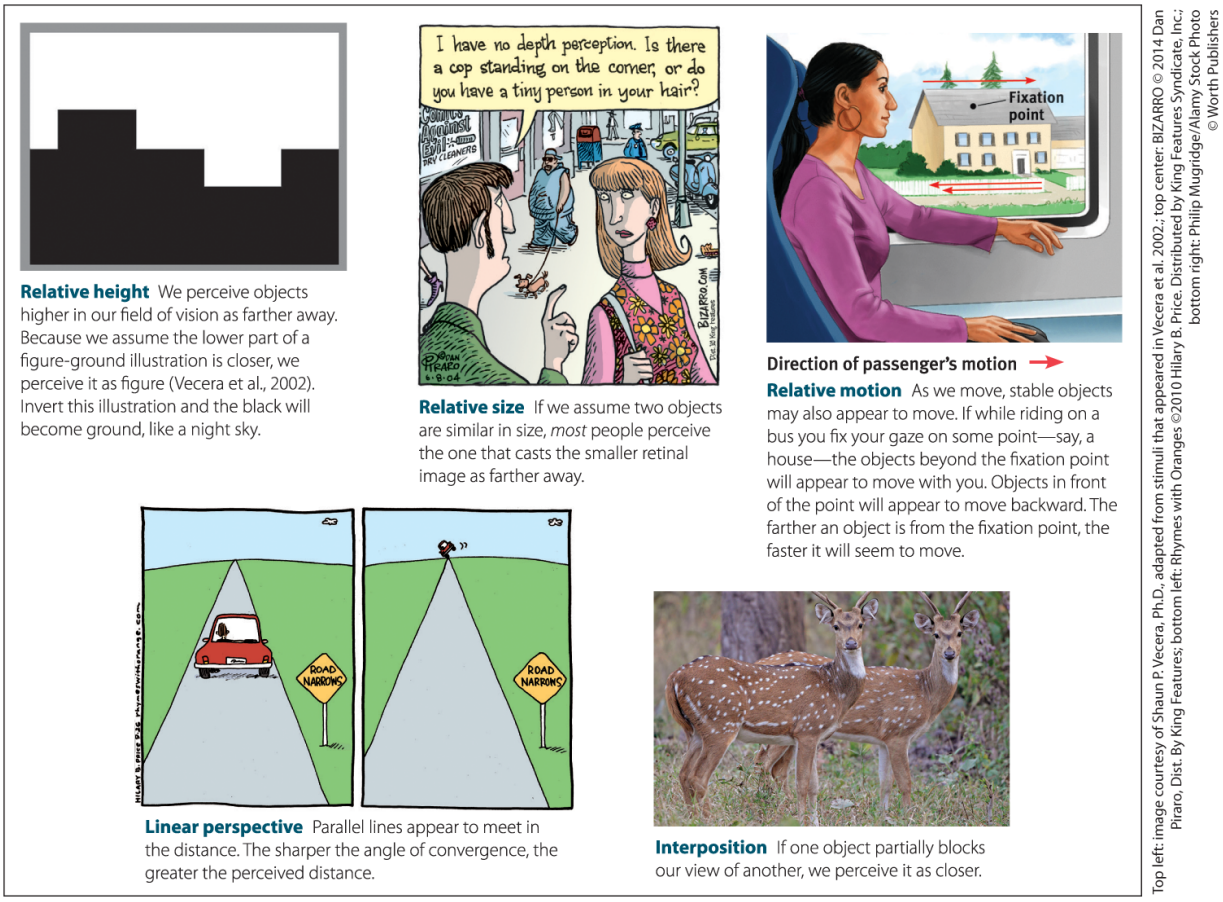
The woman is at the transparent end of the table crouched down with arms extended. The baby is on the patterned end of the table attempting to crawl to her. Visually the table appears to have a drop-off due to the application of a checkerboard pattern at the top, face, and bottom of the table.

Return to FIGURE 19.16 Gibson and Walk's visual cliff

Extended description for FIGURE 19.18 Monocular depth cues



Relative height We perceive objects higher in our field of vision as farther away. Because we assume the lower part of a figure-ground illustration is closer, we perceive it as figure (Vecera et al., 2002). Invert this illustration and the black will become ground, like a night sky.

Relative size If we assume two objects are similar in size, *most* people perceive the one that casts the smaller retinal image as farther away.

Relative motion As we move, stable objects may also appear to move. If while riding on a bus you fix your gaze on some point—say, a house—the objects beyond the fixation point will appear to move with you. Objects in front of the point will appear to move backward. The farther an object is from the fixation point, the faster it will seem to move.

Linear perspective Parallel lines appear to meet in the distance. The sharper the angle of convergence, the greater the perceived distance.

Interposition If one object partially blocks our view of another, we perceive it as closer.

Top left: image courtesy of Shaun P. Vecera, Ph.D., adapted from stimuli that appeared in Vecera et al. 2002.; top center: BIZARRO © 2014 Dan Piraro, Dist. By King Features; bottom left: Rhymes with Oranges ©2010 Hilary B. Price. Distributed by King Features Syndicate, Inc.; bottom right: Philip Mugridge/Alamy Stock Photo © Worth Publishers

An illustration in the first part shows a dark wall against a blank background. The wall is uneven, part of the wall rises up and comes back to the same level and then lowers down and comes back to the same level. Text below reads, **Relative height.** We perceive objects higher in our field of vision as farther away. Because we assume the lower part of a figure-ground illustration is closer, we perceive it as

figure (Vecera et al., 2002). Invert this illustration and the black will become ground, like a night sky.

A cartoon in the second part shows a man speaking to a woman on a sidewalk. A speech bubble from the man reads, I have no depth perception. Is there a cop standing on the corner, or do you have a tiny person in your hair? The cartoon shows a police officer standing in the corner, right above the woman's head. There is another man walking his dog. Text below reads, **Relative size.** If we assume two objects are similar in size, most people perceive the one that casts the smaller retinal image as farther away.

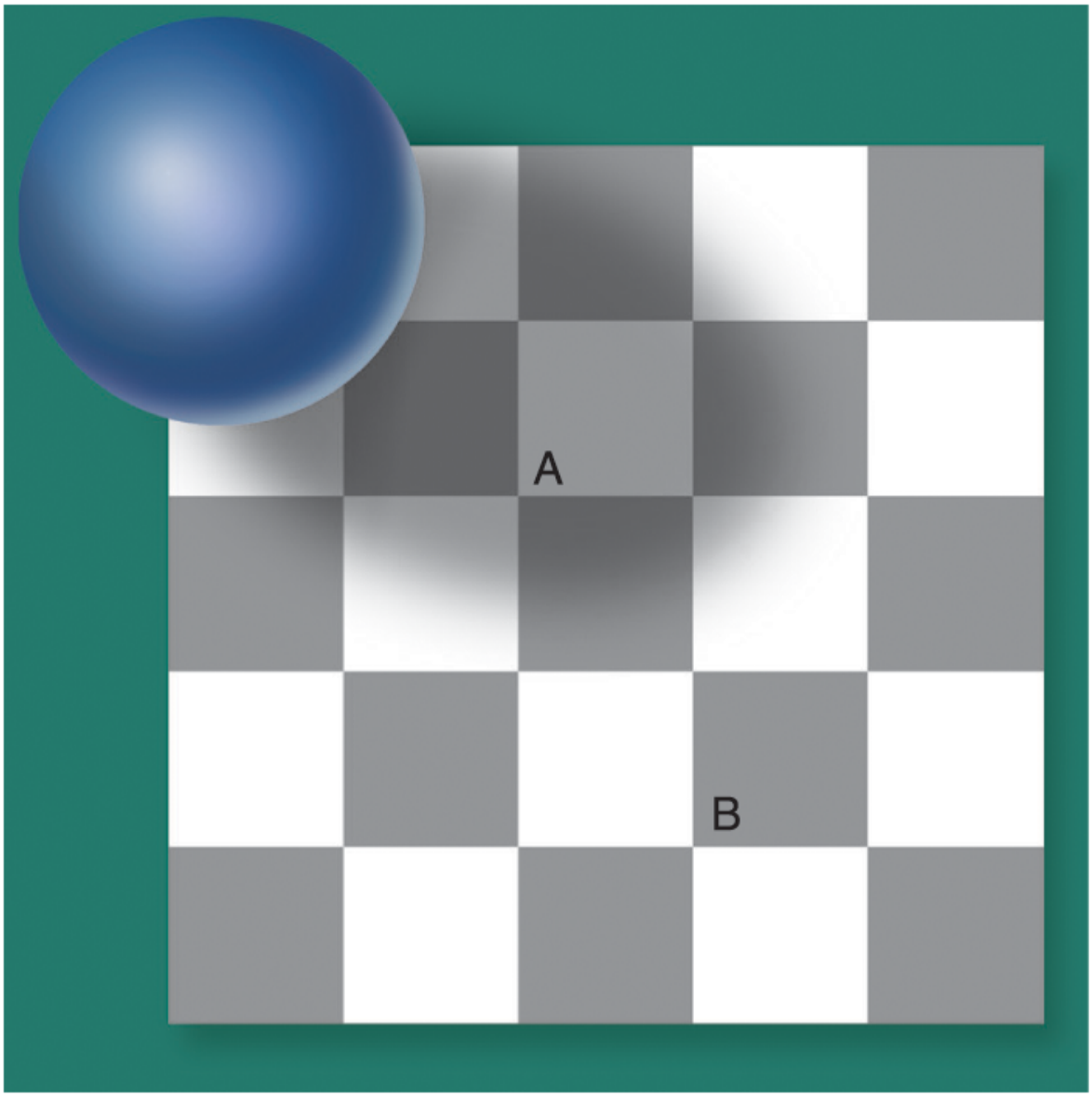
An illustration in the third part shows a woman sitting inside a bus and looking outside the window. There is a house on the other side of the bus. A dot is marked on the roof of the house and labeled fixation point. Arrows are marked along the roof of the house and on the pathway of the house. The arrow along the roof points right whereas the two arrows on the pathway points left. Text below the illustration reads, **Direction of passenger's motion.** An arrow after the text points right. Further text below reads, **Relative motion.** As we move, stable objects may also appear to move. If while riding on a bus you fix your gaze on some point—say, a house—the objects beyond the fixation point will appear to move with you. Objects in front of the point will appear to move backward. The farther an object is from the fixation point, the faster it will seem to move.

Two illustrations in the fourth part show a narrow road with a lawn on either side. There is a signboard that reads, Road Narrows. The first illustration shows a car traveling on a narrow road, and the second illustration shows a car toppling down the edge of the narrow road. Text below reads, **Linear perspective.** Parallel lines appear to meet in the distance. The sharper the angle of convergence, the greater the perceived distance.

A photo in the fifth part shows two deer standing next to each other, with one partly blocking the other from view. Text below reads, **Interposition**. If one object partially blocks our view of another, we perceive it as closer.

Return to FIGURE 19.18 Monocular depth cues

Extended description for FIGURE 19.21 Relative luminance



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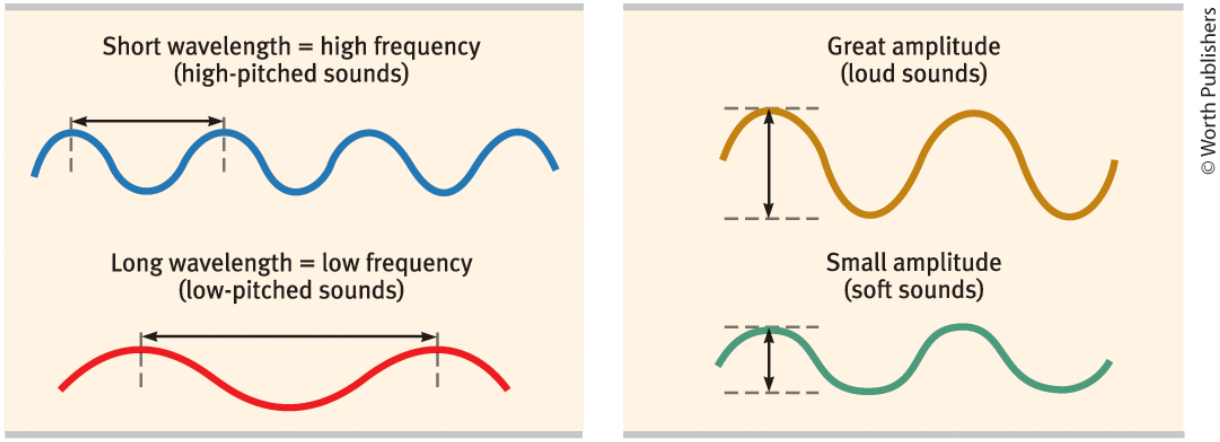
Two squares on the board, one white at the top middle in the shadowed region labeled A and one black at the bottom right in the

lit region labeled B, are identical in color. However, the visual illusion makes the square labeled A perceived as brighter than the square labeled B because of its surrounding context.

Return to FIGURE 19.21 Relative luminance

Extended description for FIGURE 20.1 The physical properties of waves



© Worth Publishers

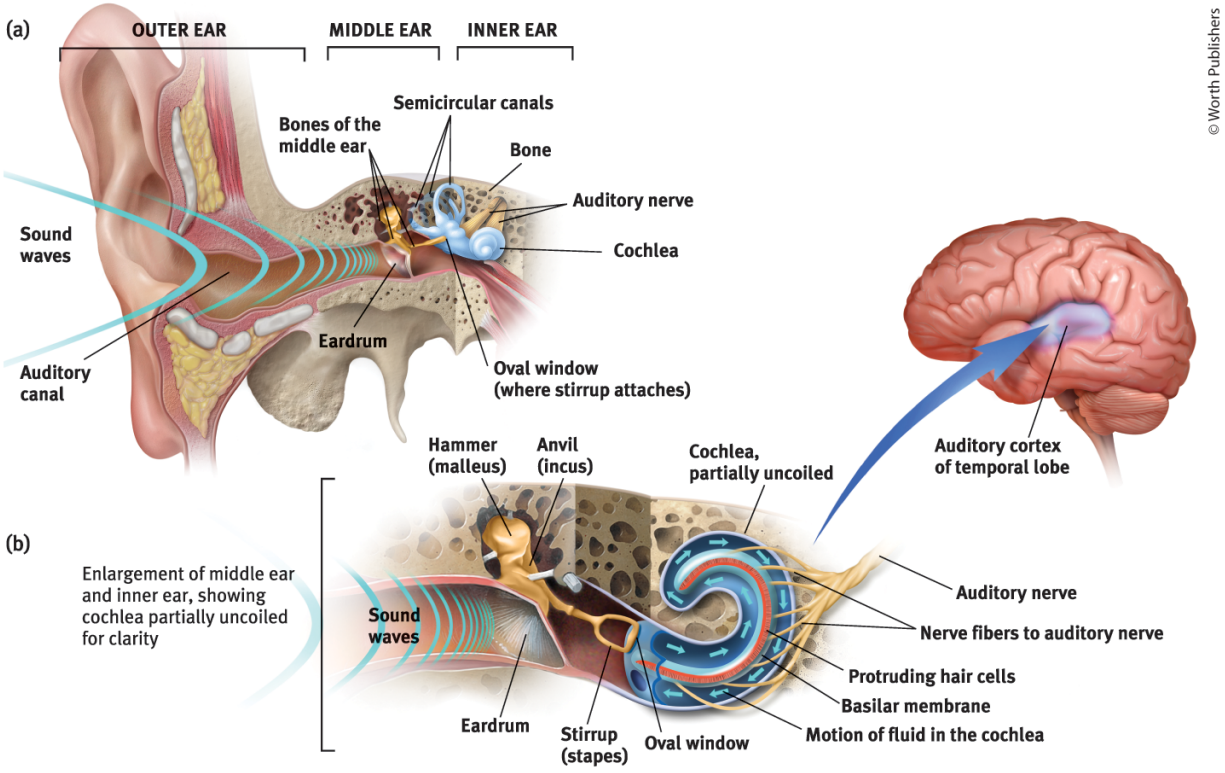
Part (a) shows two waves. The first wave has four peaks, and the distance between the first two peaks is marked with a double-headed arrow. The distance between the peaks is small. A text reads, Short wavelength equals high frequency (high-pitched sounds). The second wave has two peaks, and the distance between the first two peaks is marked with a double-headed arrow. The distance between the two peaks is large and longer compared to the first wave. A text reads, Long wavelength equals low frequency (low-pitched sounds).

Part (b) shows two waves. The first wave has two peaks and two troughs, and the distance between the peak and the trough is marked with a double-headed arrow. The distance between the peak

and the trough is long. A text reads, Great amplitude (loud sounds). The second wave also has two peaks and two troughs, the distance between the peak and the trough is marked with a double-headed arrow. The distance between the peak and the trough is short. A text reads, Small amplitude (soft sounds).

Return to FIGURE 20.1 The physical properties of waves

Extended description for FIGURE 20.2 Hear here: How we transform sound waves into nerve impulses that our brain interprets



The section labeled (a) shows the cross-sectional view of an ear with the outer ear, middle ear, and inner ear labeled. Sound waves are depicted traveling through the auditory canal in the outer ear to the eardrum in the middle ear. Bones of the middle ear and semicircular canals are marked and labeled in the middle ear. The Auditory nerve, Cochlea, and Oval window (where stirrup attaches) are marked and labeled in the inner ear.

The section labeled (b) shows an enlargement of the middle ear and inner ear, showing the cochlea partially uncoiled for clarity. Sound waves are depicted traveling to the eardrum. The Hammer (malleus) and Anvil (incus), present above the eardrum, are connected to the Stirrup (stapes), which is attached to the oval window of the inner ear to meet the Cochlea (partially coiled). Clockwise arrows indicate the motion of fluid in the cochlea, which is surrounded by the Basilar membrane having protruding hair cells. Several nerve fibers attached to the hair cells unite to reach the auditory nerve. An arrow points to the Auditory cortex of the temporal lobe in the human brain.

Return to FIGURE 20.2 Hear here: How we transform sound waves into nerve impulses that our brain interprets

Extended description for FIGURE 20.3 The intensity of some common sounds

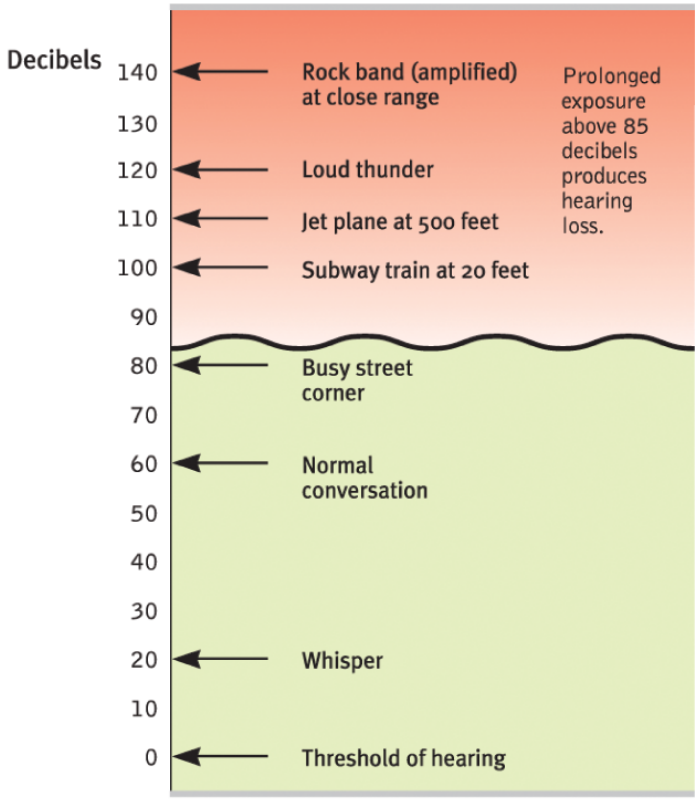




Photo: sebra/Shutterstock
© Worth Publishers

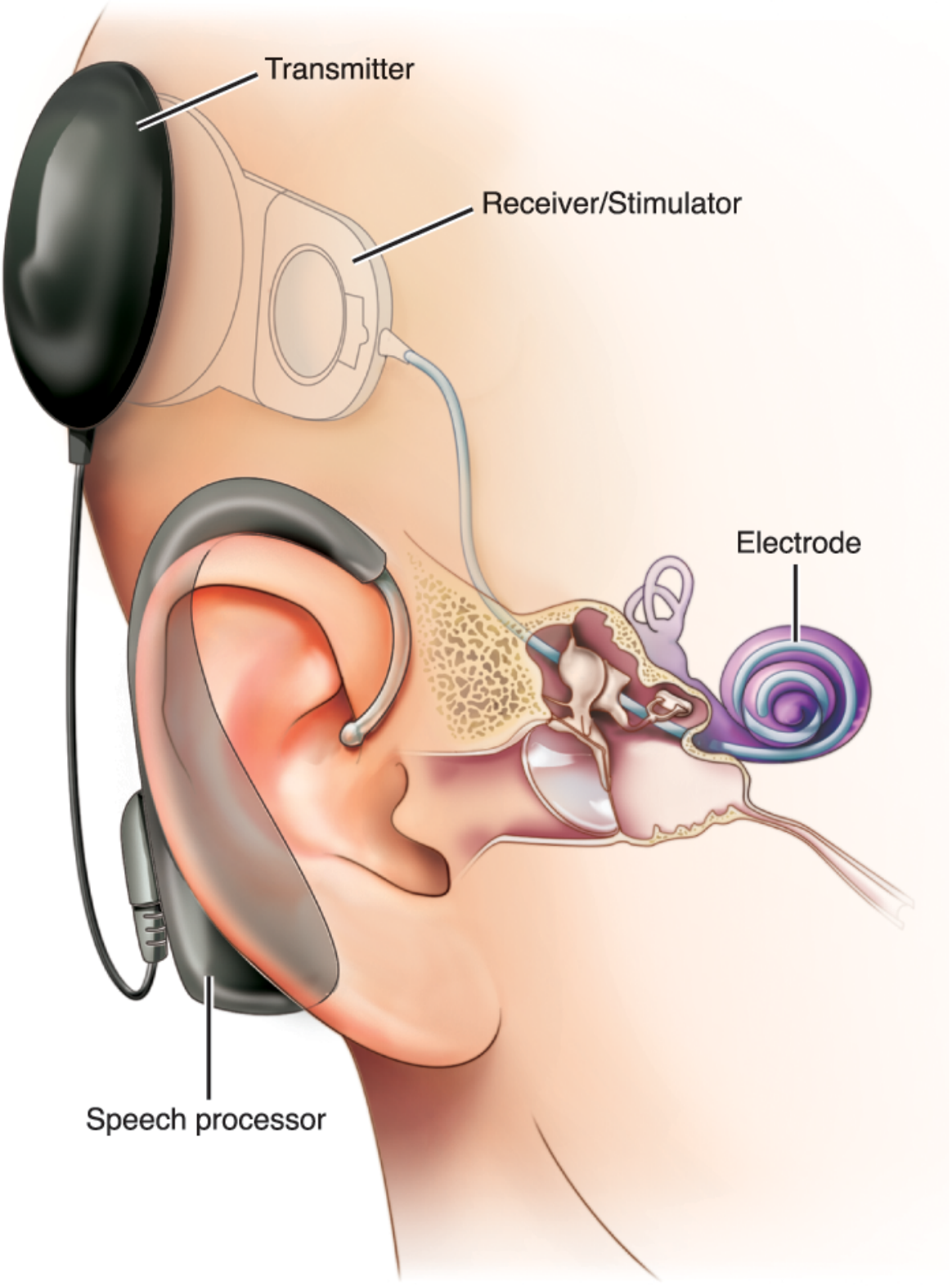
The number of decibels marked on the chart ranges from 0 to 140 with a line at 85 decibels dividing the chart. A text at the top part, above 85 decibels, reads, Prolonged exposure above 85 decibels produces hearing loss. The decibel levels of various sounds are as follows: Threshold of hearing, 0 decibels; Whisper, 20 decibels; Normal conversation, 60 decibels; Busy street corner, 80 decibels; Subway train at 20 feet, 100 decibels; Jet plane at 500 feet, 110

decibels; Loud thunder, 120 decibels; and Rock band (amplified) at close range, 140 decibels.

Return to FIGURE 20.3 The intensity of some common sounds

Extended description for FIGURE 20.4

Hardware for hearing



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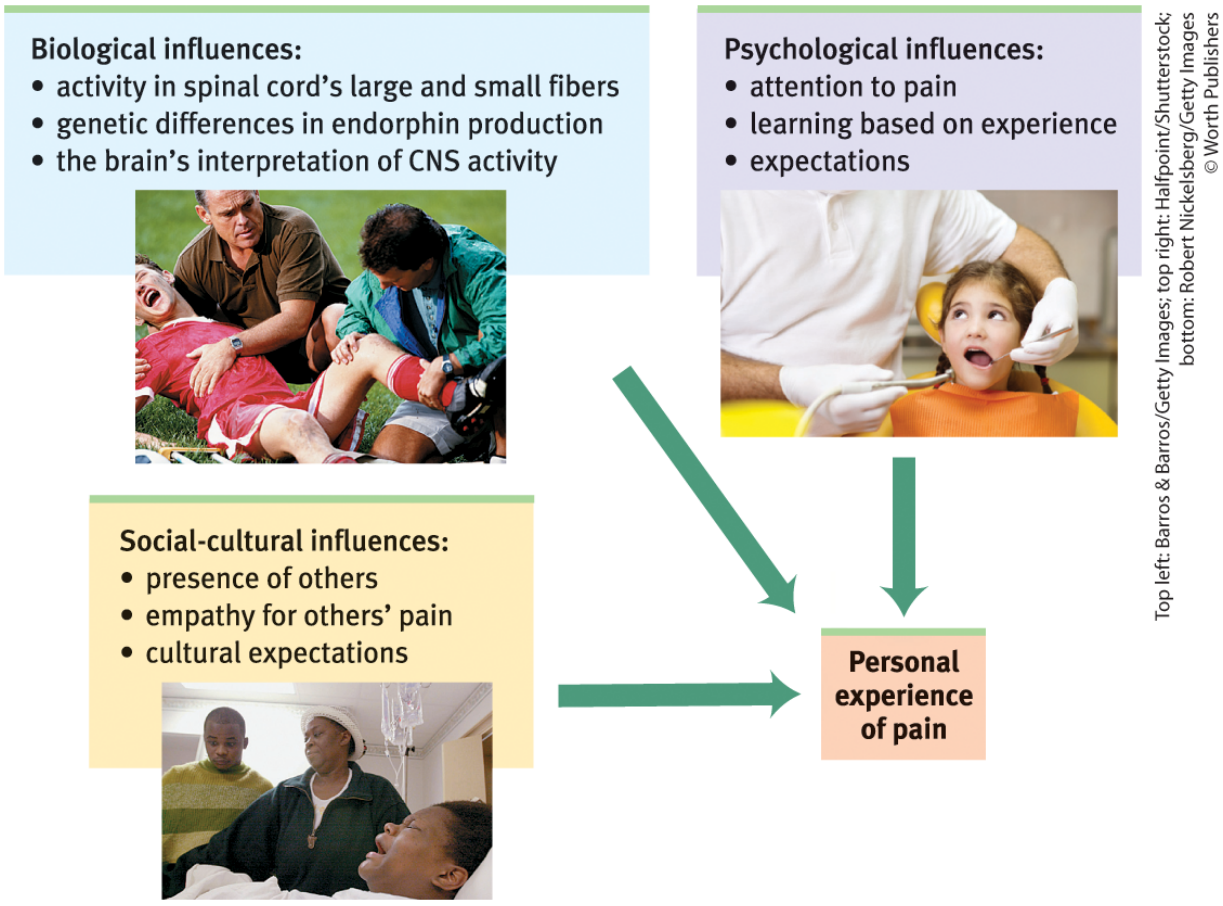
The illustration shows a speech processor placed on the outer side of the pinna. A wire attaches the speech processor to a transmitter placed on the side of the head, above the ear. A receiver slash stimulator is connected to the transmitter, from which a wire sends sound to an electrode placed within the cochlea of the ear.

Return to FIGURE 20.4 Hardware for hearing

Extended description for FIGURE 20.6 Biopsychosocial approach to pain



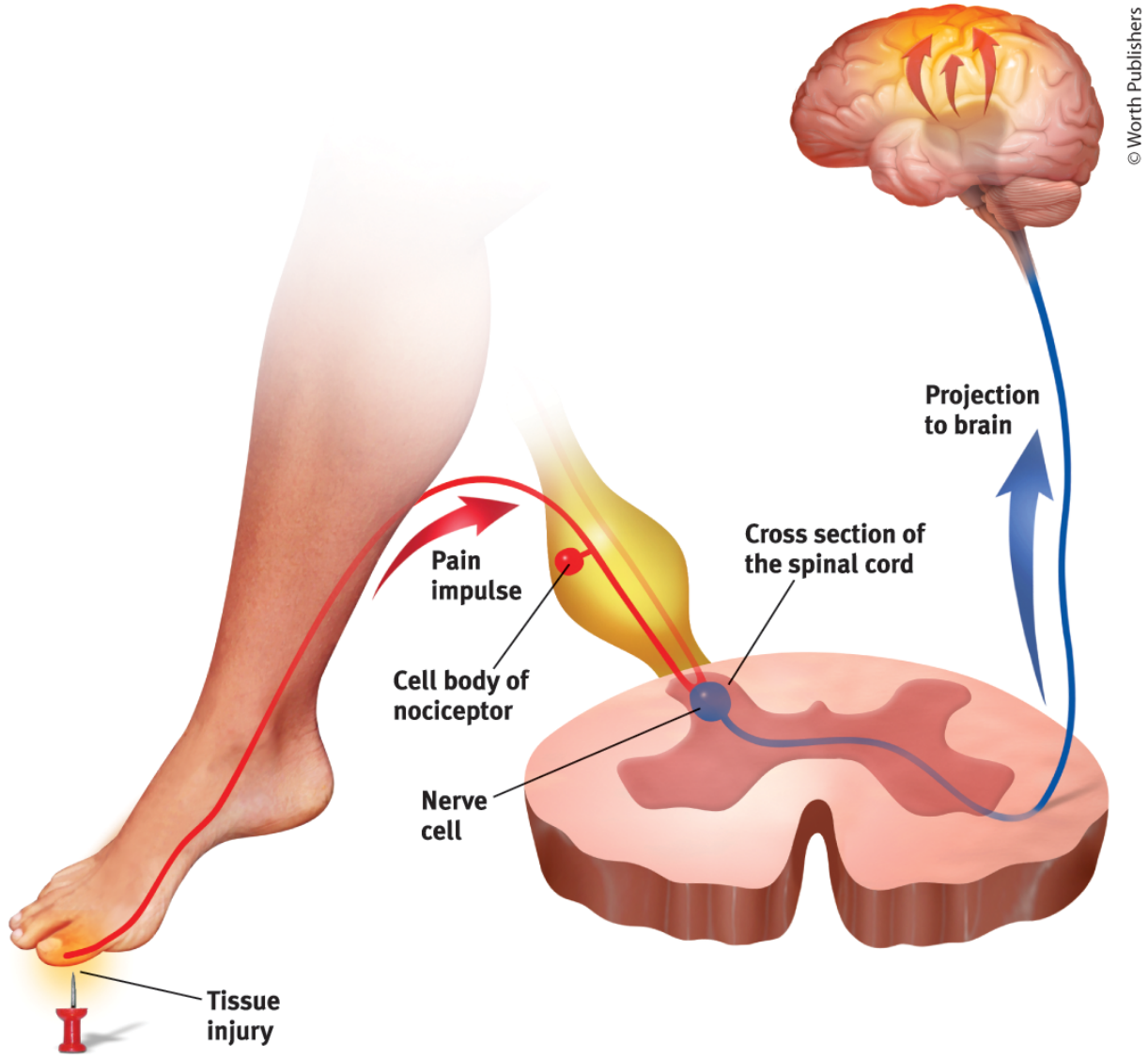
Top left: Barros & Barros/Getty Images; top right: Halfpoint/Shutterstock; bottom: Robert Nickelsberg/Getty Images
© Worth Publishers

Three text boxes with photos point to a smaller text box at the bottom right that reads, Personal experience of pain. The top left box shows **Biological influences**: activity in spinal cord's large and small fibers, genetic differences in endorphin production, and the brain's interpretation of C N S activity. A photo shows two people helping a wounded football player who is in pain. The bottom left

box shows **Social-cultural influences**: presence of others, empathy for others' pain, and cultural expectations. A photo shows a hospitalized elderly woman crying in pain. There are two people beside her. The top right box shows **Psychological influences**: attention to pain, learning based on experience, and expectations. A photo shows a young girl being treated by a dentist.

Return to FIGURE 20.6 Biopsychosocial approach to pain

Extended description for FIGURE 20.7 The pain circuit

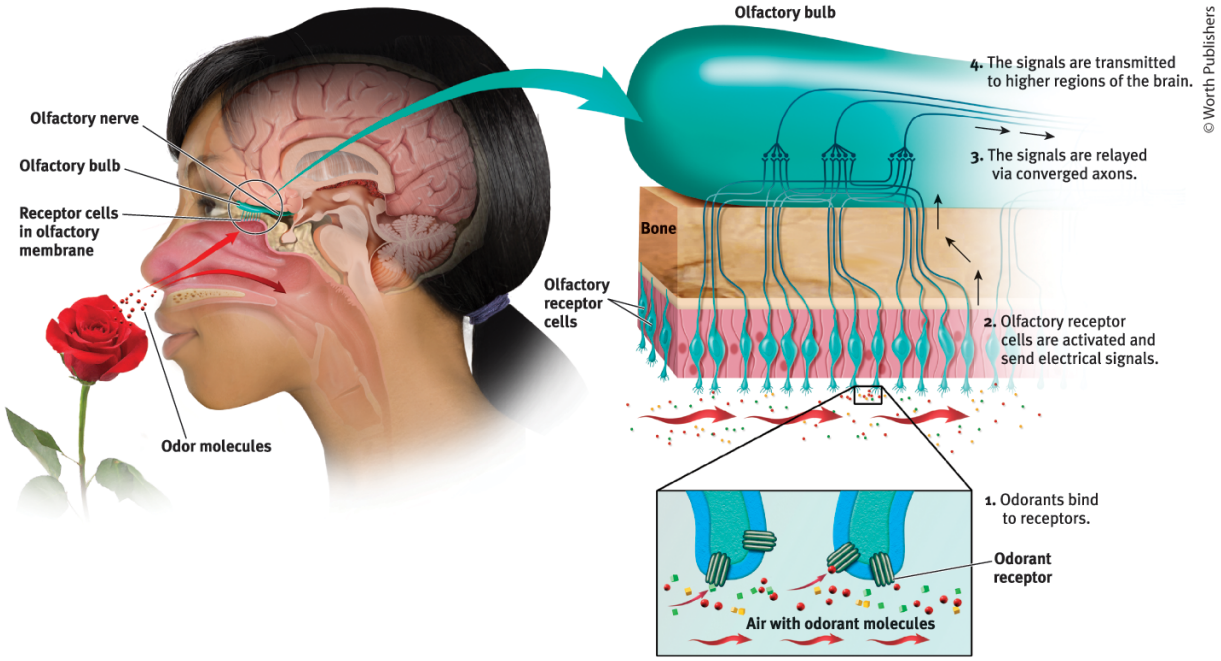


The illustration shows a human leg stepping on a thumbtack leading to a tissue injury that sends a pain impulse from the toe to the cross-

section of the spinal cord via the cell body of the nociceptor. The nerve cell receives the impulse in the cross-section of the spinal cord and projects the pain impulse to the brain. Arrows are depicted in the brain pointing from the brain stem to the top of the head.

Return to FIGURE 20.7 The pain circuit

Extended description for FIGURE 20.8 The sense of smell



The illustration shows the lateral view of a person with the brain highlighted. The person smells a rose. Odor molecules from the rose travel up the nose to the receptor cells in the olfactory membrane and then to the olfactory bulb and the olfactory nerve. An enlarged view of the olfactory bulb shows the following steps:

1: Odorants bind to receptors. An illustration shows the odorant molecules from the air binding to the odorant receptor.

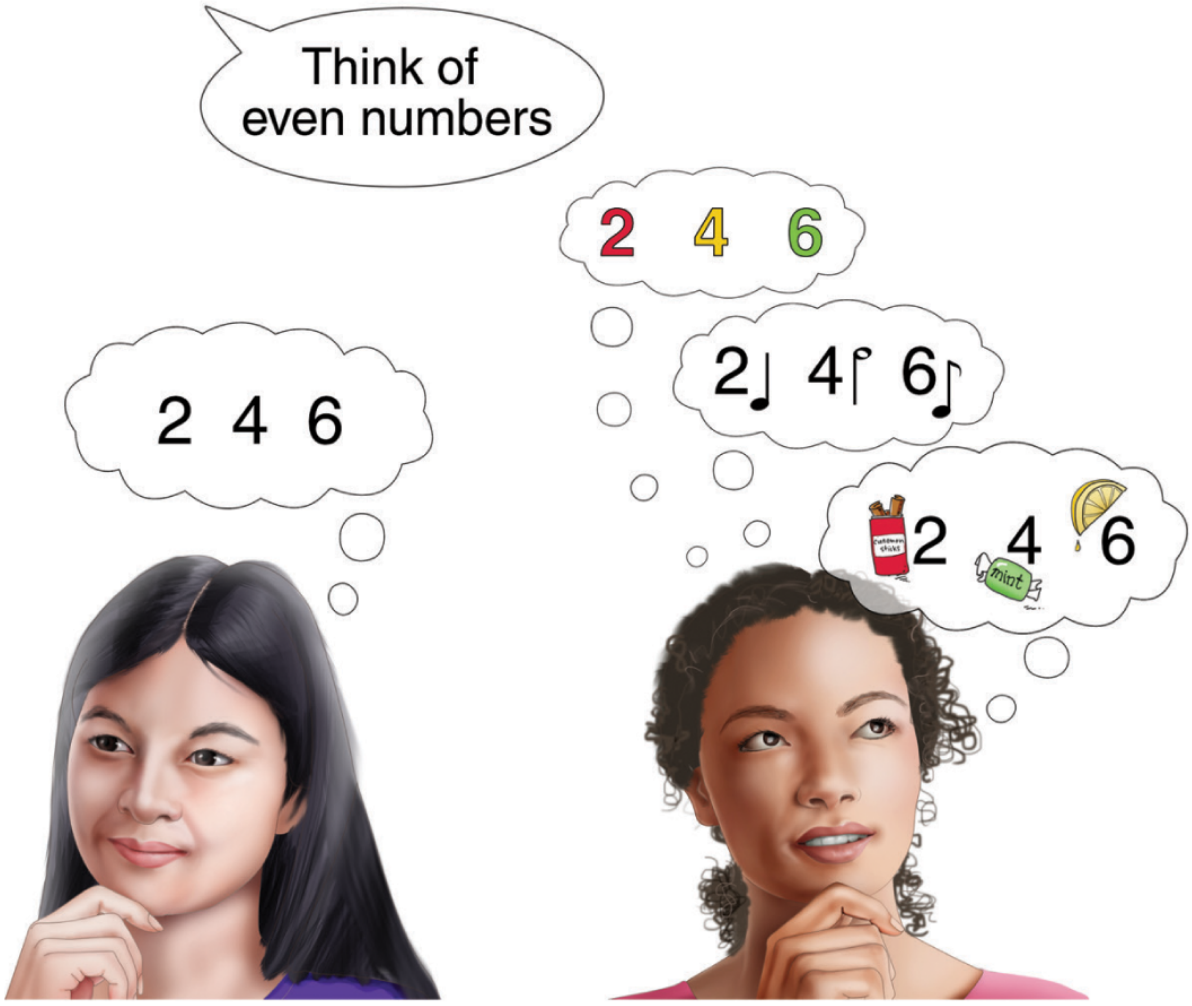
2: Olfactory receptor cells are activated and send electrical signals. An illustration shows the olfactory receptor cells ascending through a tissue layer and sending impulses up nerves through bone in the third level.

3: The signals are relayed via converged axons. An illustration shows the axons converging into a single nerve, the olfactory nerve.

4: The signals are transmitted to higher regions of the brain.

Return to FIGURE 20.8 The sense of smell

Extended description for FIGURE 20.11 Synesthesia's symphony



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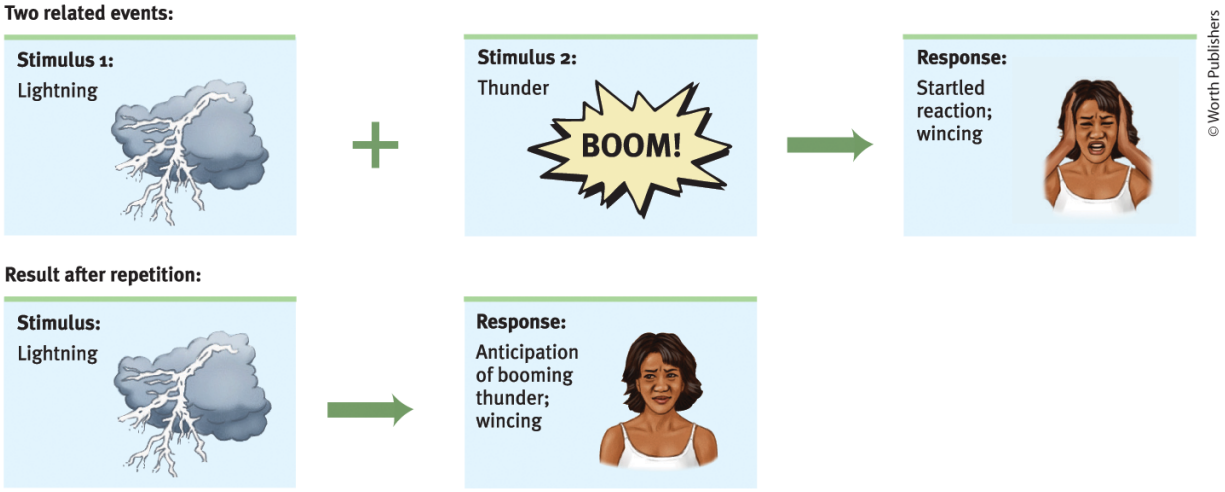
The illustration shows two persons, one without synesthesia and the other with synesthesia. A speech bubble at the top reads, Think of even numbers. A thought bubble above the person without

synesthesia reads, 2 4 6. Three thought bubbles above the person with synesthesia read, 2 4 6 in three different colors; 2 4 6 with a musical note beside each number; and 2 4 6 with a different type of food (a candy, a mint, a lemon) beside each number.

Return to FIGURE 20.11 Synesthesia's symphony

Extended description for FIGURE 21.1 Classical conditioning



© Worth Publishers

The first response titled, **Two related events**, occurs due to uncontrolled stimuli as follows:

Stimulus 1: Lightning (from a cloud) plus **Stimulus 2**: Thunder (a star-burst symbol in which a text reads, BOOM!) leads to **Response**: Startled reaction; wincing (the woman is covering her ears and wincing).

The second response titled, **Result after repetition**, occurs due to controlled stimulus as follows:

Stimulus: Lightning (from a cloud) leads to **Response**: Anticipation of booming thunder; wincing (the woman is just wincing).

Return to FIGURE 21.1 Classical conditioning

Extended description for FIGURE 21.2 Operant conditioning



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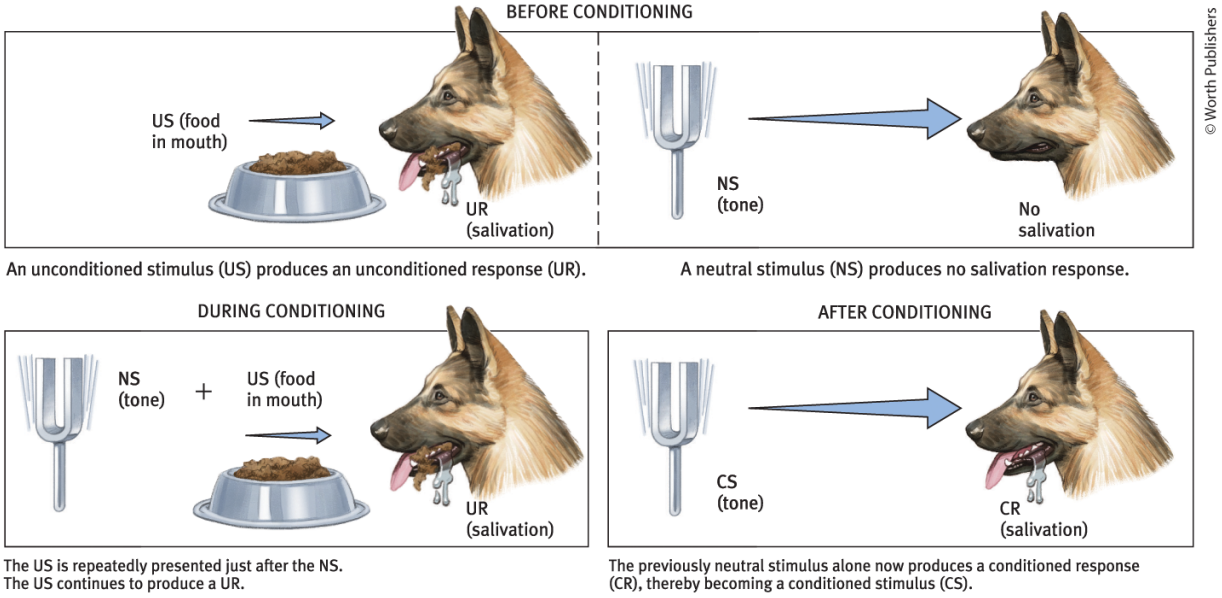
Panel A shows a young boy in a kitchen requesting something from a person. A speech bubble from the boy reads, Um…Please? Text below reads, (a) Behavior: Being polite.

Panel B shows the boy in the kitchen receiving a cookie from the person. The boy is smiling. Text below reads, (b) Consequence: Getting a treat.

Panel C shows the boy wearing a backpack inside a classroom. He is requesting something from a person. A speech bubble from the boy reads, Please? Text below reads, (c) Behavior strengthened.

Return to FIGURE 21.2 Operant conditioning

Extended description for FIGURE 21.4 Pavlov's classic experiment



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The top two panels are titled, **Before Conditioning**. The left panel shows a bowl of food placed before a salivating dog. Text beside the bowl reads, U S (food in mouth). An arrow points toward the dog's mouth. Text below the dog's mouth reads, U R (salivation). Text below the panel reads, An unconditioned stimulus (U S) produces an unconditioned response (U R).

The right panel shows a vibrating tuning fork placed before the dog. Text near the fork reads, N S (tone). An arrow points toward the dog's mouth. Text under the dog's mouth reads, No salivation. Text

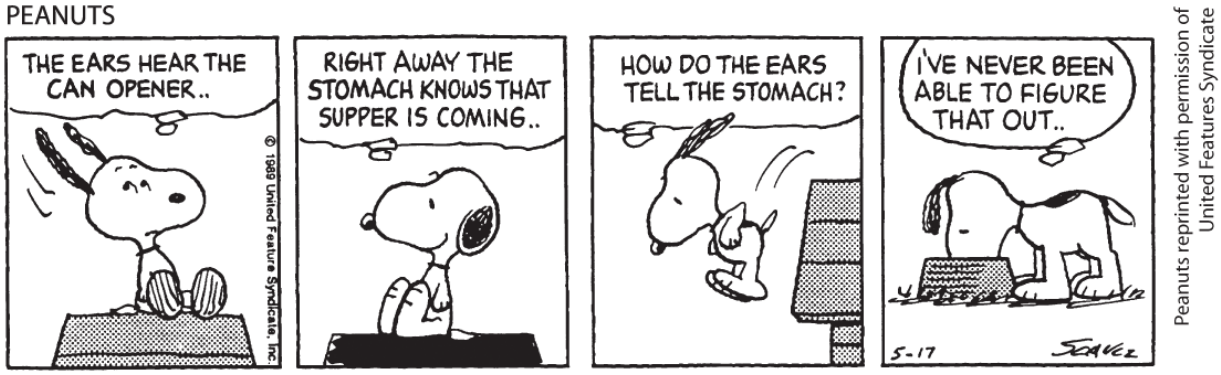
below the panel reads, A neutral stimulus (N S) produces no salivation response.

The bottom left panel is titled, **During Conditioning**. It shows both the vibrating tuning fork and bowl of food placed before a salivating dog. Text near the fork reads, N S (tone). Text on top of the bowl reads, U S (food in mouth). An arrow points toward the dog's mouth. Text under the dog's mouth reads, U R (salivation). Text below the panel reads, The U S is repeatedly presented just after the N S. The U S continues to produce a U R.

The bottom right panel is titled, **After Conditioning**. It shows the vibrating tuning fork placed before a salivating dog. Text near the tuning fork reads, C S (tone). An arrow points toward the dog's mouth. Text under the dog's mouth reads, C R (salivation). Text below the panel reads, The previously neutral stimulus alone now produces a conditioned response (C R), thereby becoming a conditioned stimulus (C S).

Return to FIGURE 21.4 Pavlov's classic experiment

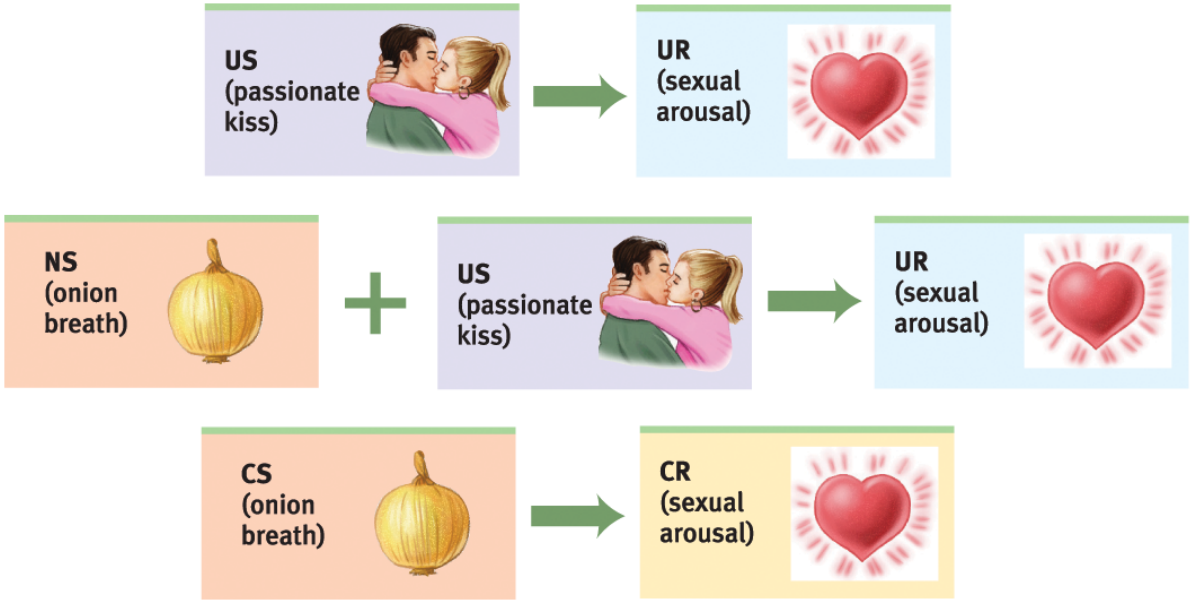
Extended description for Cartoon depicting unconditioned response



In the first panel, Snoopy is sitting on a doghouse roof, and a thought bubble reads, “The ears hear the can opener.” In the second panel, Snoopy is smiling widely, and a thought bubble reads, “Right away the stomach knows that supper is coming.” In the third panel, Snoopy jumps off the roof, and a thought bubble reads, “How do the ears tell the stomach?” In the fourth panel, Snoopy is eating from a bowl, and a thought bubble reads, “I’ve never been able to figure that out.”

Return to Cartoon depicting unconditioned response

Extended description for FIGURE 21.5 An unexpected C S



© Worth Publishers

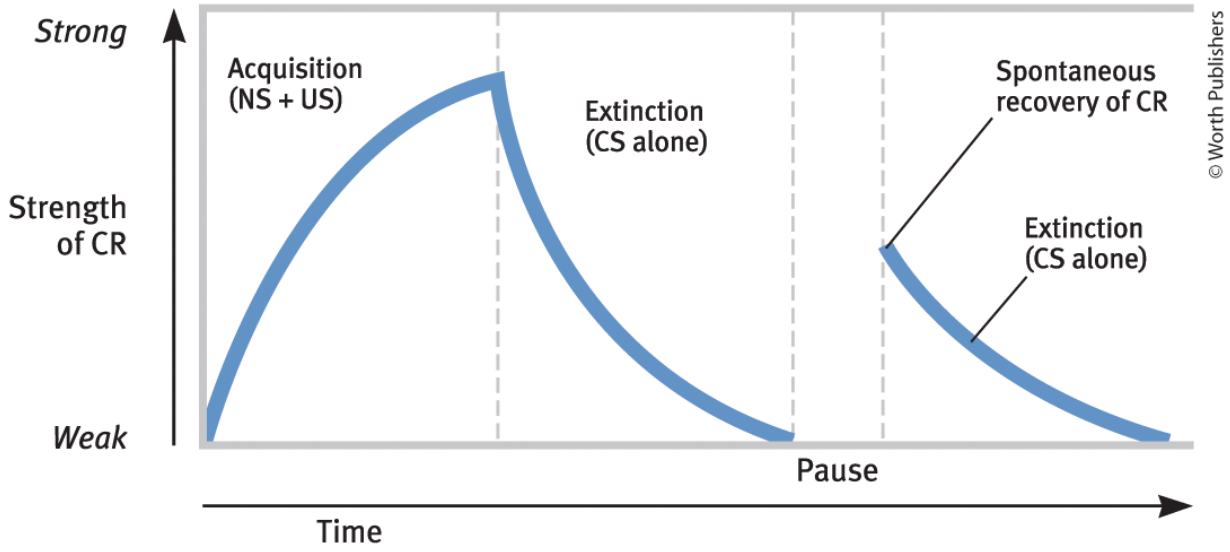
The first section shows an illustration of a couple kissing and an arrow pointing toward a glowing heart. Text next to the couple reads, U S (passionate kiss). Text near the glowing heart reads, U R (sexual arousal).

The second section shows an illustration of an onion plus a couple kissing and an arrow pointing toward a glowing heart. Text near the onion reads, N S (onion breath). Text near the couple reads, U S (passionate kiss). Text near the glowing heart reads, U R (sexual arousal).

The third section shows an illustration of an onion with an arrow pointing toward a glowing heart. Text near the onion reads, C S (onion breath). Text near the glowing heart reads, C R (sexual arousal).

Return to FIGURE 21.5 An unexpected C S

Extended description for FIGURE 21.6 Idealized curve of acquisition, extinction, and spontaneous recovery



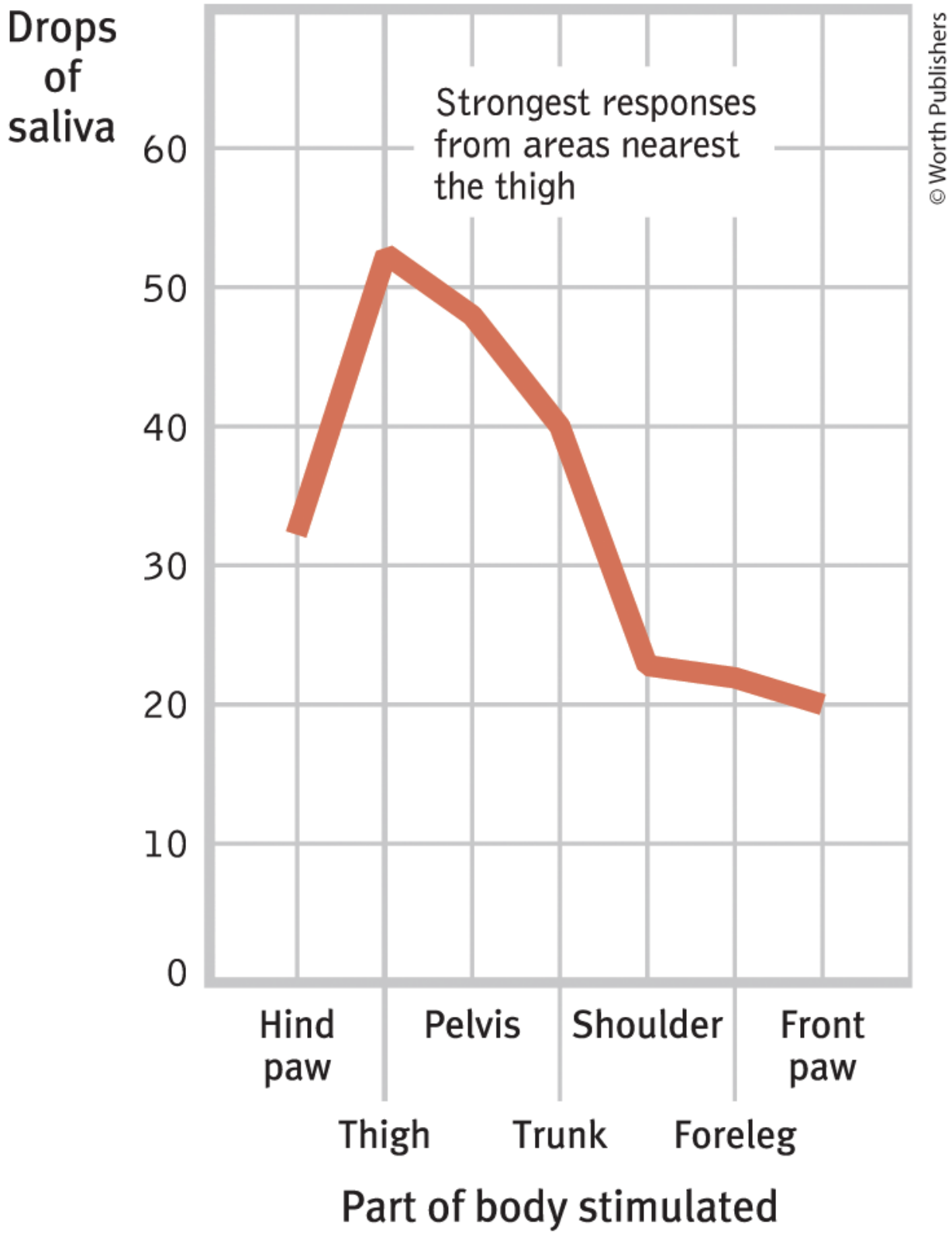
The horizontal axis represents time and the vertical axis represents the strength of C R ranging from *weak* at the bottom to *strong* at the top. A curve steeply rises in a concave down pattern from weak to strong at a peak. A vertical dashed line is drawn from the peak to the horizontal axis. The gap between the vertical axis and the peak is labeled, Acquisition (N S plus U S). Another curve from the peak steeply decreases in a concave-up pattern to the horizontal axis. A vertical dashed line is drawn from this point. The gap between the peak and the second point is labeled, Extinction (C S alone). After a short period of pause in the horizontal axis, a curve starting from

midway between strong and weak slopes down to weak. A vertical dashed line is drawn through the starting point of the curve. The starting point of the curve is labeled, Spontaneous recovery of C R. A point near the center of the curve is labeled, Extinction (C S alone). All data are approximate.

Return to FIGURE 21.6 Idealized curve of acquisition, extinction, and spontaneous recovery

Extended description for FIGURE 21.7

Generalization


Drops of saliva
60
50
40
30
20
10
0
Strongest responses from areas nearest the thigh
Hind paw
Pelvis
Shoulder
Front paw
Thigh
Trunk
Foreleg
Part of body stimulated
© Worth Publishers

The horizontal axis represents Part of body stimulated and is labeled hind paw, thigh, pelvis, trunk, shoulder, foreleg, and front paw. The vertical axis represents Drops of saliva and ranges from 0 to 60, in increments of 10. A curve starts from (Hind paw, 33); passes through (Thigh, 53), (Pelvis, 48), (Trunk, 40), (Shoulder, 22), (Foreleg, 21); and ends at (Front paw, 20). A corresponding text reads, Strongest responses from areas nearest the thigh. All data are approximate.

Return to FIGURE 21.7 Generalization

Extended description for Little Albert



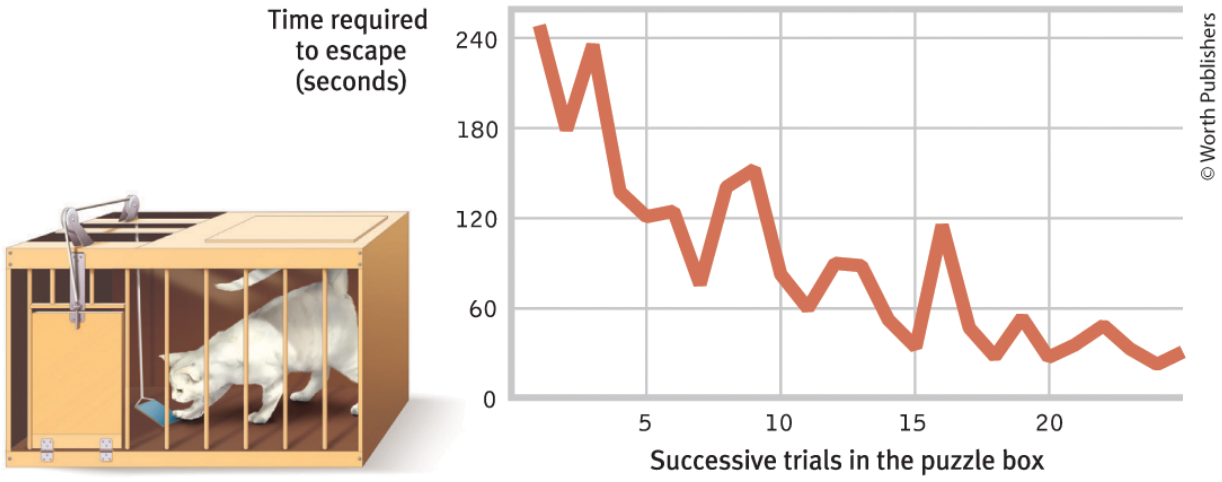


Archives of the History of American Psychology, The Center for the History of Psychology, The University of Akron

The first photo shows Little Albert with his parents and playing with a white rat. The second photo shows Little Albert sitting on a mattress crying. He is being observed by two people seated on either side of him; one of them is holding a white rat close to Little Albert.

Return to Little Albert

Extended description for FIGURE 22.1 Cat in a puzzle box



The cat inside the box steps on a rectangular chip suspended from a pulley on top of the box through a string. The other end of the string, which passes over the pulley, is attached to the door latch of the box.

In the graph, the horizontal axis represents Successive trials in the puzzle box and ranges from 0 to 20, in increments of 5. The vertical axis represents Time required to escape (seconds) and ranges from 0 to 240, in increments of 60. A curve starts from (1, 250); passes through (2, 180), (3, 230), (4, 140), (5, 120), (6, 125), (7, 80), (8, 140), (9, 160), (10, 80), (11, 60), (12, 100), (13, 95), (14, 55), (15, 40), (16, 118),

(17, 50), (18, 60), (19, 59), (20, 30), (21, 20); and ends at (23, 30). All data are approximate.

Return to FIGURE 22.1 Cat in a puzzle box

Extended description for Cartoon depicting operant conditioning

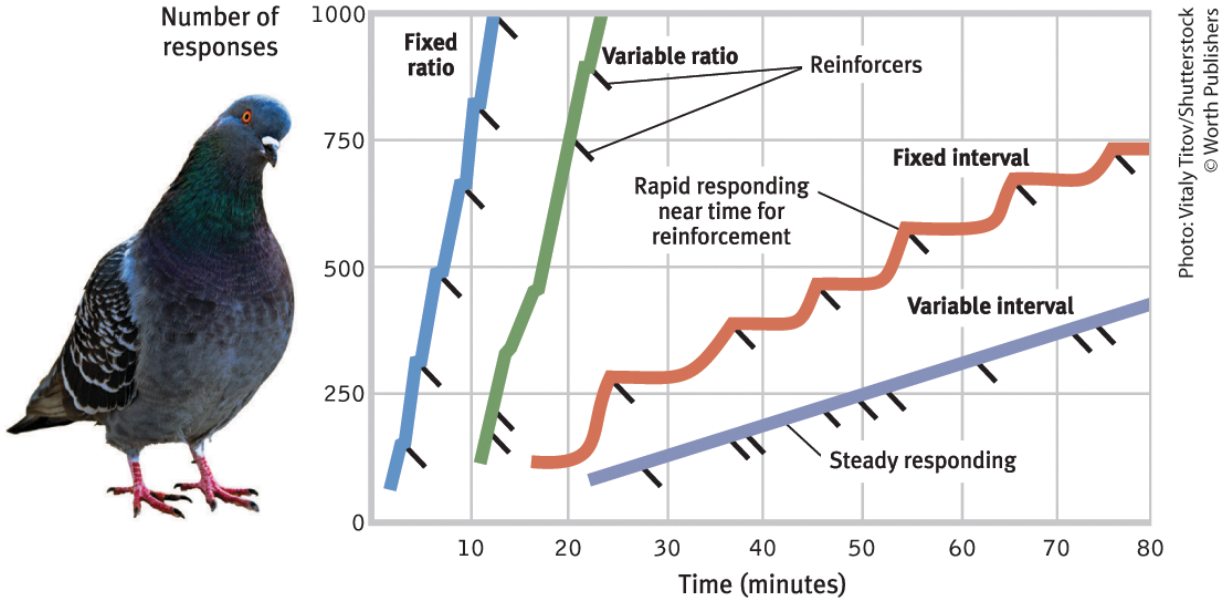


The first panel shows the baby smiling. A thought bubble from the baby reads, “THIS IS GREAT!”

In the second panel, a thought bubble from the baby reads, “I’ll have to wake up crying in the middle of the night more often.”

Return to Cartoon depicting operant conditioning

Extended description for FIGURE 22.3 Intermittent reinforcement schedules

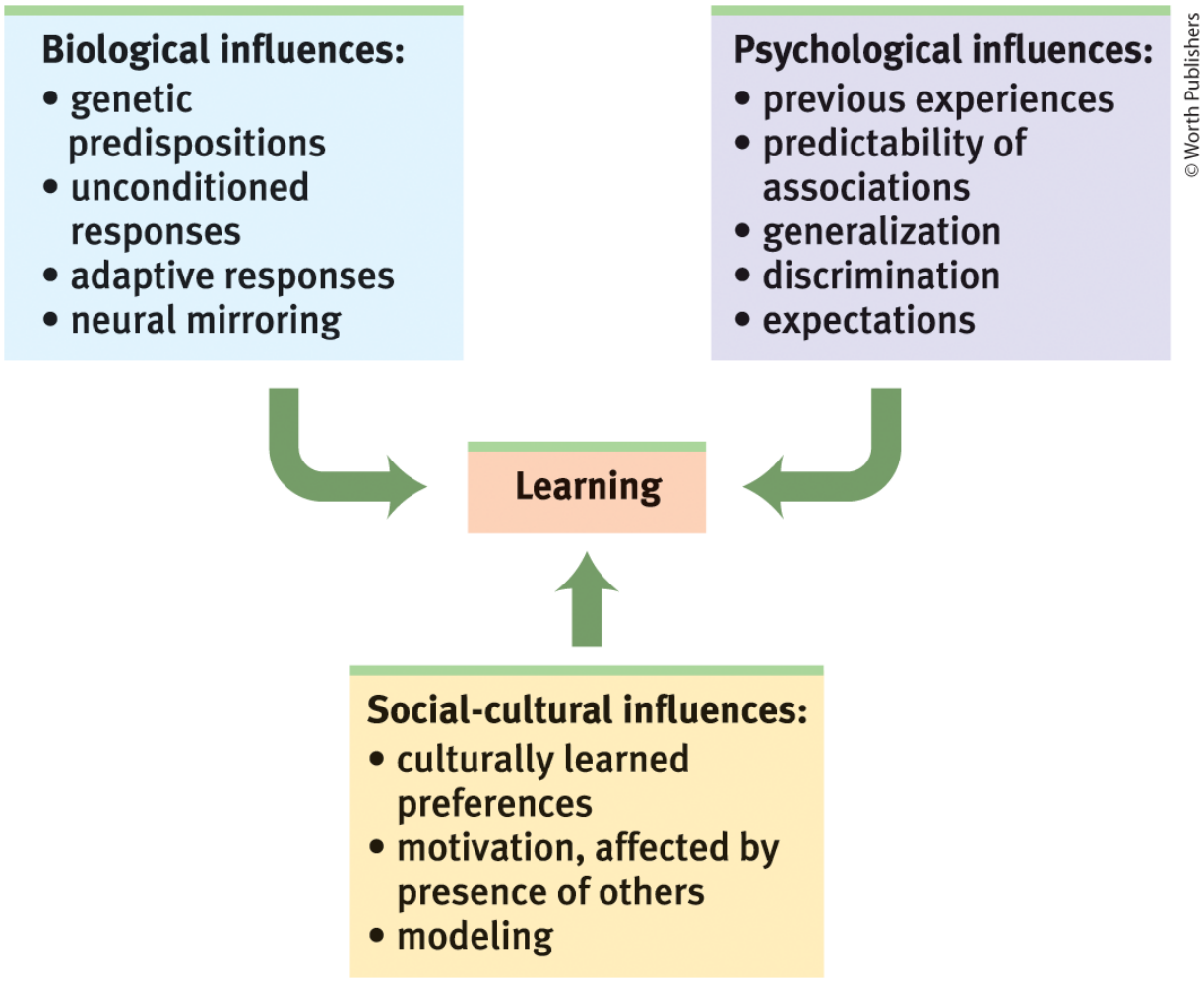


The horizontal axis represents time (minutes) and ranges from 0 to 80, in increments of 10. The vertical axis represents number of responses and ranges from 0 to 1000, in increments of 250. The graph shows four curves. The first curve for fixed ratio rises steeply starting from (2, 60) and ending at (12, 1000), spiking at regular intervals. The second curve for variable ratio starts from (11, 120) and ends at (23, 1000), spiking at variable intervals. Two such intervals are marked as reinforcers. The third curve for fixed interval starts from (18, 120) and ascends gradually with peaks and troughs to end at (80, 750). A line pointing to (54, 600) on this curve reads, Rapid responding near time for reinforcement. The fourth

curve for variable interval starts from (22, 120) and ascends gradually to end at (80, 350). A line pointing to (42, 220) on this curve reads, steady responding. All data are approximate.

Return to FIGURE 22.3 Intermittent reinforcement schedules

Extended description for FIGURE 23.1 Biopsychosocial influences on learning



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The information presented in the diagram is as follows:

Biological influences: Genetic predispositions, unconditioned responses, adaptive responses, and neural mirroring.

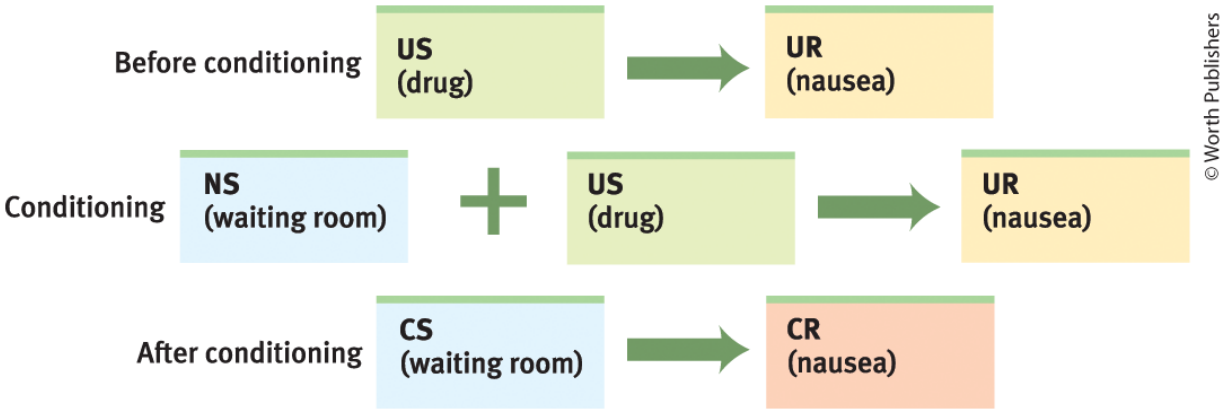
Psychological influences: Previous experiences, predictability of associations, generalization, discrimination, and expectations.

Social-cultural influences: Culturally learned preferences, motivation, affected by presence of others, and modeling.

These three boxes all point to a center box labeled, **Learning.**

Return to FIGURE 23.1 Biopsychosocial influences on learning

Extended description for FIGURE 23.2 Nausea conditioning in cancer patients



© Worth Publishers

The information presented in the diagram is as follows:

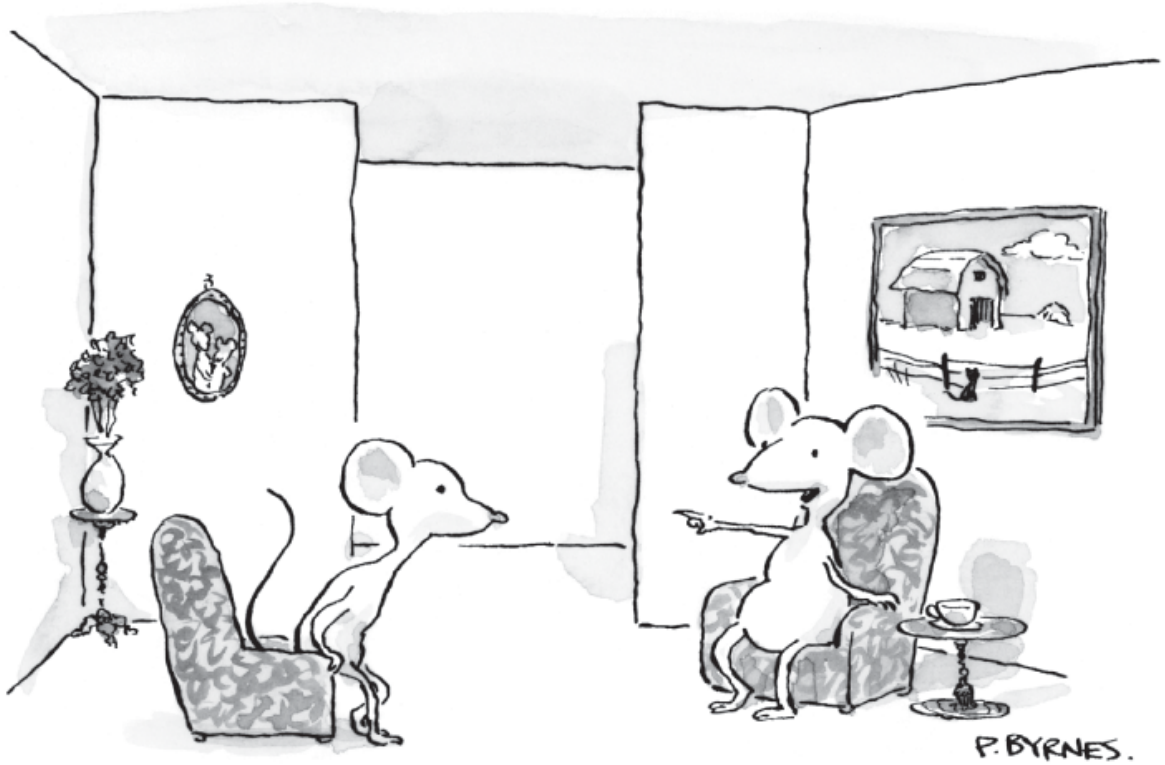
Before conditioning: U S (drug) leads to U R (nausea).

Conditioning: N S (waiting room) plus U S (drug) leads to U R (nausea).

After conditioning: C S (waiting room) leads to C R (nausea).

Return to FIGURE 23.2 Nausea conditioning in cancer patients

Extended description for Cartoon depicting latent learning



Pat Byrnes/Cartoon Stock

"Bathroom? Sure, it's just down the hall to the left, jog right, left, another left, straight past two more lefts, then right, and it's at the end of the third corridor on your right."

The mice are seated opposite to each other on two easy chairs. One mouse is starting to rise, and the other says, "Bathroom? Sure, it's just down the hall to the left, jog right, another left, straight past two

more lefts, then right, and it's at the end of the third corridor on your right."

Return to Cartoon depicting latent learning

Extended description for FIGURE 23.3 The famous Bobo doll experiment

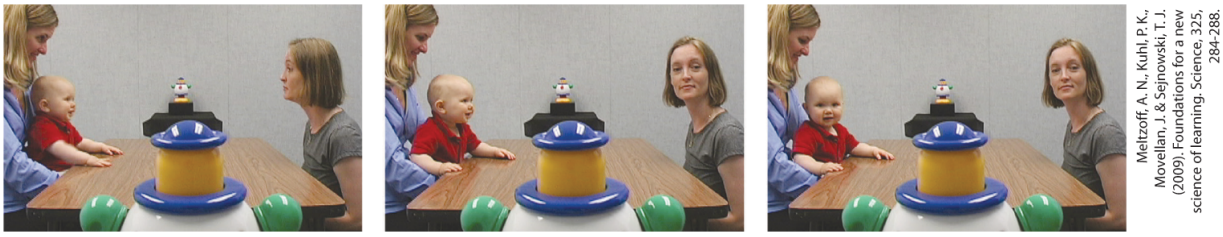


Courtesy Albert Bandura Trust

From left to right in the top row, the four photos show a woman sitting on an inflatable punching doll (the Bobo doll) and hitting its face; the woman swinging the Bobo doll; the woman punching the Bobo doll; and the woman kicking the Bobo doll. Another series of four photos in the bottom row shows two children (a boy and a girl) imitating the actions of the woman. The girl is sitting on the Bobo doll and hitting its face; the boy is swinging the Bobo doll; the boy is punching the Bobo doll; and the girl is kicking the Bobo doll.

Return to FIGURE 23.3 The famous Bobo doll experiment

Extended description for FIGURE 23.4 Imitation



Meltzoff, A. N., Kuhl, P. K., Movellan, J. & Sejnowski, T. J. (2009). Foundations for a new science of learning. Science, 325, 284-288.

The first photo shows the infant seated with his mother at a table opposite to a woman. The woman and the baby look at each other. A colorful toy is placed in the foreground.

The second photo shows the infant looking at the woman while she looks away from the infant, toward the toy.

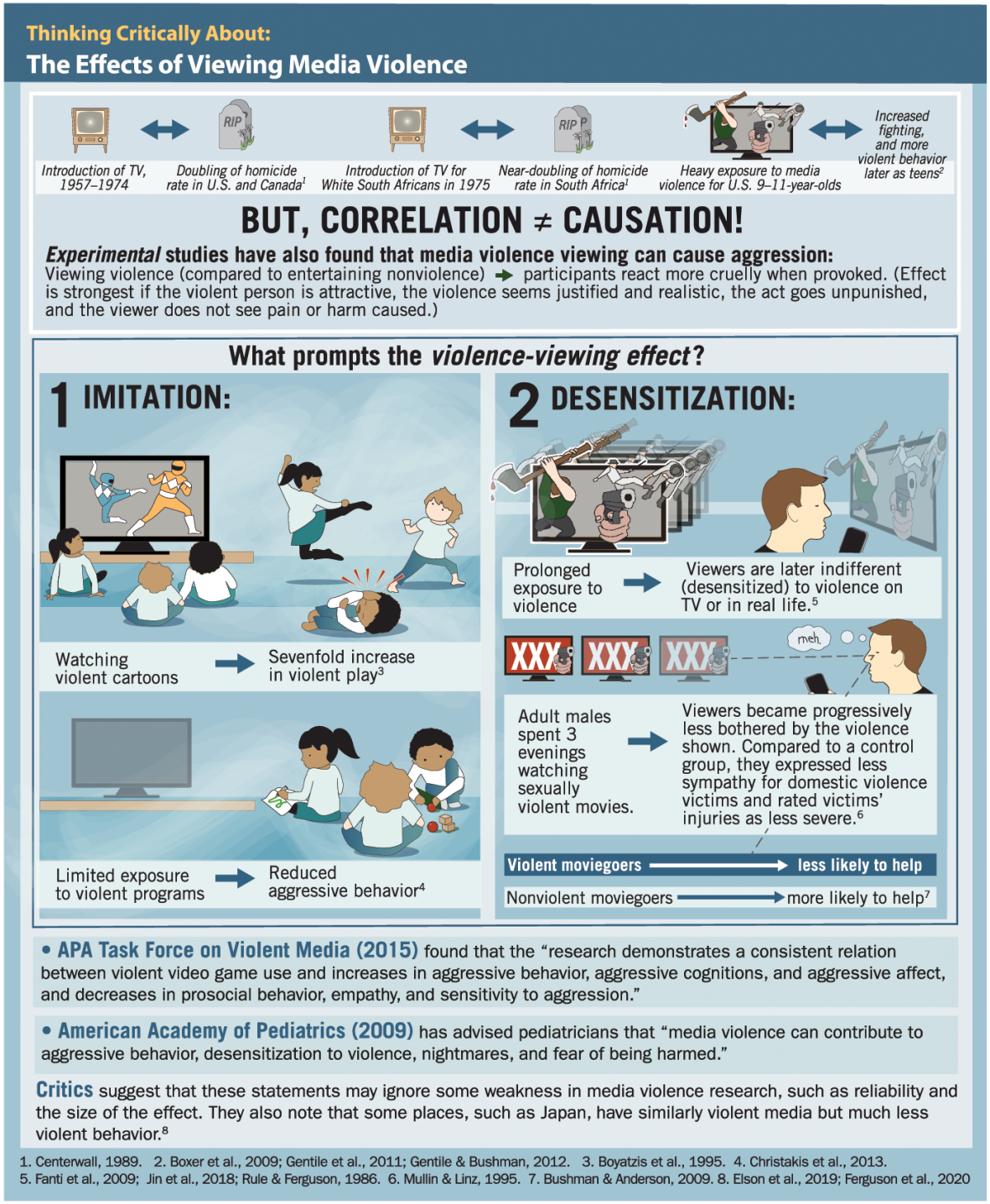
The third photo shows the infant and the woman looking at the toy.

The mother looks at the baby in all three photos.

Return to FIGURE 23.4 Imitation

Extended description for Effects of

viewing media violence



© Worth Publishers

In the top panel, three side-by-side illustrations show the effects of the introduction of T V and also of heavy exposure to media violence. The first illustration shows an old-fashioned console T V with the caption, *Introduction of T V, 19 57 to 19 74*. This is followed by a double-headed arrow, indicating a two-way relationship, then an image of a gravestone. The caption below the gravestone reads, *Doubling of homicide rate in U.S. and Canada* (Centerwall, 19 89). The second illustration shows a T V with the caption, *Introduction of T V for White South Africans in 19 75*. This is followed by a double-headed arrow, indicating a two-way relationship, then an image of a gravestone. The caption below the gravestone reads, *Near-doubling of homicide rate in South Africa* (Centerwall, 19 89). The third illustration shows a T V screen from which a hooded man holding a bloody axe, a hand pointing a gun, and two people fighting are emerging. The caption reads, *Heavy exposure to media violence for U.S. 9- to 11-year-olds*. This is followed by a double-headed arrow, indicating a two-way relationship, then the text, *Increased fighting, and more violent behavior later as teens* (Boxer et al. 2009, Gentile et al. 2011, Gentile and Bushman, 2012). Text below the three illustrations reads, **BUT, CORRELATION DOES NOT EQUAL CAUSATION! *Experimental* studies have also found that media violence viewing can cause aggression:** Viewing violence (compared to entertaining nonviolence), right-facing arrow, participants react more cruelly when provoked. (Effect is strongest if the violent person is attractive, the violence seems justified and realistic, the act goes unpunished, and the viewer does not see pain or harm caused.)

In the second panel, the heading reads, **What prompts the *violence-viewing* effect?** Two sections show imitation and desensitization, respectively. The first section has the heading, **1. Imitation**. The top of the section has an illustration that shows a group of children watching two people fighting on a T V and later imitating it. Text below reads, Watching violent cartoons, right-facing arrow, Sevenfold increase in violent play (Boyatzis et al. 19 95). The bottom of the first section, still under the Imitation heading, shows a switched-off T V and a group of children sitting beside it reading and playing games. Text below reads, Limited exposure to violent programs, right-facing arrow, Reduced aggressive behavior (Christakis et al. 2013). The second section has the heading, **2. Desensitization**. The first illustration shows the earlier image of the axe-wielding man, the hand pointing a gun, and the two men fighting emerging from the screen. But the image is replicated five times, indicating multiple views of these images. The second illustration shows a man looking at his phone with the earlier-described screen on the wall in front of him. Under these illustrations, the text reads, Prolonged exposure to violence, right-facing arrow, Viewers are later indifferent (desensitized) to violence on T V or in real life (Fanti et al. 2009; Jin et al., 2018; Rule and Ferguson, 19 86). The bottom of the second section, still under the Desensitization heading, has an illustration showing the man holding his phone, with one of his eyes looking at three T V screens with the image of a hand holding a gun and three large Xs behind the gun. His other eye is focused on a woman holding crutches who

has stumbled and fallen. A thought bubble from the man reads, meh. Text below reads, Adult males spent 3 evenings watching sexually violent movies, right-facing arrow. Viewers became progressively less bothered by the violence shown. Compared to a control group, they expressed less sympathy for domestic violence victims and rated victims' injuries as less severe (Mullin and Linz, 19 95). Text below reads, violent moviegoers, right-facing arrow, less likely to help. Nonviolent movie goers, right-facing arrow, more likely to help (Bushman and Anderson, 2009).

A bulleted list at the bottom of the infographic reads,

Bullet item 1: **A P A Task Force on Violent Media (2015)** found that the "research demonstrates a consistent relation between violent video game use and increases in aggressive behavior, aggressive cognitions, and aggressive effect, and decreases in prosocial behavior, empathy, and sensitivity to aggression."

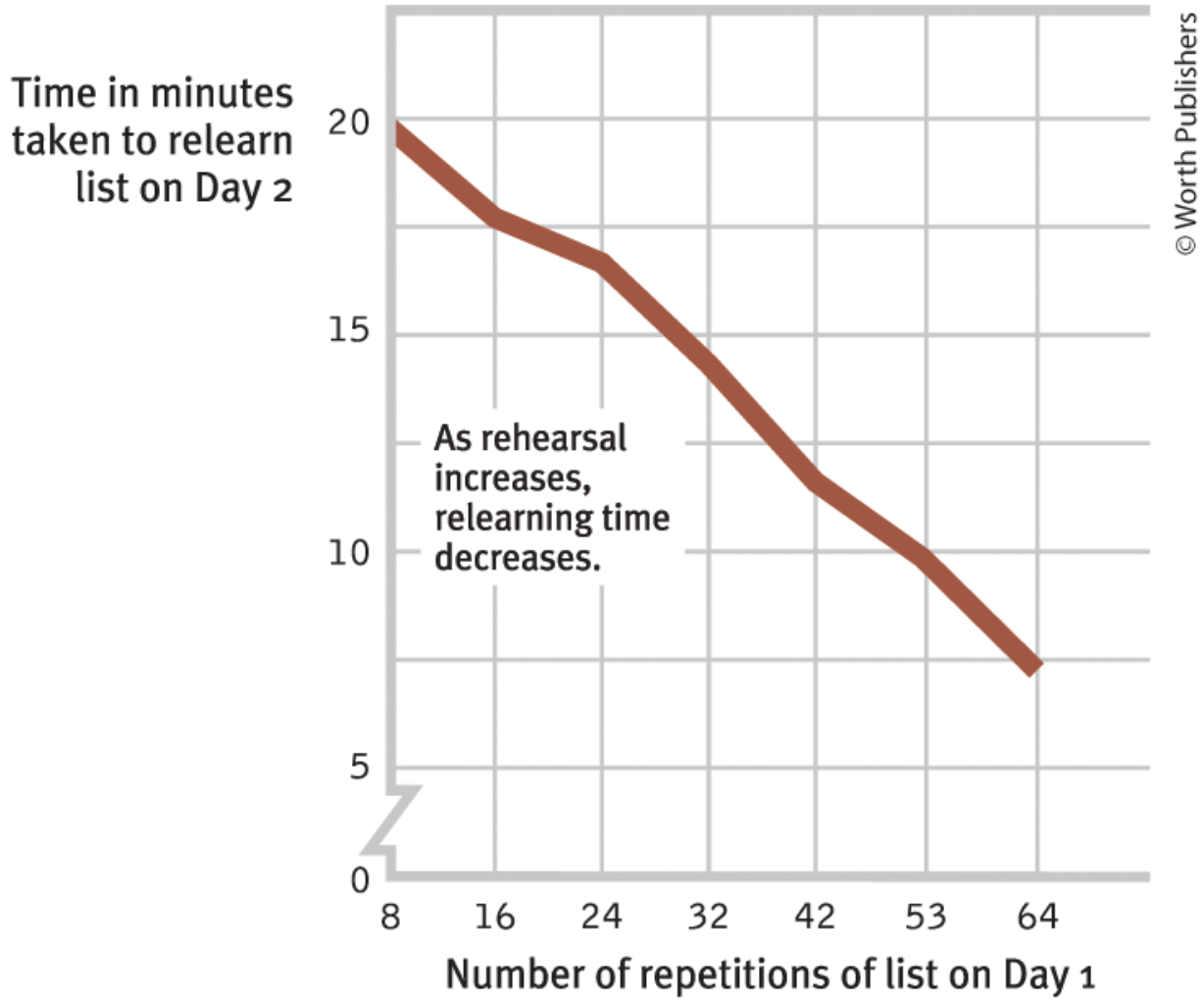
Bullet item 2: **American Academy of Pediatrics (2009)** has advised pediatricians that "media violence can contribute to aggressive behavior, desensitization to violence, nightmares, and fear of being harmed."

Text below reads, **Critics** suggest that these statements may ignore some weakness in media violence research, such as reliability and the size of the effect. They also note that some places, such as Japan,

have similarly violent media but much less violent behavior (Elson et al., 2019; Ferguson et al., 2020).

Return to Effects of viewing media violence

Extended description for FIGURE 24.3 Ebbinghaus' retention curve

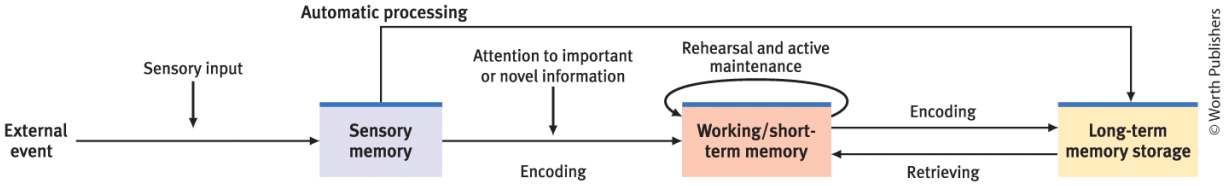


The horizontal axis plots the number of repetitions of list on Day 1 and ranges from 8 to 64, in increments of 8. The vertical axis plots time in minutes taken to relearn list on day 2 and ranges from 0 to 20, in increments of 5. The curve begins from (8, 20); passes through

(16, 17.5), (24, 17), (32, 14.5), (42, 12), (53, 10); and ends at (64, 7.5). Text corresponding to the curve reads, As rehearsal increases, relearning time decreases. All data are approximate.

Return to FIGURE 24.3 Ebbinghaus' retention curve

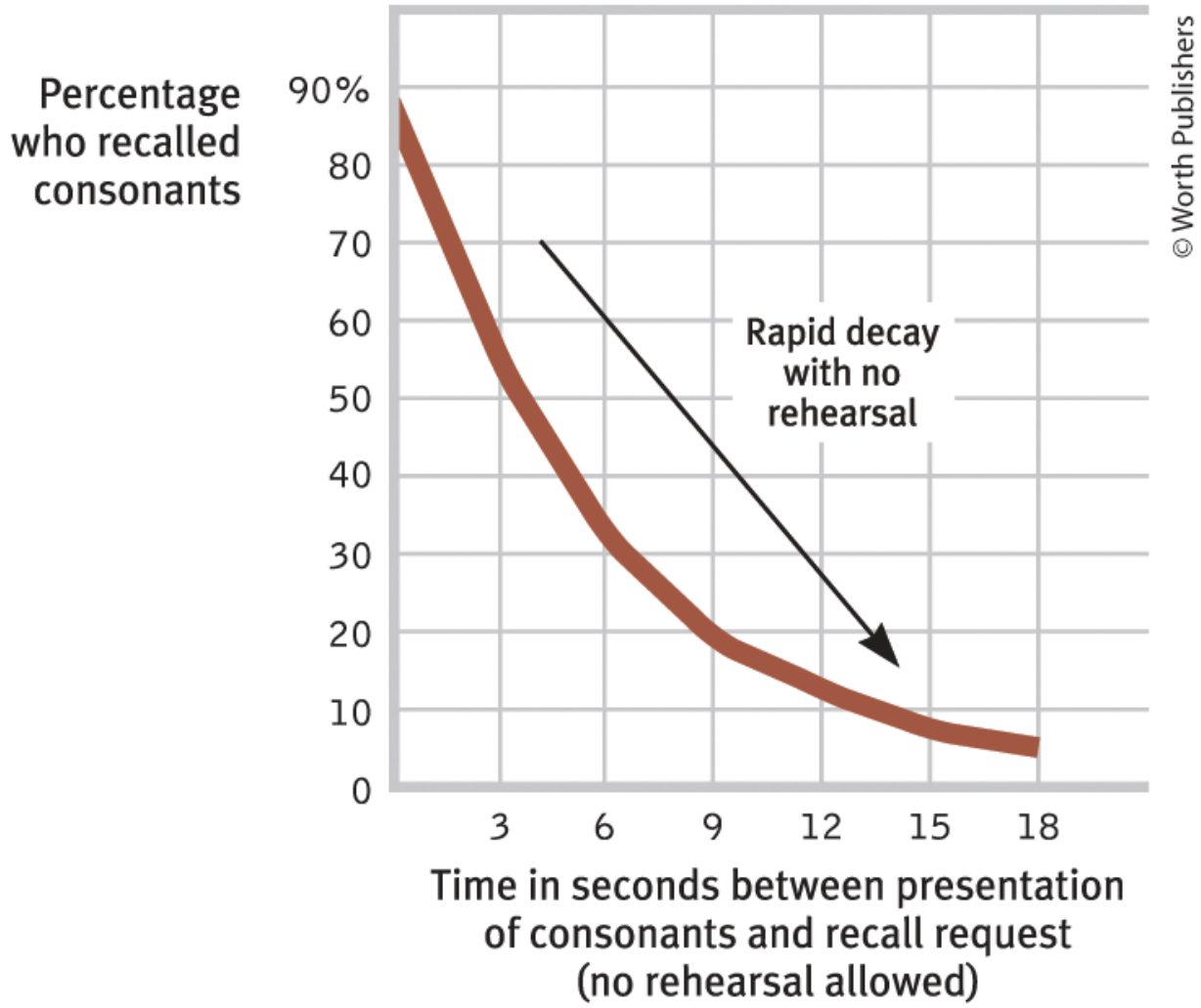
Extended description for FIGURE 24.4 A modified three-stage information-processing model of memory



Sensory input can be added to external events and stored in sensory memory. From sensory memory, the individual can pay attention to important or novel information and the memory is encoded. Once the memory is encoded in the working slash short-term memory, it can recycle back into working slash short-term memory through rehearsal and active maintenance. From working slash short-term memory encoding can move the memory in the long-term memory storage from where it can be retrieved later and available via the working slash short-term memory. Sensory memory through automatic processing gets stored in long-term memory storage.

Return to FIGURE 24.4 A modified three-stage information-processing model of memory

Extended description for FIGURE 24.6 Short-term memory decay

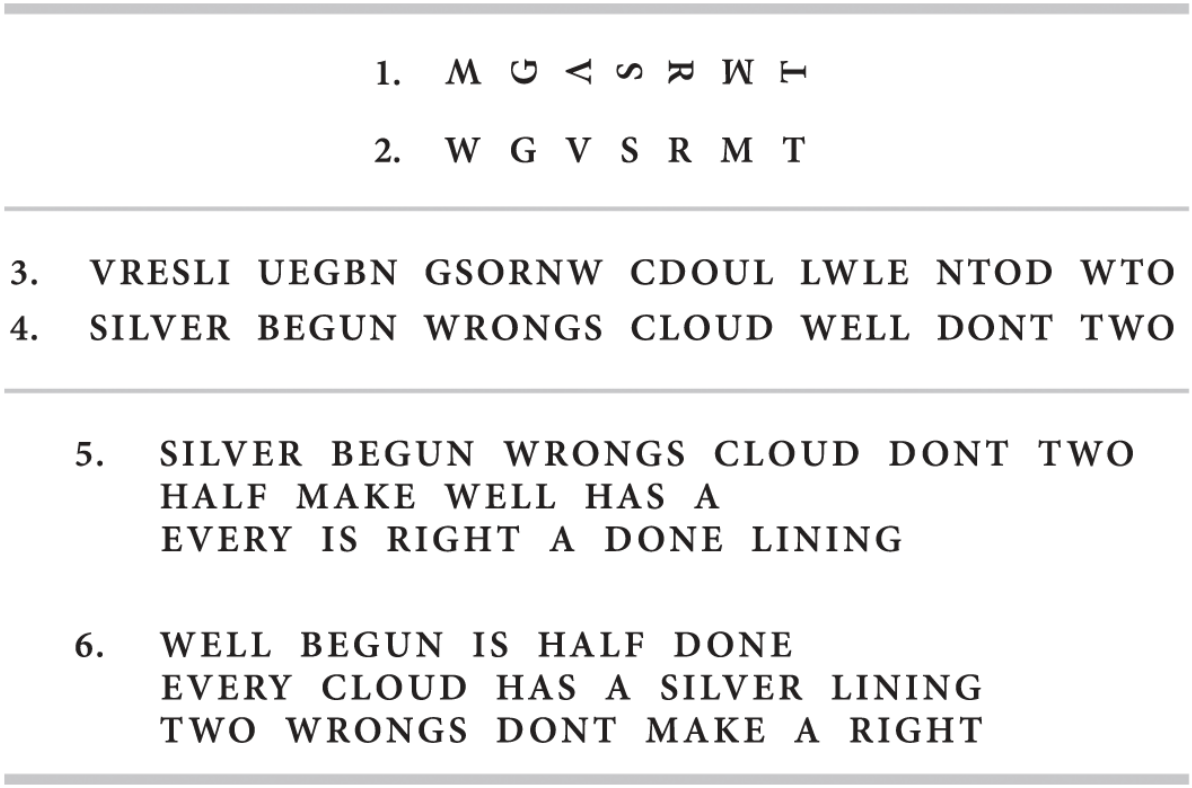


The horizontal axis represents time in seconds between presentation of consonants and recall request (no rehearsal allowed) and ranges from 0 to 18, in increments of 3. The vertical axis represents percentage who recalled consonants and ranges from 0

to 90 percent, in increments of 10. The curve begins from (0, 85) and passes through (6, 33) to end at (18, 5). A diagonal downward arrow corresponding to the curve reads, rapid decay with no rehearsal. All data are approximate.

Return to FIGURE 24.6 Short-term memory decay

Extended description for FIGURE 24.7 Chunking effects



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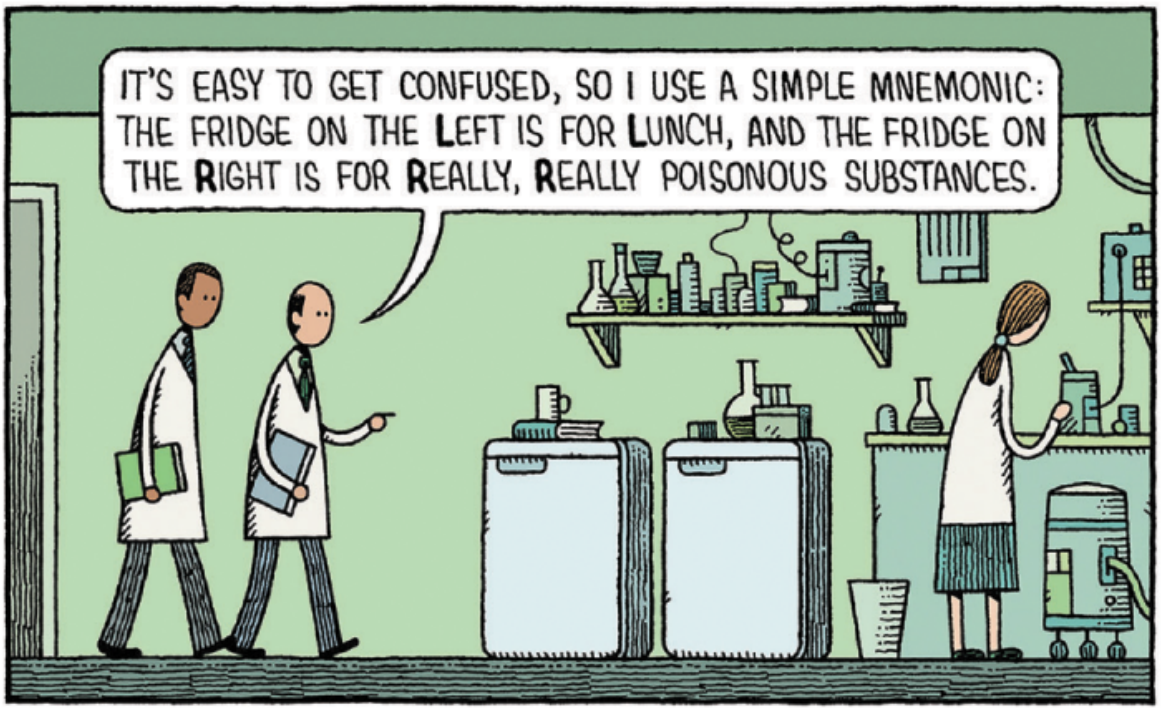
The illustration shows three sets of examples. The first set shows two rows wherein row 1 has inverted-rotated copies of the letters in row 2 (W G V S R M T). The second set shows two rows wherein row 3 has scrambled copies of the words in Row 4 as follows: 3. VRESLI UEGBN GSORNW CDOUL LWLE NTOD WTO. 4. Silver Begun Wrongs Cloud Well Dont Two. The third set shows three sentences in each 5 and 6 with point 5 having jumbled words of sentences in point 6 as follows: 5. Top: Silver begun wrongs cloud dont two. Middle: Half

make well has a. Bottom: Every is right a done lining. 6. Top: Well begun is half done. Middle: Every cloud has a silver lining. Bottom: Two wrongs dont make a right.

Return to FIGURE 24.7 Chunking effects

Extended description for Mnemonics

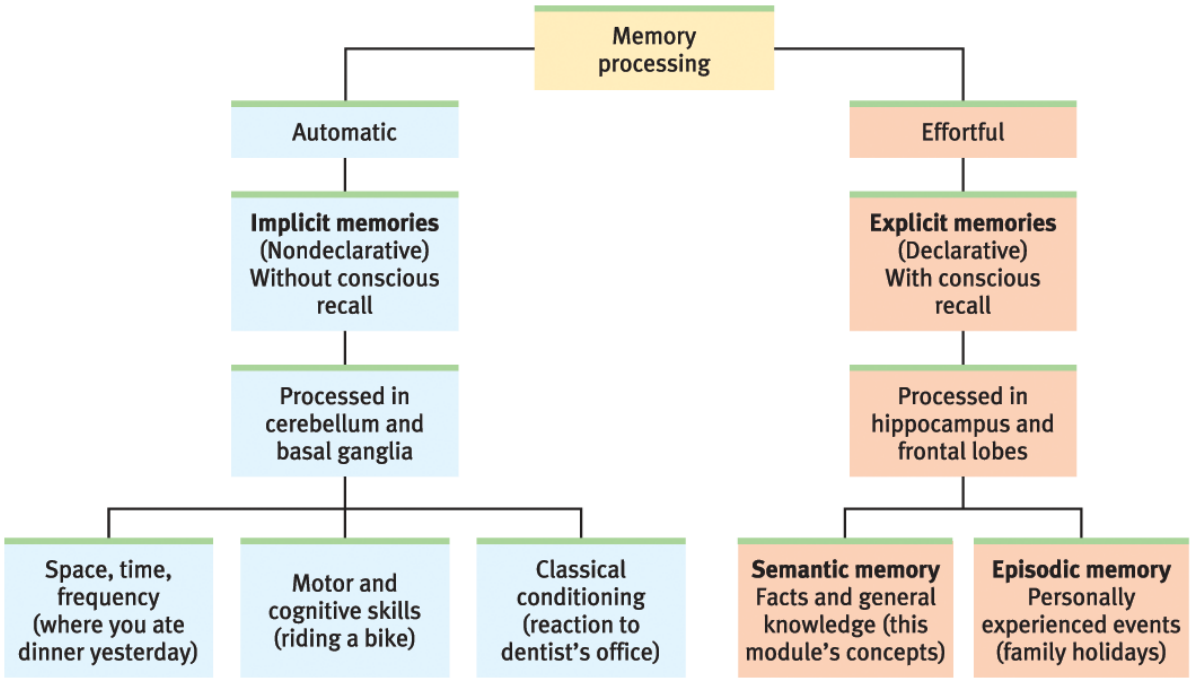


Tom Gauld/Heart Agency

The first two scientists are having a conversation as they look at the side-by-side refrigerators. One says to the other, It's easy to get confused, so I use a simple mnemonic: The fridge on the left is for lunch, and the fridge on the right is for really, really poisonous substances.

Return to Mnemonics

Extended description for FIGURE 25.4 Our two memory systems



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Memory processing can be **automatic** or **effortful**. Memories processed automatically lead to **Implicit memories** (non-declarative): without conscious recall. Memories are then processed in cerebellum and basal ganglia. Memories processed this way are divided into three groups: Space, time, frequency (where you ate dinner yesterday); Motor and cognitive skills (riding a bike); and Classical conditioning (your reaction to a dentist's office). Memories processed effortfully lead to **Explicit memories** (declarative): with conscious recall. Memories are then processed in hippocampus and

frontal lobes. Memories processed this way are divided into two groups: **Semantic memory**, facts and general knowledge (this module's concept); and **episodic memory**, personally experienced events (family holidays).

Return to FIGURE 25.4 Our two memory systems

Extended description for FIGURE 25.6 The serial position effect

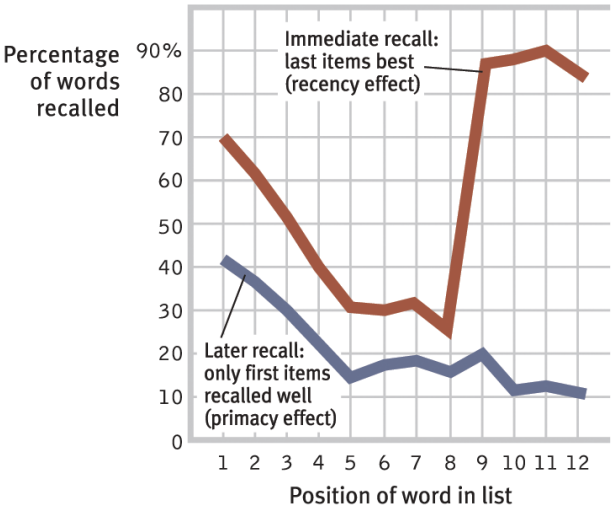



Photo: Kevork Djansezian/Getty Images
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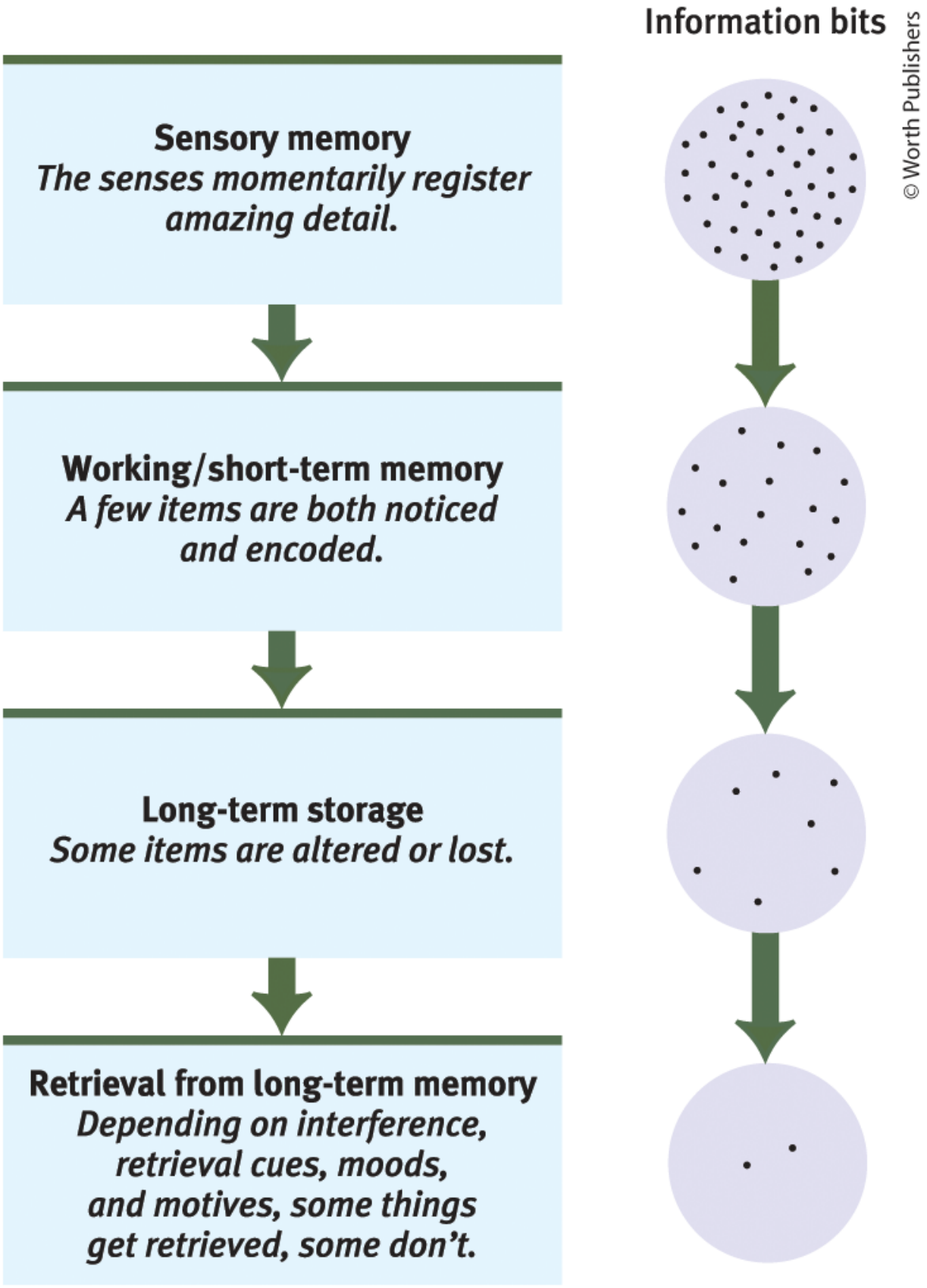
In the graph, the horizontal axis represents the position of word in list and ranges from 0 to 12, in increments of 1. The vertical axis represents the percentage of words recalled and ranges from 0 to 90 percent, in increments of 10. A red curve begins at (1, 70), drops down to (5, 30), further declines to (8, 25), increases to (9, 88), slightly increases to (11, 90), and then slightly declines to end at (12, 84). The curve is labeled, Immediate recall: last items best (recency effect). A blue curve begins at (1, 42), drops down to (5, 15), and passes through a few ups and downs to end at (12, 11). The curve is labeled, Later recall: only first items recalled well (primacy effect). All data are approximate.

Return to FIGURE 25.6 The serial position effect

Extended description for FIGURE 26.1

When do we forget?



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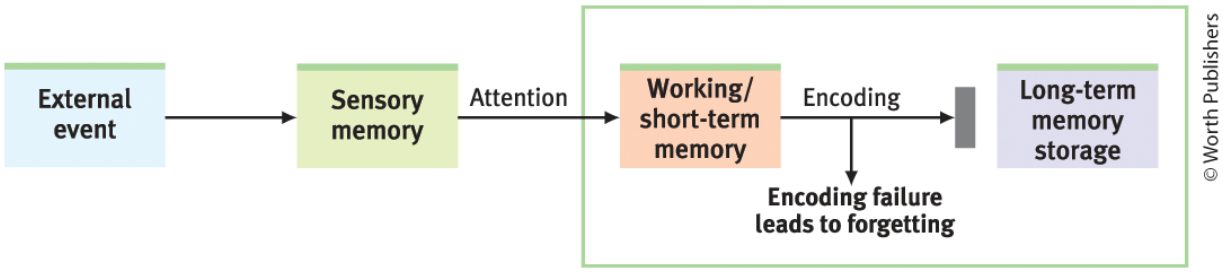
The flowchart begins with **Sensory Memory:** *The senses momentarily register amazing detail.* A downward arrow points to the next box reading, **Working slash short-term memory:** *A few items are both noticed and encoded.* Another downward arrow points to the next box reading, **Long-term storage:** *Some items are altered or lost.* A final downward arrow point to the last box reading, **Retrieval from long-term memory:** *Depending on interference, retrieval cues, moods, and motives, some things get retrieved, some don't.*

The series of illustrations for Information Bits represents information as tiny dots inside four circles, each connected by downward arrows. The number of dots corresponds to the type of memory described in the flowchart to the left. The number of dots decreases from the top to the bottom.

Return to FIGURE 26.1 When do we forget?

Extended description for FIGURE 26.2 Forgetting as encoding failure



External events are processed in the sensory memory. If they get attention, they proceed to the working slash short-term memory where encoding processes them into either long-term memory storage or encoding failure leads to forgetting. The flowchart from working slash short-term memory to long-term storage is enclosed in a box.

Return to FIGURE 26.2 Forgetting as encoding failure

Extended description for Memory trees

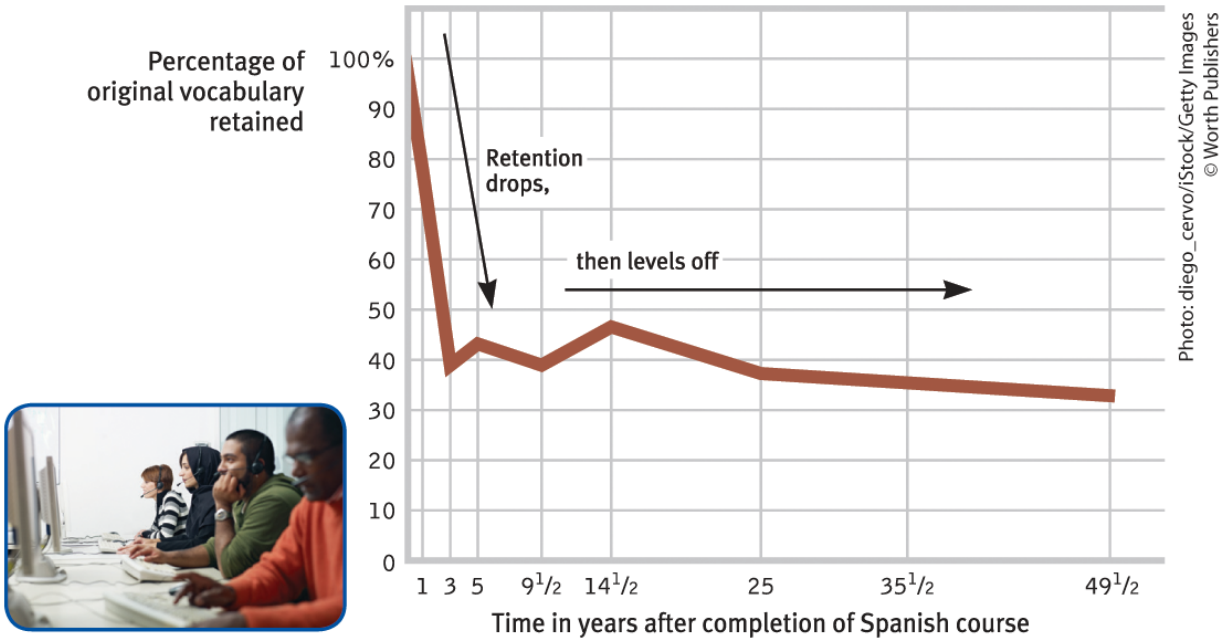


Lightspring/Shutterstock

From left to right, there is a lush, green tree full of leaves; a tree with yellow leaves and some gaps where the back of the head would be; and a tree with red leaves and has much larger gaps with more leaves gone where the back of the head would be. Below the image a text reads, Memories start to fade. As the words move from left to right they become more transparent; that is, they fade away.

Return to Memory trees

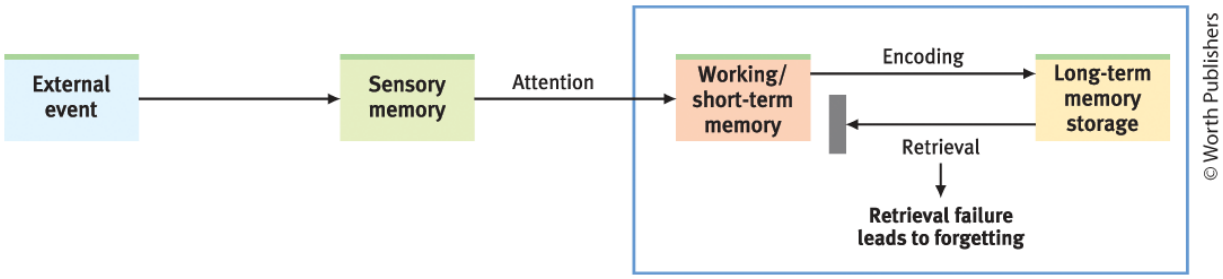
Extended description for FIGURE 26.3 The forgetting curve for Spanish learned in school



The horizontal axis represents time in years after completion of a Spanish course and ranges from 1 to 49 and one-half. The vertical axis represents percentage of original vocabulary retained and ranges from 0 to 100 percent, in increments of 10. The curve starts from (0, 100); passes through (1, 80), (3, 39), (5, 44), (9 and one-half, 40), (14 and one-half, 48), (25, 38), (35 and one-half, 36); and ends at (49 and one-half, 32). The first 5 years of the curve show a downward arrow labeled retention drops. The rest of the curve shows a rightward arrow labeled, then levels off. All data are approximate.

Return to FIGURE 26.3 The forgetting curve for Spanish learned in school

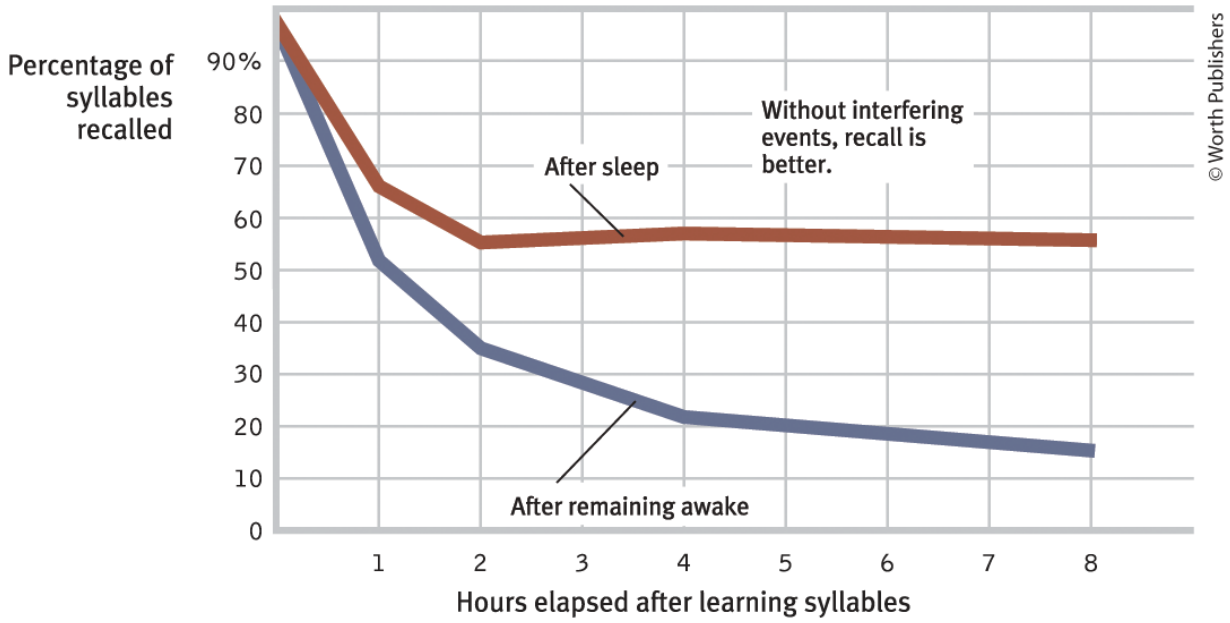
Extended description for FIGURE 26.4 Retrieval failure



External events are processed in the sensory memory. If they get attention, they proceed to the working slash short-term memory where encoding processes them into long-term memory storage. Memories can then be retrieved from the long-term memory storage and stored back in the work-short-term memory. Retrieval failure leads to forgetting. A box surrounds the flowchart from working slash short-term memory to long-term memory storage.

Return to FIGURE 26.4 Retrieval failure

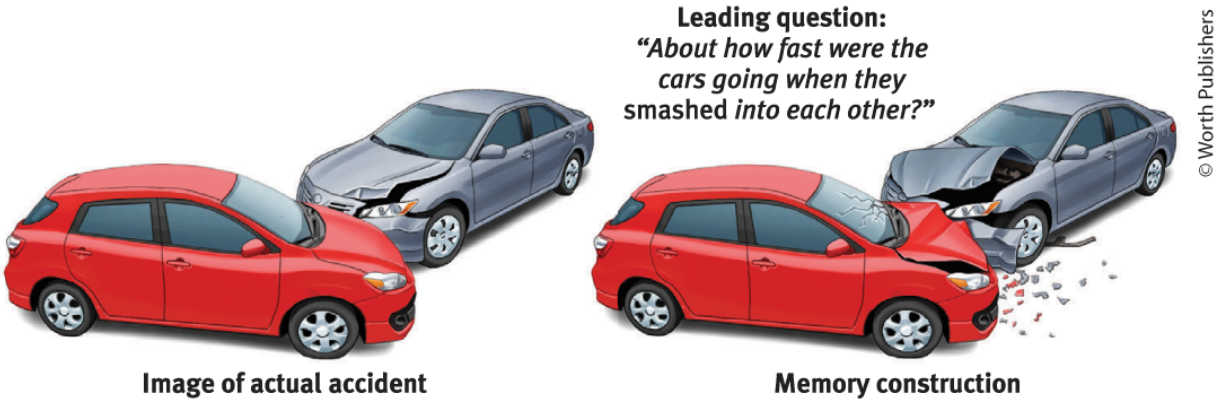
Extended description for FIGURE 26.5 Retroactive interference



The horizontal axis represents hours elapsed after learning syllables and ranges from 0 to 8, in increments of 1. The vertical axis represents percentage of syllables recalled and ranges from 0 to 90 percent, in increments of 10. The curve for after sleep starts from (0, 100); passes through (1, 68) and (2, 55); and ends at (8, 56). The curve for after remaining awake starts from (0, 95); passes through (1, 52), (2, 35), and (4, 21); and ends at (8, 16). Text on the graph reads, Without interfering events, recall is better. All data are approximate.

Return to FIGURE 26.5 Retroactive interference

Extended description for FIGURE 26.6 Memory construction



The first part of the illustration is labeled, Image of actual accident, and shows car 1 hitting the driver-side headlight of car 2. The visible damage to car 1 is minor, and there is no visible damage to car 2. A text above the second part of the illustration reads, Leading question: *"About how fast were the cars going when they smashed into each other?"* The second part is labeled, Memory construction, and shows car 1 hitting the driver-side headlight of car 2 and the damage to car 1 and car 2 is substantially greater than in the first image. Broken glass pieces are present at the accident site.

Return to FIGURE 26.6 Memory construction

Extended description for Discerning true

and false memories

Thinking Critically About:

Can Memories of Childhood Sexual Abuse Be Repressed and Then Recovered?

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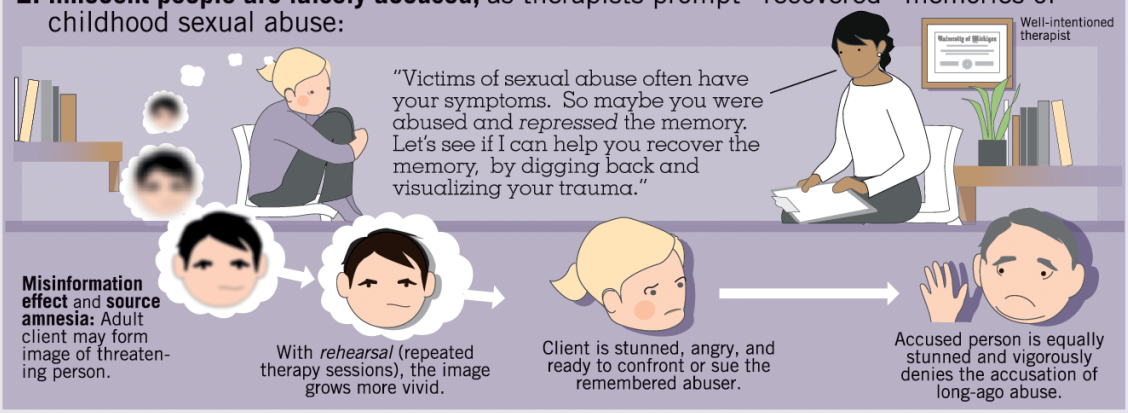
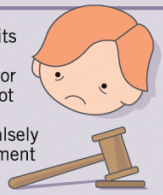
Two Possible Tragedies:

1. People doubt childhood sexual abuse survivors who tell their secret.

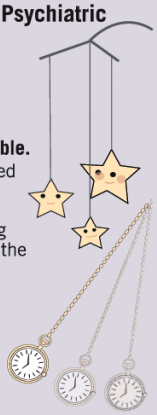
2. Innocent people are falsely accused, as therapists prompt "recovered" memories of childhood sexual abuse:



Professional organizations (including the American Medical, American Psychological, and American Psychiatric Associations) are working to find sensible common ground to resolve psychology's "memory war":[1]



- **Childhood sexual abuse happens** and can leave its victims at risk for problems ranging from sexual dysfunction to depression.[2] But there is no "survivor syndrome"—no group of symptoms that lets us spot victims of sexual abuse.[3]
- **Injustice happens.** Innocent people have been falsely convicted. And guilty people have avoided punishment by casting doubt on their truth-telling accusers.
- **Forgetting happens.** Children abused when very young may not have understood the meaning of their experience or remember it. Forgetting long-ago good and bad events is an ordinary part of everyday life.
- **Recovered memories are common.** Cued by a remark or an experience, we may recover pleasant or unpleasant memories of long-forgotten events. But does the unconscious mind forcibly repress painful experiences, and can these experiences be recovered by therapist-aided techniques?[4] Memories that surface naturally are more likely to be true.[5]
- **Memories of events before age 4 are unreliable.** Infantile amnesia results from not yet developed brain pathways. Most psychologists therefore doubt "recovered" memories of abuse during infancy.[6] The older a child was when suffering sexual abuse, and the more severe the abuse, the more likely it is to be remembered.[7]
- **Memories "recovered" under hypnosis are especially unreliable.**
- **Memories, whether real or false, can be emotionally upsetting.** What was born of mere suggestion can become, like an actual event, a stinging memory that drives bodily stress.[8]



Psychologists question whether *repression* ever occurs.
(See the Psychological Disorders modules for more on this concept, which is central to Freud's theory.)

Traumatic experiences (witnessing a loved one's murder, being terrorized by a hijacker or rapist, losing everything in a natural disaster) → **TYPICALLY LEAD TO** → **vivid, persistent, haunting memories**[9]

The Royal College of Psychiatrists Working Group on Reported Recovered Memories of Child Sexual Abuse advised that "when memories are 'recovered' after long periods of amnesia, particularly when extraordinary means were used to secure the recovery of memory, there is a high probability that the memories are false." [10]

1. Patihis et al., 2014. 2. Freyd et al., 2007. 3. Kendall-Tackett et al., 1993. 4. McNally & Geraerts, 2009. 5. Geraerts et al., 2007. 6. Gore-Felton et al., 2000; Knapp & VandeCreek, 2000. 7. Goodman et al., 2003. 8. McNally, 2003, 2007. 9. Porter & Peace, 2007; Goldfarb et al., 2019. 10. Brandon et al., 1998.

Introductory text reads, Why have reports of repressed and recovered memories been so hotly debated?

The infographic is divided into three panels as follows:

The first panel is headed, **Two Possible Tragedies. 1. People doubt childhood sexual abuse survivors who tell** their **secret. 2. Innocent people are falsely accused**, as therapists prompt "recovered" memories of childhood sexual abuse:

An illustration shows a client sitting on a chair with her knees drawn up under her chin. A well-intentioned therapist sits opposite to her with a clipboard on her lap and looks at the client. The therapist says, "Victims of sexual abuse often have your symptoms. So maybe you were abused and *repressed* the memory. Let's see if I can help you recover the memory, by digging back and visualizing your trauma." A series of thought bubbles arise from the client's head. The first thought bubble shows a blurred image of a man. Corresponding text reads, **Misinformation effect** and **source amnesia**: Adult client may form image of threatening person. Next thought bubble shows a clearer image of the man. Corresponding text reads, With *rehearsal* (repeated therapy sessions), the image grows more vivid. An arrow points to an image of a dismayed client's face. Corresponding text reads, Client is stunned, angry, and ready to confront or sue the remembered abuser. Another arrow points to a clear image of a man looking very sad, with his hand up.

Corresponding text reads, Accused person is equally stunned and vigorously denies the accusation of long-ago abuse.

The second panel shows the text: **Professional organizations (including the** American **Medical,** American **Psychological, and** American **Psychiatric Associations) are working to find sensible common ground to resolve psychology's "memory war:"** (Patihis et al., 2014 a). A bulleted list below reads as follows:

Bullet point 1: **Childhood sexual abuse happens** and can leave its victims at risk for problems ranging from sexual dysfunction to depression (Freyd et al., 2007). But there is no "survivor syndrome" — no group of symptoms that lets us spot victims of sexual abuse (Kendall-Tackett et al., 19 93).

Bullet point 2: **Injustice happens.** Innocent people have been falsely convicted. And guilty people have avoided punishment by casting doubt on their truth-telling accusers.

Bullet point 3: **Forgetting happens.** Children abused when very young may not have understood the meaning of their experience or remember it. Forgetting long-ago good and bad events is an ordinary part of everyday life.

Bullet point 4: **Recovered memories are common.** Cued by a remark or an experience, we may recover pleasant or unpleasant memories of long-forgotten events. But does the unconscious mind

forcibly repress painful experiences, and can these experiences be recovered by therapist-aided techniques? (McNally and Geraerts, 2009). Memories that surface naturally are more likely to be true (Geraerts et al., 2007).

Bullet point 5: **Memories of events before age 4 are unreliable.** Infantile amnesia results from not yet developed brain pathways. Most psychologists therefore doubt "recovered" memories of abuse during infancy (Gore-Felton et al., 2000; Knapp and VandeCreek, 2000). The older a child was when suffering sexual abuse, and the more severe the abuse, the more likely it is to be remembered (Goodman et al., 2003).

Bullet point 6: **Memories "recovered" under hypnosis are especially unreliable.**

Bullet point 7: **Memories, whether real or false, can be emotionally upsetting.** What was born of mere suggestion can become, like an actual event, a stinging memory that drives bodily stress (McNally, 2003, 2007).

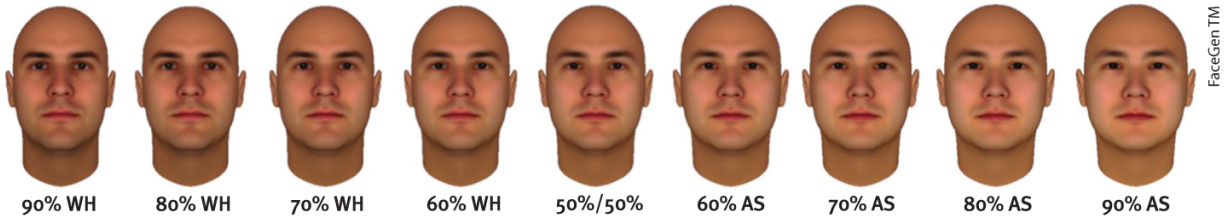
The third panel is divided into three sections. Text in the first section reads, **Psychologists question whether *repression* ever occurs.** (See the Psychological Disorders modules for more on this more on this concept, which is central to Freud's theory.)

Text in the second section reads, **Traumatic experiences** (witnessing a loved one's murder, being terrorized by a hijacker or rapist, losing everything in a natural disaster) typically lead to vivid, persistent, haunting memories. (Porter and Peace, 2007; Goldfarb et al., 2019).

Text in the third section reads, **The Royal College of Psychiatrists Working Group on Reported Recovered Memories of Child Sexual Abuse** advised that “when memories are 'recovered' after long periods of amnesia, particularly when extraordinary means were used to secure the recovery of memory, there is a high probability that the memories are false” (Brandon et al, 19 98).

Return to Discerning true and false memories

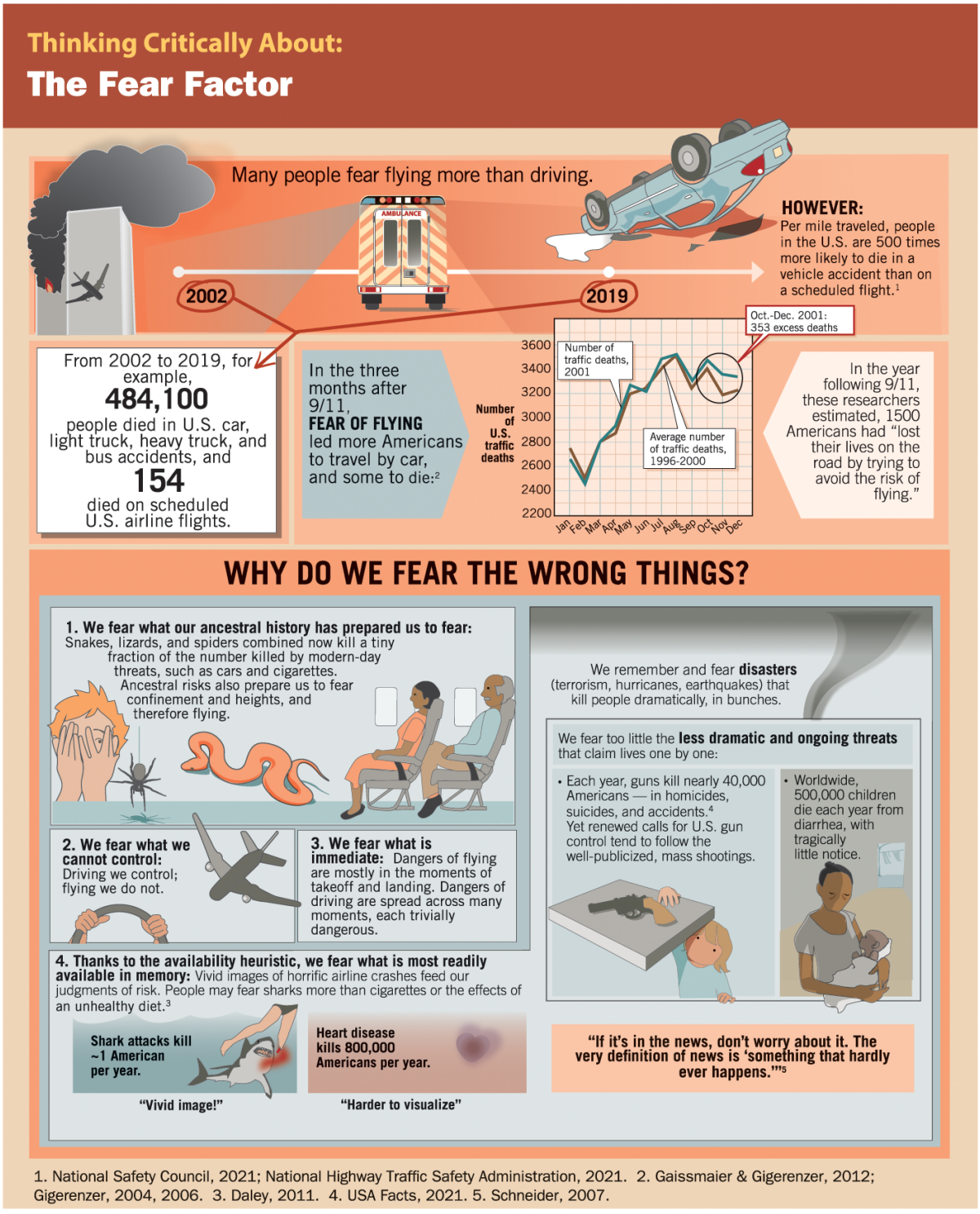
Extended description for FIGURE 27.1 Categorizing faces influences recollection



From left to right, the labels read as follows: 90 percent White, 80 percent White, 70 percent White, 60 percent White, 50 percent slash 50 percent, 60 percent Asian, 70 percent Asian, 80 percent Asian, and 90 percent Asian.

Return to FIGURE 27.1 Categorizing faces influences recollection

Extended description for Fear factor



© Worth Publishers

The infographic is divided into three panels as follows:

The top panel shows the text, Many people fear flying more than driving. **HOWEVER:** Per mile traveled, people in the U.S. are 500 times more likely to die in a vehicle accident than on a scheduled flight. (National Safety Council, 2021; National Highway Traffic Safety Administration, 2021). An illustration shows a timeline starting with the year 2002 at the far left and the year 2019 three-quarters of the way across. Three illustrations accompany the timeline: an airplane flying toward one of the World Trade Center buildings toward the far left; an ambulance with an illuminated light bar toward the middle; and an upside-down car with fluids leaking out onto the ground toward the far right.

Arrows lead from circled 2002 and 2019 on the timeline to the middle panel where the text on the left reads, From 2002 to 2019, for example, **484,100** people died in U.S. car, light truck, heavy truck, and bus accidents, and **154** died on scheduled U.S. airline flights. In the same panel, toward the right, a graph shows the number of U.S. traffic deaths. Text on the left of the graph reads, In the three months after 9 slash 11, **FEAR OF FLYING** led more Americans to travel by car, and some to die: (Gaissmater and Gigerenzer, 2012; Gigerenzer, 2004, 2006). The graph's vertical axis is labeled Number of U.S. traffic deaths and ranges from 2200 to 3600, in increments of 200. The horizontal axis lists each month of the year starting with January and ending in December. A curve for Number of traffic deaths, 2001, starts from (January, 2650), increases in a jagged pattern, and ends at (December, 3350). A curve for Average number of traffic deaths, 19 96 to 2000, starts from (January, 2750), follows a

similar jagged pattern as the previous curve, and ends at (December, 3200). A circle enclosing both curves from October to December is labeled, October to December 2001: 353 excess deaths. All data are approximate. A text on the right of the graph reads, In the year following 9 slash 11, these researchers estimated, 1500 Americans had "lost their lives on the road by trying to avoid the risk of flying."

The bottom panel is titled, **WHY DO WE FEAR THE WRONG THINGS?** The left half shows four points as follows:

1. We fear what our ancestral history has prepared us to fear: Snakes, lizards, and spiders combined now kill a tiny fraction of the number killed by modern-day threats, such as cars and cigarettes. Ancestral risks also prepare us to fear confinement and heights, and therefore flying. Three illustrations show a boy peering through his fingers at a spider; a snake; and two people sitting on an airplane.

2. We fear what we cannot control: Driving we control; flying we do not. Two illustrations show hands on a car steering wheel and an airplane.

3. We fear what is immediate: Dangers of flying are mostly in the moments of takeoff and landing. Dangers of driving are spread across many moments, each trivially dangerous.

4. Thanks to the availability heuristic, we fear what is most readily available in memory: Vivid images of horrific airline crashes feed

our judgments of risk. People may fear sharks more than cigarettes or the effects of an unhealthy diet. (Daley, 2011). An illustration titled, **"Vivid Image!"** shows a shark biting the leg of a swimmer, with a visible cloud of red blood. Accompanying text reads, Shark attacks kill about one American per year. Another illustration titled, **"Harder to visualize,"** shows a heart with a shadow around it. Accompanying text reads, Heart disease kills 800,000 Americans per year.

The right half of the bottom panel shows the text, We remember and fear **disasters** (terrorism, hurricanes, earthquakes) that kill people dramatically, in bunches. A text in a box reads, We fear too little the **less dramatic and ongoing threats** that claim lives one by one: Bullet point 1: Each year, guns kill nearly 40,000 Americans — in homicides, suicides, and accidents. (U S A Facts, 2021). Yet renewed calls for U.S. gun control tend to follow the well-publicized, mass shootings. An illustration shows a child reaching for a gun on a shelf. Bullet point 2: Worldwide, 500,000 children die each year from diarrhea, with tragically little notice. An illustration shows a woman holding a baby.

A text at the bottom of the right half reads, "If it’s in the news, don’t worry about it. The very definition of news is ’something that hardly ever happens.’" (Schneider, 2007).

Return to Fear factor

Extended description for Imaginative thinking



"For the love of God, is there a doctor in the house?"



Left: Christopher Weyant/Cartoon Stock; right: © Dave Coverly/ speedbump.com

The cartoon on the left shows a ventriloquist on a stage with a spotlight shining on him. The human is passed out in the chair and the dummy on his leg is looking alarmed. The dummy says, "For the love of God, is there a doctor in the house?"

The cartoon on the right shows two chefs wearing chef hats that are standing upright and talking to a chef wearing a chef hat that sags down his back. One chef with a tall hat says, "Well, I told you to add yeast to your shampoo."

Return to Imaginative thinking

Extended description for FIGURE 28.1 Our ability to learn a new language diminishes with age



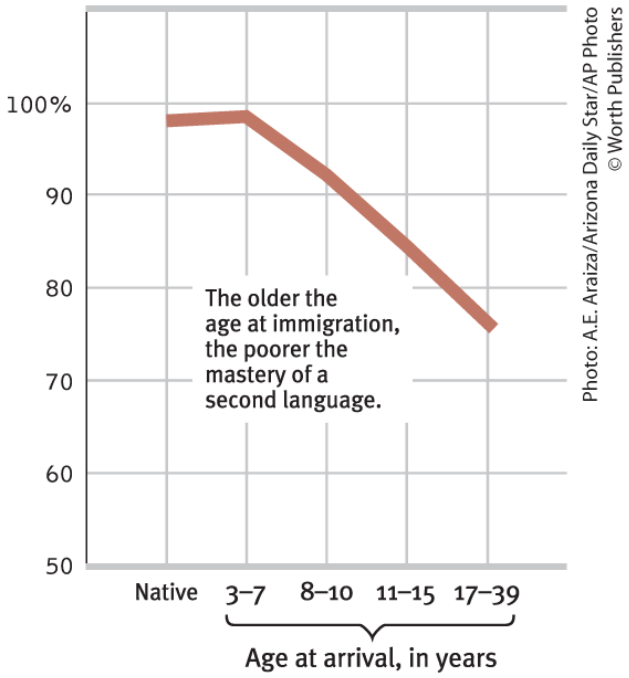


Photo: A.E. Araiza/Arizona Daily Star/AP Photo
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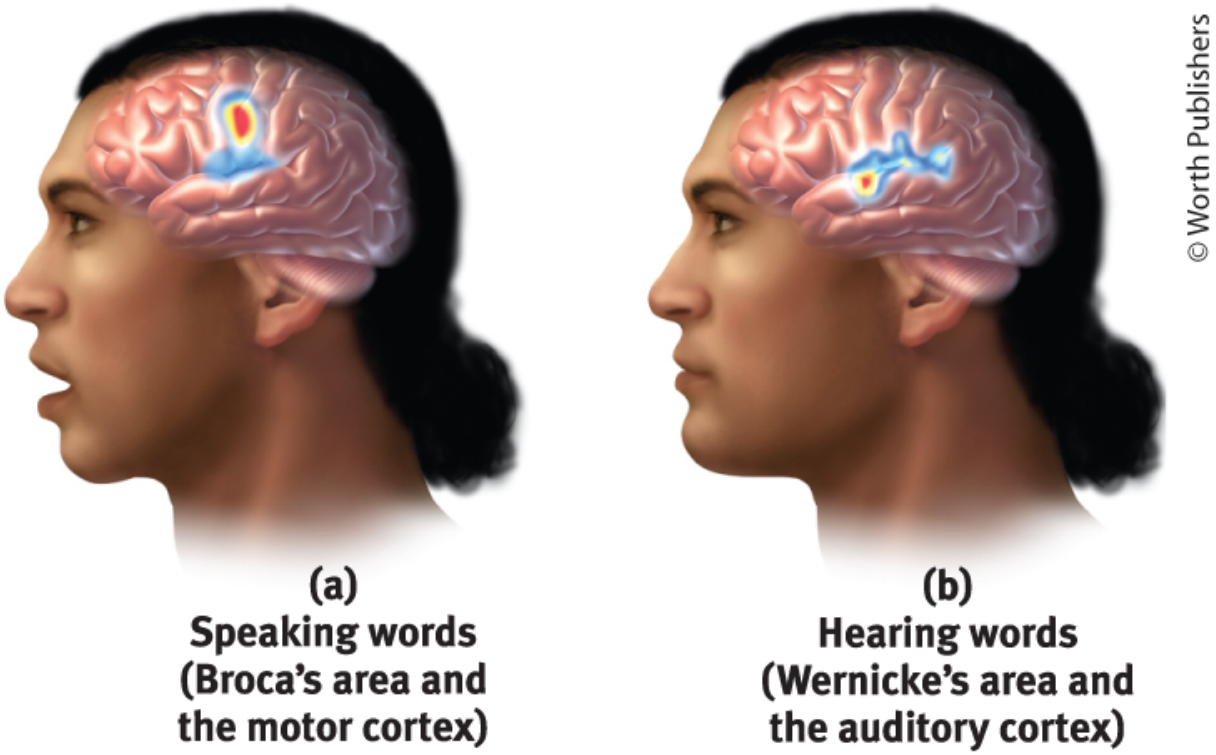
The graph plots age at arrival, in years, on the horizontal axis with markings that read native, 3 to 7 years, 8 to 10 years, 11 to 15 years, and 17 to 39 years. The vertical axis represents percentage correct on grammar test and ranges from 50 to 100 percent, in increments of 10. The curve starts from (native, 99 percent); passes through (3 to 7 years, 99.5 percent), (8 to 10 years, 92 percent), and (11 to 15 years, 84 percent); and ends at (17 to 39 years, 76 percent). All data are

approximate. Text on the graph reads, The older the age at immigration, the poorer the mastery of a second language.

Return to FIGURE 28.1 Our ability to learn a new language diminishes with age

Extended description for FIGURE 28.2 Brain activity when speaking and hearing words



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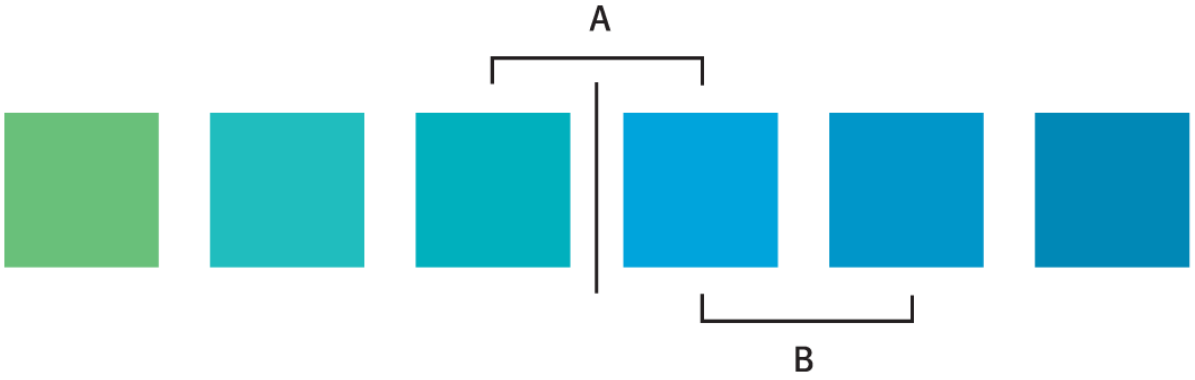
In illustration (a), Broca's area and the motor cortex are highlighted in the frontal lobe as they are the areas in the brain responsible for speaking words. In illustration (b), the auditory cortex and Wernicke's area are highlighted in the temporal lobe as these are the areas in the brain responsible for hearing words.

Return to FIGURE 28.2 Brain activity when speaking and hearing words

Extended description for FIGURE 28.3 Language and perception

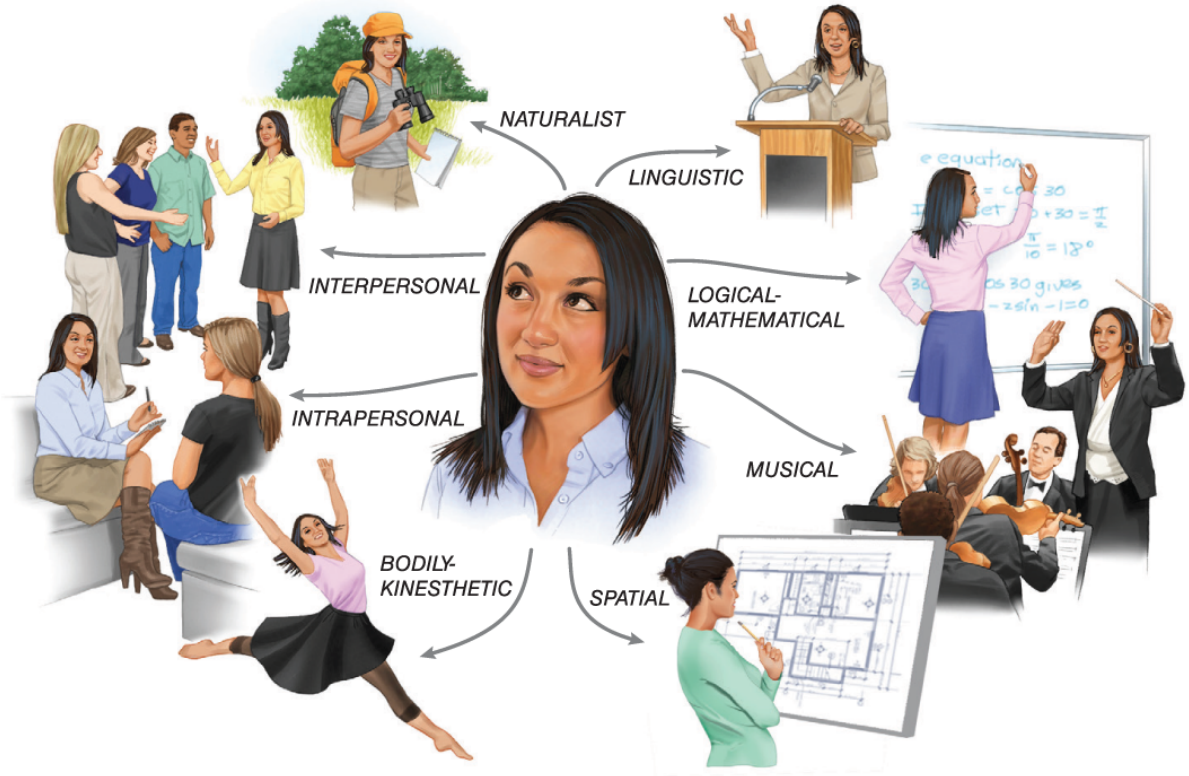


© Worth Publishers

The two central squares, one from each group, are labeled A, and the first and second blue shaded squares are labeled B. The first blue square is labeled both A and B.

Return to FIGURE 28.3 Language and perception

Extended description for FIGURE 29.1 Gardner's eight intelligences



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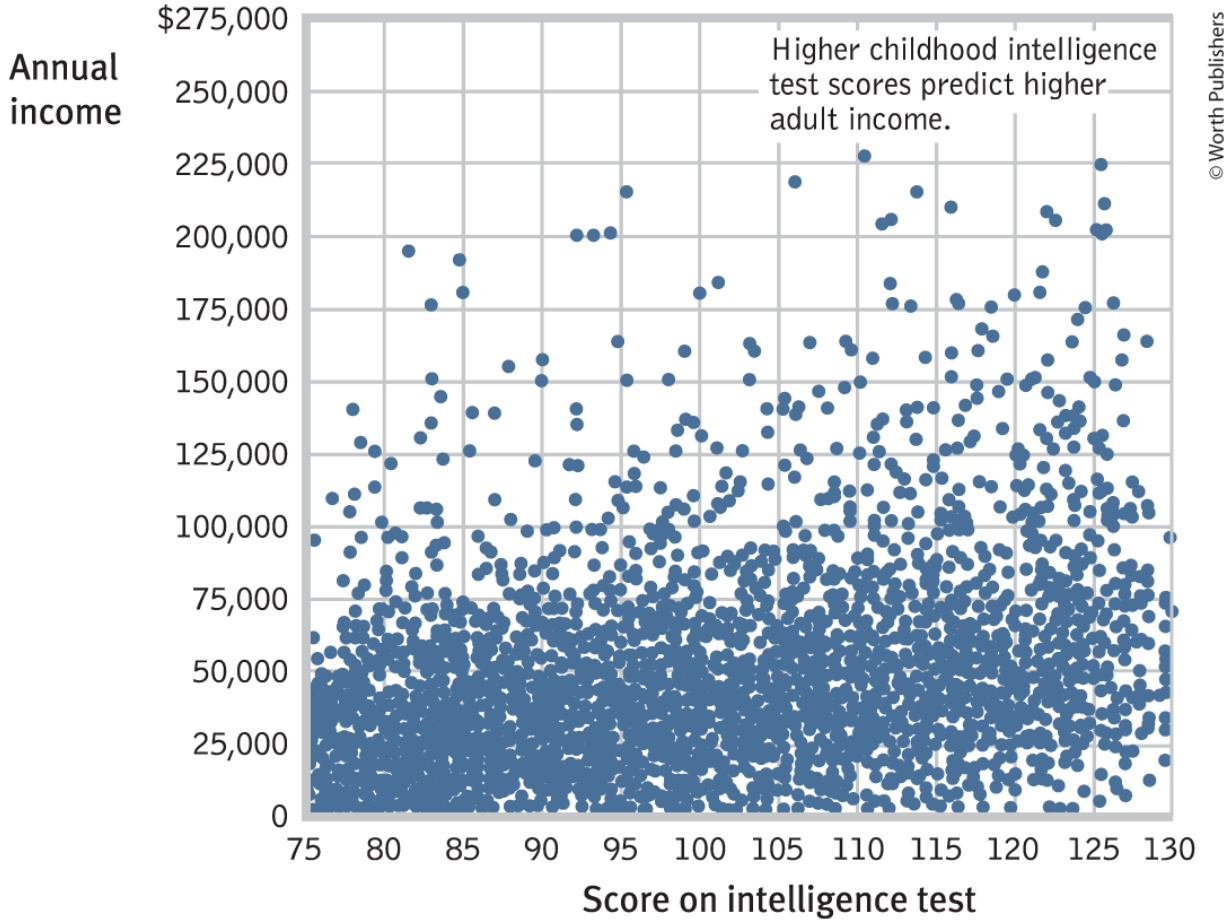
Eight arrows depicting a different kind of intelligence, point away to an image, as follows. **Linguistic intelligence:** a woman speaking at a podium; **Logical-mathematical:** a woman writing on a whiteboard; **Musical:** a woman conducting an orchestra; **Spatial:** a woman painting on a canvas; **Bodily-kinesthetic:** a woman executing a ballet leap; **Intrapersonal:** a woman conducting therapy with a client; **Interpersonal:** a woman talking to a group of three friends;

and **Naturalist:** a woman on a hike wearing a backpack and holding binoculars.

Return to FIGURE 29.1 Gardner's eight intelligences

Extended description for FIGURE 29.2 Smart and rich?

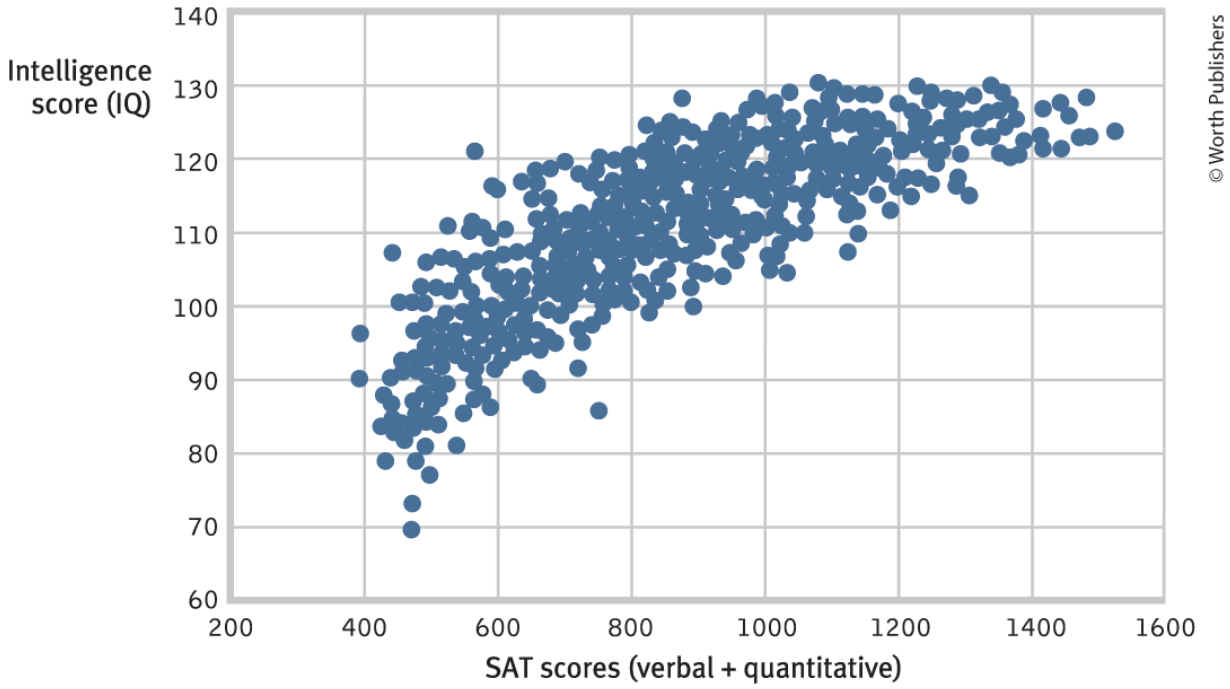


The horizontal axis represents score on intelligence test and ranges from 75 to 130, in increments of 5. The vertical axis represents annual income and ranges from 0 to 275,000 dollars, in increments of 25,000. The data points are densely distributed between points (75, 50,000) and (125, 100,000). The data points are sparsely distributed between points (85, 200,000) and (125, 225,000). All data

are approximate. Text above the scatterplot reads, Higher childhood intelligence test scores predict higher adult income.

Return to FIGURE 29.2 Smart and rich?

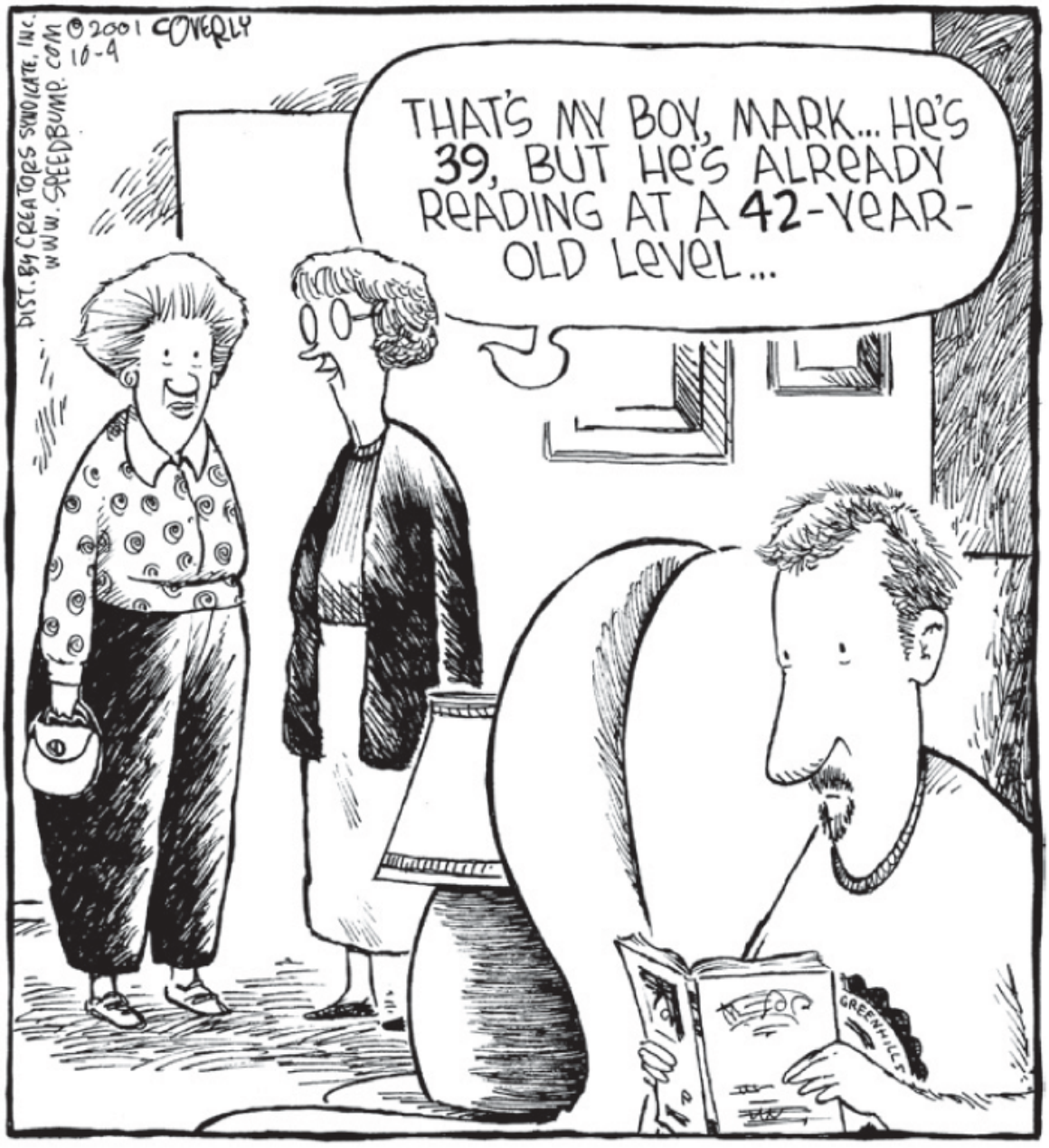
Extended description for FIGURE 30.1 Close cousins: Aptitude and intelligence test scores



The horizontal axis represents S A T scores (verbal plus quantitative) and ranges from 200 to 1600, in increments of 200. The vertical axis represents intelligence score (I Q) and ranges from 60 to 140, in increments of 10. The path traced by the data points resembles an increasing curve. The plot starts at (400, 70) and ends at (1550, 130). The data points are densely distributed between (450, 81) and (1350, 130). All data are approximate.

Return to FIGURE 30.1 Close cousins: Aptitude and intelligence test scores

Extended description for Innate intelligence

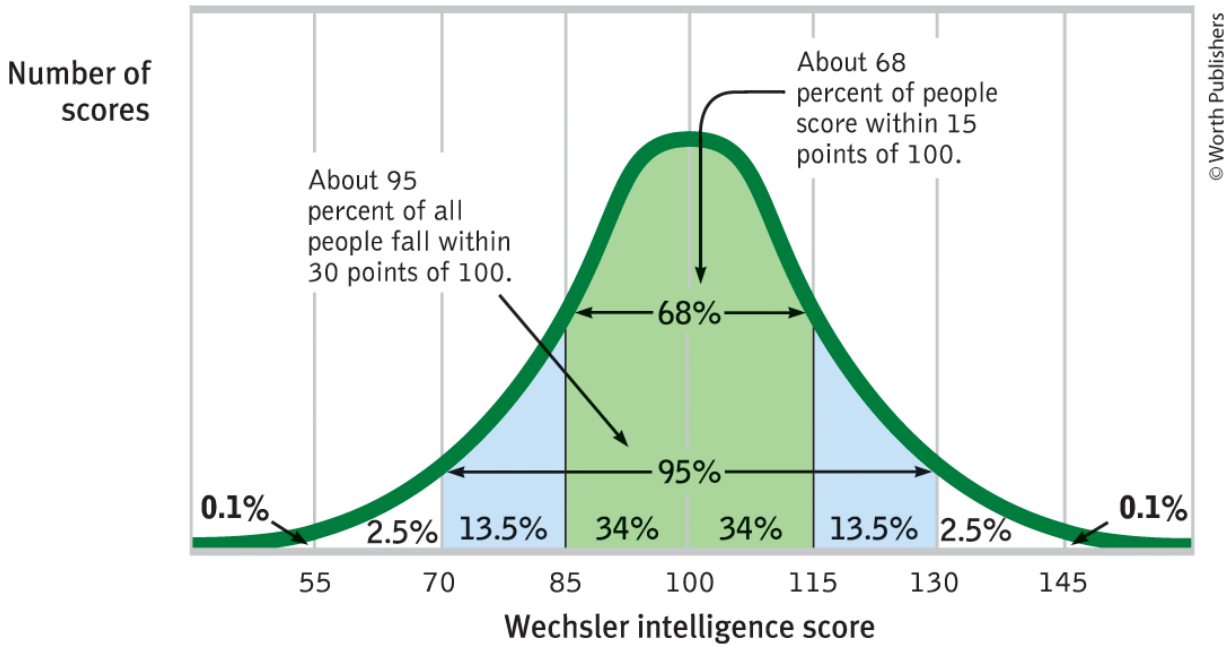


© Dave Coverly/speedbump.com

One of the woman says, “That’s my boy, Mark. He’s 39, but he’s already reading at a 42-year-old level.” Text below the cartoon reads, Mrs. Randolph takes mother’s pride too far.

Return to Innate intelligence

Extended description for FIGURE 30.2 The normal curve

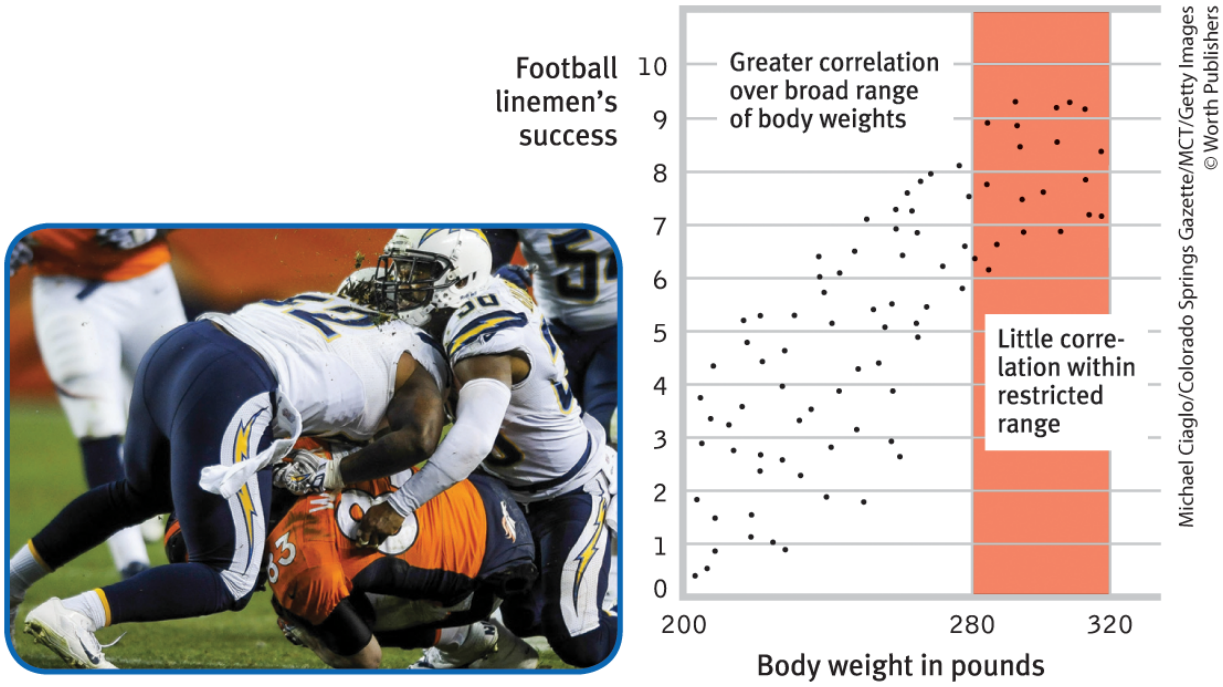


The graph shows a bell-shaped curve with different areas indicated with colors and percentages. The horizontal axis depicts the Wechsler intelligence score and ranges from 40 to 160, in increments of 15. The vertical axis represents the number of scores. The percentages of people who fall within different score ranges are presented as follows: Below 55, 0.1 percent; 55 to 70, 2.5 percent; 70 to 85, 13.5 percent; 85 to 100, 34 percent; 100 to 115, 34 percent; 115 to 130, 13.5 percent; 130 to 145, 2.5 percent; and Above 145, 0.1 percent. Text pointing to the area under the curve from 85 to 115 (68 percent) reads, About 68 percent of people score within 15 points of

100. A text pointing to the area under the curve from 70 to 130 (95 percent) reads, About 95 percent of all people fall within 30 points of 100.

Return to FIGURE 30.2 The normal curve

Extended description for FIGURE 30.3 Diminishing predictive power



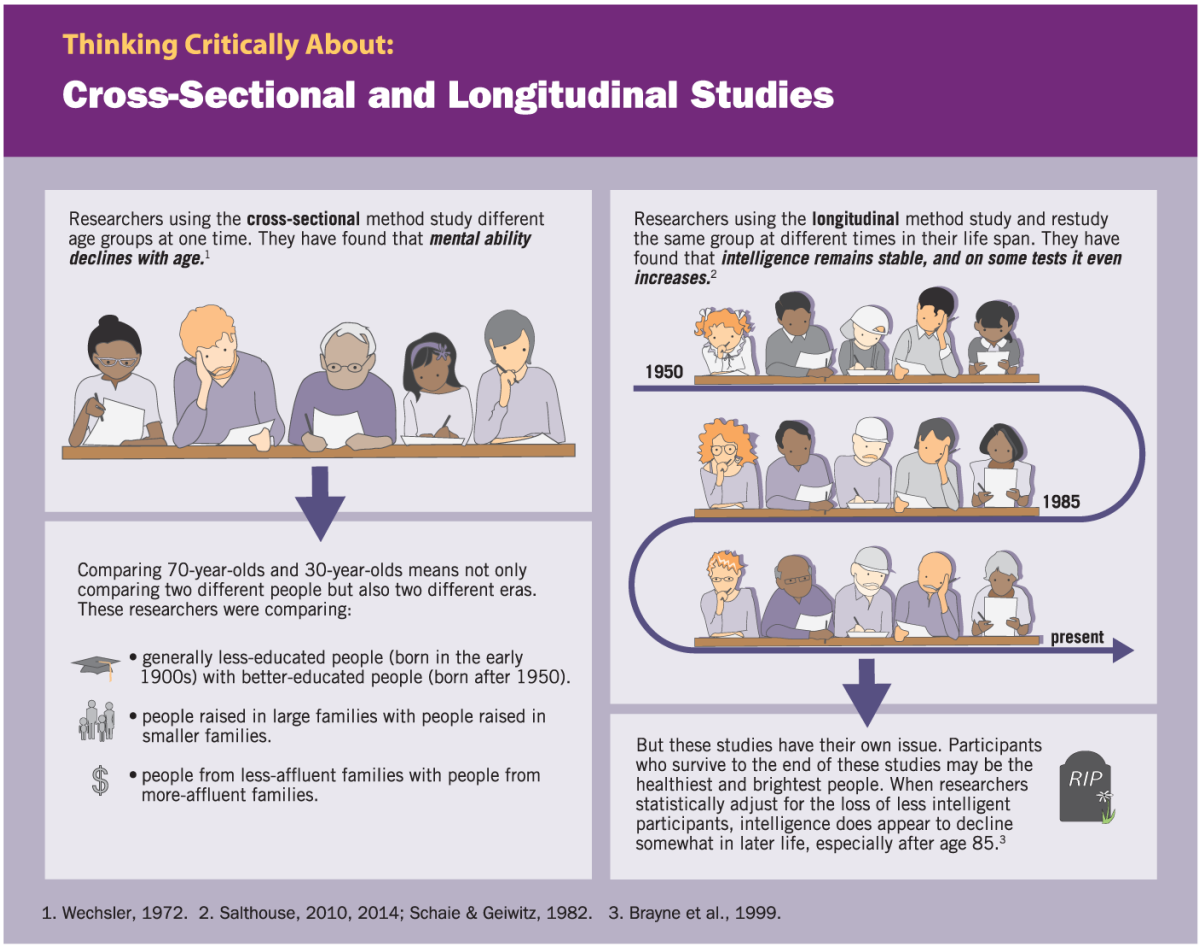
The photo shows an American football player duck under the tackle of two other American football players.

The scatterplot shows football linemen's success against body weight. The horizontal axis represents body weight in pounds and ranges from 200 to 320. A vertical region from 280 to 320 is shaded. The vertical axis represents football linemen's success and ranges from 0 to 10, in increments of 1. The data points are distributed randomly from (200, 0) and (200, 4) to (320, 7) and (320, 9). The

region between 200 and 280 is labeled, Greater correlation over broad range of body weights; and the region between 280 and 320 is labeled, Little correlation within restricted range. All data are approximate.

Return to FIGURE 30.3 Diminishing predictive power

Extended description for Cross-sectional and longitudinal studies



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The infographic is divided into two halves with both halves showing two sections as follows.

Text in the top section of the left half reads, Researchers using the **cross-sectional** method study different age groups at one time. They

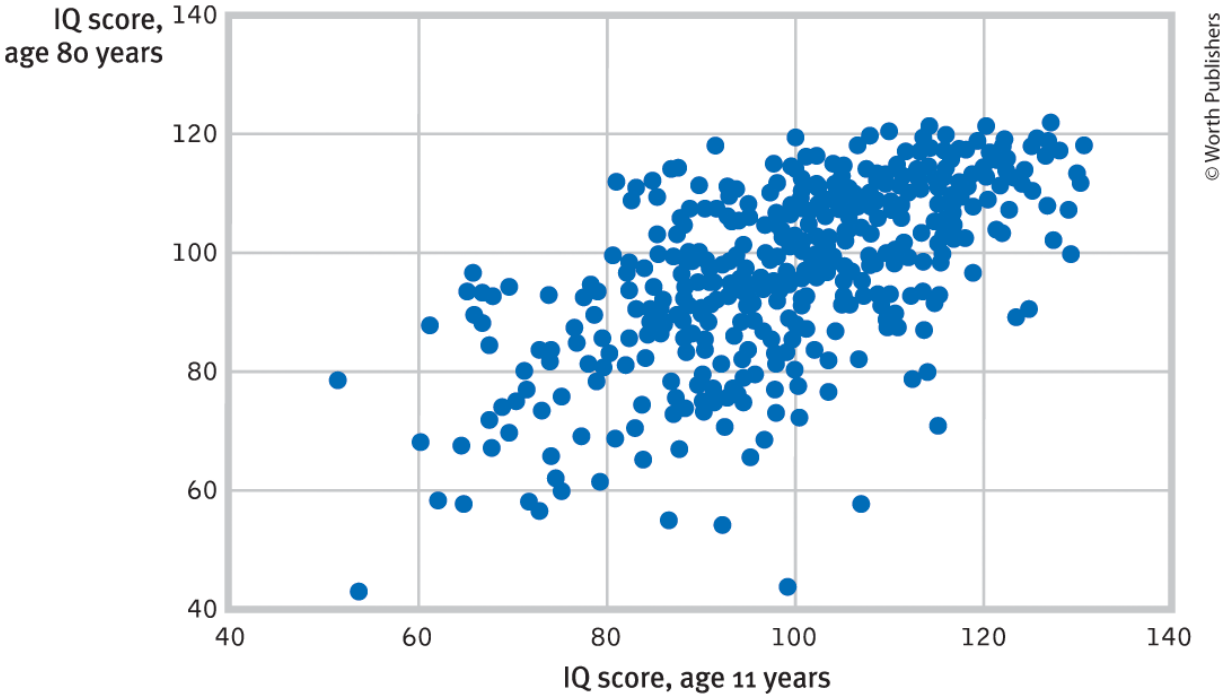
have found that ***mental ability declines with age*** (Wechsler, 19 72). An illustration shows five people of different age groups taking up a written test. An arrow points down to the lower section. Text reads, Comparing 70-year-olds and 30-year-olds means not only comparing two different people but also two different eras. These researchers were comparing: Bullet point 1: Generally less-educated people (born in the early 1900s) with better-educated people (born after 19 50). An illustration shows a gradation cap. Bullet point 2: People raised in large families with people raised in smaller families. An illustration shows four family members, two adults and two children. Bullet point 3: People from less-affluent families with people from more-affluent families. An illustration shows a dollar sign.

Text in the top section of the right half reads, Researchers using the **longitudinal** method study and restudy the same group at different times in their life span. They have found that ***intelligence remains stable, and on some tests it even increases*** (Salthouse, 2010, 2014; Schaie and Geiwitz, 19 82). An illustration shows a timeline with people of different age groups taking a written test in 19 50, then 19 85, and then at present. An arrow points down to the lower section. A text reads, But these studies have their own issue. Participants who survive to the end of these studies may be the healthiest and brightest people. When researchers statistically adjust for the loss of less intelligent participants, intelligence does appear to decline somewhat in later life, especially after age 85 (Brayne et al, 19 99).

An illustration shows a tombstone with a flower. Text on the tombstone reads, R I P.

Return to Cross-sectional and longitudinal studies

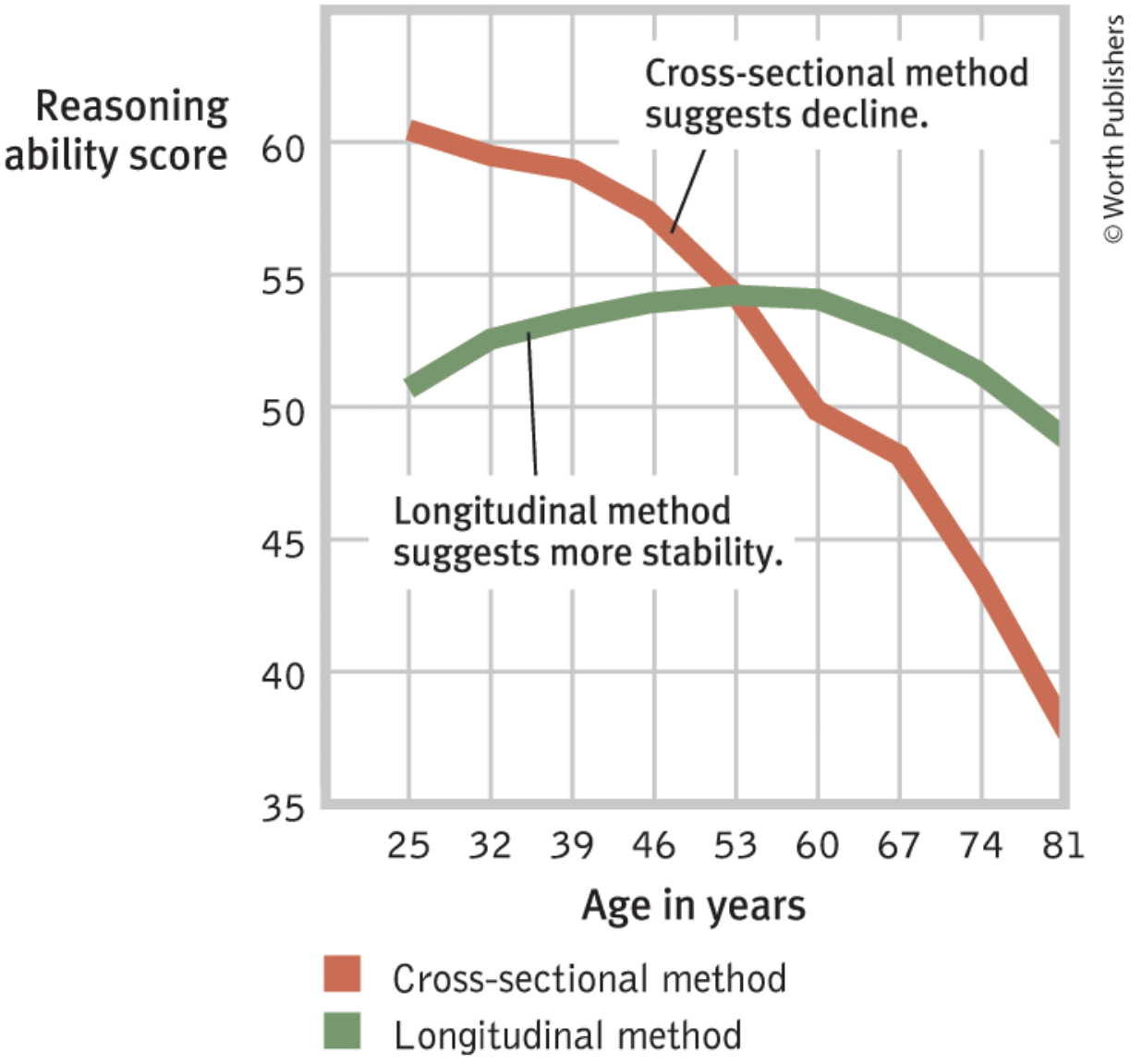
Extended description for FIGURE 30.4 Intelligence endures



The horizontal axis represents I Q score, age 11 years, and ranges from 40 to 140, in increments of 20. The vertical axis represents I Q score, age 80 years, and ranges from 40 to 140, in increments of 20. The data points are present between 60 and 130 on the horizontal axis and 55 and 121 on the vertical axis with the majority of data points lying between 90 and 120 on the horizontal axis and 70 and 120 on the vertical axis. All data are approximate.

Return to FIGURE 30.4 Intelligence endures

Extended description for FIGURE 30.5 Cross-sectional versus longitudinal testing of intelligence at various ages

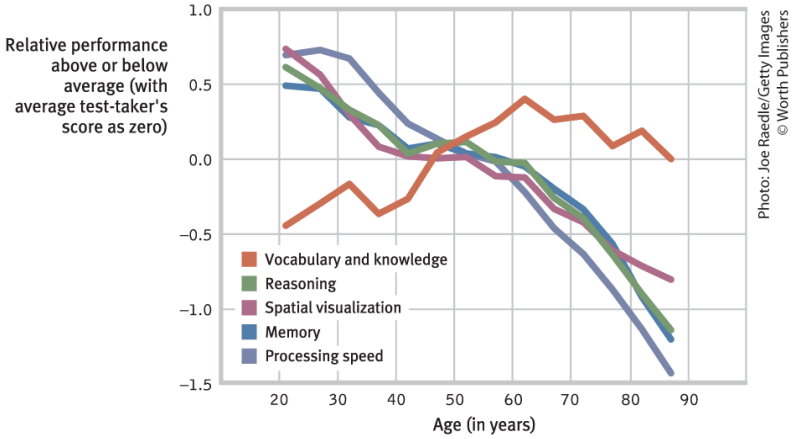


The horizontal axis represents age in years and ranges from 18 to 81, in increments of 7. The vertical axis represents the reasoning ability score and ranges from 35 to 60, in increments of 5. The cross-sectional method curve starts at (25, 61); passes through (32, 59.5), (39, 59), (46, 57), (53, 54), (60, 50), (67, 48), and (74, 44); and ends at (81, 38). A corresponding text reads, cross-sectional method suggests decline. The longitudinal method curve starts at (25, 51); passes through (32, 52.5), (39, 53), (46, 54), (53, 54.5), (60, 54), (67, 53), and (74, 52); and ends at (81, 49). A corresponding text reads, longitudinal method suggests more stability. All data are approximate.

Return to FIGURE 30.5 Cross-sectional versus longitudinal testing of intelligence at various ages

Extended description for FIGURE 30.6 With age, we lose and we win



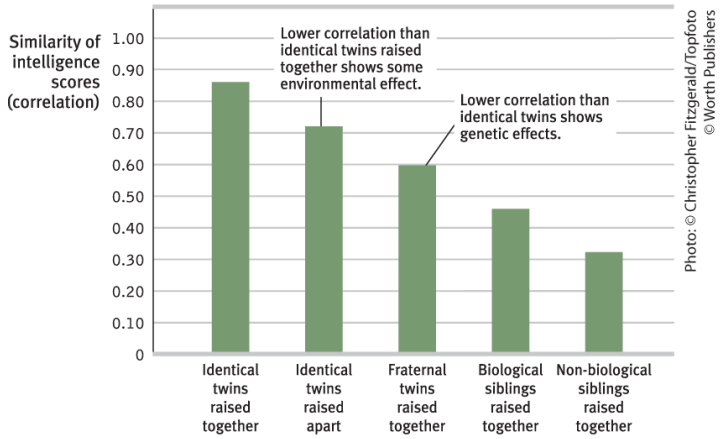


In the graph, the horizontal axis is labeled age (in years) and ranges from 10 to 90, in increments of 10. The vertical axis is labeled relative performance above or below average (with average test-taker's score as zero) and ranges from negative 1.5 to 1.0, in increments of 0.5. The curve denoting vocabulary and knowledge is a positively sloped, non-linear curve starting at (21, negative 0.45) and ending at (87, 0.0). The curves denoting reasoning, spatial visualization, memory, and processing speed are negatively sloped, non-linear curves starting at points between 0.5 to 0.75 on the vertical axis and 20 on the horizontal axis and ending at points between negative 1.4 to negative 0.75 on the vertical axis and 86 on the horizontal axis. These four curves are all very similar in their trajectories. All data are approximate.

Return to FIGURE 30.6 With age, we lose and we win

Extended description for FIGURE 31.1 Intelligence: Nature and nurture

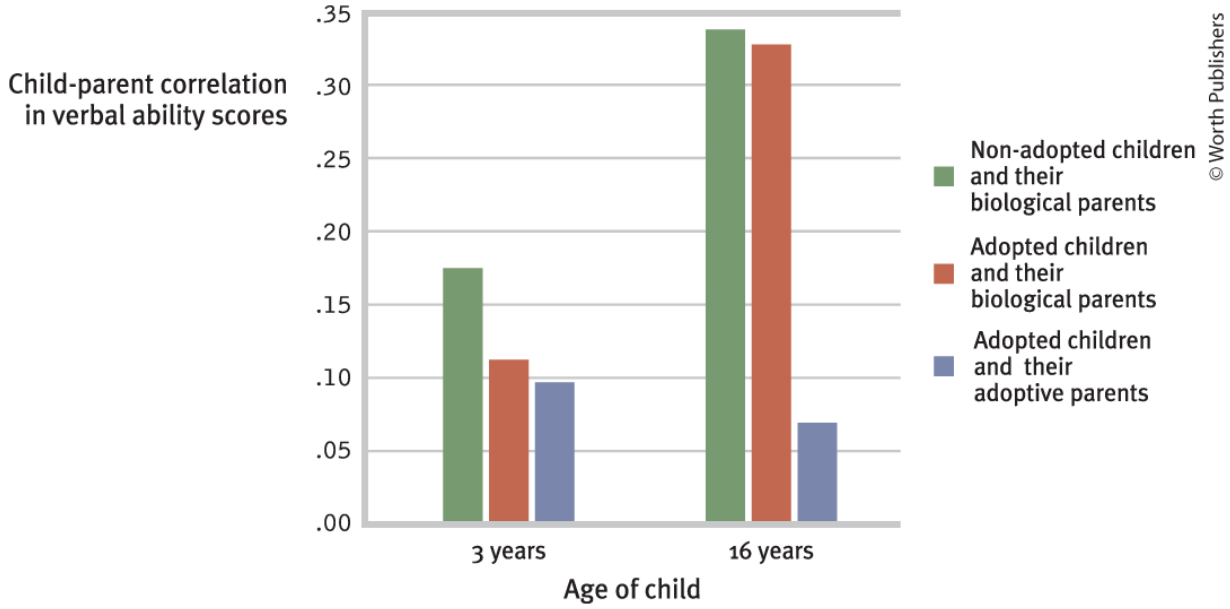




In the graph, the horizontal axis shows five bars for five different types of twins. The vertical axis is labeled similarity of intelligence scores (correlation) and has values from 0 to 1.00, in increments of 0.10. The data are as follows: Identical twins raised together, 0.85; Identical twins raised apart, 0.71; Fraternal twins raised together, 0.60; Biological siblings raised together, 0.46; and Non-biological siblings raised together, 0.32. All data are approximate. The bar for identical twins raised apart is labeled, Lower correlation than identical twins raised together shows some environmental effect. The bar for fraternal twins raised together is labeled, Lower correlation than identical twins shows genetic effects.

Return to FIGURE 31.1 Intelligence: Nature and nurture

Extended description for FIGURE 31.2 In verbal ability, who do adopted children resemble?

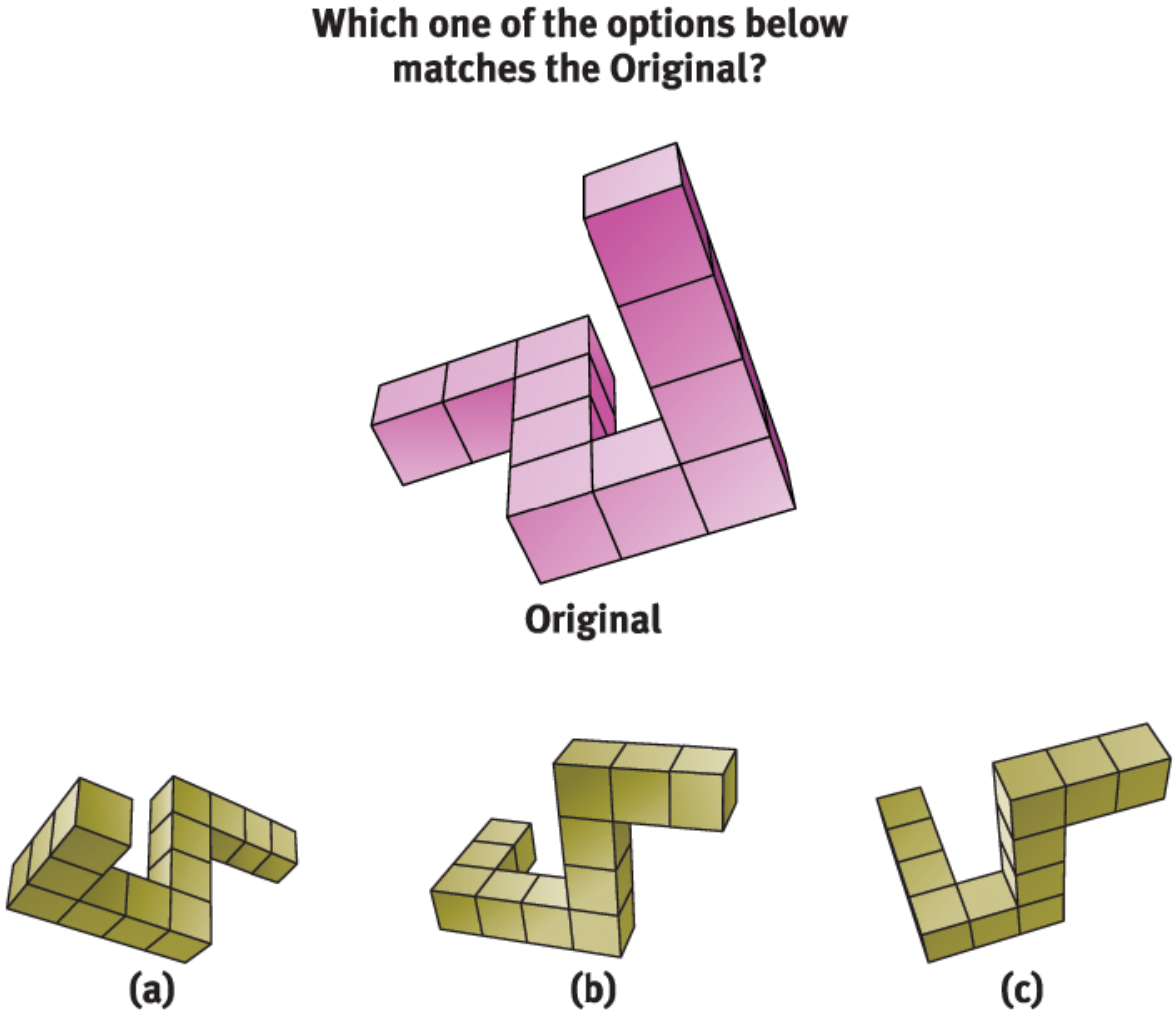


The horizontal axis represents age of child and is labeled 3 years and 16 years. The vertical axis represents child-parent correlation in verbal ability scores and ranges from .00 to .35, in increments of .05. The data for the 3-year-old children are: Non-adopted children and their biological parents, 0.17; Adopted children and their biological parents, 0.11; and Adopted children and their adoptive parents, 0.095. The data for the 16-year-old children are: Non-adopted children and their biological parents, 0.34; Adopted children and

their biological parents, 0.33; and Adopted children and their adoptive parents, 0.07. All data are approximate.

Return to FIGURE 31.2 In verbal ability, who do adopted children resemble?

Extended description for FIGURE 31.3 A mental rotation test



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Text above reads, Which one of the options below matches the Original? The illustration shows a three-dimensional shape labeled Original. The shape consists of cubes connected as follows: 3 cubes right, 4 cubes forward, 3 cubes right, and 4 cubes up. Below, three

other shapes are as follows: (a) 3 cubes back, 4 cubes right, 4 cubes up, and 2 cubes right; (b) 3 cubes forward, 4 cubes right, 4 cubes high, and 2 cubes right; and (c) 4 cubes forward, 3 cubes right, 4 cubes up, and 3 cubes right.

Return to FIGURE 31.3 A mental rotation test

Extended description for FIGURE 32.2 Maslow's hierarchy of needs

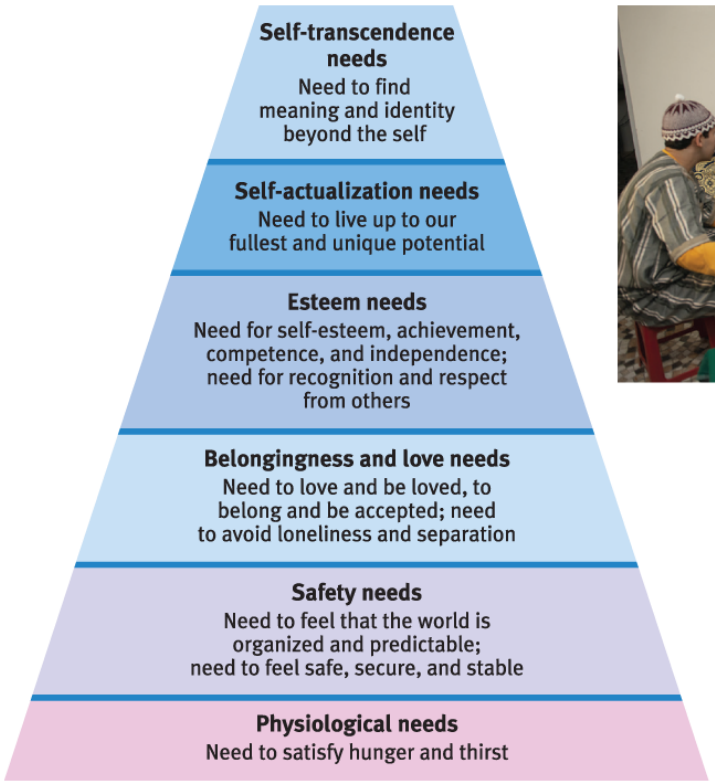



Photo: Jalal Morchidi/Anadolu Agency/Getty Images
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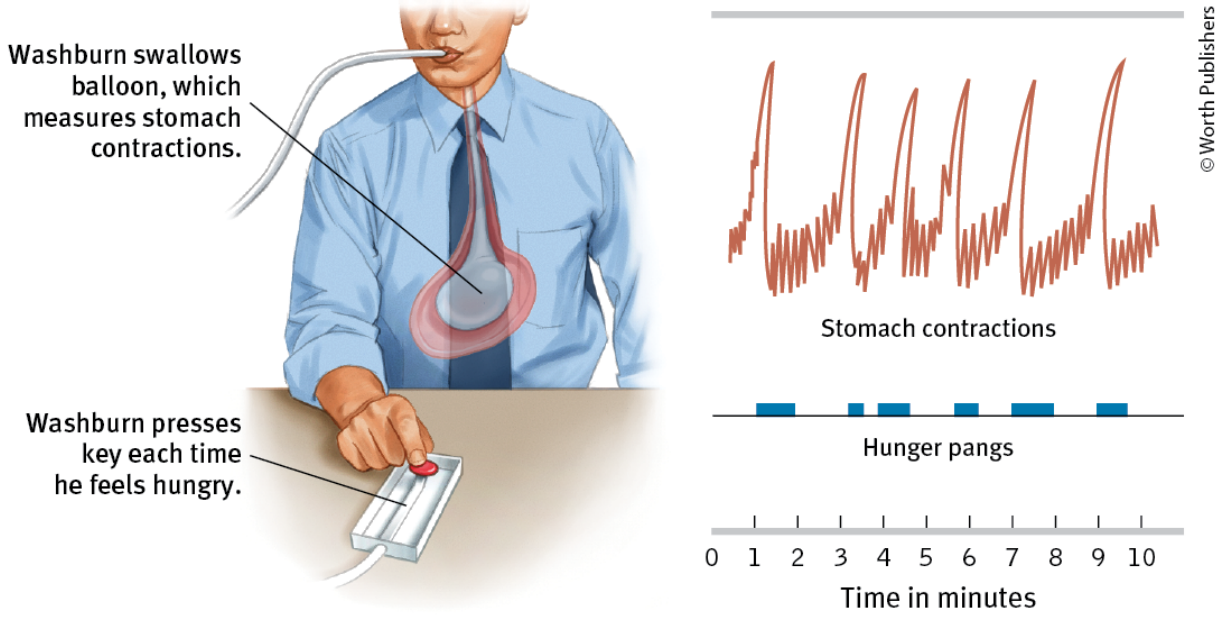
The chart from the top to bottom reads as follows: **Self-transcendence needs:** Need to find meaning and identity beyond the self. **Self-actualization needs:** Need to live up to our fullest and unique potential. **Esteem needs:** Need for self-esteem, achievement, competence, and independence; need for recognition and respect from others. **Belongingness and love needs:** Need to love and be loved, to belong and be accepted; need to avoid loneliness and separation. **Safety needs:** Need to feel that the world is organized

and predictable; need to feel safe, secure, and stable. **Physiological needs:** Need to satisfy hunger and thirst.

Return to FIGURE 32.2 Maslow's hierarchy of needs

Extended description for FIGURE 33.1 Monitoring stomach contractions



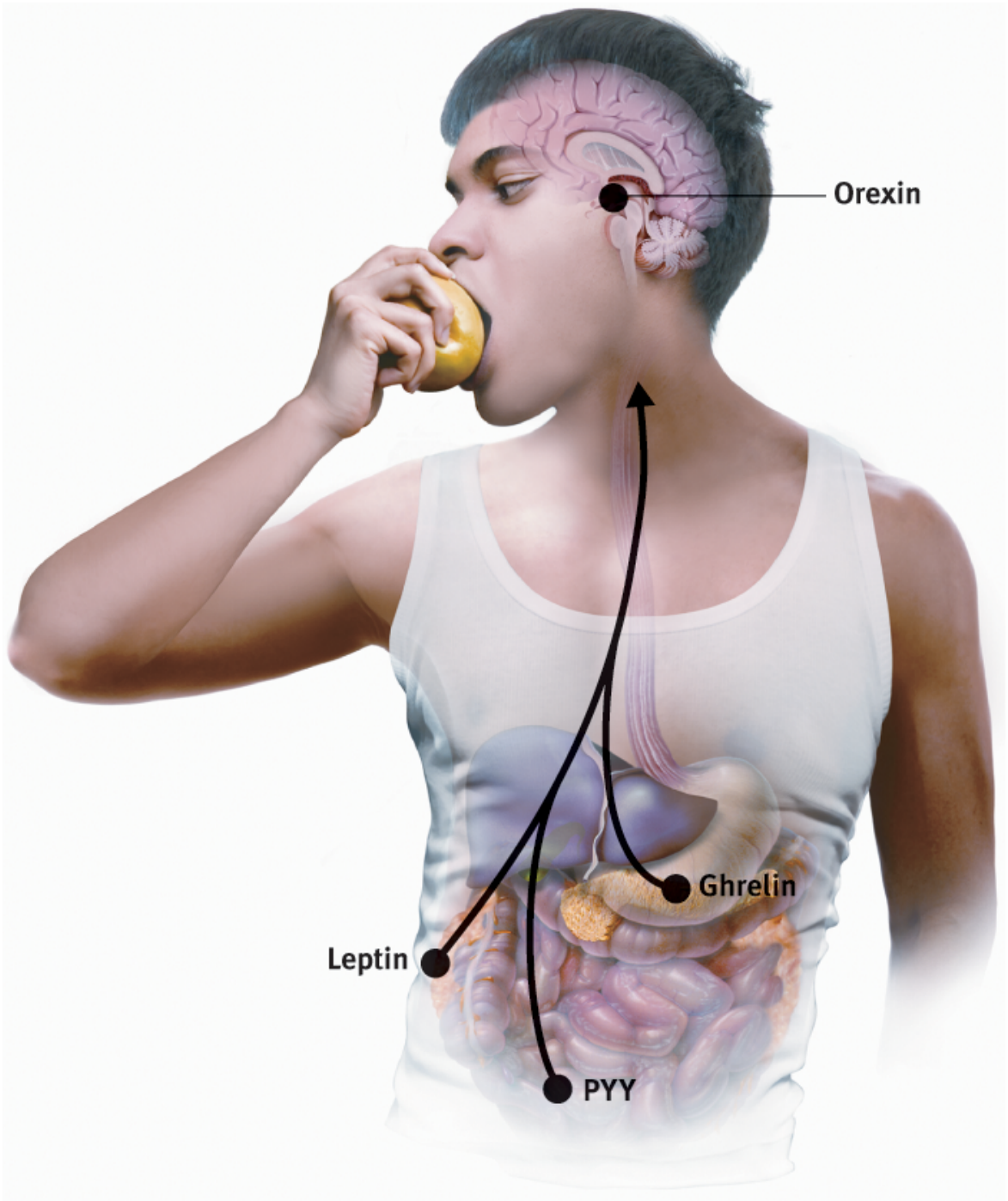
The illustration shows a man sitting at a table with a tube inserted in his mouth. He has a finger on a red button attached to an instrument on the table. A tube is depicted inside his throat, ending in a balloon in his stomach. A callout pointing toward the balloon reads, Washburn swallows balloon, which measures stomach contractions. A callout pointing toward the instrument with the red button on the table reads, Washburn presses key each time he feels hungry. A graph beside the image shows time in minutes ranging from 0 to 10 on the horizontal axis. Bars depicted along the horizontal axis indicate hunger pangs at different intervals. Pangs

are indicated between minutes 1 and 2, slightly after minute 3, most of the interval between minutes 4 and 5, just before and after minute 6, between minutes 7 and 8, and for most of the time between minutes 9 and 10. Waves depicted along the horizontal axis indicate stomach contractions as a pattern of sharp peaks and sudden downward slopes formed at different intervals.

Return to FIGURE 33.1 Monitoring stomach contractions

Extended description for FIGURE 33.3 The

appetite hormones



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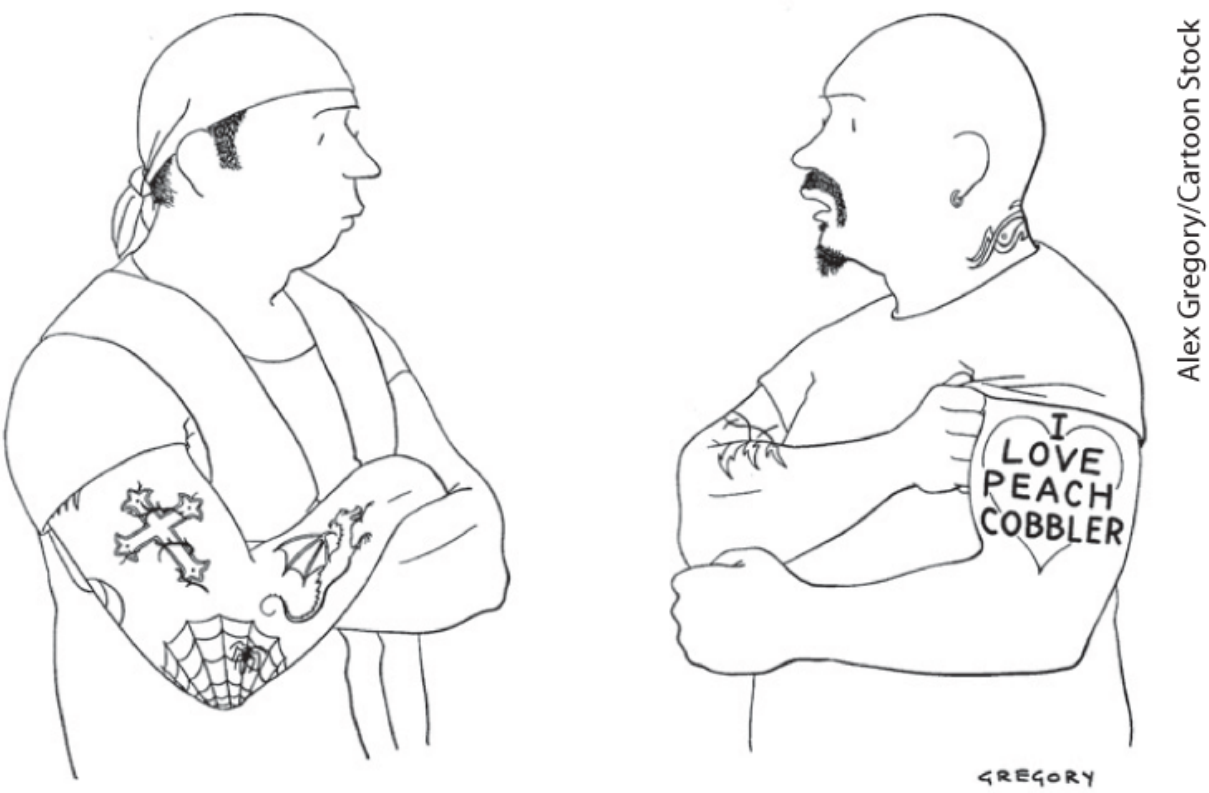
The illustration shows a man eating a fruit. His brain and intestine are displayed. A callout pointing toward his brain just underneath the hypothalamus reads, Orexin. Different regions of his digestive system are labeled as follows, Ghrelin (in the stomach), P Y Y (in the intestines), and Leptin (fat cells in the abdomen). These three labels all point up toward the man's throat.

Return to FIGURE 33.3 The appetite hormones

Extended description for Psychology of hunger



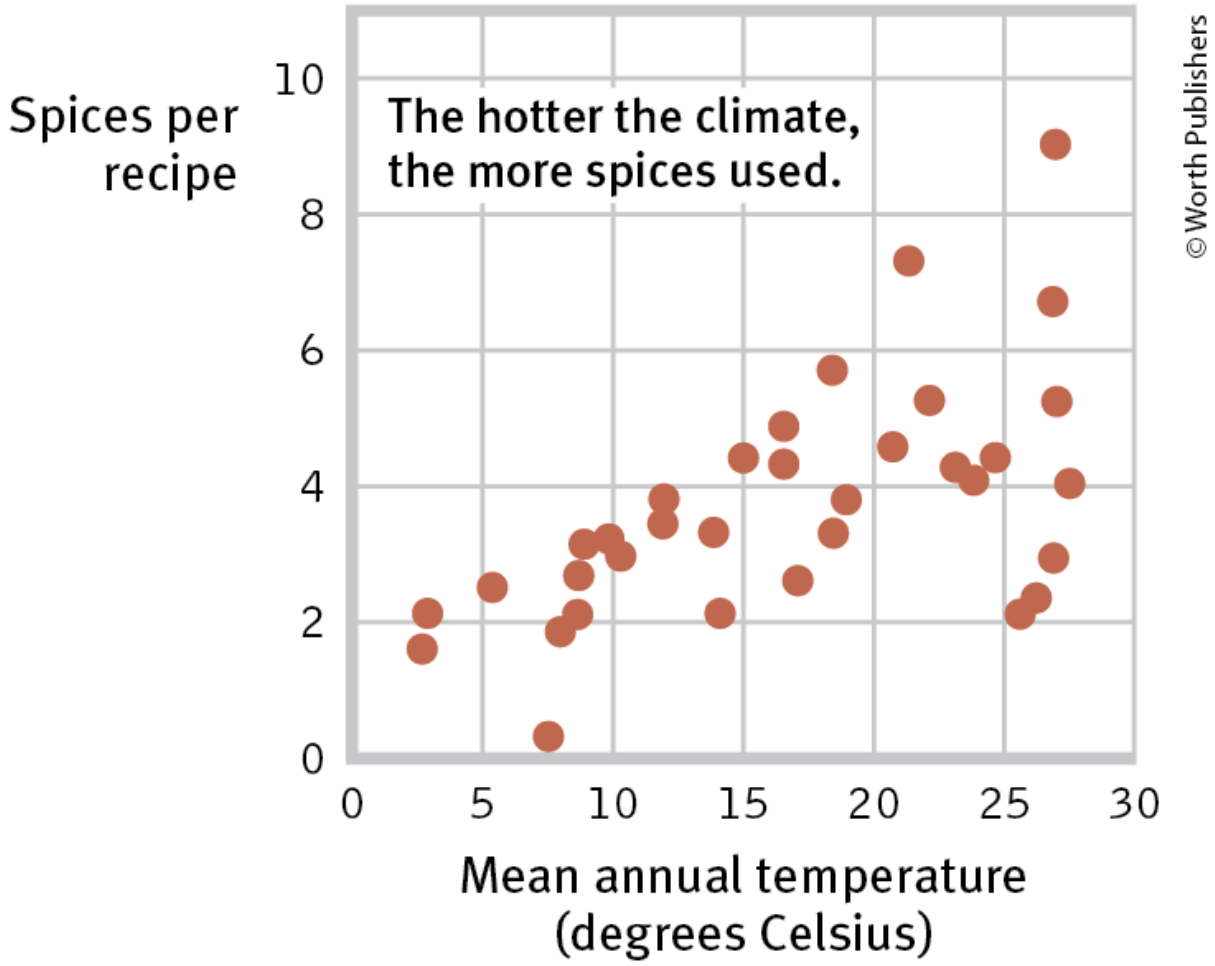
Alex Gregory/Cartoon Stock

"Never get a tattoo when you're drunk and hungry."

One of the men has tattoos of a cross, dragon, and spider web and looks puzzled. The other man is lifting his shirt sleeve to show a tattoo of a heart with the words, I love peach cobbler. He says, "Never get a tattoo when you're drunk and hungry."

Return to Psychology of hunger

Extended description for FIGURE 33.4 Hot climates and hot spices



The horizontal axis represents mean annual temperature (degrees Celsius) and ranges from 0 to 30, in increments of 5. The vertical axis represents spices per recipe and ranges from 0 to 10, in increments of 2. A series of dots starts from around (3, 2) and then moves upward to (27, 9). The overall trend of the dots is a diagonal

cluster from the lower left to upper right, with some dots in the lower right quadrant. All data are approximate. Text over the graph reads, The hotter the climate, the more spices used.

Return to FIGURE 33.4 Hot climates and hot spices

Extended description for Challenges of

obesity

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Thinking Critically About:

The Challenges of Obesity and Weight Control

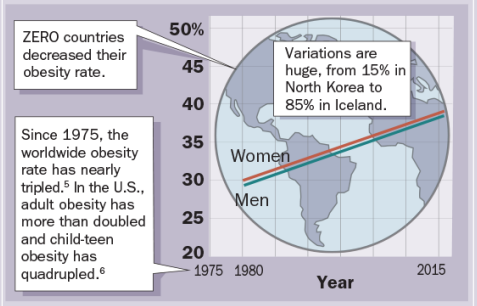
Obesity and Its Health Effects

Obesity is associated with:

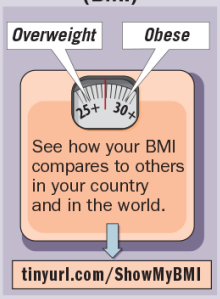
- **physical health risks**, including diabetes, high blood pressure, heart disease, gallstones, arthritis, and certain types of cancer.[1]
- **increased depression,** especially among women.[2]
- **bullying,** outranking race and sexual orientation as the biggest reason for youth bullying in Western cultures.[3]



Percentage Overweight in 195 Countries Studied[4]



Body Mass Index (BMI)



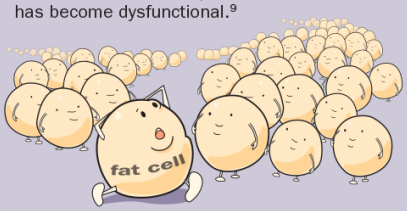
How Did We Get Here?

Does obesity reflect a simple lack of willpower, as some people presume?[7]
No. Many factors contribute to obesity.

PHYSIOLOGY FACTORS

Storing fat was adaptive.

- This ideal form of stored energy carried our ancestors through periods of famine. People in some impoverished places still find heavier bodies attractive, as plumpness signals affluence and status.[8]
- In food-rich countries, the drive for fat has become dysfunctional.[9]



Set point and metabolism matter.

- Fat (lower metabolic rate than muscle) requires less food intake to maintain than it did to gain.
- If weight drops below *set point/settling point*, the brain triggers more hunger and a slowed metabolism.
  - Body perceives STARVATION; adapts by burning fewer calories. Most dieters in the long run regain what they lose on weight-loss programs.[10]
  - After 30 weeks of competition on TV's *The Biggest Loser*, 6 years later only 1 of 14 contestants had kept the weight off. On average, they regained 70% of what they lost, and their metabolism remained slow.[11]

Genes influence us.

- Lean people seem naturally disposed to move about, burning more calories than energy-conserving overweight people, who tend to sit still longer.[12]
- Adoptive siblings' body weights are uncorrelated with one another or with their adoptive parents, instead resembling their biological parents' weight.[13]
- Identical twins have closely similar weights, even if raised apart.[14] Much lower *fraternal* twin weight correlation suggests genes explain 2/3 of our varying body mass.[15]
- More than 100 genes have been identified as each affecting weight in some small way.[16]

ENVIRONMENTAL FACTORS

- **Sleep loss** makes us more vulnerable to obesity.[17]



- **Social influences:** Our own odds of becoming obese triple if a close friend becomes obese.[18]
- **Food and activity levels:** Worldwide, we eat more energy-dense foods and we move less, with 31% of adults (including 43% of Americans and 25% of Europeans) now sedentary—averaging <20 minutes per day of moderate activity such as walking.[19]

NOTE: With weight, as with intelligence and other characteristics, there can be high levels of *heritability* (genetic influence on *individual* differences) without heredity explaining *group* differences. Genes mostly determine why one person is heavier than another. Environment mostly determines why people today are heavier than people were 50 years ago.

1. Kitahara et al., 2014. 2. Haynes et al., 2019; Jung et al., 2017; Rivera et al., 2017. 3. Puhl et al., 2015. 4. GBD, 2017. 5. NCD, 2016. 6. Flegal et al., 2010, 2012, 2016. 7. NORC, 2016. 8. Furnham & Baguma, 1994; Nettle et al., 2017; Swami, 2015. 9. Hall, 2016. 10. Mann et al., 2015. 11. Fothergill et al., 2016. 12. Levine et al., 2005. 13. Grilo & Pogue-Geile, 1991. 14. Hjelmborg et al., 2008; Plomin et al., 1997. 15. Maes et al., 1997. 16. Akiyama et al., 2017. 17. Keith et al., 2006; Nedeltcheva et al., 2010; Taheri, 2004; Taheri et al., 2004. 18. Christakis & Fowler, 2007. 19. Hallal et al., 2012.

The infographic is divided into the following two panels. The title in the first panel reads, **Obesity and Its Health Effects.** The text reads, Obesity is associated with: Bullet point 1, **Physical health risks,** including diabetes, high blood pressure, heart disease, gallstones, arthritis, and certain types of cancer (Kitahara et al., 2014). Bullet point 2, **Increased depression,** especially among women (Haynes, et al., 2019; Jung et al., 2017; Rivera et al., 2017). Bullet point 3, **Bullying,** outranking race and sexual orientation as the biggest reason for youth bullying in Western cultures (Puhl et al., 2015). An illustration shows a young woman eating a doughnut. A line graph titled, **Percentage Overweight in 195 Countries Studied** (G B D, 2017) is illustrated on a backdrop of the globe. The horizontal axis is labeled Year, starting at 19 75 and ending at 2015. The vertical axis represents percentage, starting at 20 percent and ending at 50 percent, in increments of 5. A line representing women starts at around 30 percent in 19 80 and rises linearly to 39 percent in 2015. A line representing men starts at around 29.5 percent in 19 80 and rises linearly to 38 percent in 2015. A text box in the graph reads, Variations are huge, from 15 percent in North Korea to 85 percent in Iceland. Outside the graph, a text box pointing toward the globe reads, ZERO countries decreased their obesity rate. Another text box pointing to the year 19 75 reads, since 19 75, the worldwide obesity rate has nearly tripled (N C D, 2016). In the U.S., adult obesity has more than doubled and child-teen obesity has quadrupled (Flegal et al., 2010, 2012, 2016). An illustration titled, **Body Mass Index (B M I)** shows a weighing scale. The weight window on the scale shows the B M I is 25 plus and 30 plus with a red line at the center between

both weights. A text box pointing toward 25 plus reads, overweight, and a text box pointing toward 30 plus reads, obese. Text on the scale reads, See how your B M I compares to others in your country and in the world. An arrow pointing downward reads, tinyurl dot com slash ShowMyBMI.

The title for the second panel reads, **How Did We Get Here?** Beside the title, the text reads, Does obesity reflect a simple lack of willpower, as some people presume? (N O R C, 2016 b). ***NO.*** Many factors contribute to obesity. Under this is the subtitle, **PHYSIOLOGY FACTORS.** Three sections with bullet points are under the subtitle. The first bulleted list heading reads, **Storing fat was adaptive.** Bullet point 1, This ideal form of stored energy carried our ancestors through periods of famine. People in some impoverished places still find heavier bodies attractive, as plumpness signals affluence and status (Furnham and Baguma, 19 94; Nettle et al, 2017; Swami, 2015). Bullet point 2, In food-rich countries, the drive for fat has become dysfunctional (Hall, 2016). The second bulleted list heading reads, **Set point and metabolism matter.** Bullet point 1, Fat (lower metabolic rate than muscle) requires less food intake to maintain than it did to gain. Bullet point 2, If weight drops below *set point slash settling point,* the brain triggers more hunger and a slowed metabolism. Bullet point 3, Body perceives STARVATION; adapts by burning fewer calories. Most dieters in the long run regain what they lose on weight-loss programs (Mann et al., 2015). Bullet point 4, After 30 weeks of competition on T V's *The Biggest Loser*, 6 years later,

Only 1 of 14 contestants had kept the weight off. On average, they regained 70 percent of what they lost, and their metabolism remained slow (Fothergill et al., 2016). The third bulleted list heading reads, **Genes influence us.** Bullet point 1, Lean people seem naturally disposed to move about, burning more calories than energy-conserving overweight people, who tend to sit still longer (Levine et al., 2005). Bullet point 2, Adoptive siblings' body weights are uncorrelated with one another or with their adoptive parents, instead resembling their biological parents' weight (Grilo and Pogue-Geile, 19 91). Bullet point 3, Identical twins have closely similar weights, even if raised apart (Hjelmborg et al., 2008; Plomin et al., 19 97). Much lower *fraternal* twin weight correlation suggests genes explain two-thirds of our varying body mass (Maes et al., 19 97). Bullet point 4, More than 100 genes have been identified as each affecting weight in some small way (Akiyama et al., 2017). The cartoon in this panel shows a large group of round, yellow fat cells all following their fat-cell leader.

Still in the **How Did We Get Here?** panel is another section, titled, **ENVIRONMENTAL FACTORS.** A bulleted list begins. Bullet point 1, **Sleep loss** makes us more vulnerable to obesity (Keith et al., 2006; Nedeltcheva et al., 2010; Taheri, 2004; Taheri et al., 2004). Below, three cartoonish oval shapes have eyes and mouths, all holding forks, with napkins tucked under their chins. Over these shapes is the word, ***Increasing***. Under these shapes is the caption, **Ghrelin** dash appetite-stimulating stomach hormone. Next, a left-facing

arrow points back to the ghrelin shapes from an illustration of a gray cloud with broken zees (representing broken sleep) around the words Sleep deprivation. After the sleep-deprivation cloud is a right-facing arrow pointing to three bespectacled oval shapes with closed eyes, wiping their mouths with handkerchiefs. These shapes decrease in size. Over these leptin shapes is the word, ***Decreasing***. Under the shapes is the caption, **Leptin** dash reports body fat to the brain. The illustrations show how sleep-deprivation causes ghrelin, the appetite-stimulating hormone, to increase, and leptin, which reports body fat to the brain, decreases, resulting in weight gain. Bullet point 2, **Social influences:** Our own odds of becoming obese triple if a close friend becomes obese (Christakis and Fowler, 2007). Bullet point 3, **Food and activity levels:** Worldwide, we eat more energy-dense foods and move less, with 31 percent of adults (including 43 percent of Americans and 25 percent of Europeans) now sedentary dash averaging less than 20 minutes per day of moderate activity such as walking (Hallal et al., 2012). Beside this bulleted list is a **Note** that reads: With weight, as with intelligence and other characteristics, there can be high levels of *heritability* (genetic influence on *individual* differences) without heredity explaining *group* differences. Genes mostly determine why one person today is heavier than another. Environment mostly determines why people today are heavier than people were 50 years ago.

Return to Challenges of obesity

Extended description for FIGURE 34.1 Biopsychosocial influences on sexual motivation

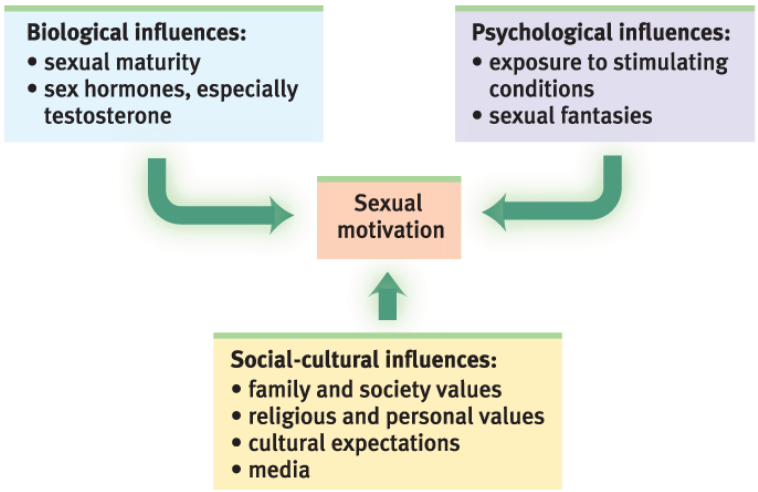


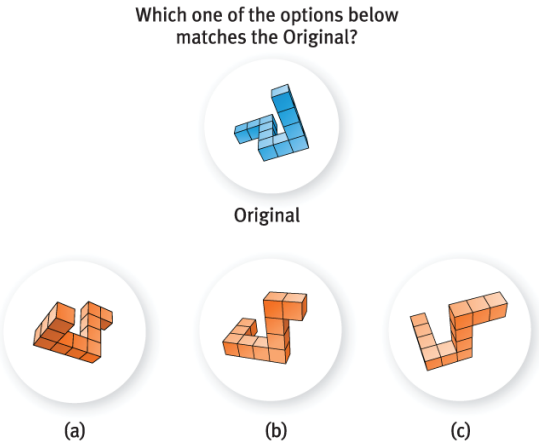


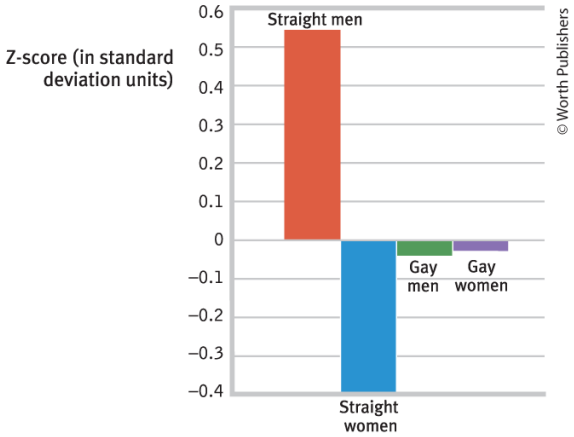
Photo: Digital Vision./Getty Images
© Worth Publishers

A text box at the top left reads, **Biological influences:** sexual maturity, and sex hormones, especially testosterone. A text box at the top left reads, **Psychological influences:** exposure to stimulating conditions, and sexual fantasies. A text box at the bottom reads, **Socio-cultural influences:** family and society values, religious and personal values, cultural expectations, and media. All three text boxes point to a central text box reading, **Sexual motivation.**

Return to FIGURE 34.1 Biopsychosocial influences on sexual motivation

Extended description for FIGURE 34.2 Spatial abilities and sexual orientation





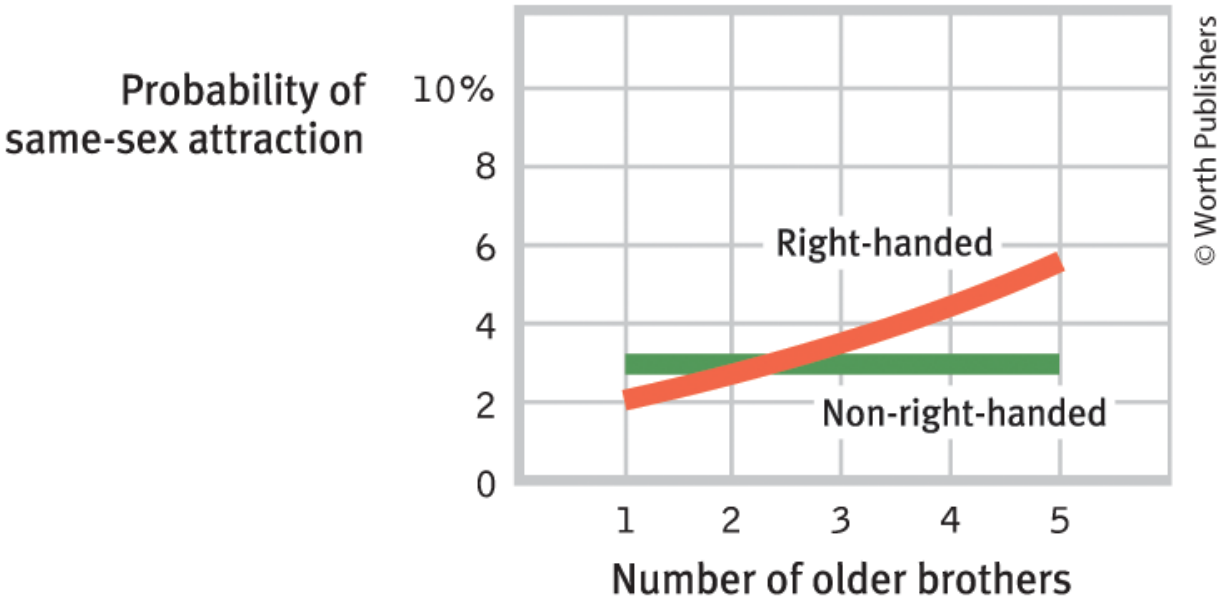
In the puzzle, a text above reads, Which one of the options below matches the Original? A 3-D shape labeled Original consists of cubes connected as follows: 3 cubes right, 4 cubes forward, 3 cubes right, and 4 cubes up. Below, three other shapes are as follows: (a) 3 cubes back, 4 cubes right, 4 cubes up, and 2 cubes right; (b) 3 cubes forward, 4 cubes right, 4 cubes high, and 2 cubes right; (c) 4 cubes forward, 3 cubes right, 4 cubes up, and 3 cubes right.

In the graph, the horizontal axis identifies sexual orientations as straight men, straight women, gay men, and gay women. The vertical axis identifies the Z-score (in standard deviation units) ranging from negative 0.4 to 0.6. Straight men have a Z-score between 0.5 and 0.6, whereas straight women have a Z-score of

negative 0.4. The Z-score of gay men is negative 0.04 and of gay women is negative 0.02. All data are approximate.

Return to FIGURE 34.2 Spatial abilities and sexual orientation

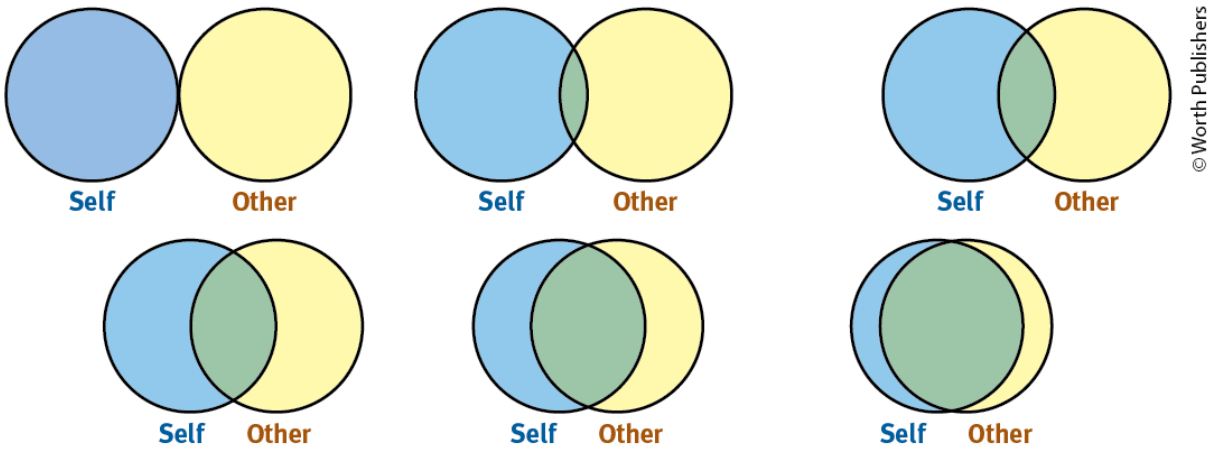
Extended description for FIGURE 34.3 The older-brother effect



The horizontal axis identifies the number of older brothers ranging from 0 to 5. The vertical axis identifies the probability of same-sex attraction ranging from 0 to 10 percent. The positive curve labeled right-handed starts from (1, 2); passes through (2, 3), (3, 3.5), (4, 4.5); and ends at (5, 5.5). The line labeled non-right-handed starts from (1, 3); passes through (2, 3), (3, 3), (4, 3); and ends at (5, 3). All data are approximate.

Return to FIGURE 34.3 The older-brother effect

Extended description for FIGURE 35.1 Inclusion of other in self (I O S) scale



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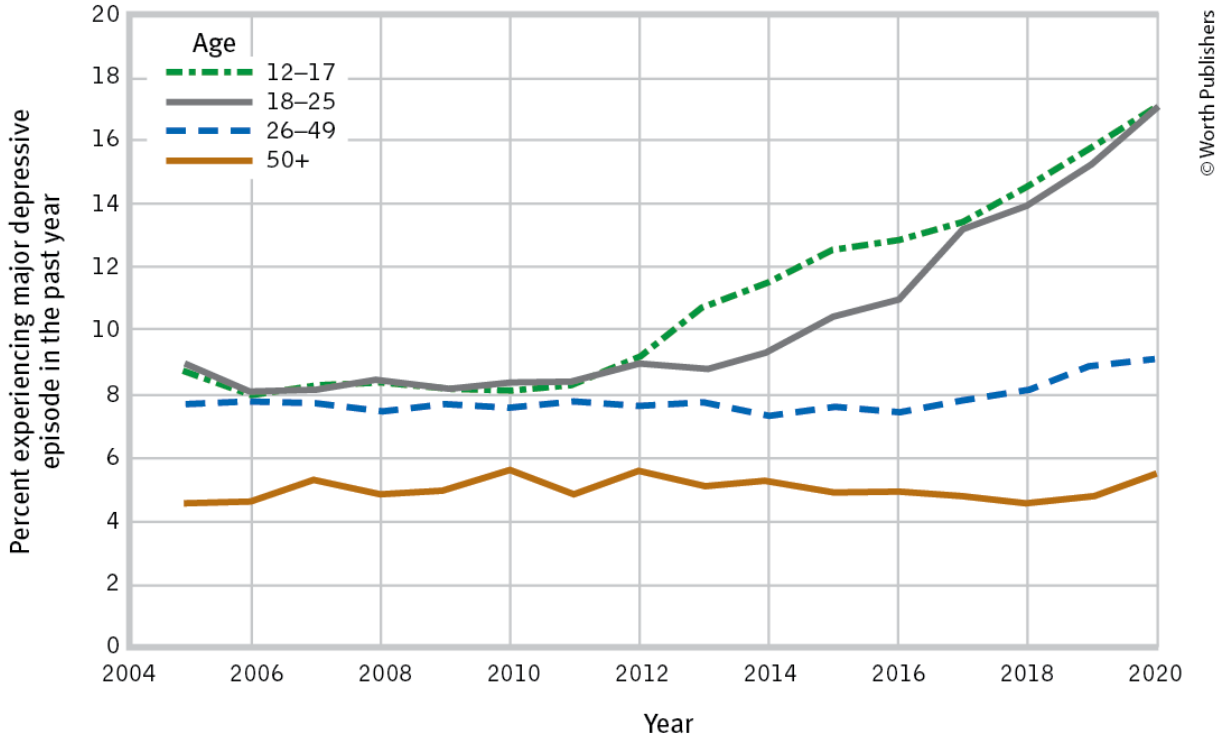
The illustration shows six sets of two circles with the blue circle labeled self and the yellow circle labeled other. The first set shows them side by side, barely touching at the edges. From the second to the sixth set of circles, they start to overlap progressively more and more until self and other almost envelope each other. The overlapped region in each set is shaded in green.

Return to FIGURE 35.1 Inclusion of other in self (I O S) scale

Extended description for FIGURE 35.2 Rise in depression coincides with rise of smartphones



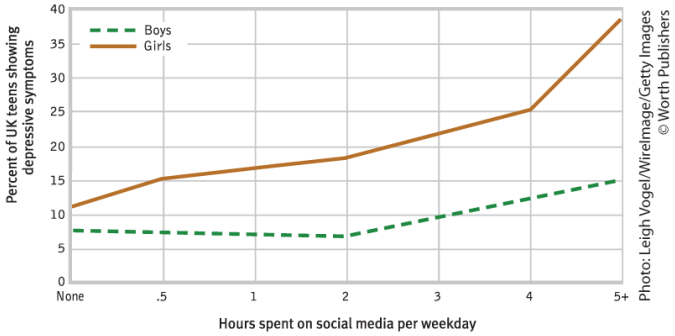
The horizontal axis represents year and ranges from 2004 to 20 20, in increments of 2. The vertical axis represents percent experiencing major depressive episode in the past year and ranges from 0 to 20, in increments of 2. A curve for age 12 to 17-year- olds starts at (2005, 9), drops to (2006, 8), remains steady until 2011 when it begins to rise sharply to (2013, 11) and steadily increases to end at (20 20, 17). A curve for age 18 to 25-year- olds begins at (2005, 9), drops to (2006, 8),

and follows the path of 12 to 17-year-olds until it slowly begins to increase at (2014, 9.5) to (2015, 11). The curve increases to (2017, 13) and ends at (20 20, 17). A curve for age 26 to 49-year- olds starts at (2005, 7.8), remains steady with a small drop in 2014 then increases slightly in 2019 to 9 percent ending at (20 20, 9.2). A curve for age 50 plus begins at (2005, 4.5), increases to its high peak at (2010, 5.8), drops slightly and increases again to (2012, 5.8), drops again, and remains steady until (20 20, 5.8). All data are approximate.

Return to FIGURE 35.2 Rise in depression coincides with rise of smartphones

Extended description for FIGURE 35.3 Depression and teen screens

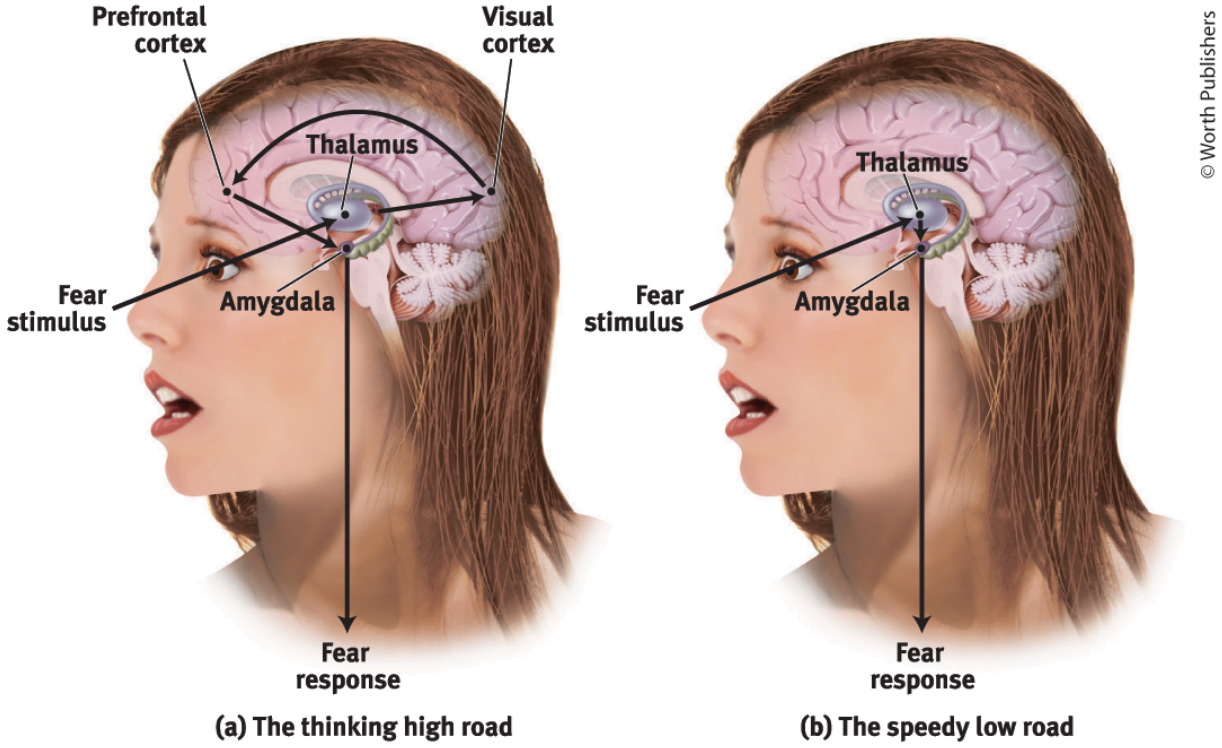




The horizontal axis represents hours spent on social media per weekday and is labeled none, 0.5, 1, 2, 3, 4, 5 plus. The vertical axis represents percent of U K teens showing depressive symptoms and ranges from 0 to 40, in increments of 5. A curve for girls starts from (none, 11); passes through (.5, 15), (1, 17.5), (2, 19), (3, 22); (4, 25); and ends at (5 plus, 38). A curve for boys starts from (none, 7); drops to (2, 6); and increases steadily to end at (5 plus, 15). All data are approximate.

Return to FIGURE 35.3 Depression and teen screens

Extended description for FIGURE 36.1 The brain's pathways for emotions



The left-hand profile is labeled (a) The thinking high road. A fear stimulus travels through the thalamus to the visual cortex, then to the prefrontal cortex, which leads to the amygdala, leading to a fear response. The right-hand profile is labeled, (b) The speedy low road. A fear stimulus travels through the thalamus to the amygdala, leading to a fear response.

Return to FIGURE 36.1 The brain's pathways for emotions

Extended description for FIGURE 36.2 Emotional arousal



Autonomic Nervous System Controls Physiological Arousal

Sympathetic division (arousing)		Parasympathetic division (calming)
Pupils dilate	EYES	Pupils contract
Decreases	SALIVATION	Increases
Perspires	SKIN	Dries
Increases	RESPIRATION	Decreases
Accelerates	HEART	Slows
Inhibits	DIGESTION	Activates
Secrete stress hormones	ADRENAL GLANDS	Decrease secretion of stress hormones
Reduced	IMMUNE SYSTEM FUNCTIONING	Enhanced



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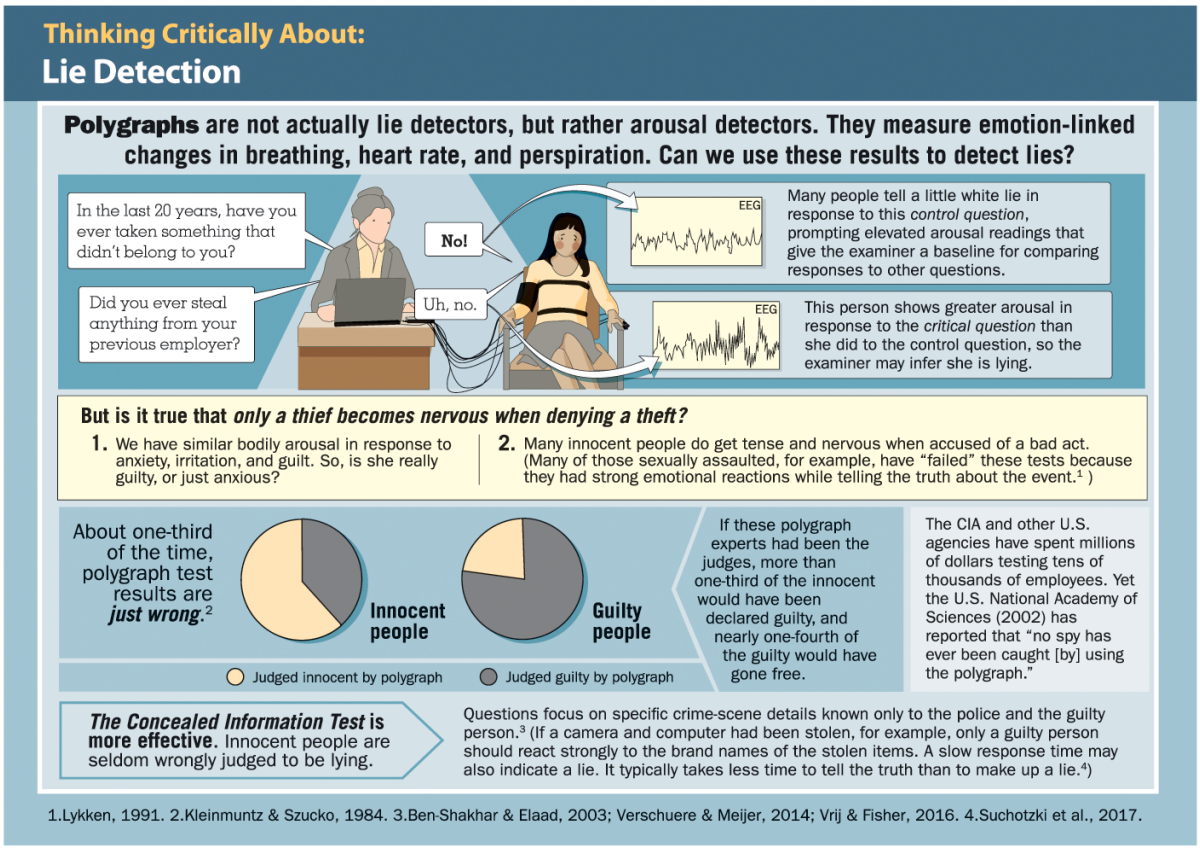
The top of the table is entitled, **Autonomic Nervous System Controls Physiological Arousal.** Two illustrations are depicted. The illustration on the left shows the son almost tripping at the edge of a dock near a body of water, and the father reaching out to catch him. The Sympathetic division (arousing) is depicted as follows: EYES: Pupils dilate, SALIVATION: Decreases, SKIN: Perspires, RESPIRATION: Increases, HEART: Accelerates, DIGESTION: Inhibits, ADRENAL GLANDS: Secrete stress hormones, and IMMUNE SYSTEM FUNCTIONING: Reduced. The illustration on the right shows the father kneeling and holding his son close to him on the dock. The parasympathetic division (calming) is depicted as follows: EYES: Pupils contract, SALIVATION: Increases, SKIN: Dries,

RESPIRATION: Decreases, HEART: Slows, DIGESTION: Activates, ADRENAL GLANDS: Decrease secretion of stress hormones, and IMMUNE SYSTEM FUNCTIONING: Enhanced.

Return to FIGURE 36.2 Emotional arousal

Extended description for Lie detection



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The infographic is divided into three panels. At the top of the first panel a text reads, **Polygraphs** are not actually lie detectors, but rather arousal detectors. They measure emotion-linked changes in breathing, heart rate, and perspiration. Can we use these results to detect lies? Below, an illustration shows a worried-looking woman sitting in a chair with polygraph test wires attached to her. The wires lead to a polygraph machine on a table where another woman sits, administering the polygraph test. In a text box pointing to the test

examiner, the examiner asks the woman taking the test, In the last 20 years, have you ever taken something that didn't belong to you? In another text box pointing to the test taker, is the word, No! From there, an arrow points to a box with an illustration of an E E G scan showing the waves of the test taker's brain activity. Text reads, Many people tell a little white lie in response to this *control question*, prompting elevated arousal readings that give the examiner a baseline for comparing responses to other questions. In another text box pointing at the examiner, the question reads, Did you ever steal anything from your previous employer? In a text box pointing to the test taker, the answer reads, Uh, no. From there, an arrow points to a box with an illustration of the higher waves of elevated brain activity. Text reads, This person shows greater arousal in response to the critical question than she did to the control question, so the examiner may infer she is lying.

In the second panel, text reads, **But is it true that *only a thief becomes nervous when denying a theft?*** Under this is a numbered list. 1. We have similar bodily arousal in response to anxiety, irritation, and guilt. So, is she really guilty, or just anxious? 2. Many innocent people do get tense and nervous when accused of a bad act. (Many of those sexually assaulted, for example, have "failed" these tests because they had strong emotional reactions while telling the truth about the event) (Lykken, 19 91).

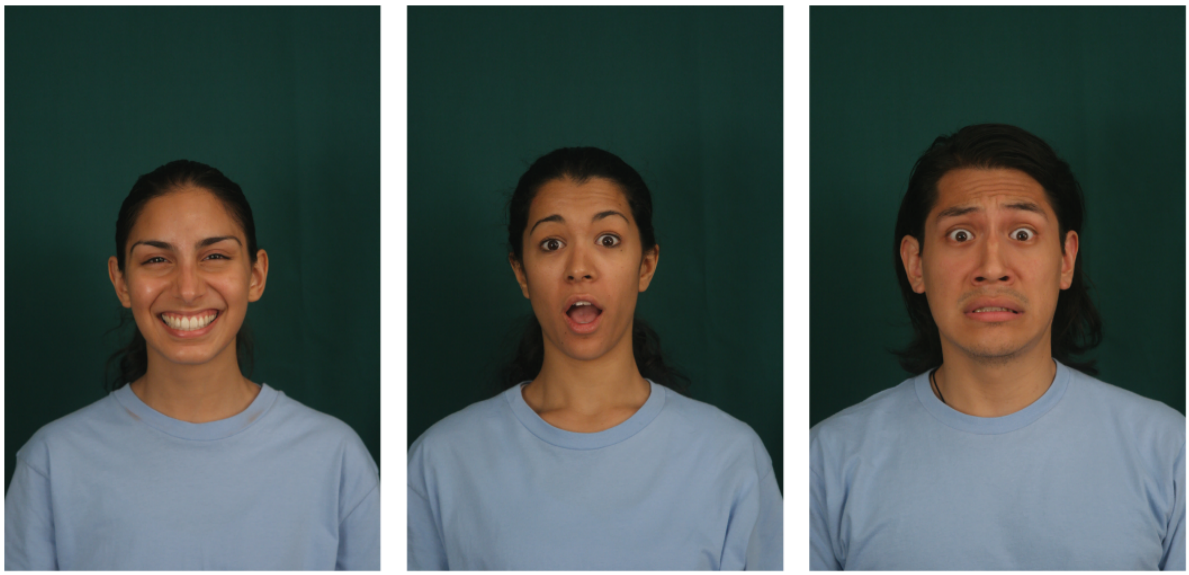
In the third panel, a text reads, About one-third of the time, polygraph test results are **just wrong** (Kleinmuntz and Szucko, 19 84). Beside this text are two pie charts with yellow and gray sections. The yellow represents Judged innocent by polygraph. The gray represents Judged guilty by polygraph. The first pie chart is labeled **Innocent People**. More than two-thirds of the pie chart is yellow (indicating innocence). But almost one-third of the pie chart is gray (indicating guilt). The second pie chart is labeled **Guilty People**. A little more than three-quarters of the chart is gray (indicating guilt). And a little less than a quarter of the chart is yellow (indicating innocence). The text beside these pie charts reads, If these polygraph experts had been the judges, more than one-third of the innocent would have been declared guilty, and nearly one-fourth of the guilty would have gone free. To the right, another area of text says, The C I A and other U.S. agencies have spent millions of dollars testing tens of thousands of employees. Yet the U.S. National Academy of Sciences (2002) has reported that "no spy has ever been caught [by] using the polygraph."

At the bottom of the infographic is a large right-facing arrow with the text inside it, ***The Concealed Information Test* is more effective**. Innocent people are seldom wrongly judged to be lying. The arrow points to text, Questions focus on specific crime-scene details known only to the police and the guilty person (Ben-Shakhar and Elaad, 2003; Verschuere and Meijer, 2014; Vrij and Fisher, 2016). (If a camera and computer had been stolen, for example, only a guilty person should react strongly to the brand names of the stolen items.

A slow response time may also indicate a lie. It typically takes less time to tell the truth than to make up a lie) (Suchotzki et al., 2017).

Return to Lie detection

Extended description for FIGURE 37.3 Culture-specific or culturally universal expressions?



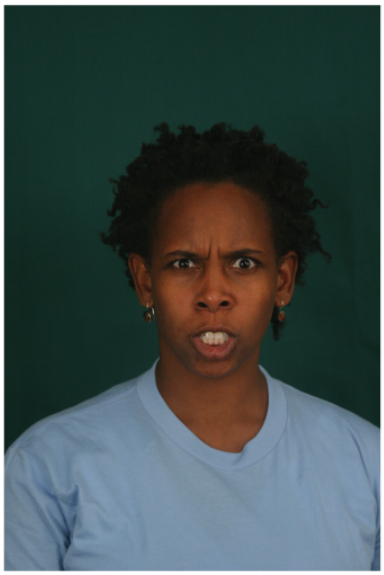
(a)

(b)

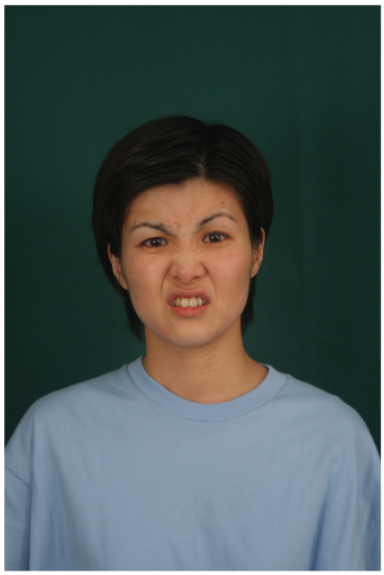
(c)



(d)



(e)



(f)

David Matsumoto/Humintell, LLC

Photo (a) shows a smiling woman. Photo (b) shows a woman looking surprised. Photo (c) shows a man looking afraid. Photo (d) shows a man looking sad. Photo (e) shows a woman looking angry. Photo (f) shows a woman looking disgusted.

Return to FIGURE 37.3 Culture-specific or culturally universal expressions?

Extended description for FIGURE 37.4 Cultural consensus in question

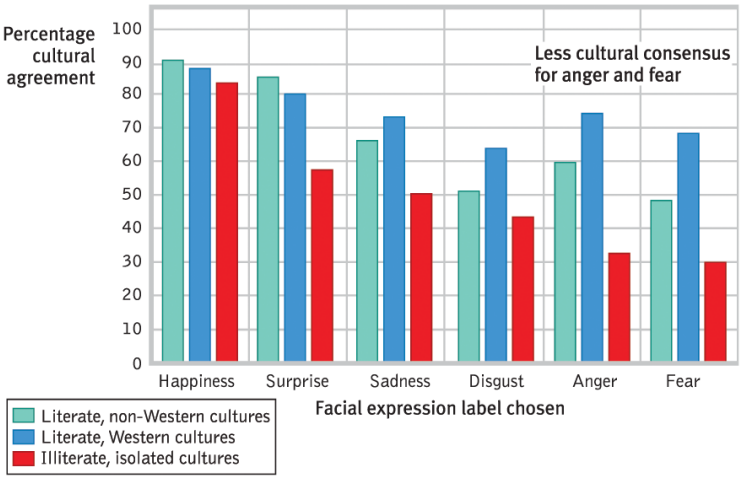




Photo: Roman Samborskyi/Alamy Stock Photo
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The horizontal axis is labeled facial expression label chosen and has areas for six emotions. They include happiness, surprise, sadness, disgust, anger, and fear. The vertical axis is labeled percentage cultural agreement and has values from 0 to 100, in increments of 10. Each emotion has three bars, representing the following: literate, non-Western cultures; literate, Western cultures; and illiterate, isolated cultures. The data are as follows:

Happiness: Literate, Non-Western cultures, 90.5 percent; Literate, Western cultures, 89.5 percent; and Illiterate, Isolate cultures, 84 percent.

Surprise: Literate, Non-Western cultures, 87.5 percent; Literate, Western cultures, 80 percent; and Illiterate, Isolate cultures, 58 percent.

Sadness: Literate, Non-Western cultures, 67.5 percent; Literate, Western cultures, 72 percent; and Illiterate, Isolate cultures, 50.1 percent.

Disgust: Literate, Non-Western cultures, 50.2 percent; Literate, Western cultures, 64.5 percent; and Illiterate, Isolate cultures, 42.5 percent.

Anger: Literate, Non-Western cultures, 60 percent; Literate, Western cultures, 74 percent; and Illiterate, Isolate cultures, 32 percent.

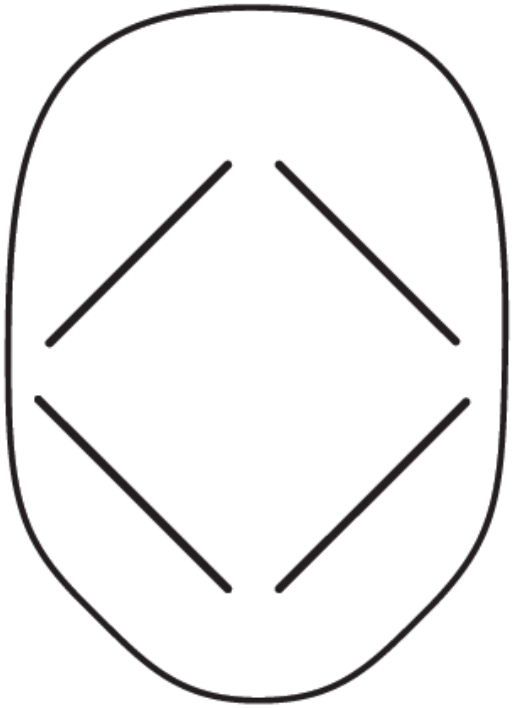
Fear: Literate, Non-Western cultures, 49 percent; Literate, Western cultures, 69 percent; and Illiterate, Isolate cultures, 30 percent.

All data are approximate.

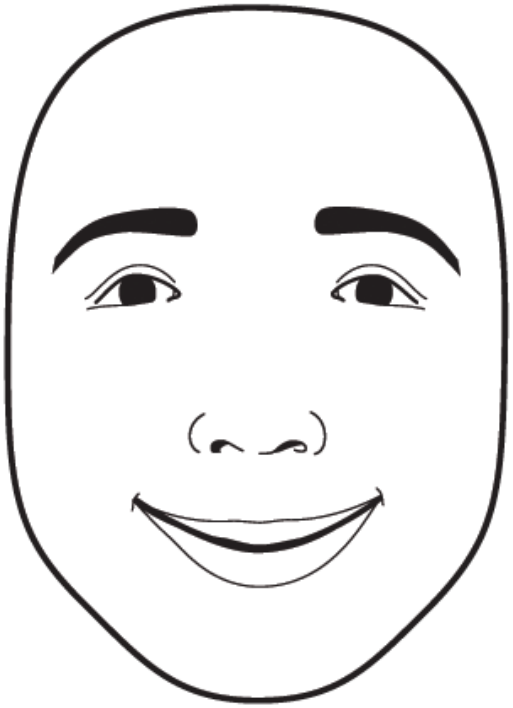
Return to FIGURE 37.4 Cultural consensus in question

Extended description for FIGURE 37.5

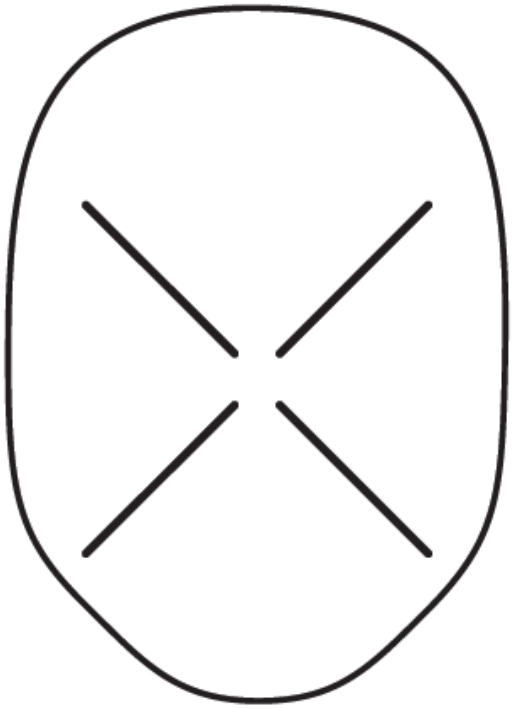
Anger expressed



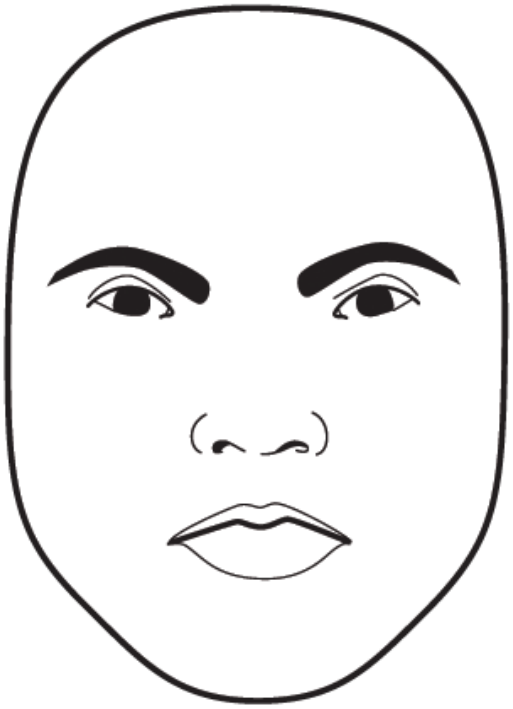
(a)



(c)



(b)



(d)

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Illustration (a) shows an outline of a face with four lines on the blank face. The lines form a diamond shape that starts at the forehead, goes to the side of each cheek, and ends at the chin. Illustration (b) shows an outline of a face with four lines that form an X shape, with the junction of the two lines around the location where the nose would be. Illustration (c) shows a face that is smiling in happiness. Illustration (d) shows a face that is frowning in anger.

Return to FIGURE 37.5 Anger expressed

Extended description for FIGURE 37.7 How to make people smile without telling them to smile

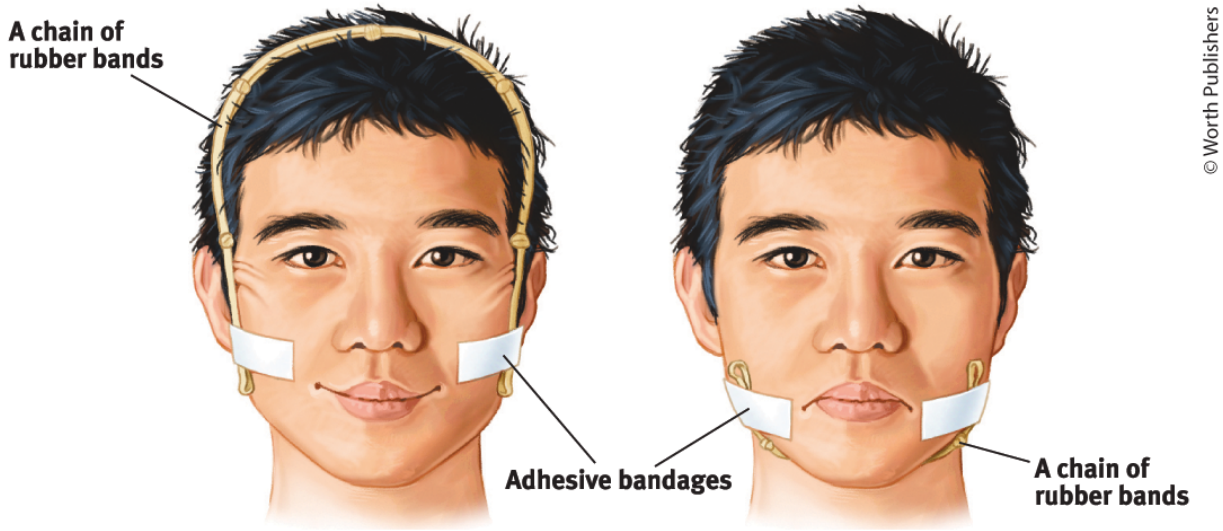
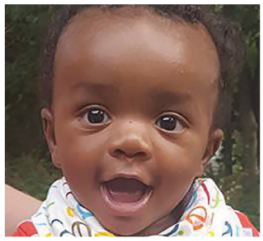


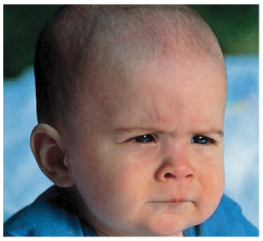
Illustration (a) shows a man with a chain of rubber bands over his head. The chain is stuck using adhesive bandages against his cheeks, seemingly pulling his cheeks upward, which makes it look like he's smiling. Illustration (b) shows the same man with a chain of rubber bands below his chin. The chain is stuck using adhesive bandages against his cheeks, seemingly pulling his cheeks downwards, which makes it look like he's frowning.

Return to FIGURE 37.7 How to make people smile without telling them to smile

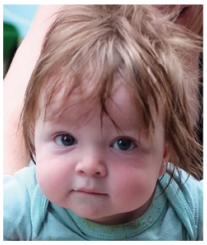
Extended description for FIGURE 38.1 Some naturally occurring infant emotions



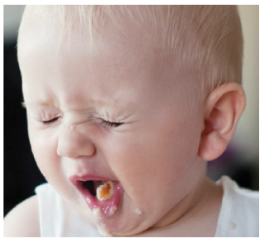
Joy (mouth forming smile, cheeks lifted, twinkle in eye)



Anger (brows drawn together and downward, eyes fixed, mouth squarish)



Interest (brows raised or knitted, mouth softly rounded, lips may be pursed)



Disgust (nose wrinkled, upper lip raised, tongue pushed outward)



Surprise (brows raised, eyes widened, mouth rounded in oval shape)



Sadness (brows' inner corners raised, mouth corners drawn down)



Fear (brows level, drawn in and up, eyelids lifted, mouth corners retracted)

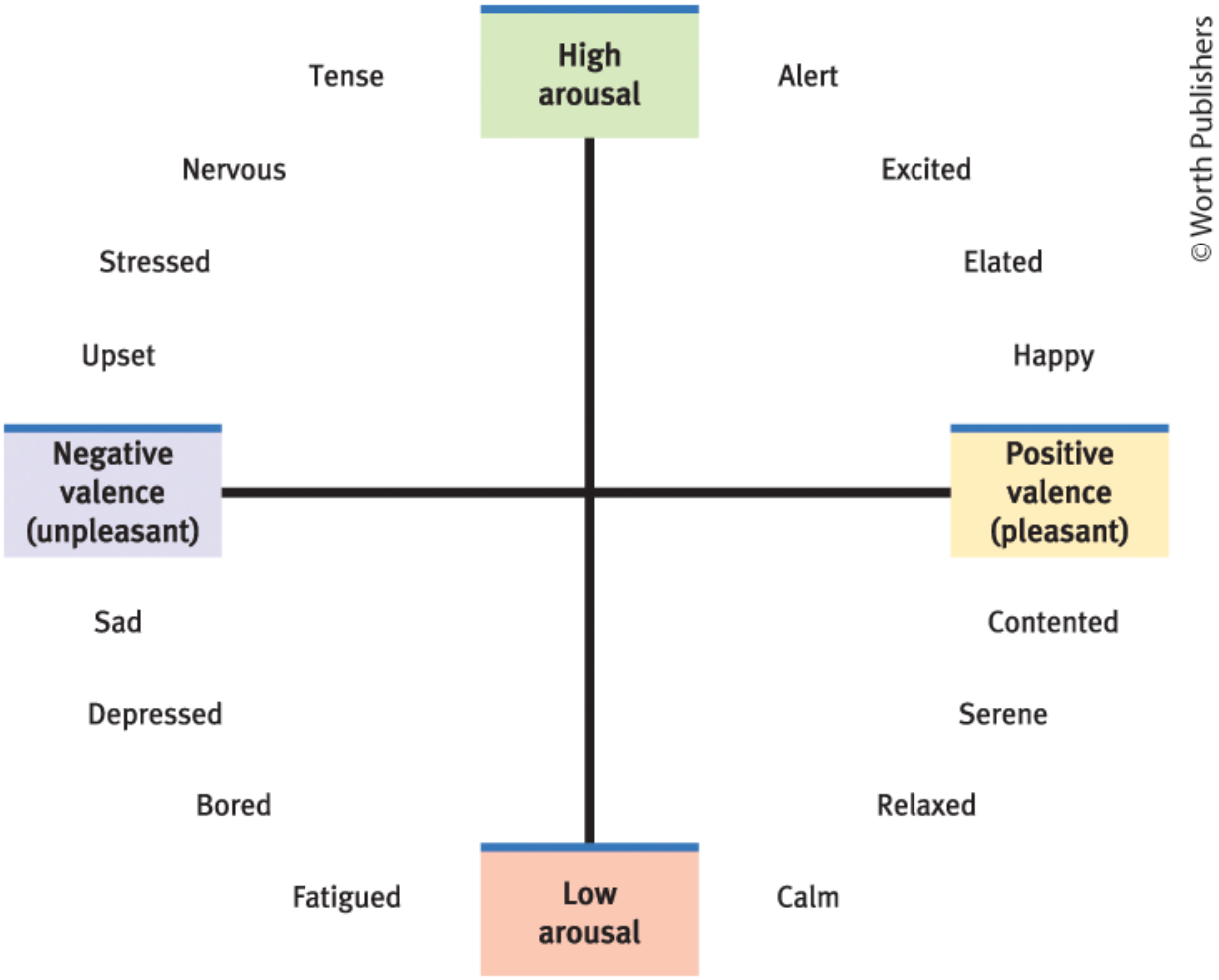
Top left to right: Lorie Hailey; Patrick Donehue/Science Source; Raul Saucedo; bottom left to right: lina aidukaite/Getty Images; Samuel Borges Photography/Shutterstock; bendao/Getty Images; Vladimir Godnik/Getty Images

From left to right, the top row has three photos. Text below reads, (a) Joy (mouth forming smile, cheeks lifted, twinkle in eye); (b) Anger (brows drawn together and downward, eyes fixed, mouth squarish); and (c) Interest (brows raised or knitted, mouth softly rounded, lips may be pursed). The bottom row shows four photos. From left to right the text below reads: (d) Disgust (nose wrinkled, upper lip raised, tongue pushed outward); (e) Surprise (brows raised, eyes widened, mouth rounded in oval shape); (f) Sadness (brow's inner

corners raised, mouth corners drawn down); and (g) Fear (brows level, drawn in and up, eyelids lifted, mouth corners retracted).

Return to FIGURE 38.1 Some naturally occurring infant emotions

Extended description for FIGURE 38.2 A tale of two emotional dimensions

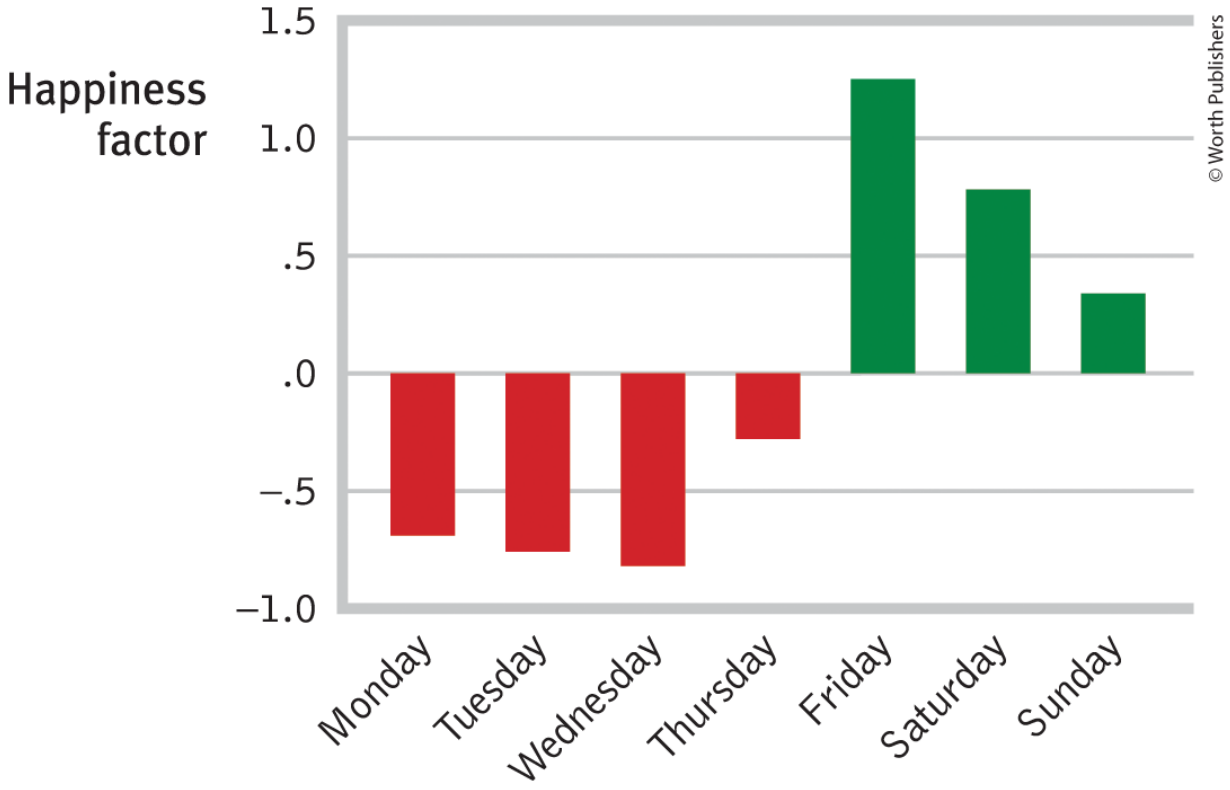


There are two dimensions represented by a vertical line and a horizontal line, crossed at 90-degree angles in the middle. At the top, a text box reads, **High arousal**; to the right, a text box reads, **Positive valence (pleasant)**; at the bottom, a text box reads, **Low arousal**; and to the left, a text box reads, **Negative valence (unpleasant)**.

There are four emotions in each of the four quadrants of this figure. The top right quadrant has the following, starting at the top and moving clockwise to the right: alert, excited, elated, and happy. The bottom right quadrant has the following, starting at the right and moving clockwise to the bottom: contented, serene, relaxed, and calm. The lower left quadrant has the following, starting at the bottom and moving clockwise to the left: fatigued, bored, depressed, and sad. The upper left quadrant has the following, starting at the left and moving clockwise to the top: upset, stressed, nervous, and tense.

Return to FIGURE 38.2 A tale of two emotional dimensions

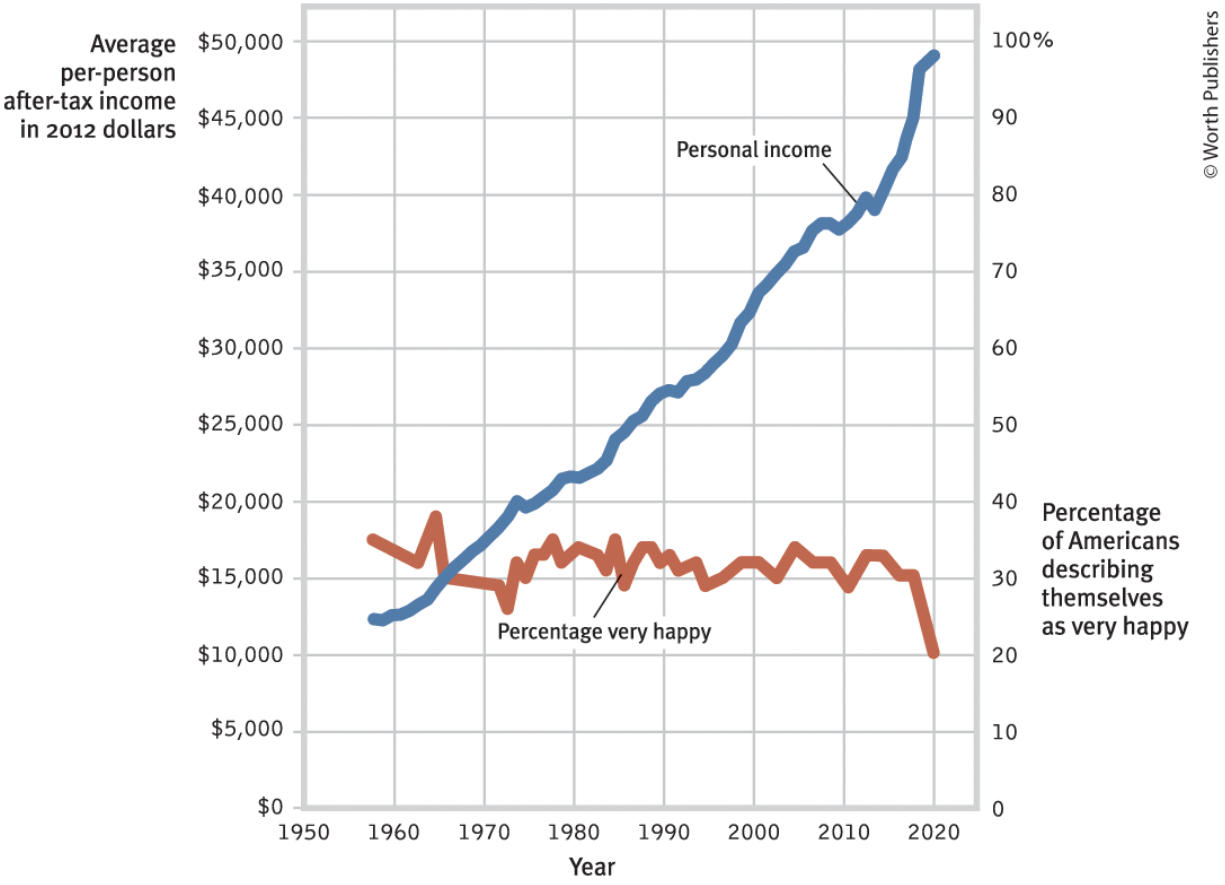
Extended description for FIGURE 38.3 Emotion notification



The horizontal axis is labeled from Monday to Sunday. The vertical axis represents Happiness factor and ranges from negative 1.0 to positive 1.5, in increments of 0.5. The data are as follows: (Monday, negative 0.7); (Tuesday, negative 0.75); (Wednesday, negative 0.80); (Thursday, negative 0.25); (Friday, positive 1.25); (Saturday, positive 0.75); and (Sunday, positive 0.35). All data are approximate

Return to FIGURE 38.3 Emotion notification

Extended description for FIGURE 38.4 Money didn’t buy happiness

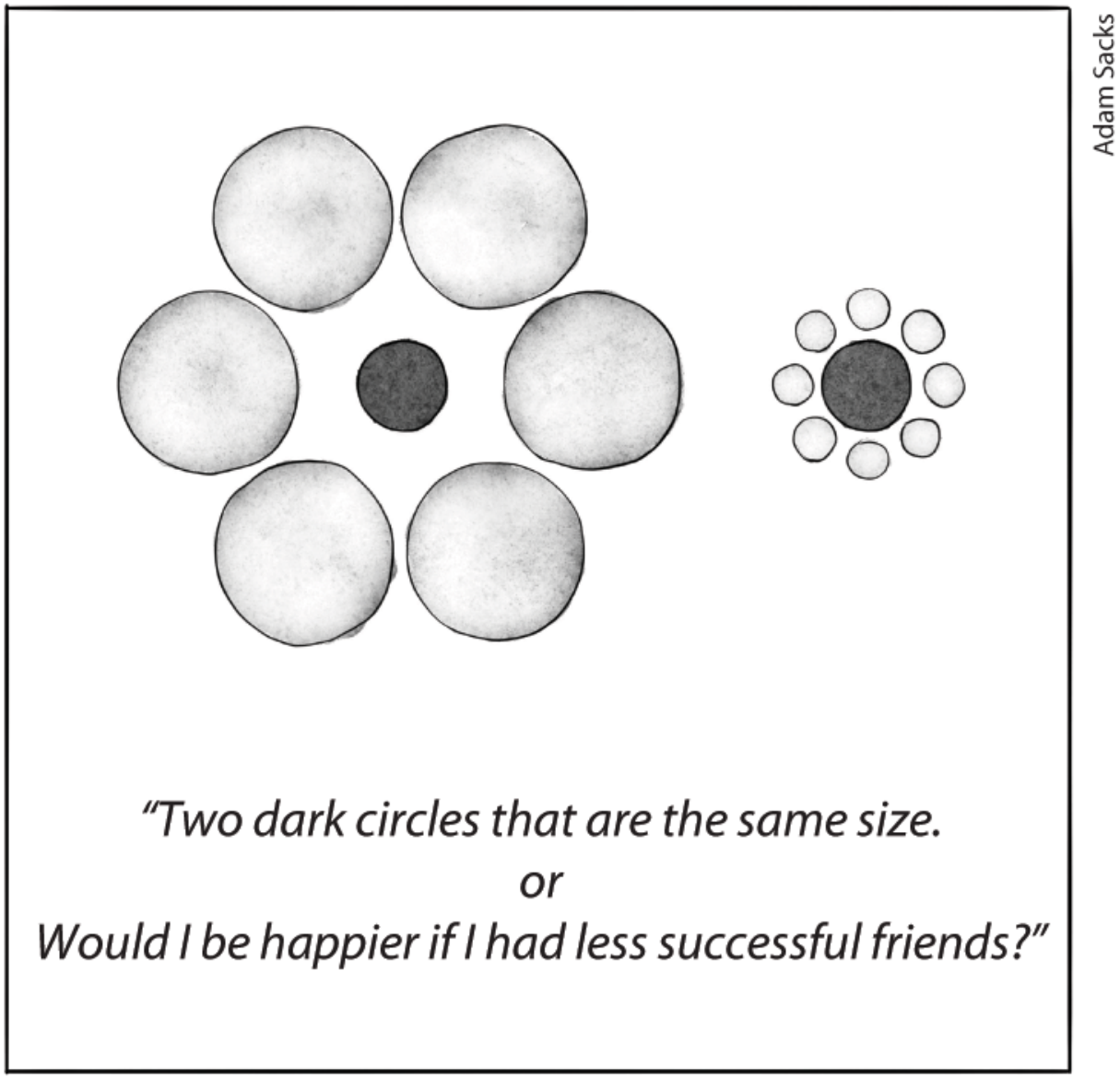


The horizontal axis represents the Year and ranges from 19 50 to 20 20, in increments of 10. The left vertical axis represents Average per-person after-tax income in 2012 dollars and ranges from dollars 0 to dollars 50,000, in increments of 5,000 dollars. The right vertical axis represents Percentage of Americans describing themselves as very happy and ranges from 0 to 100 percent, in increments of 10. A

curve representing Personal income starts at around 12,500 dollars in the year 19 57 and slopes upwards to end at 44,000 dollars in the year 2019. Another curve representing Percentage very happy starts at around 36 percent in the year 19 57 and fluctuates slightly to end at 30 percent in the year 2019. All data are approximate.

Return to FIGURE 38.4 Money didn't buy happiness

Extended description for Relative deprivation



The dark circle on the left is surrounded by six large light circles. The dark circle on the right is surrounded by eight small light

circles. Text below reads, Two dark circles that are the same size. *or* Would I be happier if I had less successful friends?

Return to Relative deprivation

Extended description for FIGURE 39.1 Stress appraisal

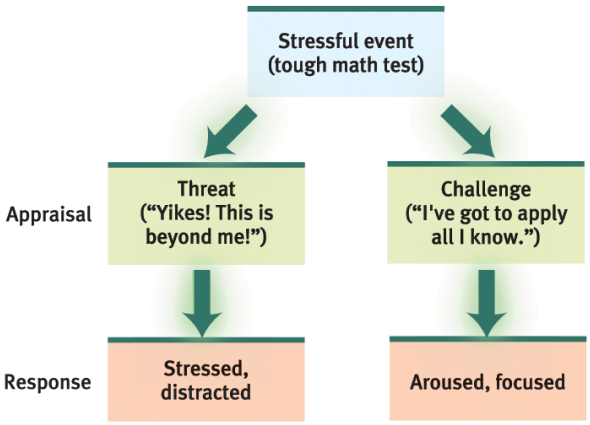




Photo: Fuse/Getty Images
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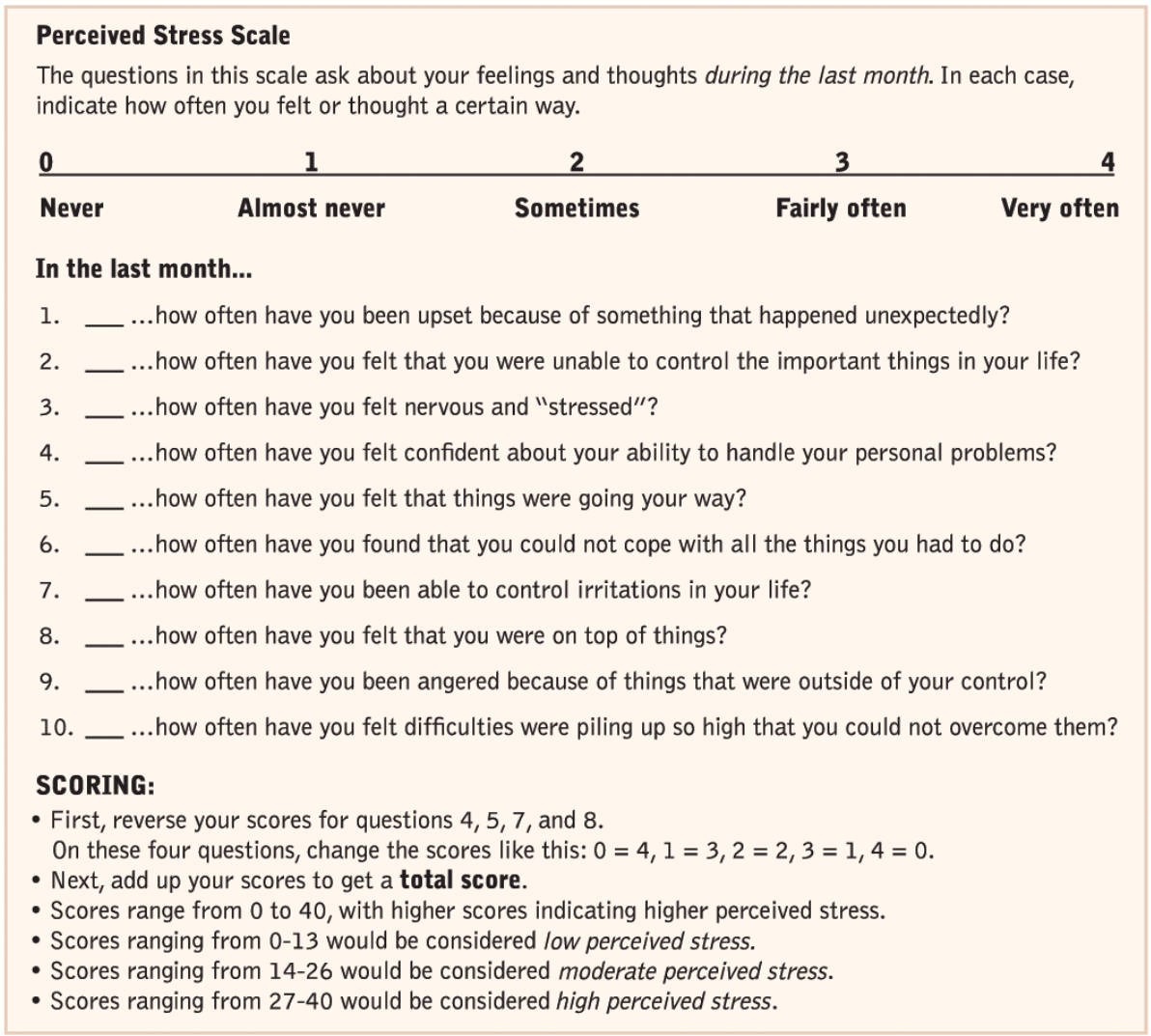
The flowchart shows Stressful event (tough math test), Appraisal, and Response. In the first path, the stressful event of a tough math test leads to an appraisal of threat (Yikes! This is beyond me!) that leads to a response of stressed and distracted. In the second path, the stressful event of a math test leads to the appraisal of challenge (I've got to apply all I know.) that leads to a response of aroused and focused.

Return to FIGURE 39.1 Stress appraisal

Extended description for FIGURE 39.2 Perceived Stress Scale



Perceived Stress Scale

The questions in this scale ask about your feelings and thoughts *during the last month*. In each case, indicate how often you felt or thought a certain way.

0	1	2	3	4
Never	Almost never	Sometimes	Fairly often	Very often

In the last month...

1. ___ ...how often have you been upset because of something that happened unexpectedly?
2. ___ ...how often have you felt that you were unable to control the important things in your life?
3. ___ ...how often have you felt nervous and "stressed"?
4. ___ ...how often have you felt confident about your ability to handle your personal problems?
5. ___ ...how often have you felt that things were going your way?
6. ___ ...how often have you found that you could not cope with all the things you had to do?
7. ___ ...how often have you been able to control irritations in your life?
8. ___ ...how often have you felt that you were on top of things?
9. ___ ...how often have you been angered because of things that were outside of your control?
10. ___ ...how often have you felt difficulties were piling up so high that you could not overcome them?

SCORING:

- First, reverse your scores for questions 4, 5, 7, and 8.
  On these four questions, change the scores like this: 0 = 4, 1 = 3, 2 = 2, 3 = 1, 4 = 0.
- Next, add up your scores to get a **total score**.
- Scores range from 0 to 40, with higher scores indicating higher perceived stress.
- Scores ranging from 0-13 would be considered *low perceived stress.*
- Scores ranging from 14-26 would be considered *moderate perceived stress*.
- Scores ranging from 27-40 would be considered *high perceived stress*.

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The survey is titled, **Perceived Stress Scale**. Text reads as follows: The questions in this scale ask about your feelings and thoughts

during the last month. In each case, indicate how often you felt or thought a certain way.

Under this text is a scale reading: **0, Never; 1, Almost never; 2, Sometimes; 3, Fairly often; 4, Very often.**

Under the scale the questions to be rated are as follows:

In the last month… 1. How often have you been upset because of something that happened unexpectedly? 2. How often have you felt that you were unable to control the important things in your life? 3. How often have you felt nervous and stressed? 4. How often have you felt confident about your ability to handle your personal problems? 5. How often have you felt that things were going your way? 6. How often have you found that you could not cope with all the things you had to do? 7. How often have you been able to control irritations in your life? 8. How often have you felt that you were on top of things? 9. How often have you been angered because of things that were outside of your control? 10. How often have you felt difficulties were piling up so high that you could not overcome them?

Scoring: First, reverse your scores for questions 4, 5, 7, and 8. On these four questions, change the scores like this: 0 equals 4, 1 equals 3, 2 equals 2, 3 equals 1, and 4 equals 0. Next, add up your scores to get a **total score**. Scores range from 0 to 40, with higher scores indicating higher perceived stress. Scores ranging from 0 to 13

would be considered *low perceived stress*. Scores ranging from 14 to 26 would be considered *moderate perceived stress*. Scores ranging from 27 to 40 would be considered *high perceived stress*.

Return to FIGURE 39.2 Perceived Stress Scale

Extended description for FIGURE 39.3 Studying stress



1. Participants chew gum so that collecting saliva is easy. The researcher takes a saliva sample from each participant at the beginning of the experiment to measure levels of the stress hormone *cortisol*.



2. Participant gives simulated job interview speech to a critical panel. Next, the participant is asked to complete difficult math problems out loud.

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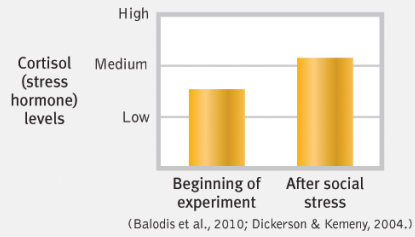


3. Measuring cortisol in participants' saliva before and after tells us that although they enter the lab experiencing some stress, that level goes up 40 percent after they experience social stress.



4. Research team thanks and *debriefs* the participant—explaining the purpose of the experiment and the role she played.

The four-step model is as follows:

1. An illustration shows a researcher holding a clipboard as the participant spits into a test tube and returns it to the researcher. Accompanying text reads, Participants chew gum so that collecting saliva is easy. The researcher takes a saliva sample from each participant at the beginning of the experiment to measure levels of the stress hormone *cortisol*.

2. An illustration shows the participant giving a speech into a microphone at a podium in front of three people seated at a table. One of the observers asks the participant, What is 1223 minus 37? Accompanying text reads, Participant gives simulated job interview speech to a critical panel. Next, the participant is asked to compute difficult math problems out loud.

3. A bar graph is labeled Beginning of experiment and After social stress on the horizontal axis. The vertical axis represents Cortisol (stress hormone) levels and is labeled low, medium, and high from bottom to top. The bar for the beginning of the experiment goes to halfway between low and medium cortisol levels, and the bar for after social stress rises to just above the medium cortisol level. Accompanying text reads, Measuring cortisol in participants' saliva before and after tells us that although they enter the lab experiencing some stress, that level goes up 40 percent after they experience social stress.

4. An illustration shows the participant smiling and shaking hands with the panel while receiving a thank you written note. Accompanying text reads, Research team thanks and *debriefs* the participant - explaining the purpose of the experiment and the role she played.

Return to FIGURE 39.3 Studying stress

Extended description for Stress response system



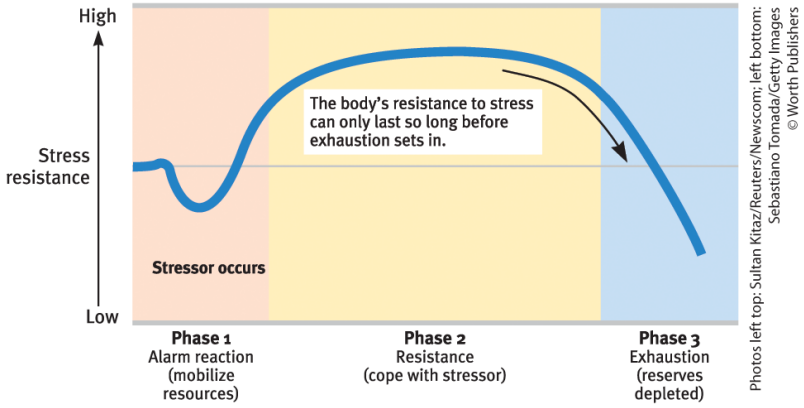
Roz Chast/Cartoon Stock

Above the five faces, a question reads, How is your terror today? The first face shows a wide smile; the text reads, Shhh. I am sleeping. The second face shows a moderate smile; the text reads, I am awake. The third face shows a slightly worried expression; the text reads, What? The fourth face shows a deeply worried face with wide eyes and a frightened frown; the text reads, WHAT? in all capital letters. The fifth face shows a highly terrified face with large, wide eyes that are trembling and a wide open mouth with teeth showing in a deep frown. Text reads, WHAT?!?! in all capital bold letters.

Return to Stress response system

Extended description for FIGURE 39.4 Selye's general adaptation syndrome





Photos left top: Sultan Kitaz/Reuters/Newscom; left bottom: Sebastiano Tomada/Getty Images
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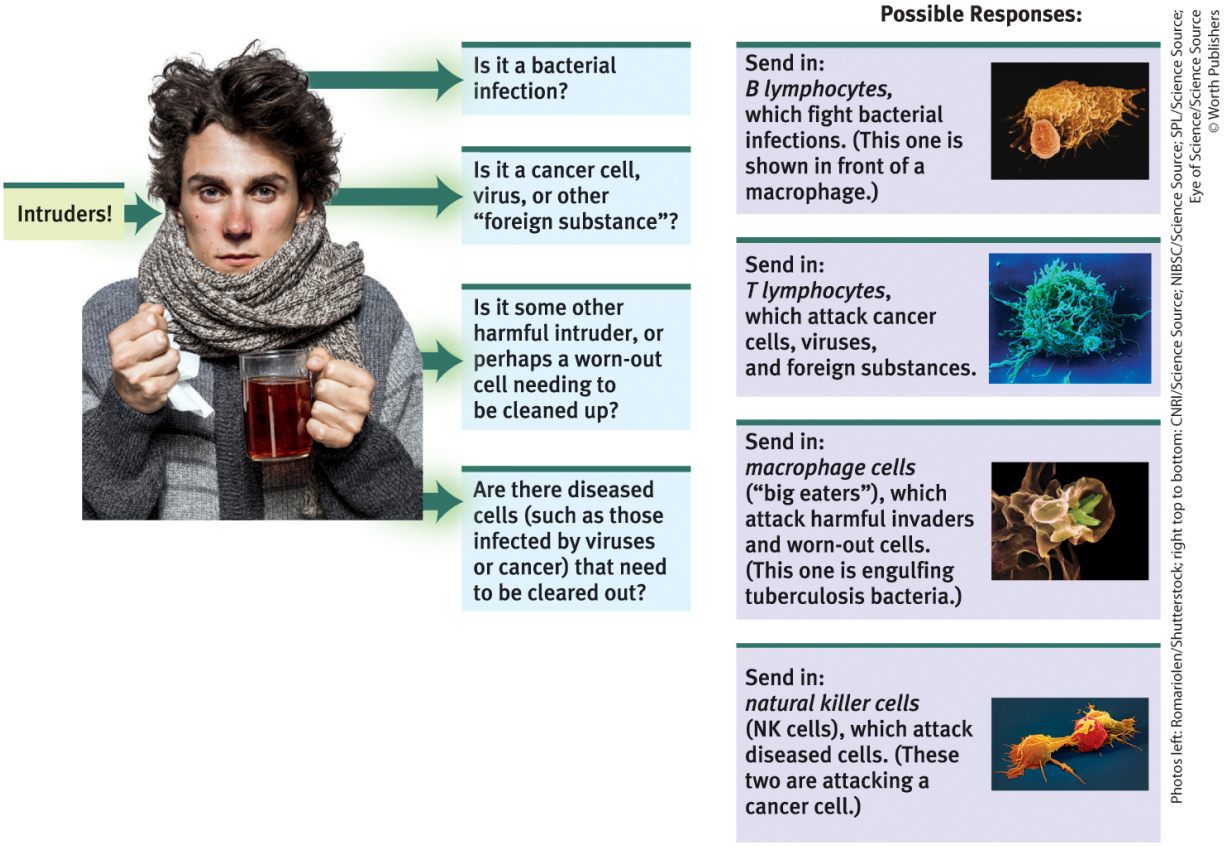
In the graph, the horizontal axis is labeled **Phase 1**, Alarm reaction (mobilize resources); **Phase 2**, Resistance (cope with stressor); **Phase 3**, Exhaustion (reserves depleted). The vertical axis represents Stress resistance and ranges from low at the bottom to high at the top. The curve ranges from medium to high-stress resistance at phase 1. The phase one curve range is labeled, Stressor occurs. The curve rises to its highest level and then stays at a constant high level at phase 2. Right at the end of phase 2, the curve begins to drop. Accompanying text reads, The body's resistance to stress can only last so long before exhaustion sets in. The curve drops down to the lowest stress resistance at phase 3.

The top photo shows two men wearing helmets rescuing children and carrying them in their arms amid the rubble of a damaged building.

The bottom photo shows two of those rescuers looking depressed and anxious while seated in a building.

Return to FIGURE 39.4 Selye's general adaptation syndrome

Extended description for FIGURE 39.5 A simplified view of immune responses



A photo on the left shows a man in a sweater and a scarf with a hot drink in one hand and a handkerchief in the other hand. To the left of the man, the word Intruders! is written with an arrow that points to him. Arrows from the man point right toward text boxes representing possibilities.

The text boxes read as follows from top to bottom: Is it a bacterial infection? Is it a cancer cell, virus, or other foreign substance? Is it some other harmful intruder, or perhaps a worn-out cell needing to be cleaned up? Are there diseased cells (such as those infected by viruses or cancer) that need to be cleared out?

The final column shows Possible Responses in boxes as follows from top to bottom. The first response reads, Send in: *B lymphocytes*, which fight bacterial infections. (This one is shown in front of a macrophage.) An electron micrograph shows B lymphocytes. The second response reads, Send in: *T lymphocytes*, which attack cancer cells, viruses, and foreign substances. An electron micrograph shows T lymphocytes. The third response reads, Send in: *macrophage cells* (big eaters), which attack harmful invaders and worn-out cells. (This one is engulfing tuberculosis bacteria.) An electron micrograph shows macrophage cells. The fourth response reads, Send in: *natural killer cells* (N K cells), which attack diseased cells. (These two are attacking a cancer cell.) An electron micrograph shows N K cells. Each response lines up approximately in order with the possible intruder.

Return to FIGURE 39.5 A simplified view of immune responses

Extended description for FIGURE 39.6 Stress and colds



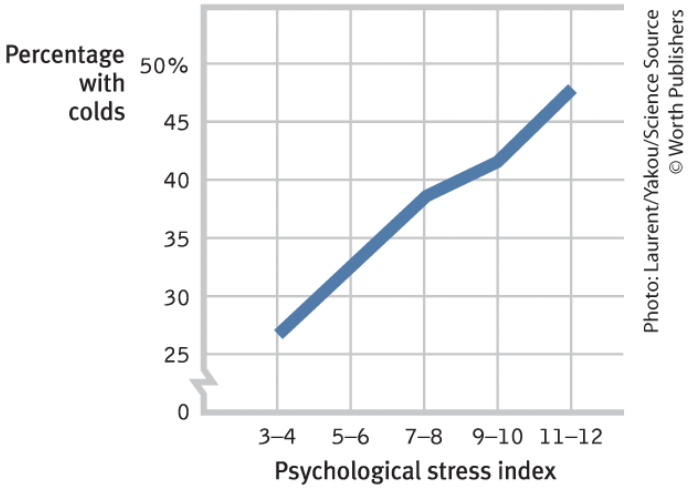
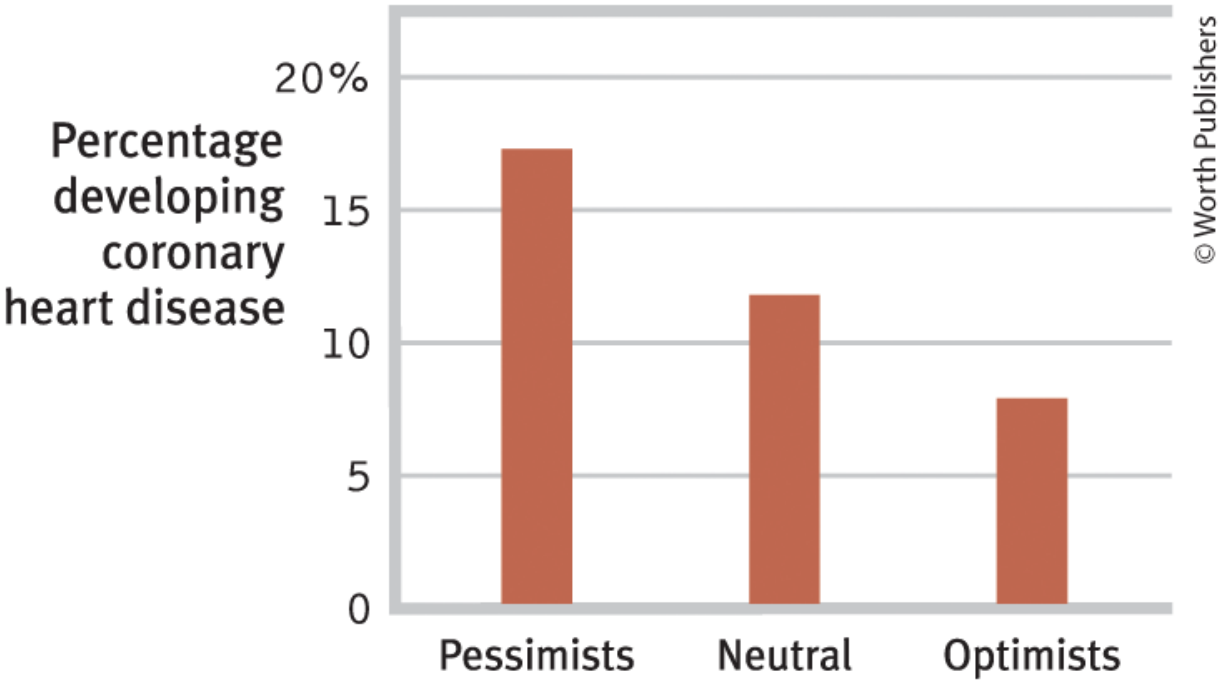


Photo: Laurent/Yakou/Science Source
© Worth Publishers

The horizontal axis represents psychological stress index and is labeled 3 to 4, 5 to 6, 7 to 8, 9 to 10, and 11 to 12. The vertical axis represents percentage with colds and ranges from 0 to 50 percent, in increments of 5. Between 0 and 25 percent, there are no values. A line begins at 3 to 4 and is about 27 percent. It increases in a linear fashion to 7 to 8 where it is at 39 percent. The line then flattens slightly, and at 9 to 10 the value is 42 percent. It then increases again to 11 to 12 and 47.5 percent. All data are approximate.

Return to FIGURE 39.6 Stress and colds

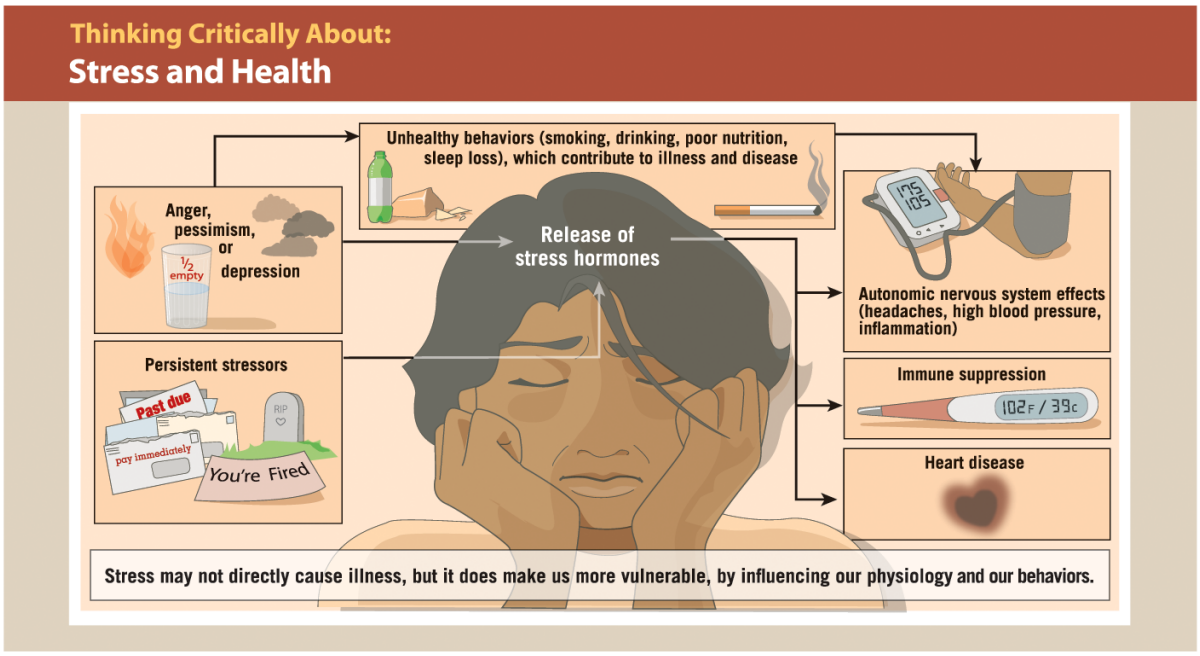
Extended description for FIGURE 39.7 Pessimism and heart disease



The horizontal axis is labeled Pessimists, Neutral, and Optimists. The vertical axis represents percentage developing coronary heart disease and ranges from 0 to 20 percent, in increments of 5. The data are as follows: Pessimists, 17 percent; Neutral, 12 percent; and Optimists, 8 percent. All data are approximate.

Return to FIGURE 39.7 Pessimism and heart disease

Extended description for Stress and health



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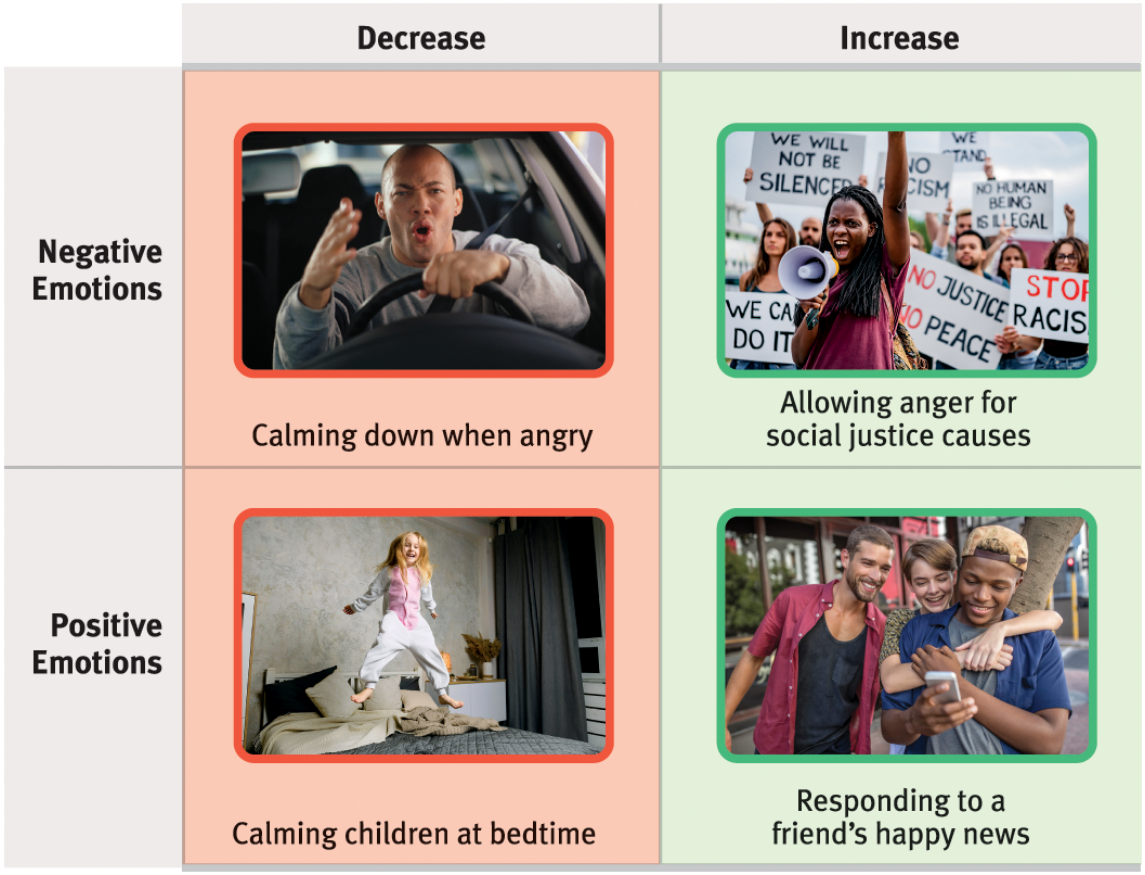
In the center of the infographic is an illustration showing a sad woman with clenched hands against both cheeks and eyes closed. A text overlaid on the head reads, Release of stress hormones. A box on the bottom left titled, Persistent stressors, shows overdue bills, a gravestone, and a pink slip with the words, you're fired. A box on the top left shows flames, dark clouds, and a half empty cup. Text reads: Anger, pessimism, or depression. Arrows point from the boxes to the text on the woman's head, Release of stress hormones. An arrow points from the top left box to a box on the top showing an open soft-drink bottle, an open bag of chips, and a lit cigarette. Text reads: Unhealthy behaviors (smoking, drinking, poor nutrition, sleep loss),

which contribute to illness and disease. An arrow from the text on the woman's head, Release of stress hormones, points to three boxes on the right. The box on the top right shows a sphygmomanometer with the cuff around an arm and the display reading 175 over 105. Text reads: Autonomic nervous system effects (headaches, high blood pressure, inflammation). The box on the middle right titled, Immune suppression, shows a thermometer with a reading of 102 degrees Fahrenheit or 39 degrees Celsius. The box on the middle right titled, Heart disease, shows a heart surrounded by blurry gray. An arrow also points from the box on the top to the box on the top right. A text box at the bottom of the infographic reads: Stress may not directly cause illness, but it does make us more vulnerable, by influencing our physiology and our behaviors.

Return to Stress and health

Extended description for FIGURE 40.1 How do we change our feelings?



Top left: Anthony Redpath/The Image Bank/Getty Images; top right: urbazon/E+/Getty Images; bottom left: Oleksandr Lypa/Alamy Stock Photo; bottom right: Tomas Rodriguez/Stone/Getty Images
© Worth Publishers

The column headers are Decrease and Increase. The row headers are Negative Emotions and Positive Emotions. The row entries are as follows:

Row 1, column 1 shows a photo of an angry man driving and making an angry gesture. Accompanying text reads, Calming down when

angry.

Row 1, column 2 shows a photo of a woman using a megaphone at a rally. Several other people are behind her holding signs supporting their cause. Accompanying text reads, Allowing anger for social justice causes.

Row 2, column 1 shows a photo of a child in pajamas jumping on her bed. Accompanying text reads, Calming children at bedtime.

Row 2, column 2 shows a photo of three women sitting together. One is showing another the ring on her finger. The third woman is looking on. They are all smiling broadly. Accompanying text reads, Responding to a friend's happy news.

Return to FIGURE 40.1 How do we change our feelings?

Extended description for Social support



Baby Blues: © 2010 Baby Blues Partnership Distributed by King Features Syndicate, Inc

The first panel shows a woman scanning through magazine covers. A callout pointing toward one of the magazine covers reads, “Scientists: Holding hands with loved ones lowers blood pressure.”

The second panel shows the woman in front of the cash counter holding hands with two wailing children. The woman has a tired look on her face. A callout pointing toward the same magazine continues and reads, “May not include small children.” A thought bubble emerging from the woman reads, “Duh.”

Return to Social support

Extended description for FIGURE 40.2 Aerobic exercise reduces mild depression



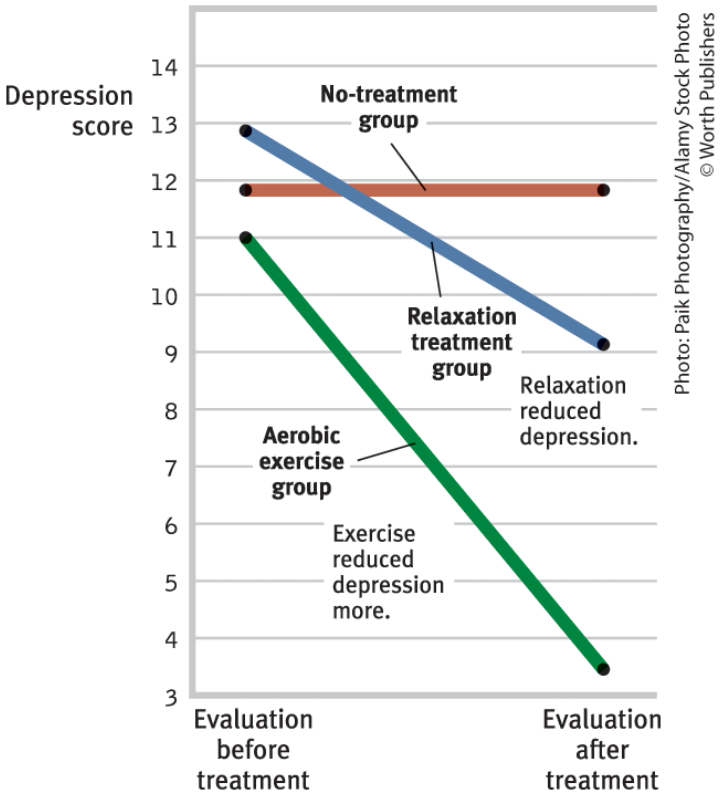


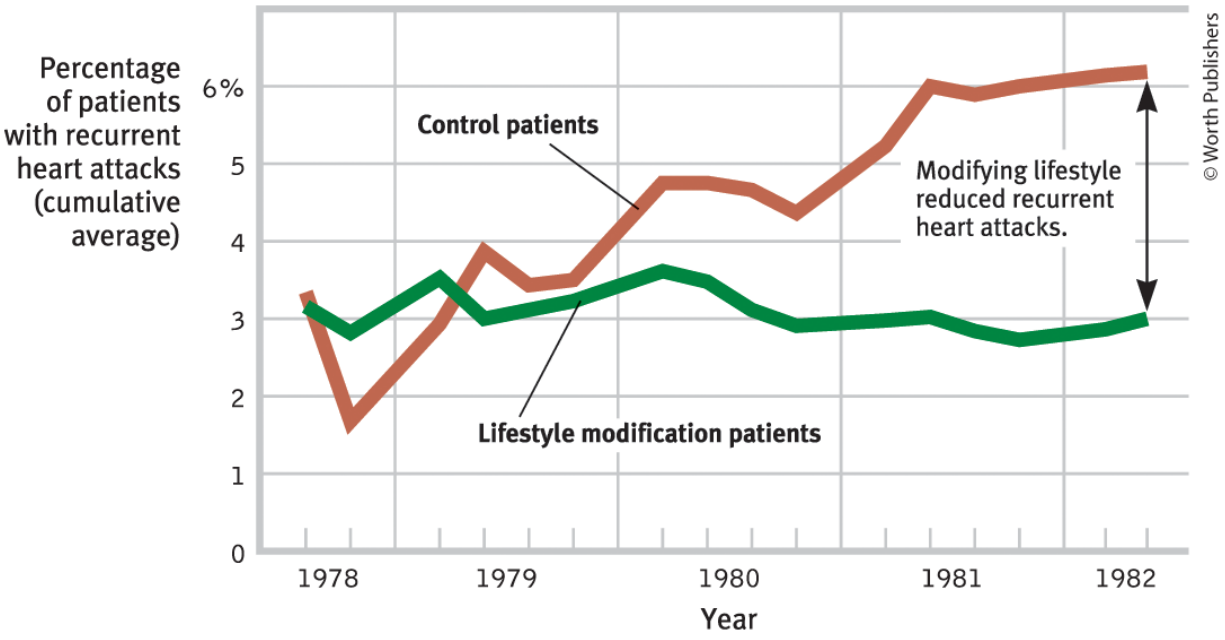
Photo: Paik Photography/Alamy Stock Photo
© Worth Publishers

The horizontal axis is labeled Evaluation before treatment on the left and Evaluation after treatment on the right. The vertical axis represents Depression score and ranges from 3 to 14, in increments of 1. The line for No-treatment group remains stable at a score of 12 from evaluation before treatment till evaluation after treatment. The line for Relaxation treatment group starts at a score of 13 for evaluation before treatment and slopes down to a score of 9 for evaluation after treatment. Accompanying text reads: Relaxation

reduced depression. The line for Aerobic exercise group starts at a score of 11 for evaluation before treatment and slopes down to a score of 3.5 for evaluation after treatment. Accompanying text reads: Exercise reduced depression more. All data are approximate.

Return to FIGURE 40.2 Aerobic exercise reduces mild depression

Extended description for FIGURE 40.3 Recurrent heart attacks and lifestyle modification

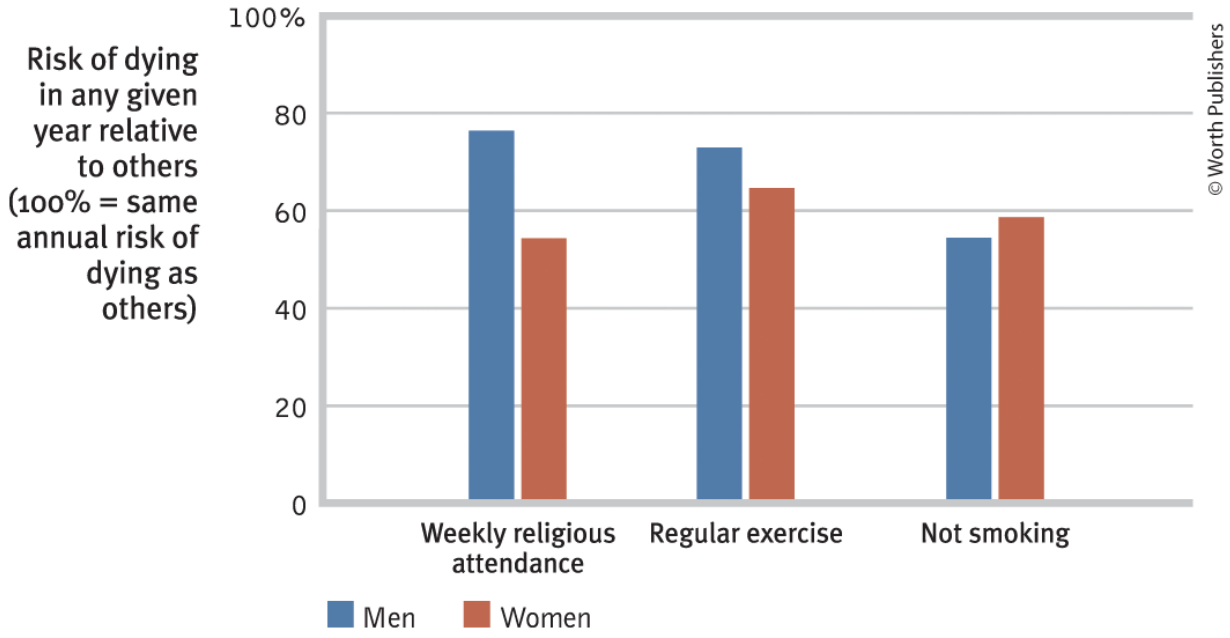


The horizontal axis represents Year and ranges from 19 78 to 19 82, in increments of 1. The vertical axis represents Percentage of patients with recurrent heart attacks (cumulative average) and ranges from 0 to 6 percent, in increments of 1. A curve representing Control patients starts from 3.2 percent patients with recurrent heart attacks in 19 78, slopes down to 1.5 percent patients with recurrent heart attacks in 19 78, and slopes upward to 6 percent patients with recurrent heart attacks in 19 82. A curve representing Lifestyle modification patients starts at 3.2 percent patients with

recurrent heart attacks in 19 78 and stays steady to 3 percent patients with recurrent heart attacks in 19 82, indicating that modifying lifestyle reduced recurrent heart attacks. A vertical double-headed arrow between control patients (19 82, 6.1 percent) and lifestyle modification patients (19 82, 3 percent) reads: Modifying lifestyle reduced recurrent heart attacks. All data are approximate.

Return to FIGURE 40.3 Recurrent heart attacks and lifestyle modification

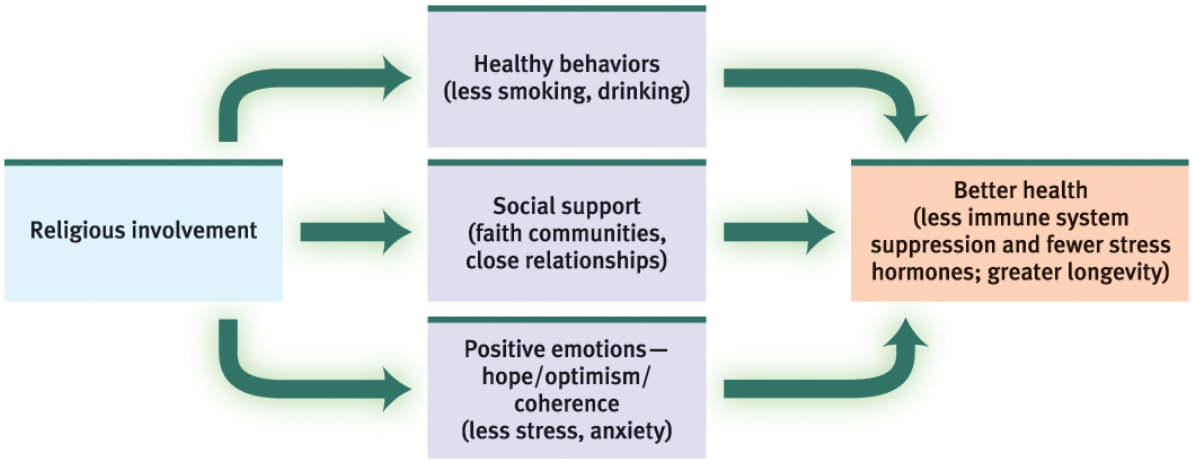
Extended description for FIGURE 40.4 Predictors of longer life



The horizontal axis is labeled Weekly religious attendance, Regular exercise, and Not smoking. The vertical axis represents Risk of dying in any given year relative to others (100 percent equals same annual risk of dying as others) and ranges from 0 to 100 percent, in increments of 20. The data are as follows: For weekly religious attendance: Men, 78 percent and Women, 55 percent; For regular exercise: Men, 73 percent and Women, 65 percent; and For not smoking: Men, 55 percent and Women, 59 percent. All data are approximate.

Return to FIGURE 40.4 Predictors of longer life

Extended description for FIGURE 40.5 Correlation between religious involvement and health



© Worth Publishers

The flowchart shows arrows pointing from the text box on the left reading, religious involvement, to three text boxes in the middle reading as follows from the top: Healthy behaviors (less smoking, drinking); Social support (faith communities, close relationships); and Positive emotions - hope slash optimism slash coherence (less stress, anxiety). Arrows point from the three text boxes to another text box on the right reading, Better health (less immune system suppression and fewer stress hormones; greater longevity).

Return to FIGURE 40.5 Correlation between religious involvement and health

Extended description for FIGURE 41.1 Attitudes follow behavior

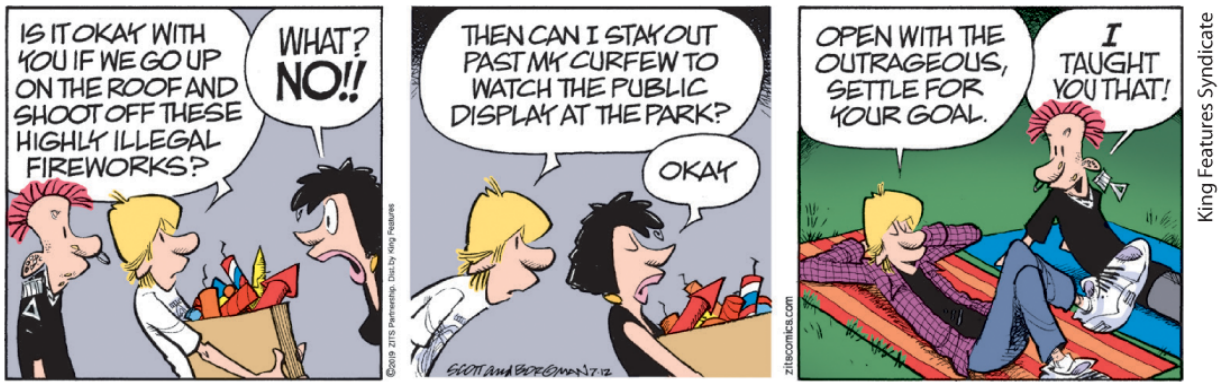


Photo: Matthias Hangst/Getty Images
© Worth Publishers

Above the photo is a box labeled, Actions. Arrows come from that box, go around the photo, and connect to a box beneath the photo labeled, Attitudes. An arrow comes from that box, goes up around the photo, and reconnects to the first box in a closed loop.

Return to FIGURE 41.1 Attitudes follow behavior

Extended description for Foot-in-the-door phenomenon



In the first panel, the teenager holds a large bag of fireworks. While his friend watches, he asks his mother, “Is it okay with you if we go up on the roof and shoot off these highly illegal fireworks?” The mother replies, “What? No!!” Her response is emphatic in all capital letters.

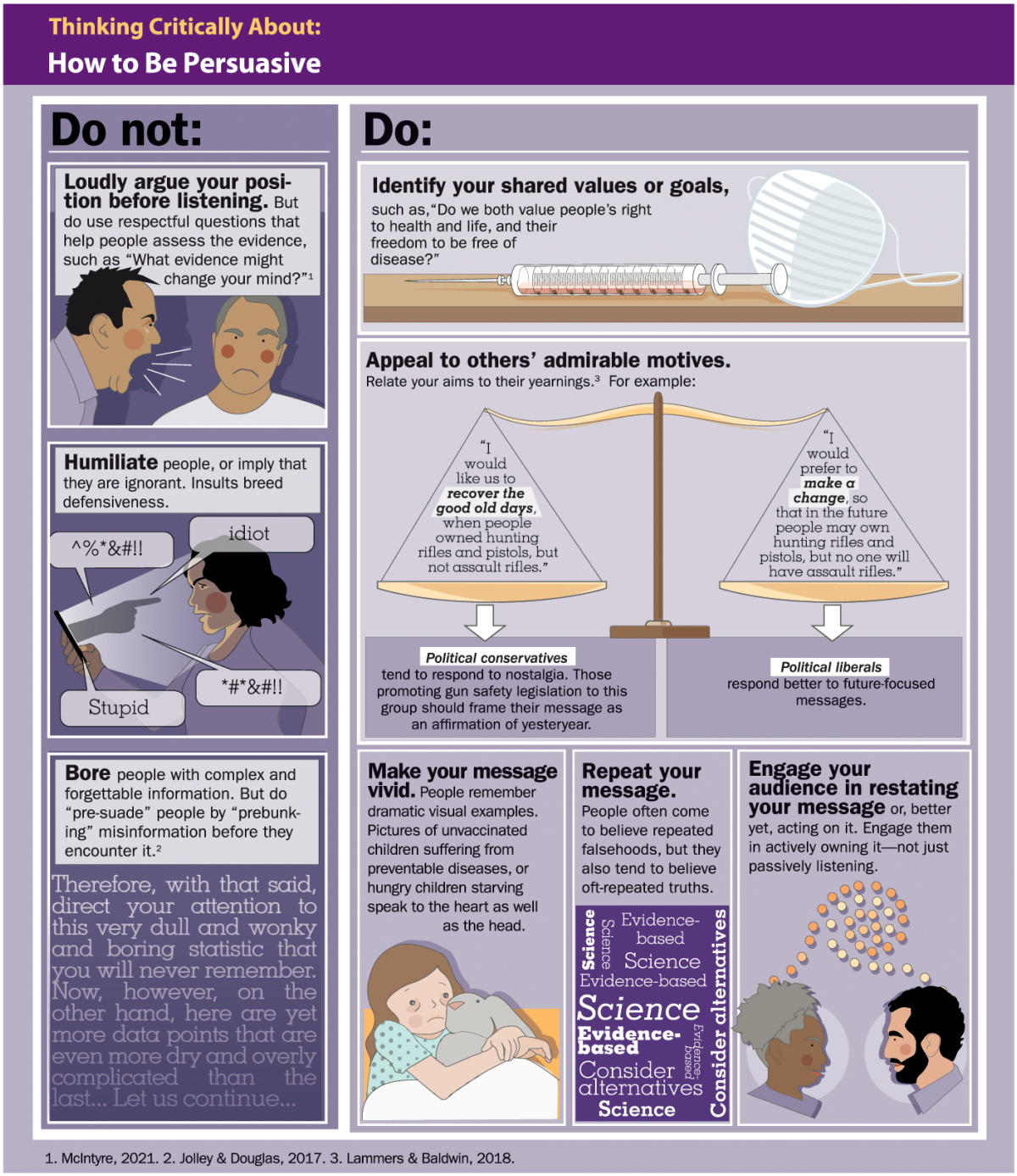
In the second panel, the teenager asks the mother, “Then can I stay out past my curfew to watch the public display at the park?” The mother replies, “Okay,” as she walks away holding the bag of fireworks.

In the third panel, the two teenagers are laying on blankets on the grass in a park. The first says, “Open with the outrageous, settle for your goal.” The second says, “I taught you that!”

Return to Foot-in-the-door phenomenon

Extended description for How to be

persuasive



© Worth Publishers

The infographic lists things to do and things not to do in two sections. The section on the left, titled **Do not**, shows three panels.

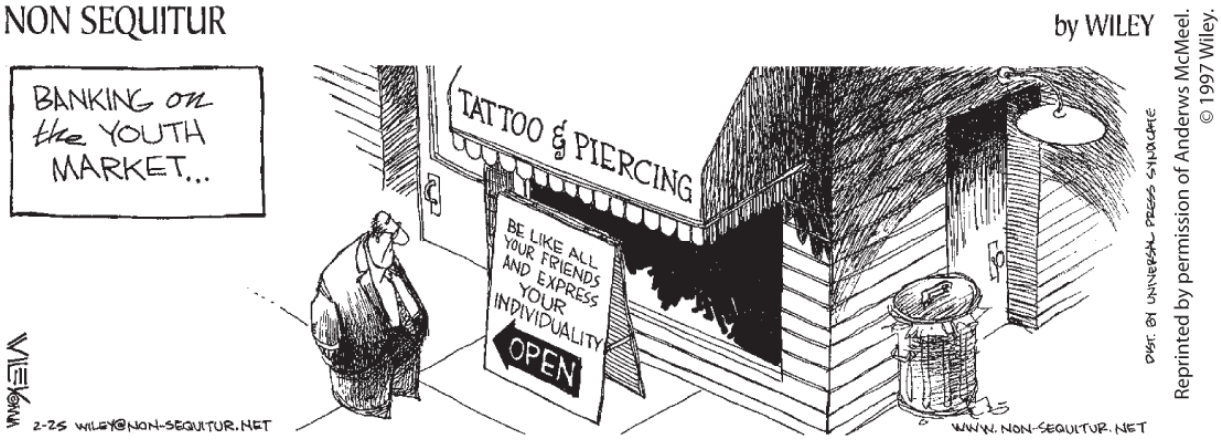
Panel 1: **Loudly argue your position before listening**. But do use respectful questions that help people assess the evidence, such as, "what evidence might change your mind?" (McIntyre, 2021). A cartoon shows an angry man yelling loudly into the face of another person, whose cheeks are read with anger. Panel 2: **Humiliate** people, or imply that they are ignorant. Insults breed defensiveness. A cartoon shows a woman checking a text on her phone with several texts communicated. One says stupid, the other says idiot, and two text boxes have symbols that indicate profanity. The woman has red cheeks from anger. Panel 3: **Bore** people with complex and forgettable information. But do "pre-suade" people by "prebunking" misinformation before they encounter it (Jolley and Douglas, 2017). As an example of useless information, Text reads, therefore with that said, direct your attention to this very dull and wonky and boring statistic that you will never remember. Now, however, on the other hand, here are yet more data points that are even more dry and overly complicated than the last…. Let us continue….

The section on the right, titled **Do,** shows five panels. Panel 1: **Identify your shared values or goals**, such as, "Do we both value people's right to health and life, and their freedom to be free of disease?" An illustration of a protective mask and a hypodermic needle appears beneath the text. Panel 2: **Appeal to others' admirable motives**. Relate your aims to their yearnings (Lammers and Baldwin, 2018). For example: A balancing scale is depicted with text on both sides that are evenly balanced. On the left side of the balance, the text reads, "I would like us to ***recover the good old days***,

when people owned hunting rifles and pistols, but not assault rifles." This text points to another text box below that reads ***Political conservatives*** tend to respond to nostalgia. Those promoting gun safety legislation to this group should frame their message as an affirmation of yesteryear. On the right side of the balance, the text reads, "I would prefer to ***make a change***, so that in the future people may own hunting rifles and pistols, but no one will have assault rifles." This text points toward another text box below that reads, ***Political liberals*** respond better to future-focused messages. Panel 3: **Make your message vivid**. People remember dramatic visual examples. Pictures of unvaccinated children suffering from preventable diseases, or hungry children starving, speak to the heart as well as the head. A cartoon shows a little girl hugging a soft toy while lying in bed under a blanket. Panel 4: **Repeat your message**. People often come to believe repeated falsehoods, but they also tend to believe oft-repeated truths. The phrases 'evidence-based science' and 'consider alternatives' are repeated below. Panel 5: **Engage your audience in restating your message** or, better yet, acting on it. Engage them in actively owning it dash not just passively listening. An illustration depicts a sequence of information being passed from one woman's brain to a man's brain.

Return to How to be persuasive

Extended description for *Non-Sequitur* cartoon



A signboard outside reads, Be like all your friends and express your individuality, with an arrow labeled Open pointing to the door of the tattoo parlor. A textbox on the top left corner reads, Banking on the Youth Market.

Return to *Non-Sequitur* cartoon

Extended description for FIGURE 42.1 Asch's conformity experiments

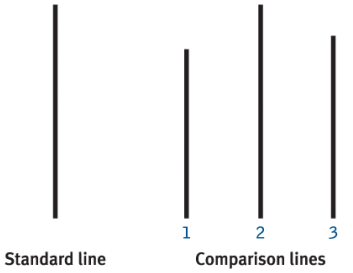




Photo: William Vendivert/Scientific American
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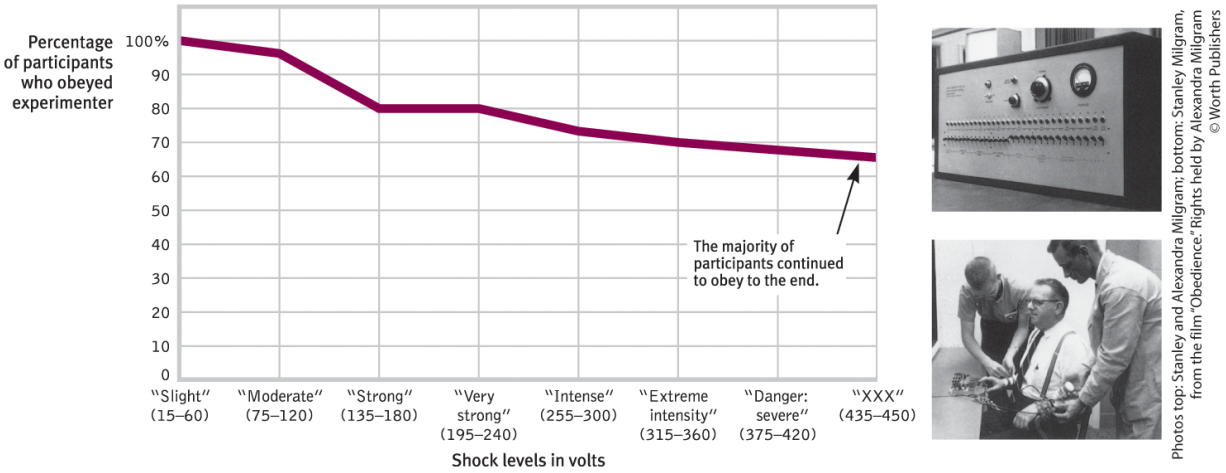
An illustration shows a standard line and three comparison lines. On the left side, a vertical line is labeled Standard line. On the right side are three vertical lines numbered 1, 2, and 3, collectively labeled Comparison lines. Line 1 is shorter than the standard line, line 2 is identical to the standard line, and line 3 is also shorter than the standard line but taller than line 1. A black-and-white photo shows three men sitting at a table. Each man has a small sign in front of him with an identifying number ranging from 5 to 7 (from left to right).

Return to FIGURE 42.1 Asch's conformity experiments

Extended description for FIGURE 42.2 Milgram's follow-up obedience experiment



Photos top: Stanley and Alexandra Milgram; bottom: Stanley Milgram, from the film "Obedience." Rights held by Alexandra Milgram © Worth Publishers

The graph shows the **Percentage of participants who obeyed the experimenter** along the vertical axis with values ranging from 0 to 100 percent in increments of 10 and **Shock levels in volts** along the horizontal axis. At slight (15 to 60 volts) shock level, obedience was 100 percent. It descends to 80 percent at a strong shock of 135 to 180 volts. The descent continues until about 68 percent at the highest shock, marked x x x, of 435 to 450 volts. An arrow points to the end of the curve and is labeled, **The majority of participants continued to obey to the end.**

The photo on the top shows a Milgram obedience shock generator. The photo below shows two men, one in a lab coat, attaching wires to the arms of a man who is sitting.

Return to FIGURE 42.2 Milgram's follow-up obedience experiment

Extended description for The power of one





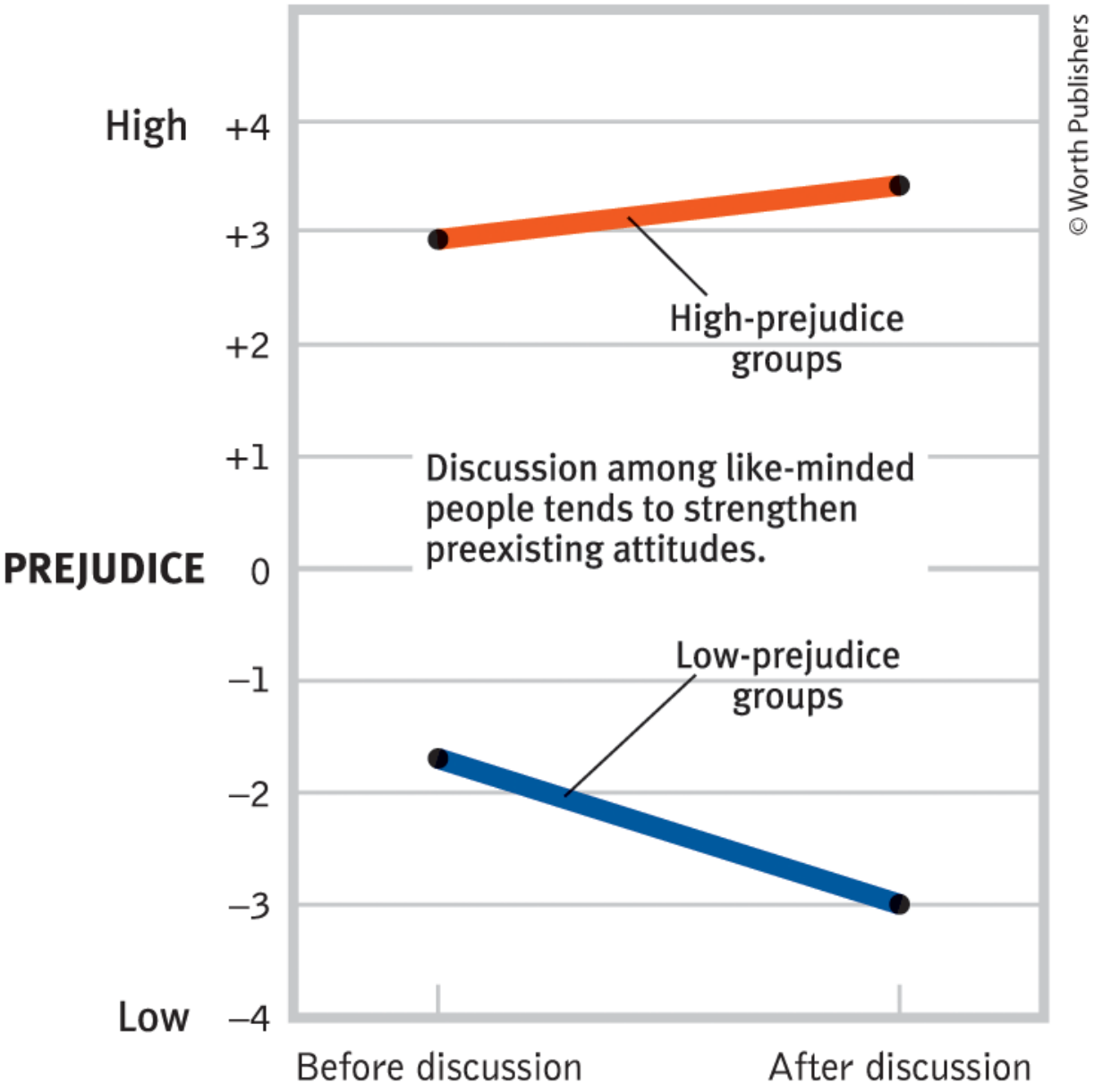


Left to right: Michael Campanella/Getty Images; Michael Nigro/Pacific Press Agency/Alamy Stock Photo; Macmillan Learning

A photo on the left shows a young Greta Thunberg sitting next to a sign that says, Skolstrejk for klimatet. A photo in the middle shows a protest rally with several people holding up signs. A photo on the right shows the cover of *Time* magazine with an image of Greta Thunberg under the heading, Person of the Year.

Return to The power of one

Extended description for FIGURE 42.3 Group polarization



© Worth Publishers

The horizontal axis is labeled, Before discussion on the left end and After discussion on the right end. The vertical axis represents PREJUDICE and ranges from minus 4 (low) to plus 4 (high) in increments of 1. A line labeled, Low-prejudice groups starts from minus 2.2 before the discussion, and slopes downward to end at minus 3 after the discussion. A second line labeled, High-prejudice groups starts slightly below plus 3 before the discussion, and slopes upward to end at plus 3.4 after the discussion. The text reads, Discussion among like-minded people tends to strengthen preexisting attitudes.

Return to FIGURE 42.3 Group polarization

Extended description for Technology’s a

mixed bag



Technology is a Mixed Bag by Andy Singer/Cagle Cartoons, Inc.

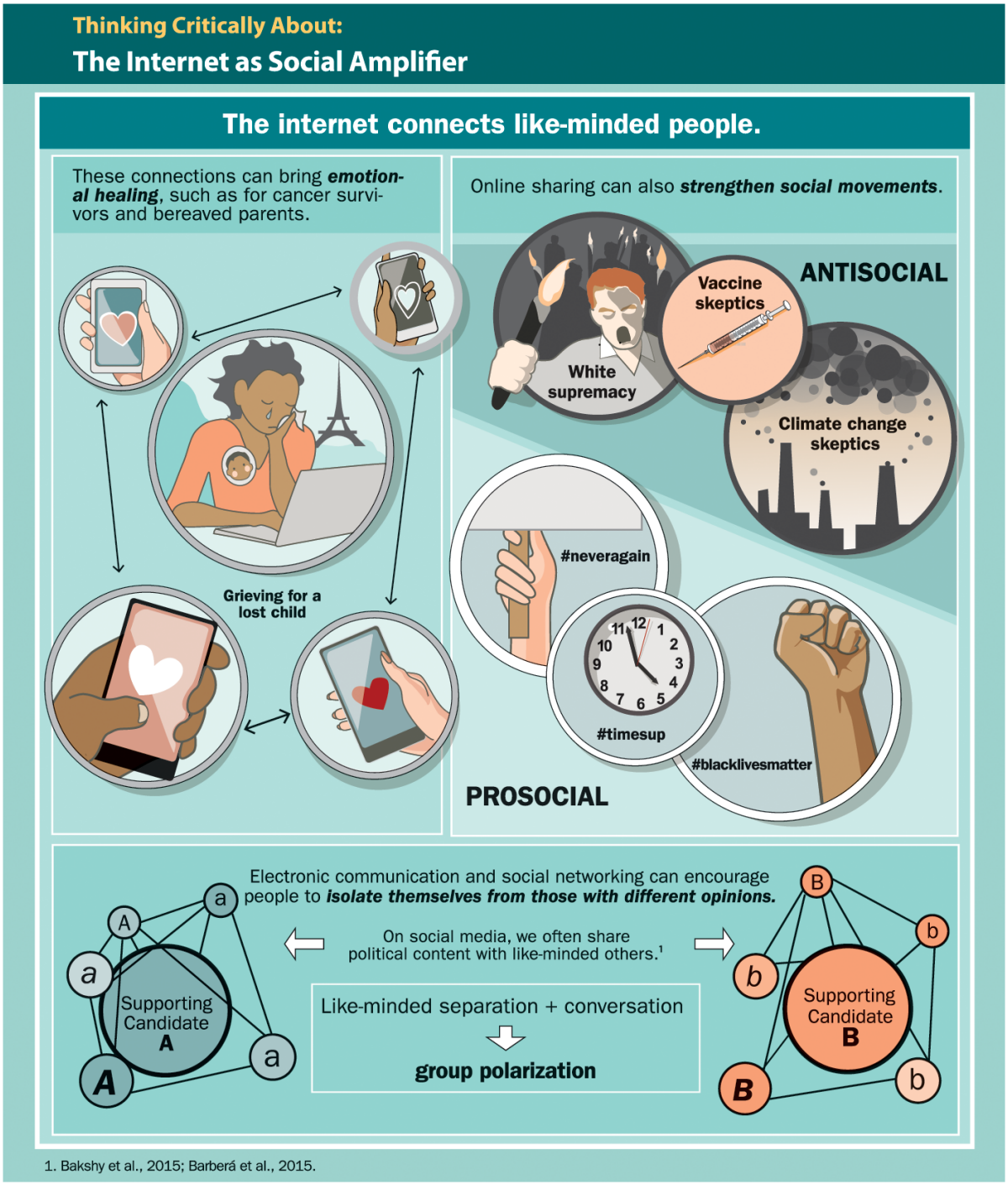
In the first panel, the boy has his hand raised, elbow bent, as he gesticulates a victory sign. He says, Social media helps me connect with other gay and bisexual kids and feel less isolated in my small town.

In the second panel, the boy has his hand raised with fingers fully stretched upward. He says, Social media helps me connect with Nazis and White supremacists and feel less isolated in my small town.

Return to Technology's a mixed bag

Extended description for Internet as social

amplifier



© Worth Publishers

The header reads, **The internet connects like-minded people.** The infographic shows three sections. The first section shows the text, These connections can bring ***emotional healing***, such as for cancer survivors and bereaved parents. The illustration has a large circle with four smaller circles surrounding it. The large circle shows a woman looking at her laptop, crying. Behind her is the Eiffel Tower, and she is wearing a pin with the face of a young boy on it. The caption under the woman reads, Grieving for a lost child. In the smaller circles around her are images of phone screens with heart symbols. There are double arrows between all the circles, indicating interconnectedness.

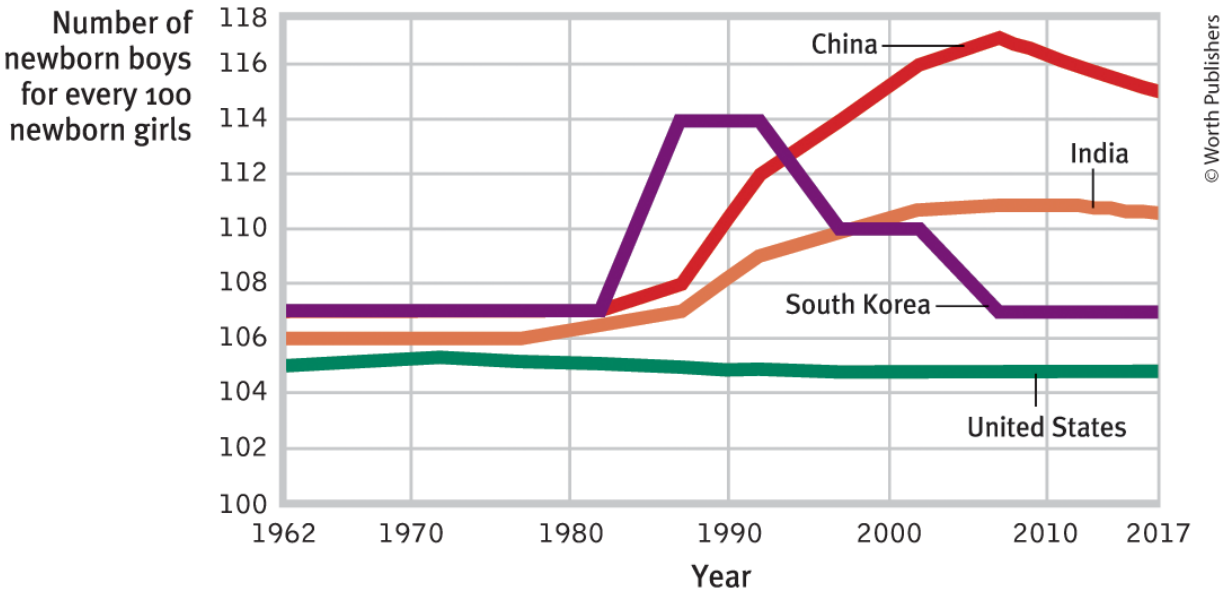
The second section shows the text, Online sharing can also ***strengthen social movements***. There are six circles arranged in a circle. Three circles have dark colors, and three circles have light colors. The three dark circles have the label, **ANTISOCIAL**. Inside the first circle is an illustration of an angry White man brandishing a lit torch, with dark silhouettes of other people holding torches behind him. The label in the circle is White supremacy. Inside the second circle is an illustration of a hypodermic needle. The label in the circle is Vaccine skeptics. Inside the third circle is an illustration of dark smokestacks spewing black clouds into an orange sky. The label in the circle is Climate change skeptics. The three light circles have the label **PROSOCIAL**. Inside the first circle is an illustration of a woman's hand holding up a sign. The label in the circle is hashtag never again. Inside the second circle is an illustration of a Black

person's raised, clenched fist. The label in the circle is hashtag Black Lives Matter. Inside the third circle is an illustration of a clock with the hour hand at five and the minute hand almost to twelve. The label in the circle is hashtag Time's Up.

The third section shows the text, Electronic communication and social networking can encourage people to ***isolate themselves from those with different opinions***. Under this are two illustrations with a textbox in the middle. The text reads, On social media, we often share political content with like-minded others (Bakshy et al., 2015; Barberá et al., 2015). On the left of this text is a left-facing arrow. It points to a large circle surrounded by five smaller circles. The text in the large circle reads, Candidate **A**. The text in the smaller circles has the letter a. The small circles around the large circle are all connected by lines to each other, and two are connected to the center circle. On the right of the text is a right-facing arrow. It points to the same arrangement of circles, but the text in these circles is Candidate **B** in the large circle and the letter b in the smaller circles. The connecting lines are the same. The lines in these illustrations create a closed system and show how Candidates A and B and their supporters isolate themselves. A text box below these illustrations reads, Like-minded separation plus conversation leads to **group polarization**.

Return to Internet as social amplifier

Extended description for FIGURE 43.2 Boy bias



The horizontal axis represents **Year** with values 1962, 1970, 1980, 1990, 2000, 2010, and 2017. The vertical axis represents **Number of newborn boys for every 100 newborn girls** and ranges from 100 to 118 in increments of 2. The curve representing the United States starts from (1962, 105), and passes through the following points: (1970, 107), (1980, 105), (1990, 103), (2000, 103), (2010, 103), and ends at (2017, 103).

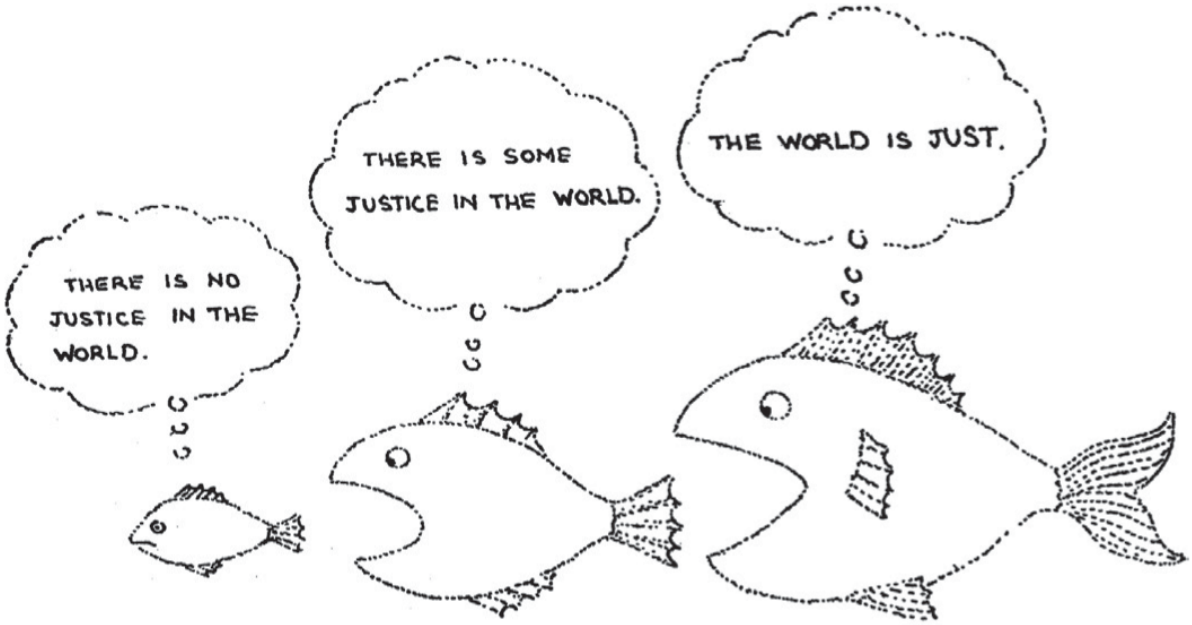
The curve representing India starts at (1962, 106), and passes through the following points: (1970, 106), (1980, 106), (1990, 108), (2000, 111), (2010, 111), and ends at (2017, 110.5).

The curve representing South Korea starts at (1962, 107), and passes through the following points: (1970, 107), (1980, 107), (1990, 114), (2000, 110), (2010, 107), and ends at (2017, 107).

The curve representing China starts from (1980, 107), passes through the following points: (1990, 106), (2000, 115), (2010, 116), and ends in (2017, 115).

Return to FIGURE 43.2 Boy bias

Extended description for Just-world phenomenon



Robert Mankoff/Cartoon Stock

From left to right, the fish increase in size. The smallest fish thinks, There is no justice in the world. The medium fish has its mouth open to eat the small fish and thinks, There is some justice in the world. The large fish has its mouth open to eat the medium fish and thinks, The world is just

Return to Just-world phenomenon

Extended description for FIGURE 43.3 Categorizing mixed-race people



The first photo is labeled 100 percent Chinese; the second photo is labeled 80 percent Chinese, 20 percent White (woman's face widens); the third photo is labeled 60 percent Chinese, 40 percent White (woman's face widens further); the fourth photo is labeled 40 percent Chinese, 60 percent White (face widens further, eye and hair color becomes lighter); the fifth photo is labeled 20 percent Chinese, 80 percent White (hair lightens further); and the sixth photo is labeled 100 percent White.

Return to FIGURE 43.3 Categorizing mixed-race people

Extended description for FIGURE 43.5 Gun ownership and murder rates



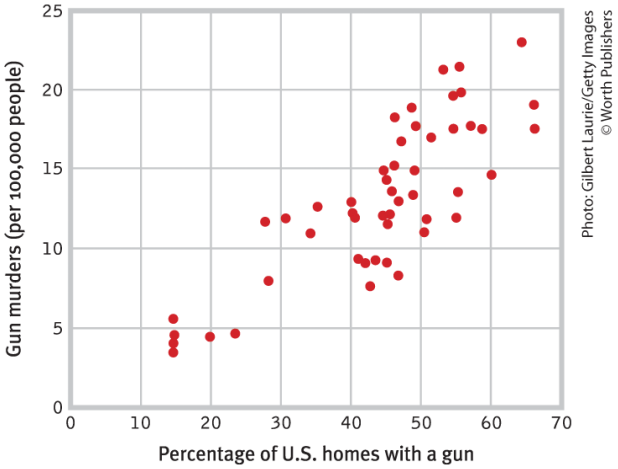


Photo: Gilbert Laurie/Getty Images
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The graph shows **Gun murders (per 100,000 people)** on the vertical axis from 0 through 25 in increments of 5 and the **Percentage of U S homes with a gun** on the horizontal axis from 0 through 70 in increments of 10. The plot points on the graph indicate that fewer percentage of homes with guns have fewer murders ranging from approximately 10, 5 to 70, 20. A heavier cluster of points is present between 40, 8, and 50, 15.

Return to FIGURE 43.5 Gun ownership and murder rates

Extended description for FIGURE 43.6 Temperature, tempers, and retaliation



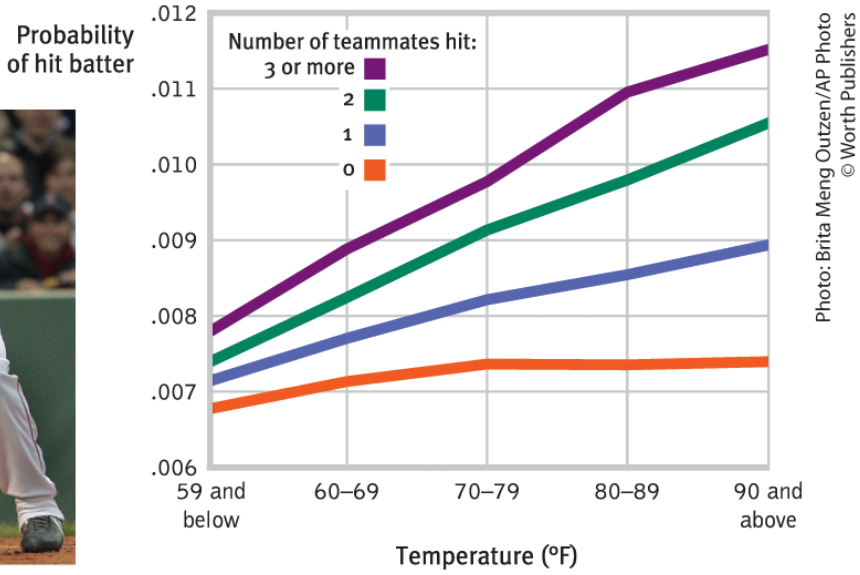


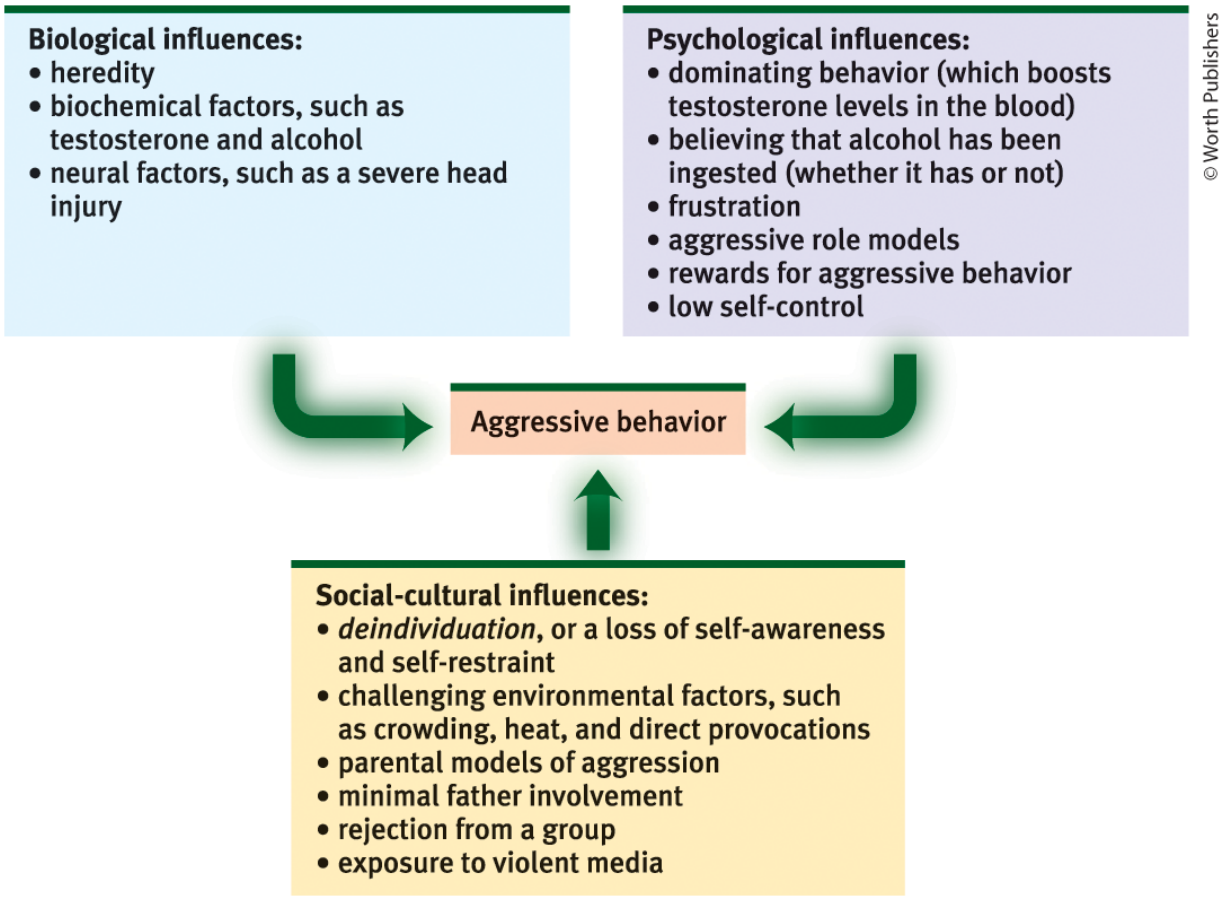
Photo: Brita Meng Outzen/AP Photo
© Worth Publishers

In the graph, the horizontal axis plots **Temperature (in degrees Fahrenheit)** and is labeled 59 and below, 60 to 69, 70 to 79, 80 to 89, and 90 and above. The vertical axis plots the **Probability of hit batter** ranging from 0.006 to 0.012 in increments of 0.001. The curves represent the number of teammates hits, from zero to 3 or more. The upward curve for a number of teammates hit: 3 or more, starting from (59 and below, 0.008) and ending at (90 and above, 0.0115). The upward curve for the number of teammates hit: 2, which starts from (59 and below, 0.0075) and ends at (90 and above, 0.0105). The upward curve for the number of teammates hit: 1, starts from (59 and below, 0.0072) and ends at (90 and above, 0.009). The

upward curve for the number of teammates hit: 0, starts from (59 and below, 0.0069) and ends at (90 and above, 0.0073). All data are approximate.

Return to FIGURE 43.6 Temperature, tempers, and retaliation

Extended description for FIGURE 43.7 Biopsychosocial understanding of aggression



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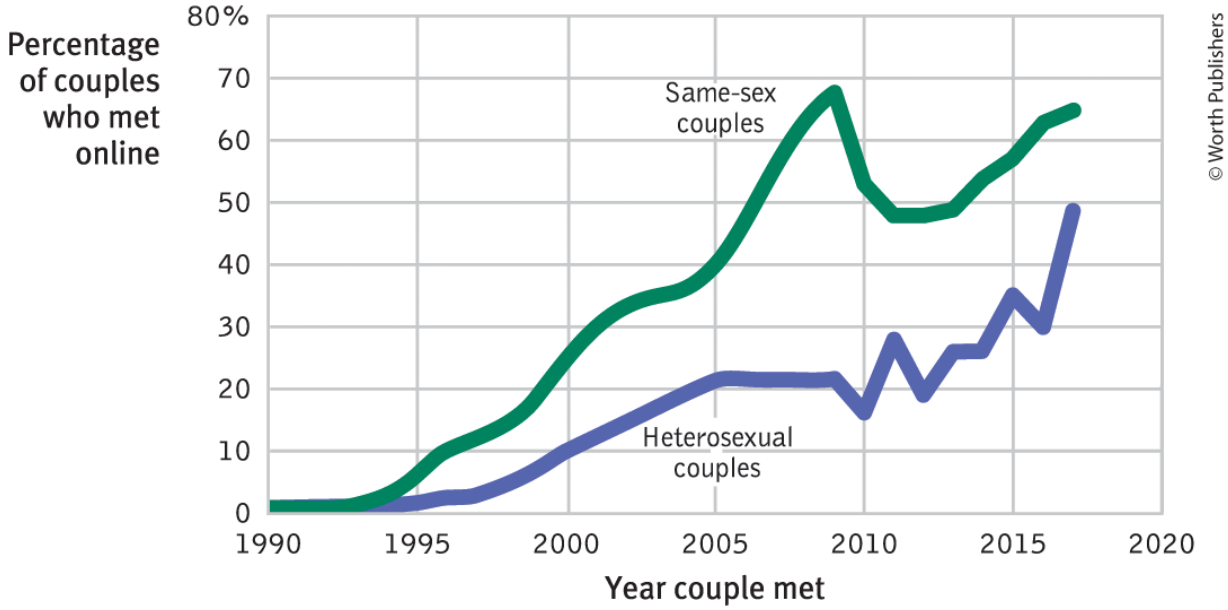
The box at the center is labeled **Aggressive behavior**. It is surrounded by three boxes, all with arrows pointing from them to the central box. A box at the top left is labeled, **Biological Influences**, which includes heredity; biochemical factors, such as testosterone and alcohol; and neural factors, such as a severe head

injury. A box at the top right is labeled, **Psychological Influences**, which includes dominating behavior (which boosts testosterone levels in the blood), believing that alcohol has been ingested (whether it has or not), frustration, aggressive role models, rewards for aggressive behavior, and low self-control. The box below is labeled, **Social-cultural influences**, which includes *deindividuation*, or a loss of self-awareness and self-restraint; challenging environmental factors, such as crowding, heat, and direct provocations; parental models of aggression; minimal father involvement; rejection from a group; and exposure to violent media.

Return to FIGURE 43.7 Biopsychosocial understanding of aggression

Extended description for FIGURE 44.1 The changing way we meet our partners



The horizontal axis represents **Year couple met** with values ranging from 1990 to 2020 in increments of 5. The vertical axis represents **Percentage of couples who met online** with values ranging from 0 to 80 percent in increments of 10. A curve representing Same-sex couples starts from (1990, 0 percent), gradually slopes upward in an irregular trend, and ends in (2009, 68 percent), declines in (2010, 48 percent), and finally reaches (2017, 65 percent). Another curve representing Heterosexual couples starts from (1990, 0 percent), gradually moves upward till (2005, 20 percent), remains constant till

(2009, 20 percent), gradually increases in an irregular trend, and ends in (2017, 50 percent). All data are approximate.

Return to FIGURE 44.1 The changing way we meet our partners

Extended description for Similarity

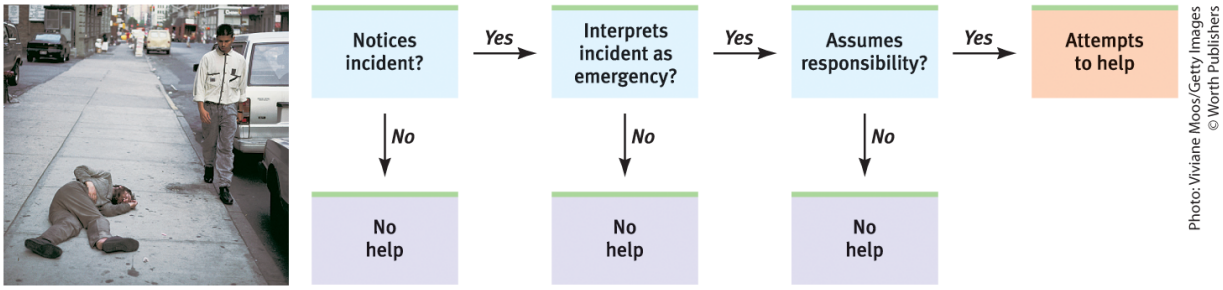


© Dave Coverly/speedbump.com

A caption below the cartoon reads, *Similarity attracts; perceived dissimilarity does not.*

Return to Similarity

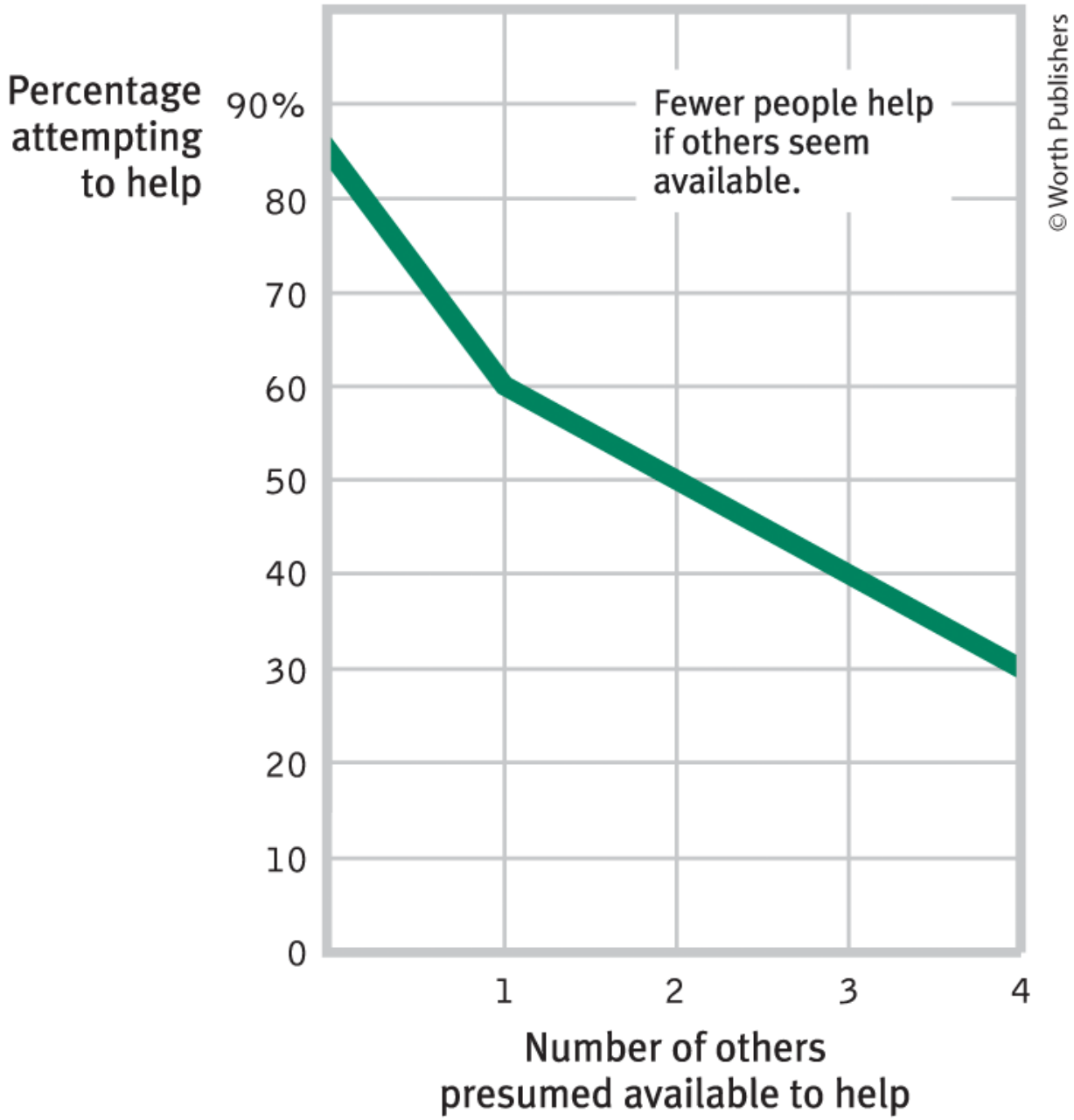
Extended description for FIGURE 44.2 The decision-making process for bystander intervention



A photo shows a man walking past another man lying down in the street. The man looks disconcerted by the sight. The path diagram shows that for a bystander to act, they have to Notice the incident (if not, they do not help); Interpret the incident as an emergency (if not, they do not help); Assume responsibility for the incident (if not, they do not help). If they do assume responsibility, then they attempt to help

Return to FIGURE 44.2 The decision-making process for bystander intervention

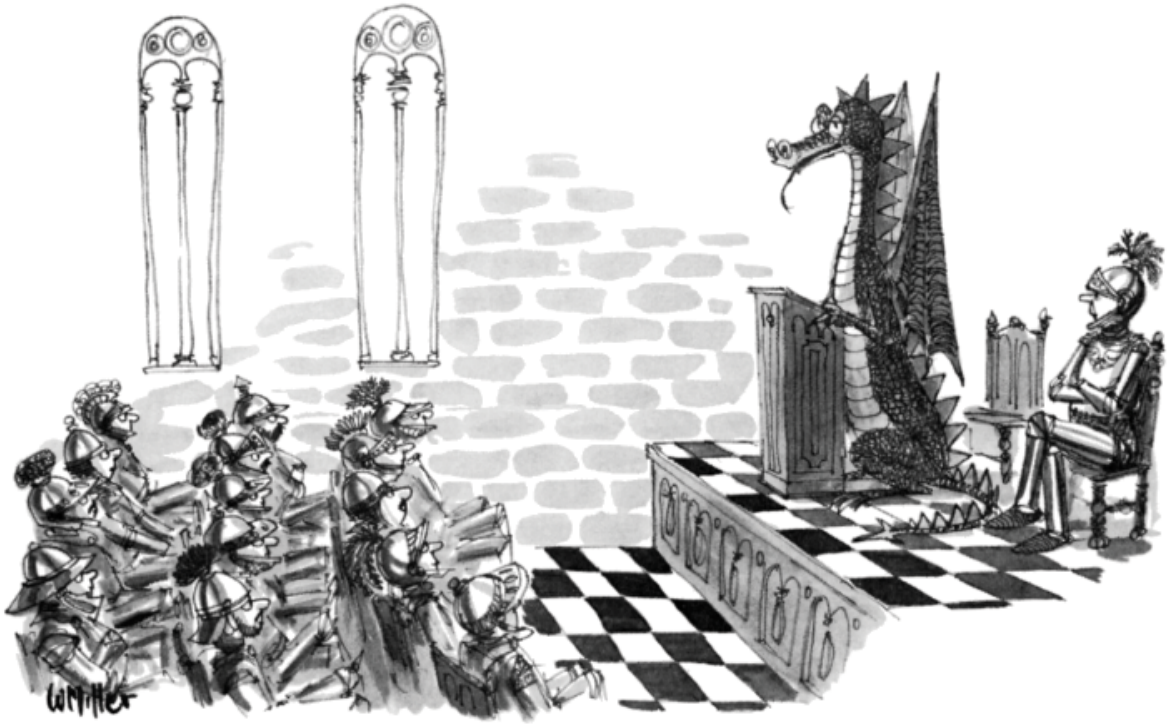
Extended description for FIGURE 44.3
Responses to a simulated emergency



The horizontal axis represents the **Number of others presumed available to help** with values ranging from 0 to 4 in increments of 1. The vertical axis represents the **Percentage attempting to help** with values ranging from 0 to 90 percent, in increments of 10. The graph is labeled, Fewer people help if others seem available. A curve starts from (0, 85 percent), slopes downward to (1, 60 percent), and ends at (4, 30 percent).

Return to FIGURE 44.3 Responses to a simulated emergency

Extended description for Conciliation



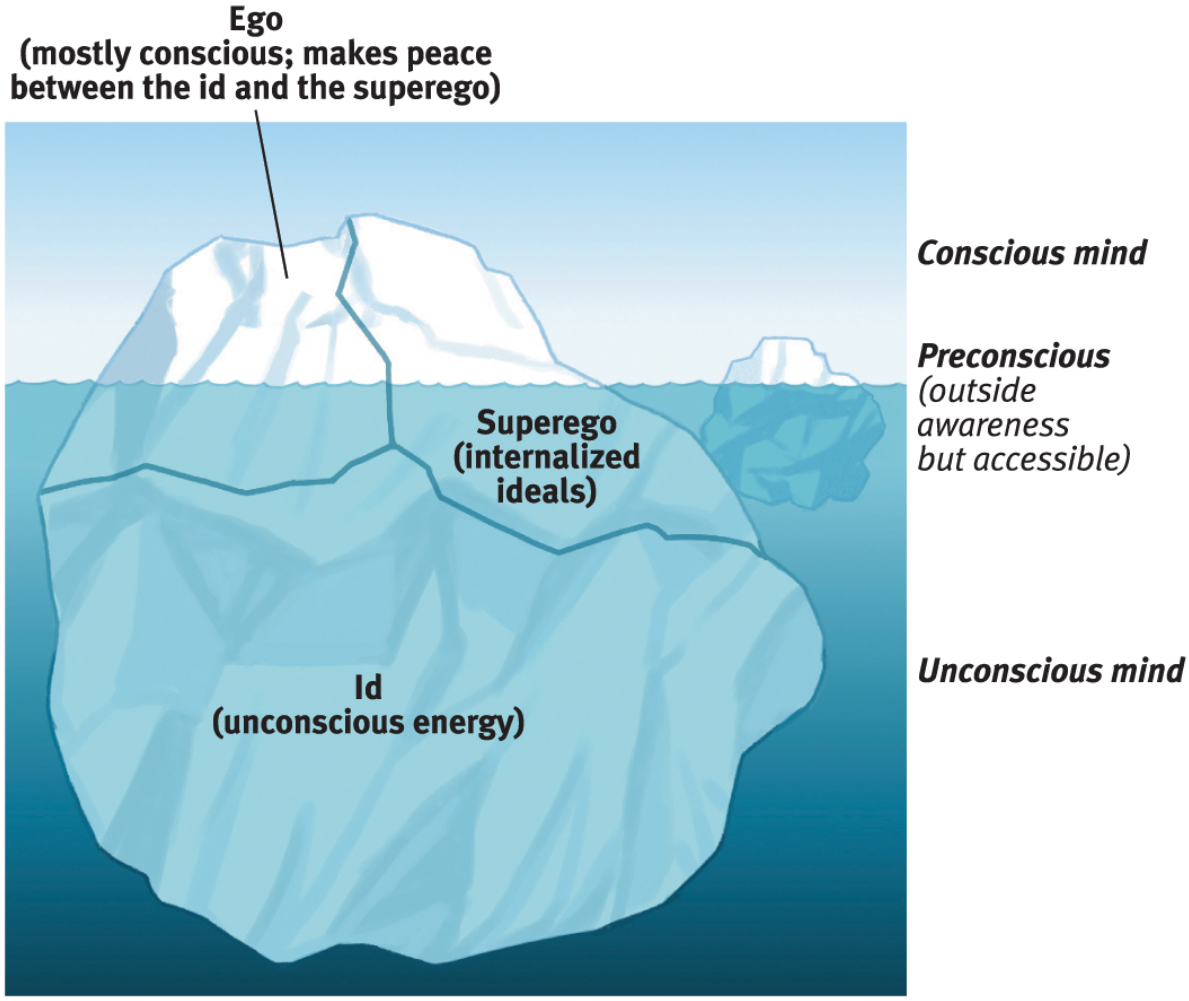
Warren Miller/Cartoon Stock

"To begin with, I would like to express my sincere thanks and deep appreciation for the opportunity to meet with you. While there are still profound differences between us, I think the very fact of my presence here today is a major breakthrough."

A quote below reads, “To begin with, I would like to express my sincere thanks and deep appreciation for the opportunity to meet with you. While there are still profound differences between us, I think the very fact of my presence here today is a major breakthrough.”

Return to Conciliation

Extended description for FIGURE 45.1 Freud's idea of the mind's structure



© Worth Publishers

The part of the iceberg above the water line is labeled ***Conscious mind***. The area immediately below the water but close to the surface is labeled, ***Preconscious mind*** *(outside awareness but accessible)*. The area at the bottom of the iceberg that is deeply submerged is labeled

Unconscious mind. The conscious and preconscious parts of the iceberg are each split into two halves, the ego and the superego. The **Ego** is mostly conscious; makes peace between the i d and the superego. The **Superego** is internalized ideas. Contained entirely in the unconscious mind is the **I d**, which is labeled unconscious energy.

Return to FIGURE 45.1 Freud's idea of the mind's structure

Extended description for FIGURE 46.1 Characteristics of Self-Actualization Scale (C S A S)

© Worth Publishers

Characteristics of Self-Actualization Scale (CSAS)

Here are a number of characteristics that may or may not describe you. Please select the answer that best indicates the extent to which you agree or disagree with each statement. Be as honest as possible, but rely on your initial feeling and do not think too much.

1	2	3	4	5
Strongly disagree	**Disagree**	**Neutral**	**Agree**	**Strongly agree**

1. ___I often feel gratitude for the good in my life no matter how many times I encounter it.
2. ___I accept all sides of myself, including my shortcomings.
3. ___I take responsibility for my actions.
4. ___I am often undisturbed and unruffled by things that seem to bother most people.
5. ___I have a purpose in life that will help the good of humankind.
6. ___I often have a clear perception of reality.
7. ___I have a genuine desire to help the human race.
8. ___I often have experiences in which I feel one with all people and things on this planet.
9. ___I have a strong sense of right and wrong in my daily life.
10. ___I bring a generally creative attitude to all of my work.

Scoring Guide:
Add up your scores and divide by 10 for your total score. The items above represent the 10 characteristics of self-actualization studied by Scott Barry Kaufman (2018):
(1) Continued freshness of appreciation, (2) Acceptance, (3) Authenticity, (4) Equanimity (mental calmness), (5) Purpose, (6) Truth seeking, (7) Humanitarianism (concern with human welfare), (8) Peak experiences, (9) Good moral intuition, and (10) Creative spirit.

Kaufman found that those with higher scores experienced "greater life satisfaction, self-acceptance, positive relations, personal growth, purpose in life, and self-transcendent experiences" as well as "creativity across multiple domains of achievement."

Information from Kaufman (2018)

The survey is titled, Characteristics of Self-Actualization Scale (C S A S). Text reads as follows: Here are a number of characteristics that may or may not describe you. Please select the number that best indicates the extent to which you agree or disagree with each statement. Be as honest as possible, but rely on your internal feelings and do not think too much.

Under this is a scale from 1 (left) to 5 (right) that reads: **1, strongly disagree; 2, disagree; 3, neutral; 4, agree; and 5, strongly agree.**

Ten statements come next, as follows:

1. I often feel gratitude for the good in my life no matter how many times I encounter it.

2. I accept all sides of myself, including my shortcomings.

3. I take responsibility for my actions.

4. I am often undisturbed and unruffled by things that seem to bother most people.

5. I have a purpose in life that will help the good of humankind.

6. I often have a clear perception of reality.

7. I have a genuine desire to help the human race.

8. I often have experiences in which I feel one with all people and things on this planet.

9. I have a strong sense of right and wrong in my daily life.

10. I bring a generally creative attitude to all of my work.

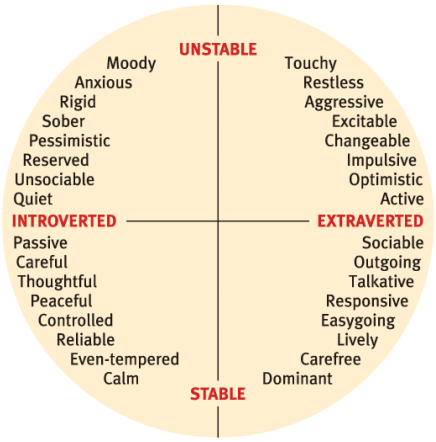
A **Scoring Guide** appears next: Add up your scores and divide by 10 for your total score. The items above represent the 10 characteristics of self-actualization studied by Scott Barry Kaufman (2018): (1) continued freshness of appreciation, (2) acceptance, (3) authenticity, (4) equanimity (mental calmness), (5) purpose, (6) truth seeking, (7) humanitarianism (concern for human welfare), (8) peak experiences, (9) good moral intuition, and (10) creative spirit.

Kaufman found that those with higher scores experienced "greater life satisfaction, self-acceptance, positive relations, personal growth, purpose in life, and self-transcendent experiences" as well as "creativity across multiple domains of achievement."

Return to FIGURE 46.1 Characteristics of Self-Actualization Scale (C S A S)

Extended description for FIGURE 46.2 Two personality dimensions







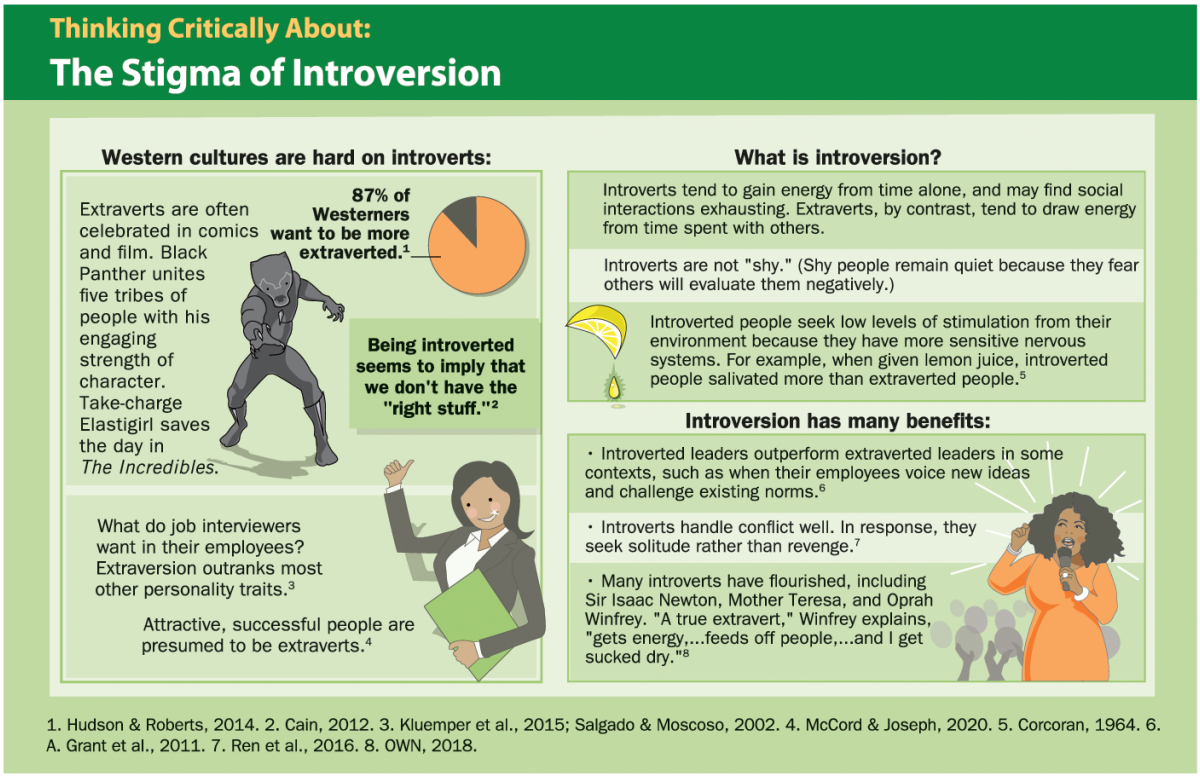
Photos left: HBO/Photofest; right: Abaca Press/Sipa/AP Photo
© Worth Publishers

The photo on the left shows actor Issa Rae, and the photo on the right shows comedian Jimmy Fallon. Issa looks quiet and calm, and Jimmy looks astonished as well as joyful. In the center is a circle with the top portion marked **UNSTABLE,** the bottom portion marked **STABLE**, the right portion marked **EXTRAVERTED**, and the left portion marked **INTROVERTED**. The traits between unstable and extraverted are Touchy, Restless, Aggressive, Excitable, Changeable, Impulsive, Optimistic, and Active. The traits between extraverted and stable are Sociable, Outstanding, Talkative, Responsive, Easygoing, Lively, Carefree, and Dominant. The traits between stable and introverted are Passive, Careful, Thoughtful, Peaceful, Controlled, Reliable, Even-tempered, and Calm. The traits between

unstable and introverted are Quiet, Unsociable, Reserved, Pessimistic, Sober, Rigid, Anxious, and Moody.

Return to FIGURE 46.2 Two personality dimensions

Extended description for Stigma of introversion



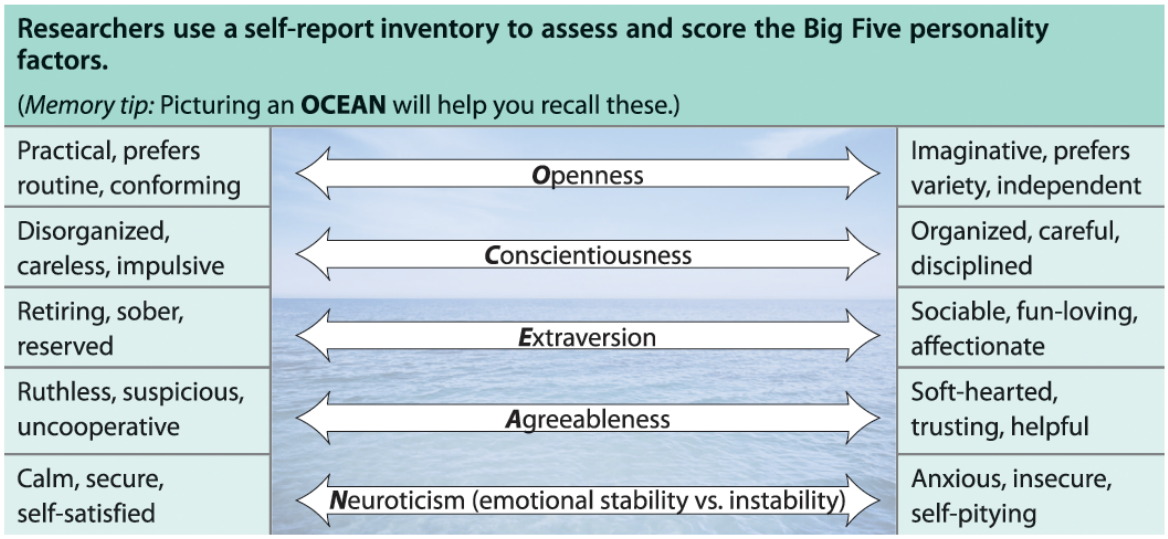
© Worth Publishers

The infographic has three sections as follows: Section 1 is titled, **Western cultures are hard on introverts:** Part 1 reads, Extraverts are often celebrated in comics and film. Black Panther unites five tribes of people with his engaging strength of character. Take-charge Elastigirl saves the day in *The Incredibles*. An illustration shows Black Panther. A pie chart is depicted that says **87 percent of Westerners want to be more extraverted** (Hudson and Roberts, 2014). **Being introverted seems to imply that we don't have the "right stuff"**

(Cain, 2012). Part 2 reads, What do job interviewers want in their employees? Extraversion outranks most other personality traits (Kluemper et al., 2015; Salgado and Moscoso, 2002). An illustration shows a woman holding a file folder and giving thumbs up. Attractive, successful people are presumed to be extraverts (McCord and Joseph, 20 20). Section 2 is titled, **What is introversion?** Part 1 reads, Introverts tend to gain energy from time alone, and may find social interactions exhausting. Extraverts, by contrast, tend to draw energy from time spent with others. Part 2 reads, Introverts are not "shy." (Shy people remain quiet because they fear others will evaluate them negatively.) Part 3 reads, Introverted people seek low levels of stimulation from their environment because they have more sensitive nervous systems. For example, when given lemon juice, introverted people salivated more than extraverted people (Corcoran, 19 64). An illustration shows a lemon wedge with a bit of juice dripping from it. Section 3 is titled, **Introversion has many benefits:** Bullet point 1 reads, Introverted leaders outperform extraverted leaders in some contexts, such as when their employees voice new ideas and challenge existing norms (A. Grant et al., 2011). Bullet point 2 reads, Introverts handle conflict well. In response, they seek solitude than revenge (Ren et al., 2016). Bullet point 3 reads, Many introverts have flourished, including Sir Isaac Newton, Mother Teresa, and Oprah Winfrey. "A true extravert," Winfrey explains, "gets energy, ellipses, feeds off people, ellipses, and I get sucked dry" (O W N, 2018).

Return to Stigma of introversion

Extended description for Big five personality factors



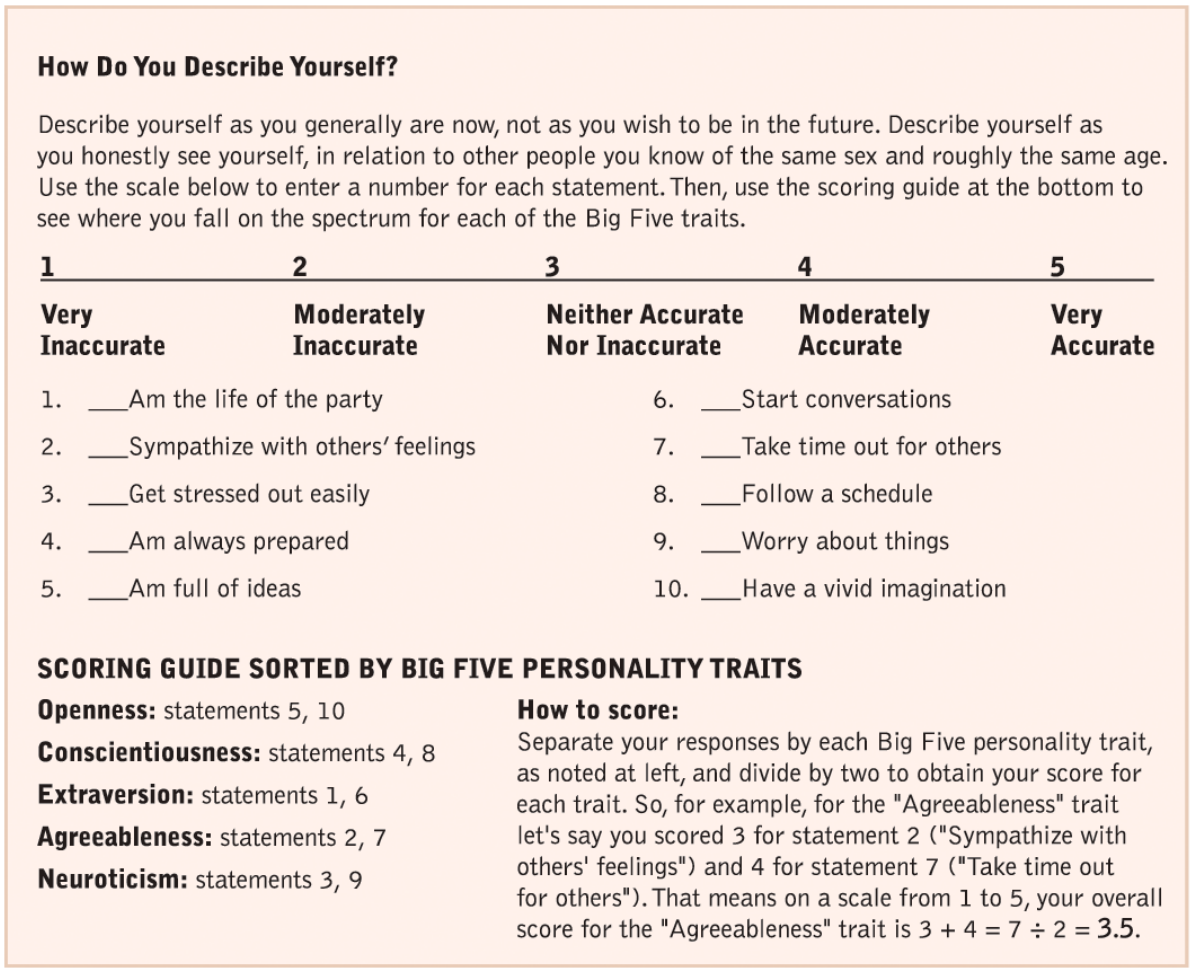
Aaron Foster/The Image Bank/Getty Images
© Worth Publishers

A text on the top reads: **Researchers use a self-report inventory to assess and score the Big Five personality factors.** (*Memory tip:* Picturing an **OCEAN** will help you recall these.) Below, five double-headed arrows each represent one personality factor as follows: Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism (emotional stability versus instability). Openness: Left side reads, Practical, prefers routine, conforming; Right side reads, Imaginative, prefers variety, independent. Conscientiousness: Left side reads, Disorganized, careless, impulsive; Right side reads, Organized careful, disciplined. Extraversion: Left side reads, Retiring, sober, reserved; Right side reads, Sociable, fun-loving,

affectionate. Agreeableness: Left side reads, Ruthless, suspicious, uncooperative; Right side reads, Soft-hearted, trusting, helpful. Neuroticism (emotional stability versus instability): Left side reads, Calm, secure, self-satisfied; Right side reads, Anxious, insecure, self-pitying.

Return to Big five personality factors

Extended description for FIGURE 46.3 The Big Five self-assessment



How Do You Describe Yourself?

Describe yourself as you generally are now, not as you wish to be in the future. Describe yourself as you honestly see yourself, in relation to other people you know of the same sex and roughly the same age. Use the scale below to enter a number for each statement. Then, use the scoring guide at the bottom to see where you fall on the spectrum for each of the Big Five traits.

1	2	3	4	5
Very Inaccurate	**Moderately Inaccurate**	**Neither Accurate Nor Inaccurate**	**Moderately Accurate**	**Very Accurate**

1. ___Am the life of the party
2. ___Sympathize with others' feelings
3. ___Get stressed out easily
4. ___Am always prepared
5. ___Am full of ideas
6. ___Start conversations
7. ___Take time out for others
8. ___Follow a schedule
9. ___Worry about things
10. ___Have a vivid imagination

SCORING GUIDE SORTED BY BIG FIVE PERSONALITY TRAITS

Openness: statements 5, 10

Conscientiousness: statements 4, 8

Extraversion: statements 1, 6

Agreeableness: statements 2, 7

Neuroticism: statements 3, 9

How to score:
Separate your responses by each Big Five personality trait, as noted at left, and divide by two to obtain your score for each trait. So, for example, for the "Agreeableness" trait let's say you scored 3 for statement 2 ("Sympathize with others' feelings") and 4 for statement 7 ("Take time out for others"). That means on a scale from 1 to 5, your overall score for the "Agreeableness" trait is 3 + 4 = 7 ÷ 2 = 3.5.

© Worth Publishers

The header reads, **How Do You Describe Yourself?** Text below reads: Describe yourself as you generally are now, not as you wish to be in the future. Describe yourself as you honestly see yourself, in relation to other people you know of the same sex and roughly the same age. Use the scale below to enter a number for each statement.

Then, use the scoring guide at the bottom to see where you fall on the spectrum for each of the Big Five traits.

A scale below from 1 on left to 5 on right reads: **1, very inaccurate; 2, moderately inaccurate; 3, Neither Accurate Nor Inaccurate; 4, Moderately Accurate; and 5, Very Accurate.**

Ten statements below read as follows:

1. Am the life of the party.

2. Sympathize with others' feelings.

3. Get stressed out easily.

4. Am always prepared.

5. Am full of ideas.

6. Start conversations.

7. Take time out for others.

8. Follow a schedule.

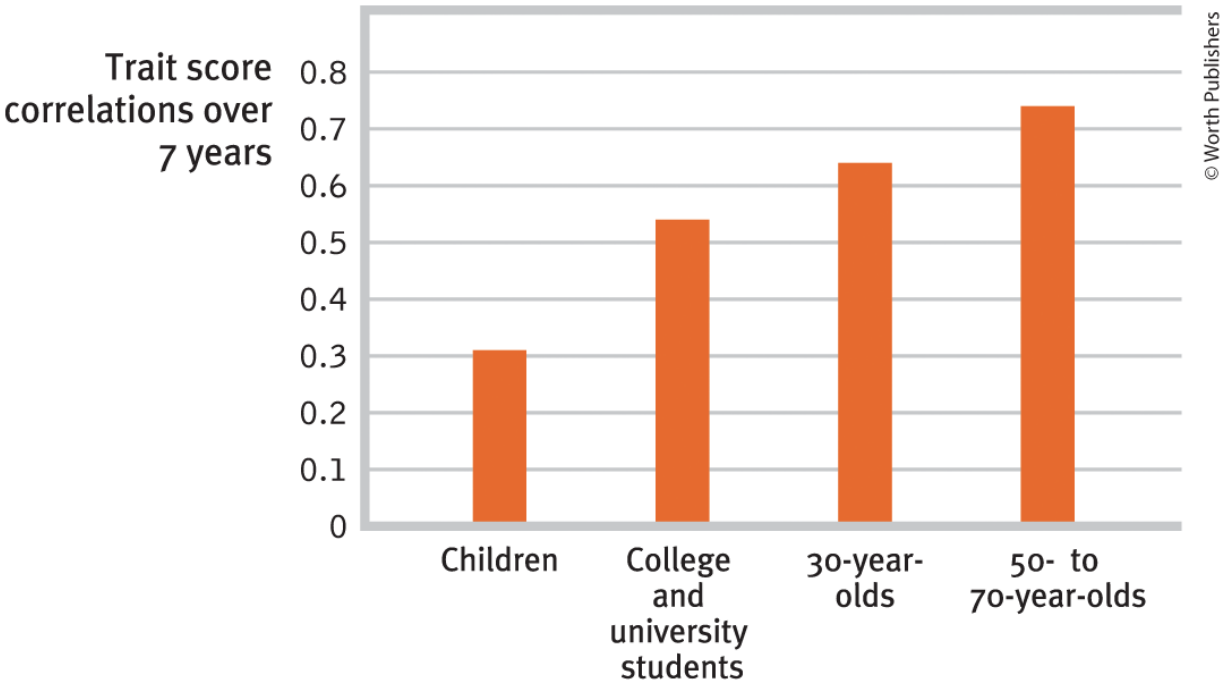
9. Worry about things.

10. Have a vivid imagination.

Text below under the heading, **SCORING GUIDE SORTED BY BIG FIVE PERSONALITY TRAITS**, reads: **Openness:** statements 5, 10. **Conscientiousness:** statements 4, 8. **Extraversion:** statements 1, 6. **Agreeableness:** statements 2, 7. **Neuroticism:** statements 3, 9. The text to the right reads, **How to score:** Separate your responses by each Big Five personality trait, as noted at left, and divide by two to obtain your score for each trait. So, for example, for the "Agreeableness" trait let's say you scored 3 for statement 2 ("Sympathize with others' feelings") and 4 for statement 7 ("Take time out for others"). That means on a scale from 1 to 5, your overall score for the "Agreeableness" trait is 3 plus 4 equals 7 divided by 2 equals 3.5.

Return to FIGURE 46.3 The Big Five self-assessment

Extended description for FIGURE 46.4 Personality stability



The horizontal axis is labeled Children, College and university students, 30-year-olds, and 50- to 70-year-olds. The vertical axis is labeled Trait score correlations over 7 years and has values from 0 to 0.8, in increments of 0.1. The data are as follows: Children: 0.305; College and University students: 0.54; 30-years-olds: 0.64; and 50- to 70-years-olds: 0.73. All data are approximate.

Return to FIGURE 46.4 Personality stability

Extended description for FIGURE 47.1 Reciprocal determinism

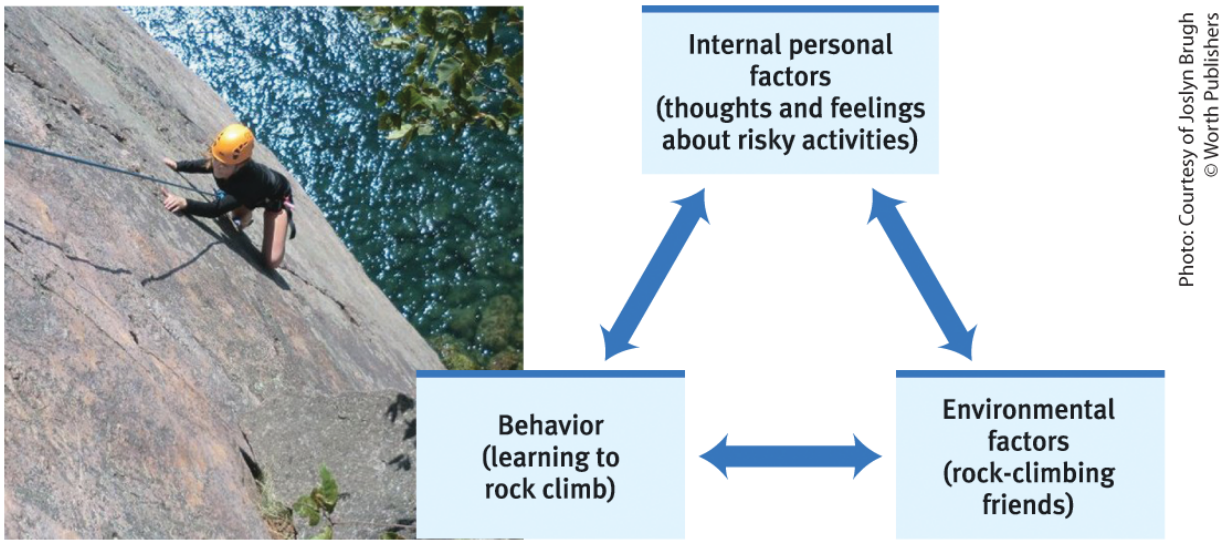


Photo: Courtesy of Joslyn Brugh
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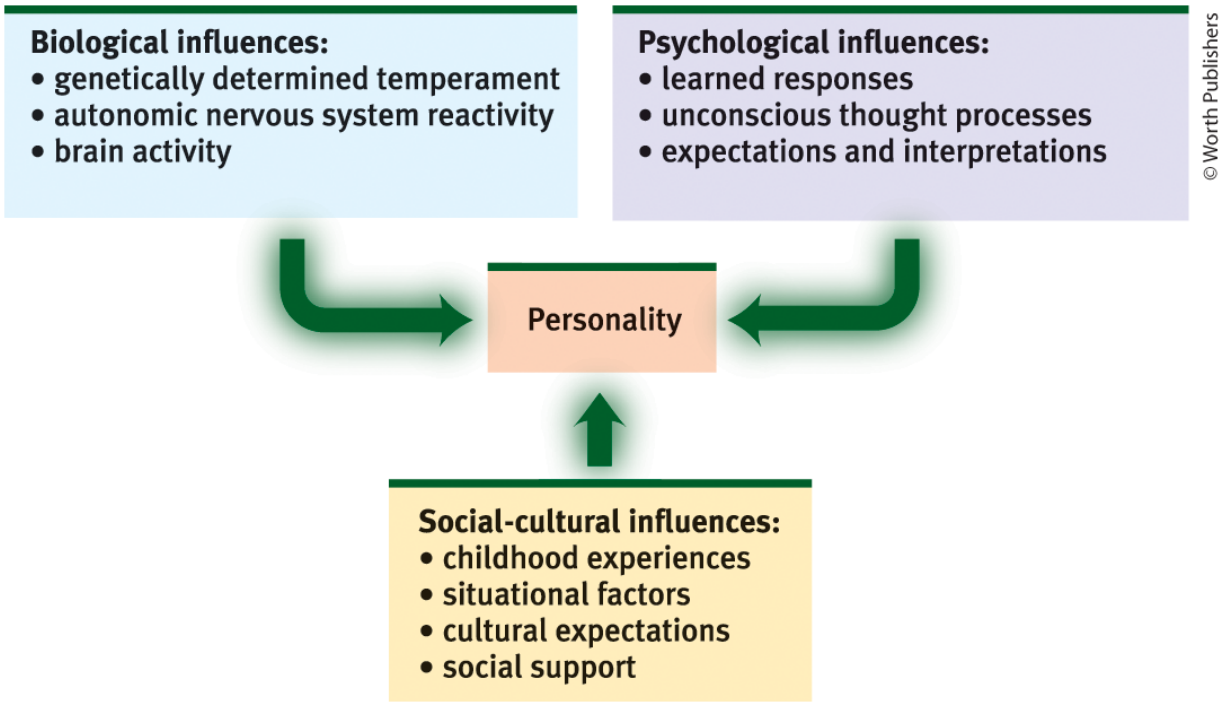
In the flowchart, three boxes are interconnected, with arrows pointing to and from each box to both the others. The top box reads Internal personal factors (thoughts and feelings about risky activities). The box at the bottom right reads: Environmental factors (rock-climbing friends). The box at the bottom left reads: Behavior (learning to rock climb). The triangle is equal on all sides so none of the three factors is indicated to be more or less important than the other two.

Return to FIGURE 47.1 Reciprocal determinism

Extended description for FIGURE 47.2 The biopsychosocial approach to the study of personality



The box at the center is labeled **Personality**. It is surrounded by three boxes, all with arrows pointing from them to the central box. Text in the top left box reads, **Biological Influences:** genetically determined temperament, autonomic nervous system reactivity, and brain activity. Text in the top right box reads, **Psychological Influences:** learned responses, unconscious thought processes, and expectations and interpretations. Text in the bottom box reads,

Social-cultural influences: childhood experiences, situational factors, cultural expectations, and social support.

Return to FIGURE 47.2 The biopsychosocial approach to the study of personality

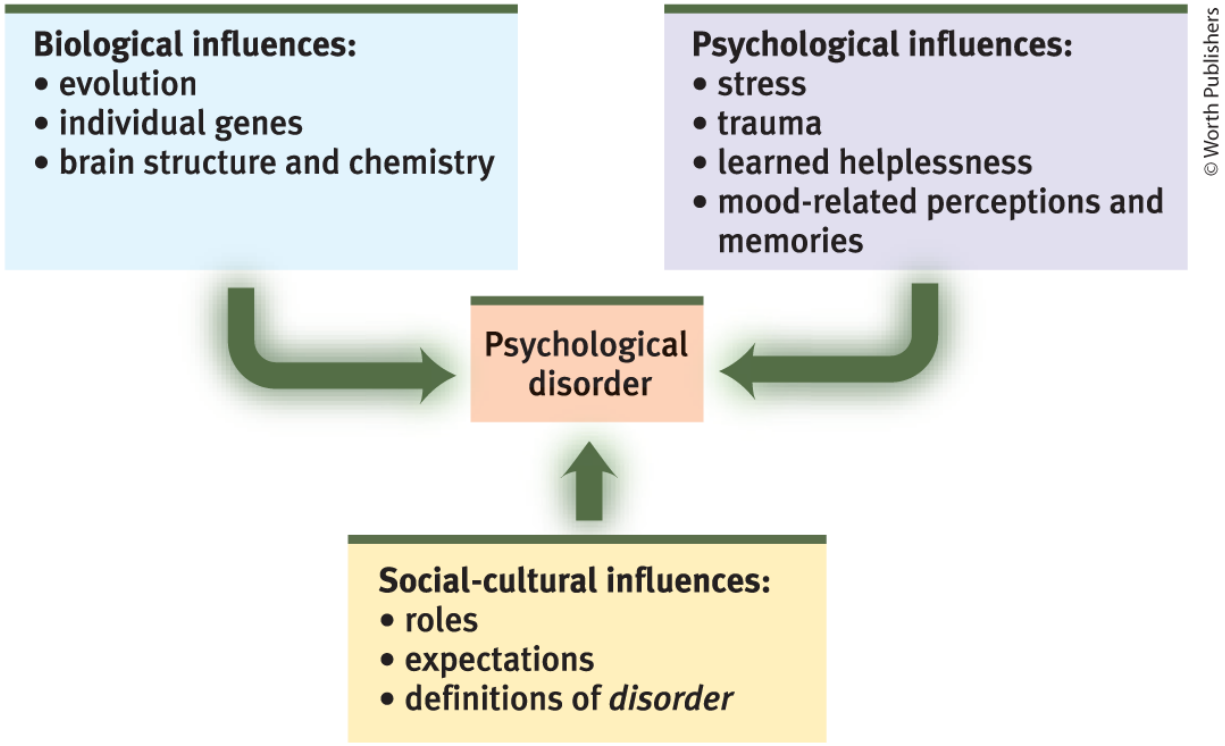
Extended description for Peanuts cartoon



The first panel shows Linus sitting on the ground holding a blanket and sucking his thumb. Lucy sits beside him. Linus says, “Why are you always so anxious to criticize me?” The second panel shows a close-up of Lucy saying, “I just think I have a knack for seeing other people’s faults.” The third panel shows Linus grasping his head with his hands, his blanket having fallen to his lap. He says, “What about your own faults?” Lucy with her arms stretched to her side replies, “I have a knack for overlooking them.”

Return to Peanuts cartoon

Extended description for FIGURE 48.1 The biopsychosocial approach to psychological disorders

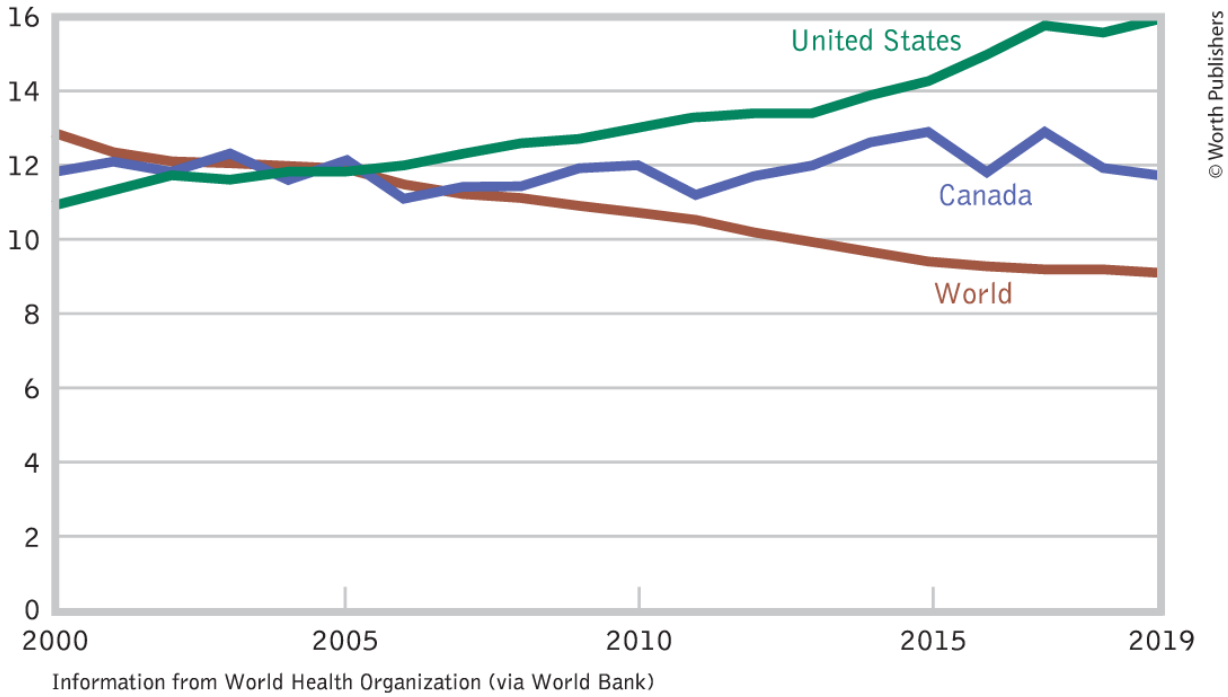


© Worth Publishers

A text box in the center reads, **Psychological disorder**. Three other text boxes have arrows pointing to the central box. The top left box reads, **Biological influences**: evolution, individual genes, and brain structure and chemistry. The top right box reads, **Psychological influences:** stress, trauma, learned helplessness, and mood-related perceptions and memories. The bottom box reads, **Social-cultural influences:** roles, expectations, and definitions of *disorder*.

Return to FIGURE 48.1 The biopsychosocial approach to psychological disorders

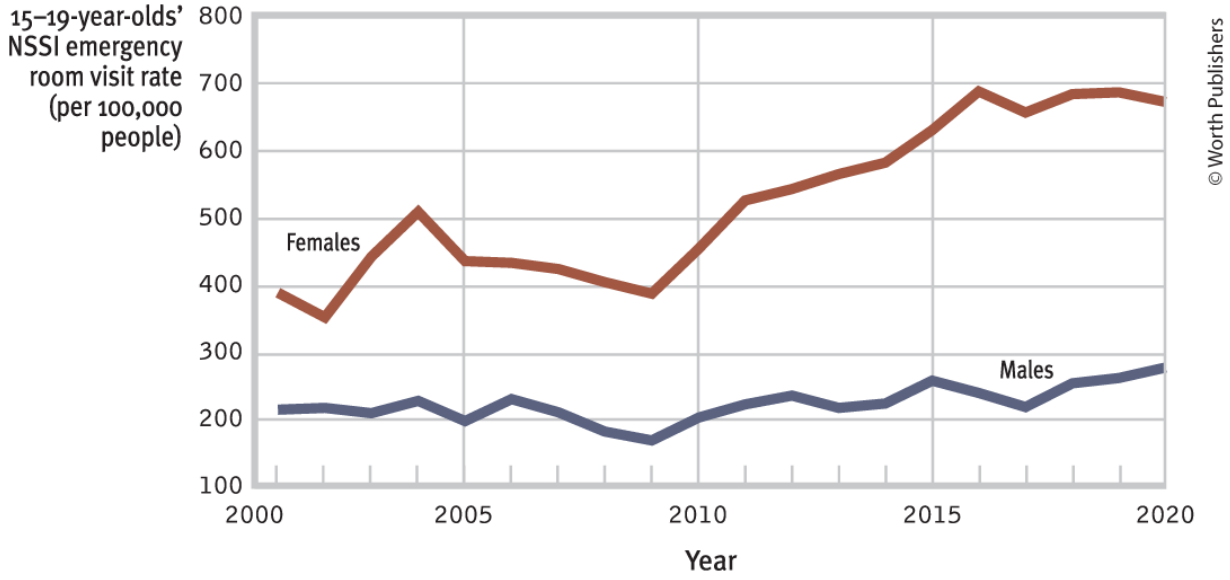
Extended description for FIGURE 48.2 Suicide death rates, 2000 to 2019



The horizontal axis is labeled 2000, 2005, 2010, 2015, and 2019. The vertical axis ranges from 0 to 16, in increments of 2. The curve for the World starts at (13, 2000), slopes downward, and ends at (9.3, 2019). The curve for Canada begins at (12, 2000), fluctuates slightly but trends upward to end at (12, 2019). Its highest point is in 2016 at 13. The United States curve begins at (11, 2000), fluctuates slightly but steadily increases to end at (16, 2019). All data are approximate.

Return to FIGURE 48.2 Suicide death rates, 2000 to 2019

Extended description for FIGURE 48.3 Rates of U.S. nonsuicidal self-injury emergency room visits

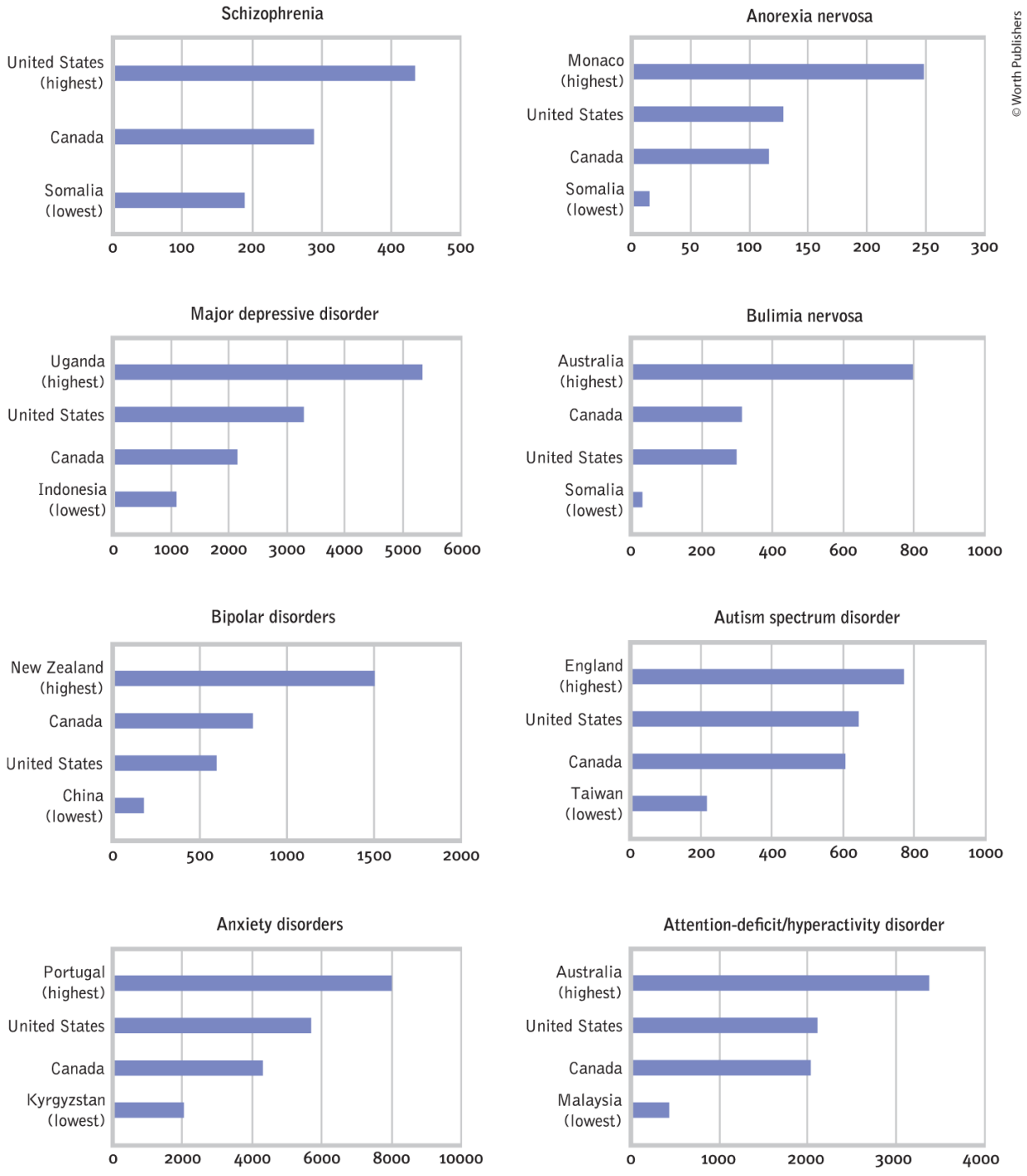


The horizontal axis represents Year and ranges from 2000 to 2015, in increments of 5. The horizontal axis represents 15- to 19-year-olds' N S S I emergency room visit rate (per 100,000 people) and ranges from 100 to 800, in increments of 100. A curve for females starts from (2001, 400), drops to (2002, 350), rises to (2004, 510), drops to (2009, 390), and rises to end at (2015, 620). A curve for males starts from (2001, 210), fluctuates slightly to (2009, 170), and rises to end at (2015, 260). All data are approximate.

Return to FIGURE 48.3 Rates of U.S. nonsuicidal self-injury emergency room visits

Extended description for FIGURE 48.4 Highest and lowest rates of selected

disorders worldwide



The first graph is labeled **Schizophrenia.** The horizontal axis ranges from 0 to 500, in increments of 100. The vertical axis plots bars for

different countries. The data in the graph are as follows: United States (highest), 420; United States, 420; Canada, 290; and Somalia (lowest), 190.

The second graph is labeled **Anorexia nervosa**. The horizontal axis ranges from 0 to 300, in increments of 50. The vertical axis plots bars for different countries. The data in the graph are as follows: Monaco (highest), 249; United States, 130; Canada, 120; and Somalia (lowest), 20.

The third graph is labeled **Major depressive disorder**. The horizontal axis ranges from 0 to 6000, in increments of 1000. The vertical axis plots bars for different countries. The data in the graph are as follows: Uganda (highest), 5300; United States, 3200; Canada, 2100; and Indonesia (lowest), 1100.

The fourth graph is labeled **Bulimia nervosa**. The horizontal axis ranges from 0 to 1000, in increments of 200. The vertical axis plots bars for different countries. The data in the graph are as follows: Australia (highest), 800; Canada, 320; United States, 300; and Somalia (lowest), 20.

The fifth graph is labeled **Bipolar disorders**. The horizontal axis ranges from 0 to 2000, in increments of 500. The vertical axis plots bars for different countries. The data in the graph are as follows: New Zealand (highest), 1500; Canada, 750; United States, 600; and China (lowest), 200.

The sixth graph is labeled **Autism spectrum disorder.** The horizontal axis ranges from 0 to 1000, in increments of 200. The vertical axis plots bars for different countries. The data in the graph are as follows: England (highest), 780; United States, 630; Canada, 600; and Taiwan (lowest), 210.

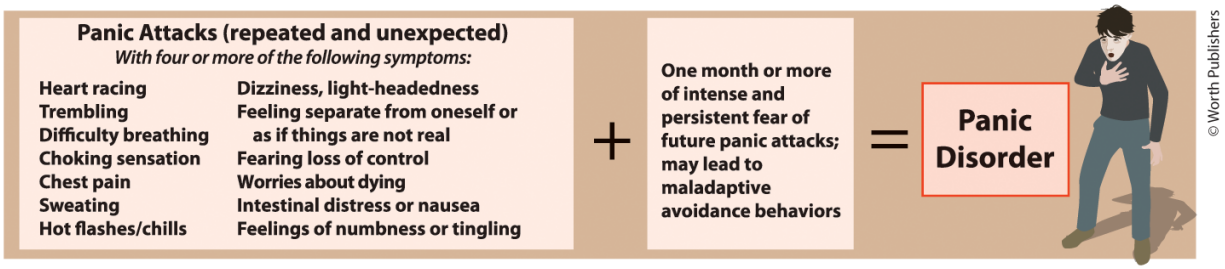
The seventh graph is labeled **Anxiety disorders**. The horizontal axis ranges from 0 to 10000, in increments of 2000. The vertical axis plots bars for different countries. The data in the graph are as follows: Portugal (highest), 8000; United States, 5800; Canada, 4200; and Kyrgyzstan (lowest), 2000.

The eighth graph is labeled **Attention-deficit slash hyperactivity disorder**. The horizontal axis ranges from 0 to 4000, in increments of 1000. The vertical axis plots bars for different countries. The data in the graph are as follows: Australia (highest) 3300; United States, 2100; Canada, 2050; and Malaysia (lowest), 500.

All data are approximate.

Return to FIGURE 48.4 Highest and lowest rates of selected disorders worldwide

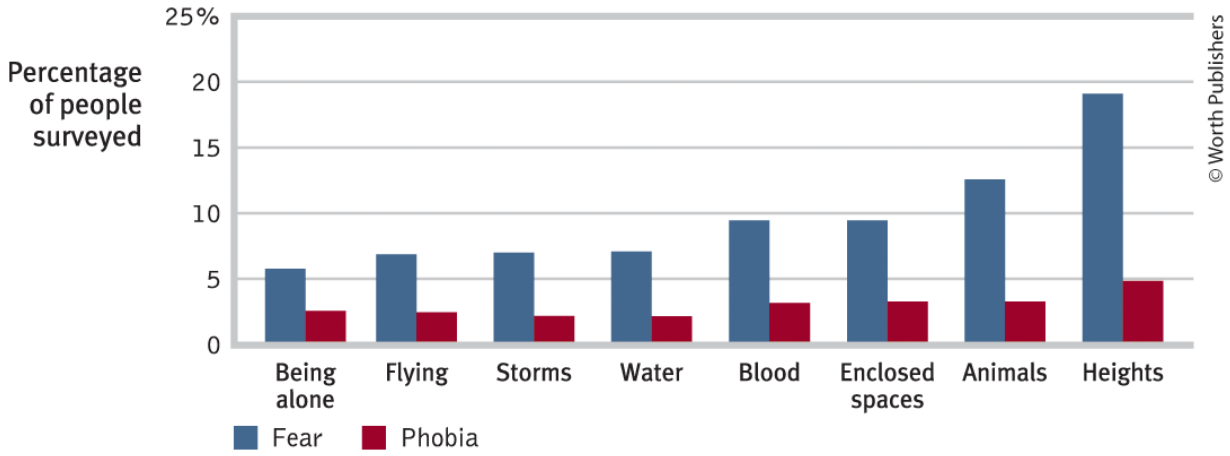
Extended description for FIGURE 49.1 Panic disorder



The illustration is presented like a mathematical equation. The first part reads, **Panic Attack (repeated and unexpected),** *With four or more of the following symptoms:* heart racing, trembling, difficulty breathing, choking sensation, chest pain, sweating, hot flashes slash chills, dizziness, light-headedness, feeling separate from oneself or as if things are not real, fearing loss of control, worries about dying, intestinal distress or nausea, and feelings of numbness or tingling. A plus sign follows the list of symptoms. The following text appears next: One month or more of intense and persistent fear of future panic attacks; may lead to maladaptive avoidance behaviors. Then an equal sign appears, followed by the words panic disorder and an illustration of a distressed-looking person with his hand on his chest.

Return to FIGURE 49.1 Panic disorder

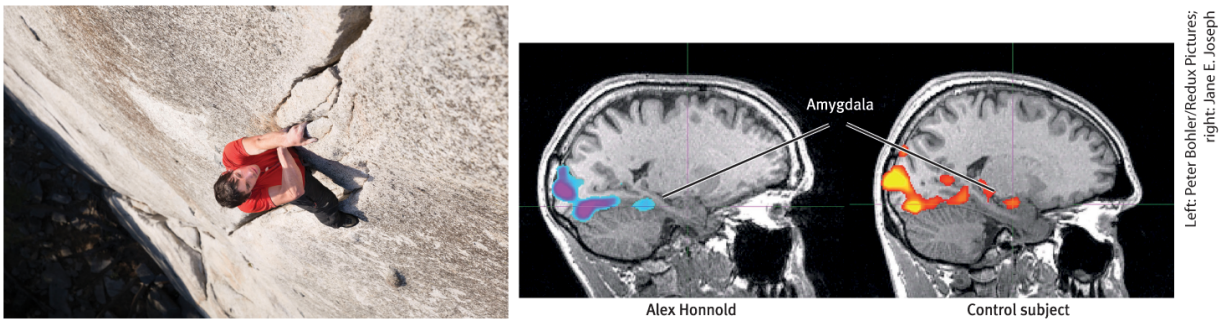
Extended description for FIGURE 49.2 Some common specific fears



The horizontal axis lists different events or objects that inspire fears or phobias, which are indicated by the bars on the chart. The vertical axis represents Percentage of people surveyed and ranges from 0 to 25 percent, in increments of 5. The data are as follows: Being alone: Fear 5.5 and Phobia 2.3; Flying: Fear 7 and Phobia 2.3; Storms: Fear 7 and Phobia 2.3; Water: Fear 7 and Phobia 2.3; Blood: Fear 9.5 and Phobia 3; Enclosed spaces: Fear 9.5 and Phobia 3.2; Animals: Fear 12.5 and Phobia 3.2; and Heights: Fear 19 and Phobia 5. All data are approximate.

Return to FIGURE 49.2 Some common specific fears

Extended description for Fearless

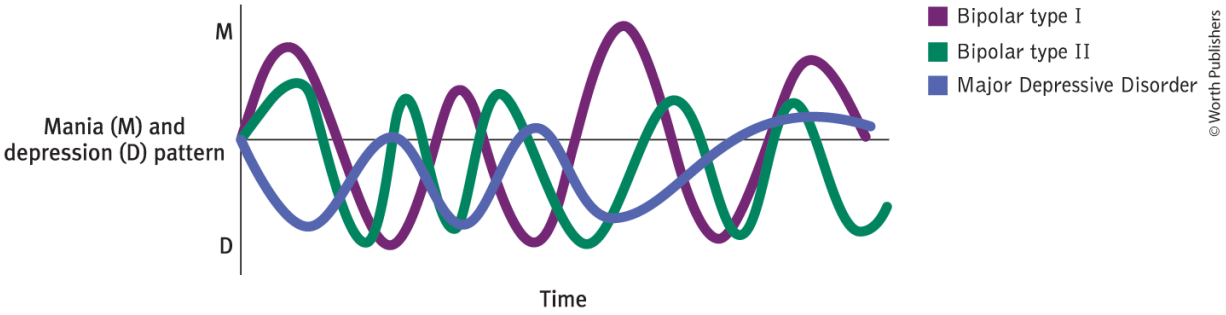


Left: Peter Bohler/Redux Pictures; right: Jane E. Joseph

The photo in part (a) shows an overhead view of Alex Honnold climbing a sheer rock wall without any safety ropes. Two M R I scans in part (b) show Alex Honnold's brain and a control subject's brain. In Honnold, the amygdala and nearby areas are seen in blue and purple, and in the control, the same areas are seen in orange and yellow, showing greater activation.

Return to Fearless

Extended description for FIGURE 50.1 Mood fluctuation in bipolar disorders, compared with major depressive disorder



A vertical line representing Mania (M) and depression (D) pattern is marked D at the bottom and M at the top. A horizontal line labeled Time begins at the center of the vertical line and extends to the right representing a steady mood. The wave-like major depressive disorder curve begins at the center of the vertical line and fluctuates below the steady mood line, in the depression (D) region. The curve ends slightly above the steady mood line on the right end. The wave-like bipolar type 1 curve begins at the center of the vertical line, rises sharply to mania, fluctuates strongly between depressive and mania regions, and ends at the steady mood line on the right end. The wave-like bipolar type 2 curve begins at the center of the vertical line, rises and drops to depression only rising slightly above the steady line in the mania region. The curve lies mostly in the

depressive state and ends well below the steady line in the depression region. All data are approximate.

Return to FIGURE 50.1 Mood fluctuation in bipolar disorders, compared with major depressive disorder

Extended description for Bipolar disorders



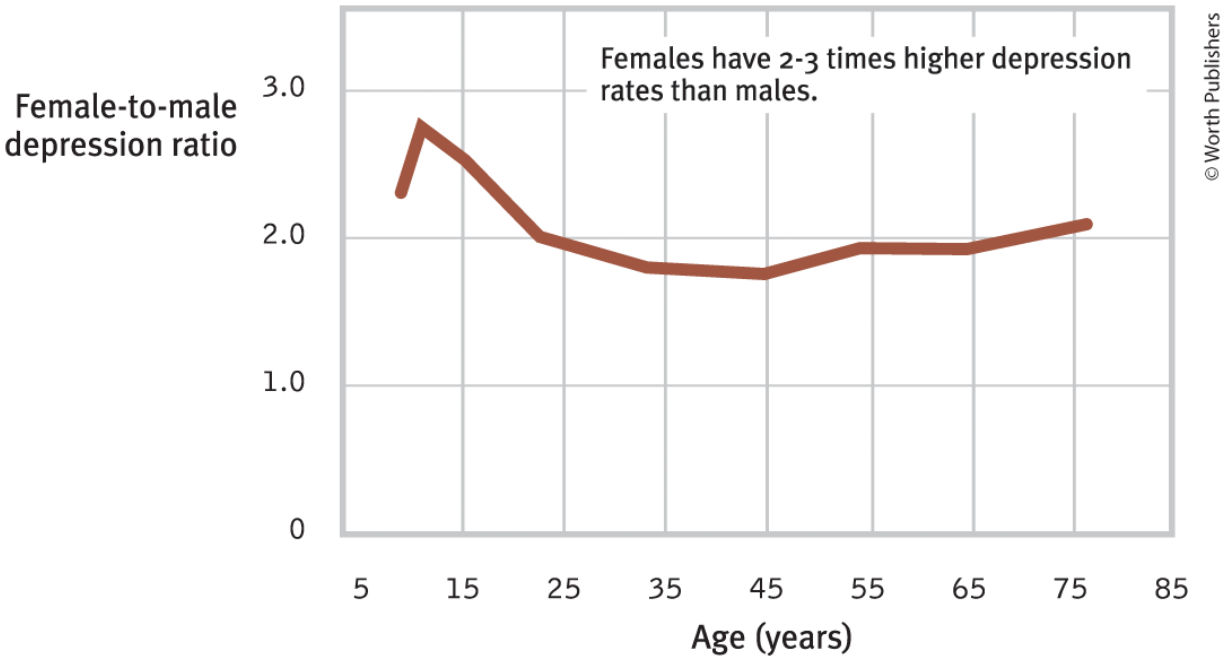
Life as a Two-Headed Beast: Bipolar, Abigail Southworth

The panting has one body and two heads, one dark and looking left and the other bright and looking right. There are several descriptive words by both heads. The head on the left has black hair, a blue and purple face, and looks downward with a despondent expression. Sentences float in the background of this half of the painting that read: Pills make you weak; Stop feeling sorry for yourself; I keep trying to help you but you don't want it; What do you have to be depressed about? and What's wrong with you? The head on the right has hair with red, purple, and blond stripes, a red and yellow face, and looks upward, with eyes and mouth opened wide in a very happy expression. Sentences float in the background of this half of the painting that read: Can't you just calm down? I don't get why you

can’t just act normal; Don’t you have pills for this? and You’re deluded. A large word showing the title of the image says BIPOLAR.

Return to Bipolar disorders

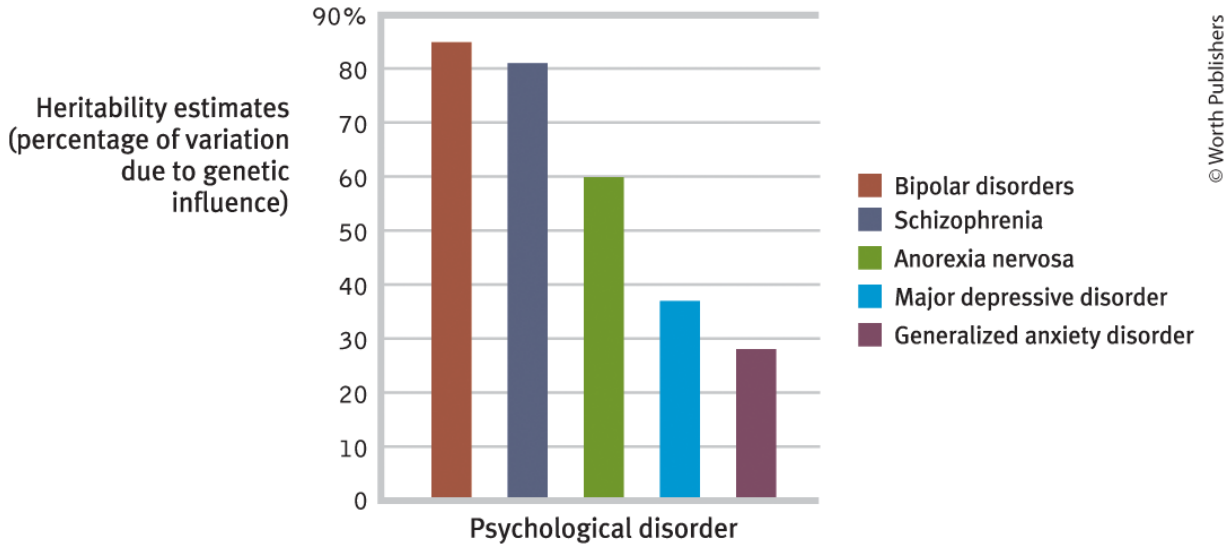
Extended description for FIGURE 50.2 Worldwide gender gap in depression



The horizontal axis represents Age (years) and ranges from 5 to 85, in increments of 10. The vertical axis represents Female-to-male depression ratio and ranges from 0 to 3.0, in increments of 1.0. The curve begins from 2.3 depression ratio at 7.5 years, rises to 2.8 depression ratio at 9 years, dips to 2.0 ratio at 25 years, then to 1.7 ratio by 45 years before climbing to end at 2.1 ratio at 77 years. All data are approximate. A text above reads, Females have 2 to 3 times higher depression rates than males.

Return to FIGURE 50.2 Worldwide gender gap in depression

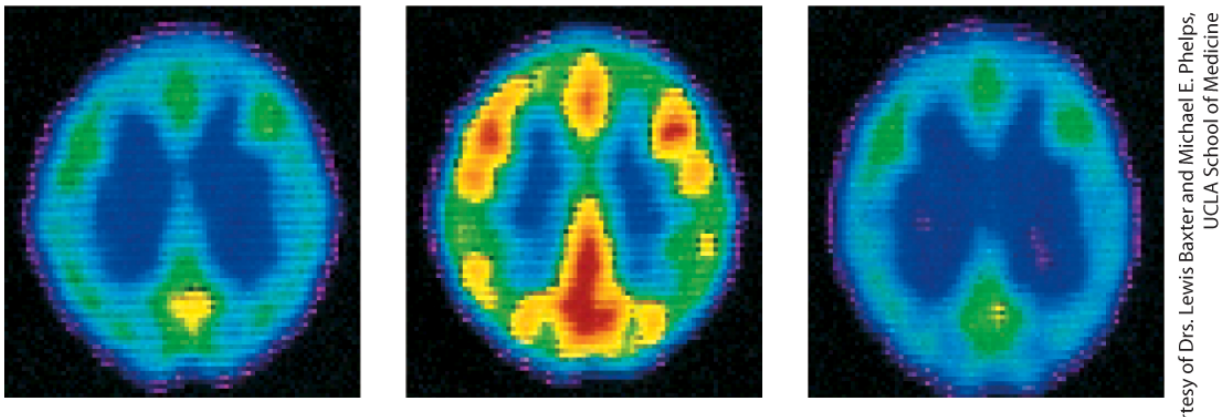
Extended description for FIGURE 50.3 The heritability of various psychological disorders



The horizontal axis represents Psychological disorder. The vertical axis represents Heritability estimates (percentage of variation due to genetic influence) and ranges from 0 to 90 percent, in increments of 10 percent. The percent of each psychological disorder are as follows: Bipolar disorder, 85 percent; Schizophrenia, 81 percent; Anorexia nervosa, 60 percent; Major depressive disorder, 38 percent; and Generalized anxiety disorder, 29 percent. All data are approximate.

Return to FIGURE 50.3 The heritability of various psychological disorders

Extended description for FIGURE 50.4 The ups and downs of a bipolar disorder



The first P E T scan of the top of a brain shows a small yellow area lit up near the back of the brain and is identified as **Depressed state** (May 17). The second P E T scan of the top of a brain shows several yellow and red areas lit up around the brain's perimeter, one red with a yellow border leading from the back of the brain toward the center. This scan is identified as **Manic state** (May 18). The third P E T scan of the top of a brain shows a small faint yellow area lit up near the back of the brain and is identified as **Depressed state** (May 27).

Return to FIGURE 50.4 The ups and downs of a bipolar disorder

Extended description for Rumination runs wild

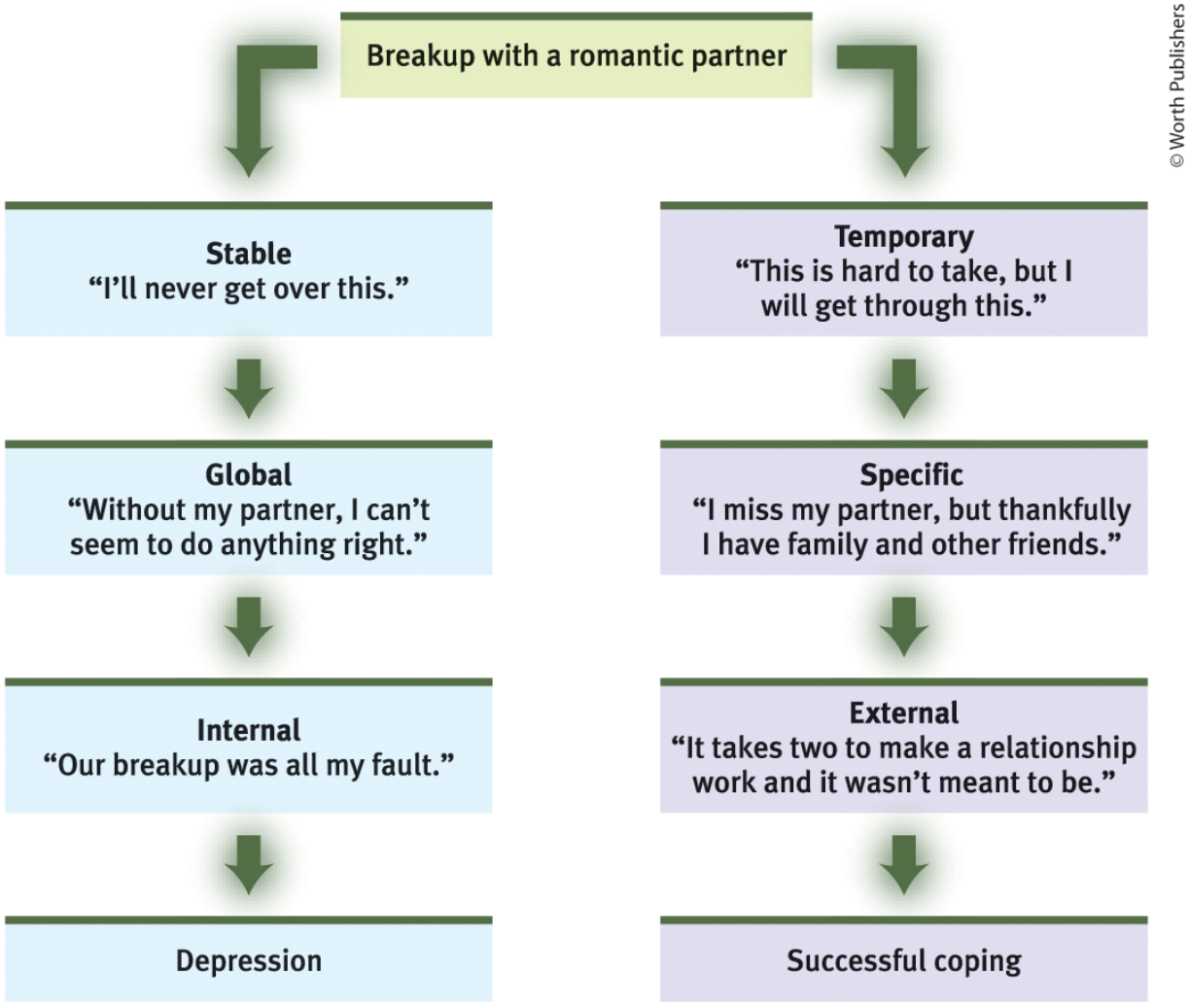


© Worth Publishers

A number of thoughts are depicted in thought bubbles around her face such as: No one wants to be around me; I never know what to say to people; Will I ever get a job?!; and Do I smell bad? I'm so ugly.

Return to Rumination runs wild

Extended description for FIGURE 50.5 Explanatory style and depression



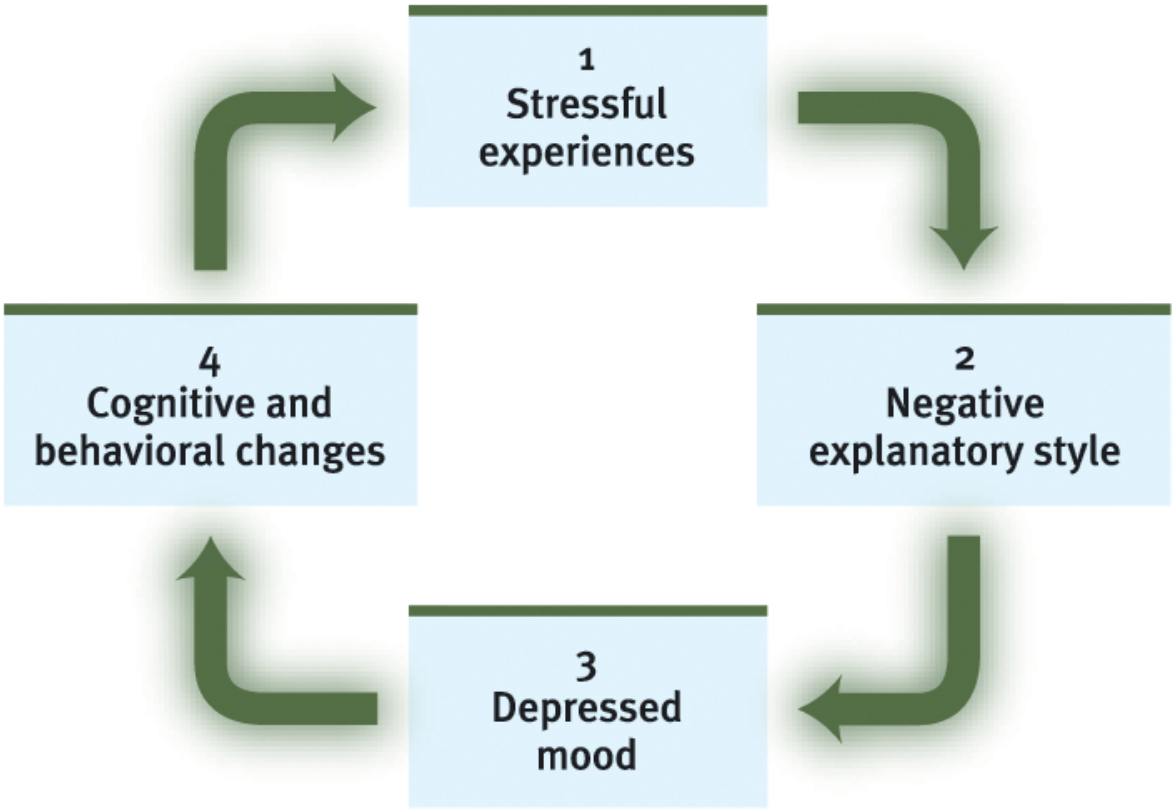
© Worth Publishers

A text box at the top reads: Breakup with a romantic partner. Arrows lead from the text box to two columns of four text boxes each on the left and the right. On the left, the text boxes connected by downward arrows read: Stable: "I'll never get over this"; Global: "Without my

partner, I can't seem to do anything right"; Internal: "Our breakup was all my fault"; and Depression. On the right, the text boxes connected by downward arrows read: Temporary: "This is hard to take, but I will get through this"; Specific: "I miss my partner, but thankfully I have family and other friends"; External: "It takes two to make a relationship work and it wasn't meant to be"; and Successful coping.

Return to FIGURE 50.5 Explanatory style and depression

Extended description for FIGURE 50.6 The vicious cycle of depressed thinking

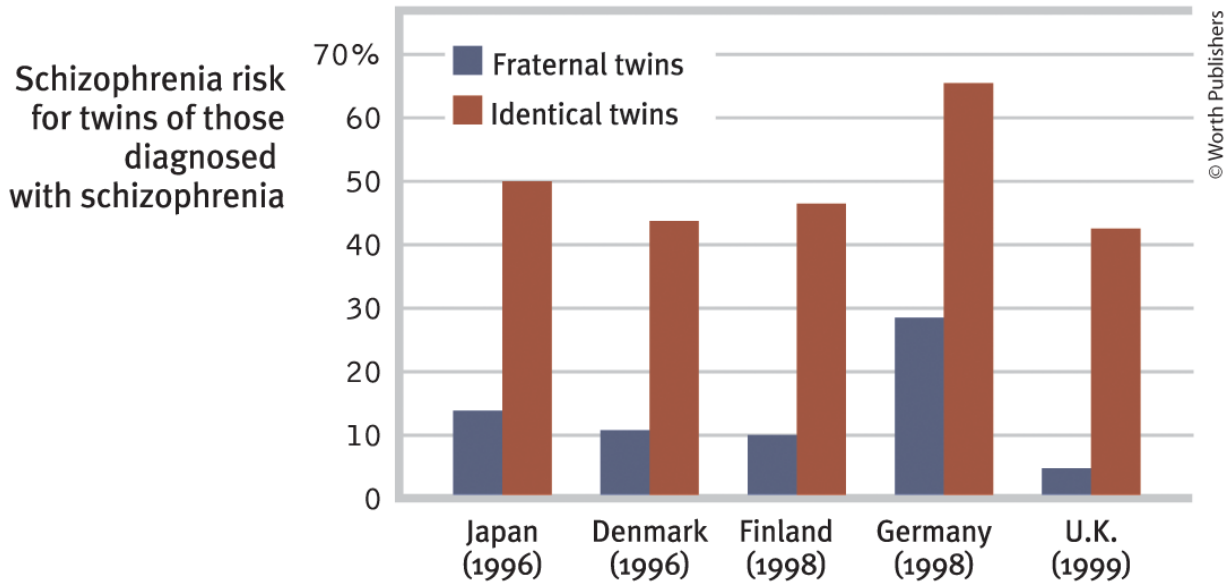


© Worth Publishers

Four text boxes arranged in a circle are linked by arrows moving clockwise. The text boxes read as follows in a clockwise manner from the top: (1) Stressful experiences; (2) Negative explanatory style; (3) Depressed mood; (4) Cognitive and behavioral changes. Box 4 points back to box 1 in a closed loop.

Return to FIGURE 50.6 The vicious cycle of depressed thinking

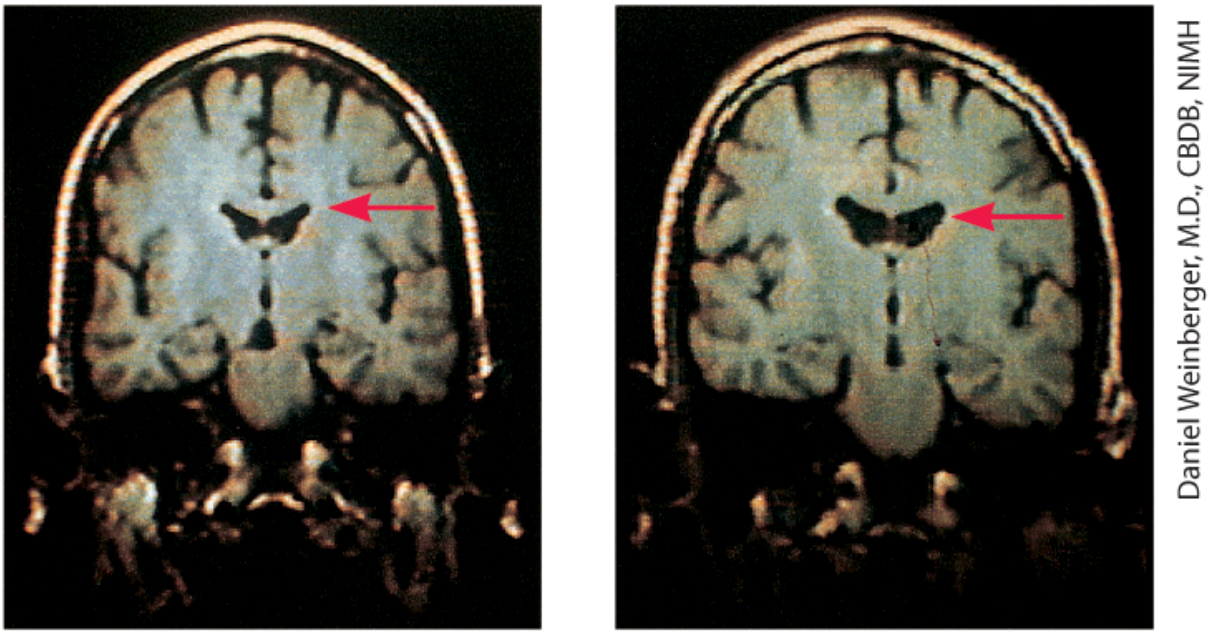
Extended description for FIGURE 51.1 Risk of developing schizophrenia



The vertical axis represents Schizophrenia risk for twins of those diagnosed with schizophrenia and ranges from 0 to 70 percent, in increments of 10. The data are as follows: Japan (19 96): Fraternal twins, 14 percent and Identical twins, 50 percent; Denmark (19 96): Fraternal twins, 11 percent and Identical twins, 44 percent; Finland (19 98): Fraternal twins, 10 percent and Identical twins, 47 percent; Germany (19 98): Fraternal twins, 29 percent and Identical twins, 65 percent; and U.K. (19 99): Fraternal twins, 4 percent and Identical twins, 42 percent. All data are approximate.

Return to FIGURE 51.1 Risk of developing schizophrenia

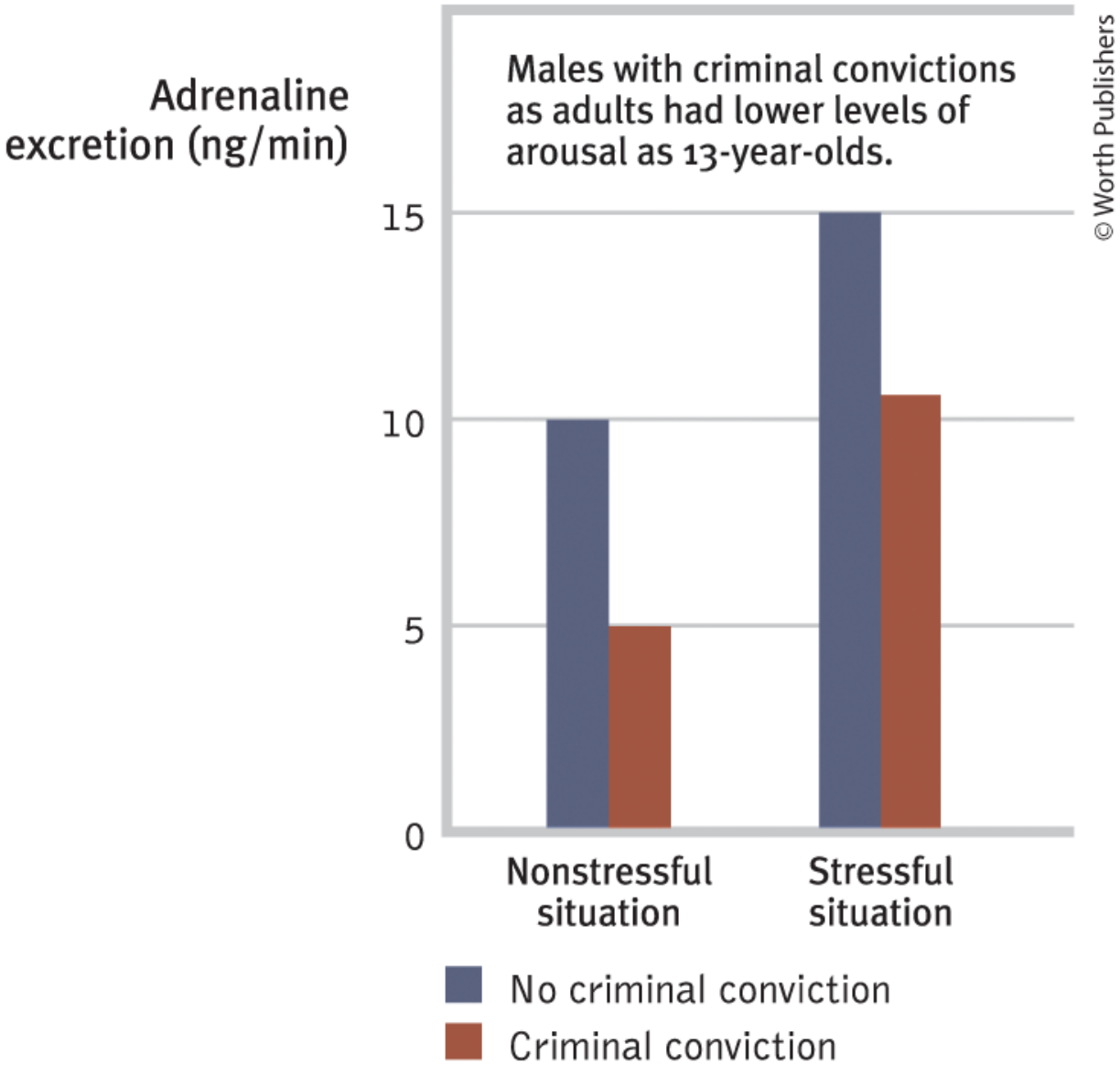
Extended description for FIGURE 51.2 Schizophrenia in only one identical twin



(a) No schizophrenia: A scan of the brain from above shows an arrow pointing to a normal-sized cranial cavity in the middle of the brain. (b) Schizophrenia: A scan of the brain from above shows an arrow pointing to an enlarged cranial cavity in the middle of the brain.

Return to FIGURE 51.2 Schizophrenia in only one identical twin

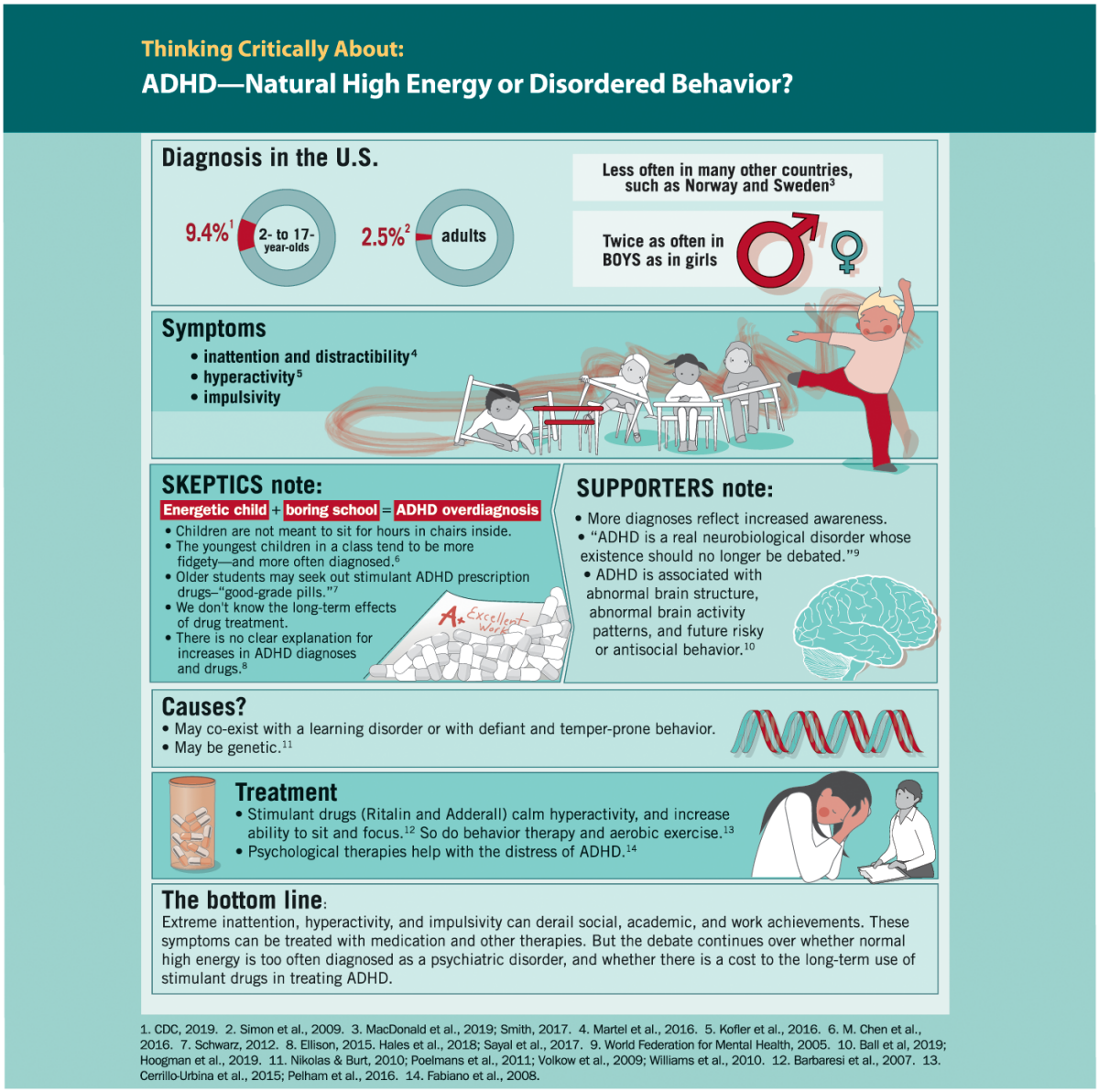
Extended description for FIGURE 52.1 Cold-blooded arousability and risk of crime



The horizontal axis is labeled Nonstressful situation and Stressful situation. The vertical axis represents Adrenaline excretion (nanograms per minute) and ranges from 0 to 15, in increments of 5. In nonstressful situations: No criminal conviction equals 10 and criminal convictions equals 5. In stressful situations: No criminal conviction equals 15 and criminal convictions equals 10.5. All data are approximate. Text on the top reads: Males with criminal convictions as adults had lower levels of arousal as 13-year-olds.

Return to FIGURE 52.1 Cold-blooded arousability and risk of crime

Extended description for Attention-deficit slash hyperactivity disorder



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The infographic shows six panels. The first panel has the heading, **Diagnosis in the U.S.** Under the heading are two pie charts. The one on the left is labeled, 2- to 17-year-olds, and shows that 9.4 percent of 2- to 17-year-olds have been diagnosed with A D H D (C D C, 2019 a). The second pie chart is labeled, Adults, and shows that 2.5 percent of adults have been diagnosed with A D H D (Simon et al., 2009). To the right of the pie charts text reads, Less often in many other countries such as Norway and Sweden (MacDonald et al., 2019; Smith, 2017). Below, text reads, Twice as often in BOYS as in girls, besides a large symbol for males and a small symbol for females.

The second panel has the heading, **Symptoms.** A bulleted list reads as follows: 1. Inattention and distractibility (Martel et al., 2016). 2. Hyperactivity (Kofler et al., 2016). 3. Impulsivity. Beside the bulleted list is an illustration of three children (two girls and a boy) sitting at their desks with another boy jumping all over the room, tipping the children's desks. One other boy is sitting on the floor under his desk, having been knocked out of his chair by the rambunctious boy.

The third panel is divided into two sections. On the left, the heading reads, **SKEPTICS note:** Energetic child plus boring school equals A D H D overdiagnosis. A bulleted list reads as follows: 1. Children are not meant to sit for hours in chairs inside. 2. The youngest children in a class tend to be more fidgety - and more often diagnosed (Chen, M. et al., 2016). 3. Older students may seek out stimulant A D H D prescription drugs - "good grade pills" (Schwarz, 2012). 4. We don't know the long-term effects of drug treatment. 5. There is no clear

explanation for increases in A D H D diagnoses and drugs (Ellison, 2015; Hales et al, 2018; Sayal et al., 2017). Next to the bullet list is an illustration of a pile of pills on top of a paper with the words A plus, Excellent work. On the right of this panel is the second section, where the heading reads, **SUPPORTERS note:** A bulleted list reads as follows: 1. More diagnoses reflect increased awareness. 2. "A D H D is a real neurobiological disorder whose existence should no longer be debated" (World Federation for Mental Health, 2005). 3. A D H D is associated with abnormal brain structure, abnormal brain activity patterns, and future risky or antisocial behavior (Ball et al., 2019; Hoogman et al., 2019). Under this bulleted list is an illustration of a right-facing brain.

The fourth panel has the heading, **Causes?** A bulleted list reads as follows: 1. May co-exist with a learning disorder or with defiant and temper-prone behavior. 2. May be genetic (Nikolas and Burt, 2010; Poelmans et al., 2011; Volkow et al., 2009; Williams et al., 2010). Beside this bulleted list is an illustration of a double helical of D N A.

The fifth panel has the heading, **Treatment.** To the left is an illustration of a vial of medication capsules. A bulleted list reads as follows: 1. Stimulant drugs (Ritalin and Adderall) calm hyperactivity, and increase ability to sit and focus (Barbaresi et al., 2007). So do behavior therapy and aerobic exercise (Cerrillo-Urbina et al., 2015; Pelham et al., 2016). 2. Psychological therapies help with the distress of A D H D (Fabiano et al., 2008). To the right, an illustration shows a

young woman with her head in her hands. Another woman with a clipboard is looking at her.

The sixth panel has the heading, **The bottom line:** The text reads, Extreme inattention, hyperactivity, and impulsivity can derail social, academic, and work achievements. These symptoms can be treated with medication and other therapies. But the debate continues over whether normal high energy is too often diagnosed as a psychiatric disorder, and whether there is a cost to the long-term use of stimulant drugs in treating A D H D.

Return to Attention-deficit slash hyperactivity disorder

Extended description for The history of treatment

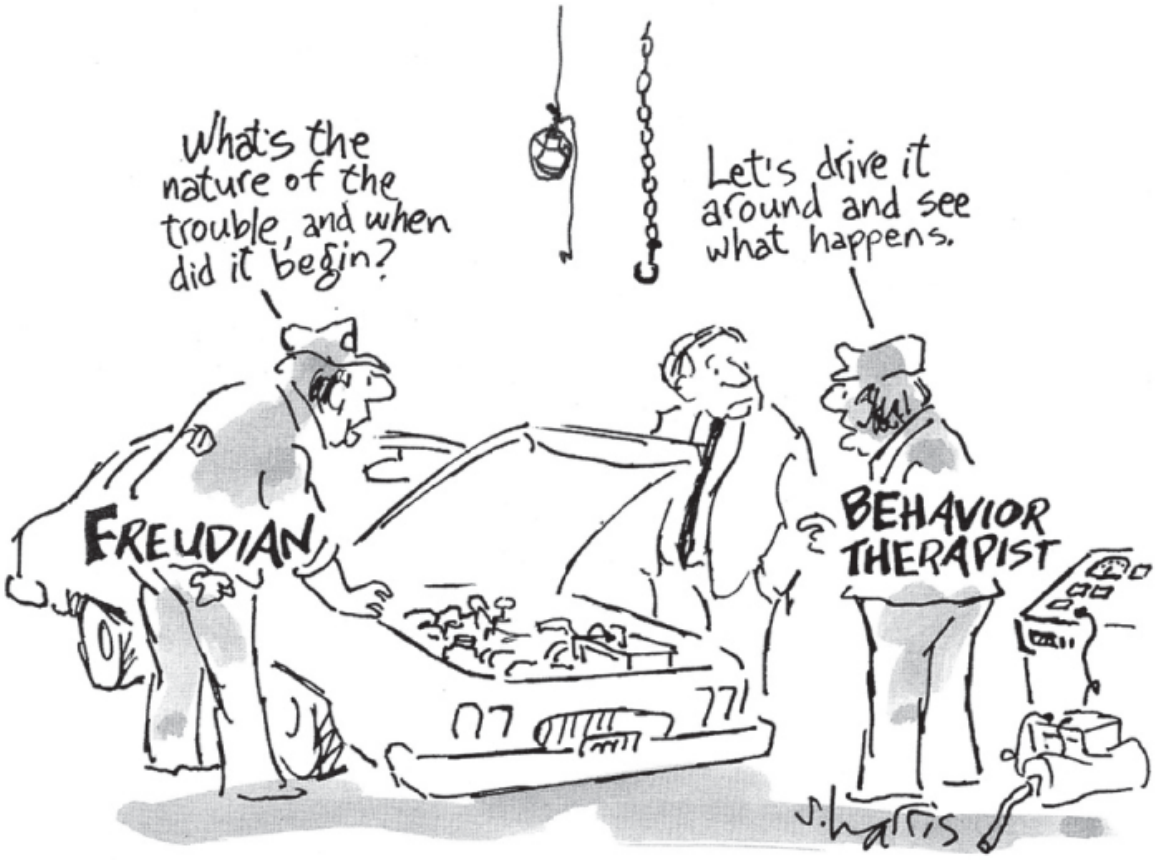


The Granger Collection

The room has bars on the window and door. One woman whispers to another, who holds a fan to her face, as patients in period dress stand nearby. One male patient lying in the foreground is naked except for a sheet around his middle. A woman holds him and dabs her eye with a cloth.

Return to The history of treatment

Extended description for Cartoon depicting behavior therapy



Sidney Harris/Cartoon Stock

The first mechanic, labeled Freudian, looks in the car and says, “What’s the nature of the trouble, and when did it begin?” The second mechanic, labeled Behavior Therapist, says, “Let’s drive it around and see what happens.”

Return to Cartoon depicting behavior therapy

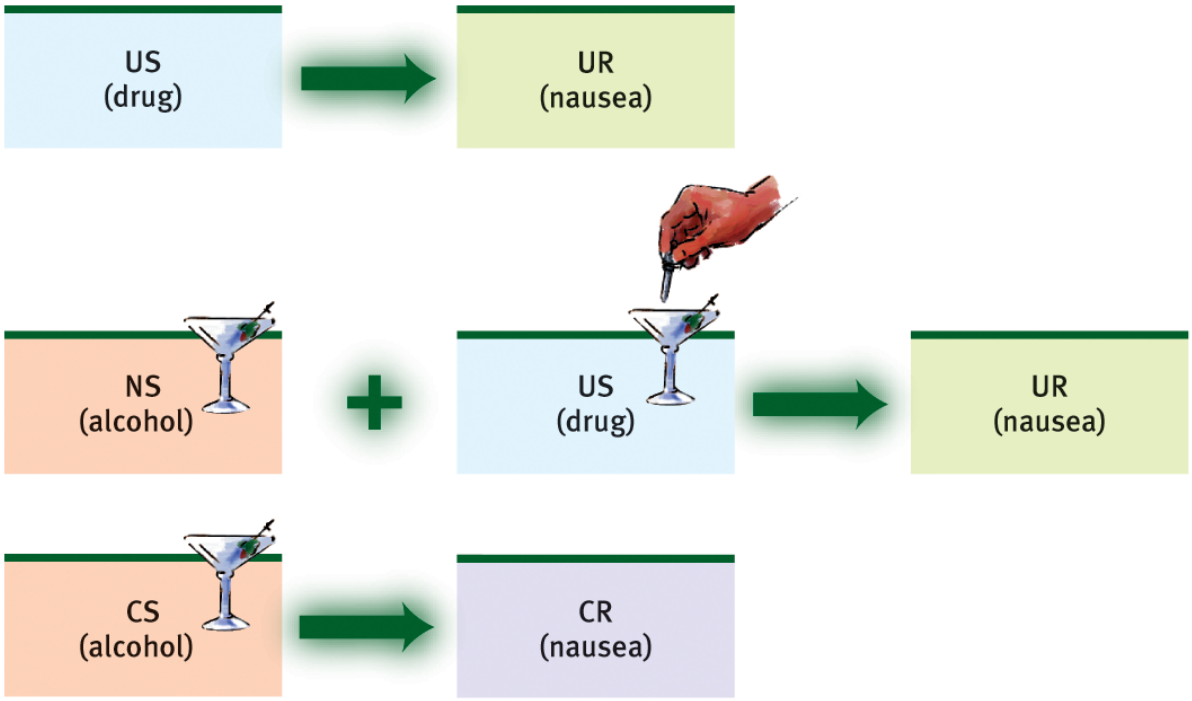
Extended description for FIGURE 54.1 Scary spider



The woman sits at a table with a set of V R goggles over her eyes. She is reaching toward a large spider that is drawn so as to show that it is not real but is visible to the woman with the V R headset. At the table, another woman in a lab coat and holding a laptop looks on.

Return to FIGURE 54.1 Scary spider

Extended description for FIGURE 54.2 Aversion therapy for alcohol use disorder



© Worth Publishers

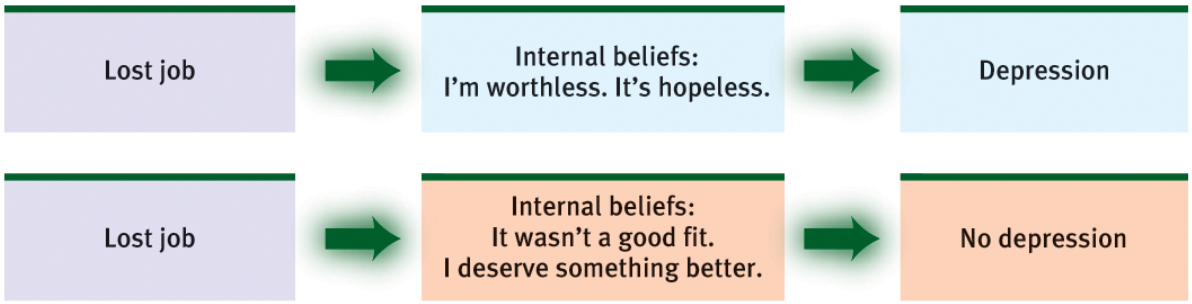
The top row has two boxes. The first box is labeled, U S (drug). An arrow points to the second box that reads, U R (nausea).

The middle row has three boxes. From left to right, the first box is labeled, N S (alcohol), and has an image of a martini glass with an olive in it; then a plus sign leads to the next box which reads, U S (drug), and has an image of a hand holding a medicine dropper over the martini glass. An arrow leads to a third box labeled, U R (nausea).

The final row has two boxes. The first box is labeled, C S (alcohol), and has an image of a martini glass with an olive in it. An arrow points to the second box that reads, C R nausea.

Return to FIGURE 54.2 Aversion therapy for alcohol use disorder

Extended description for FIGURE 54.3 A cognitive perspective on psychological disorders

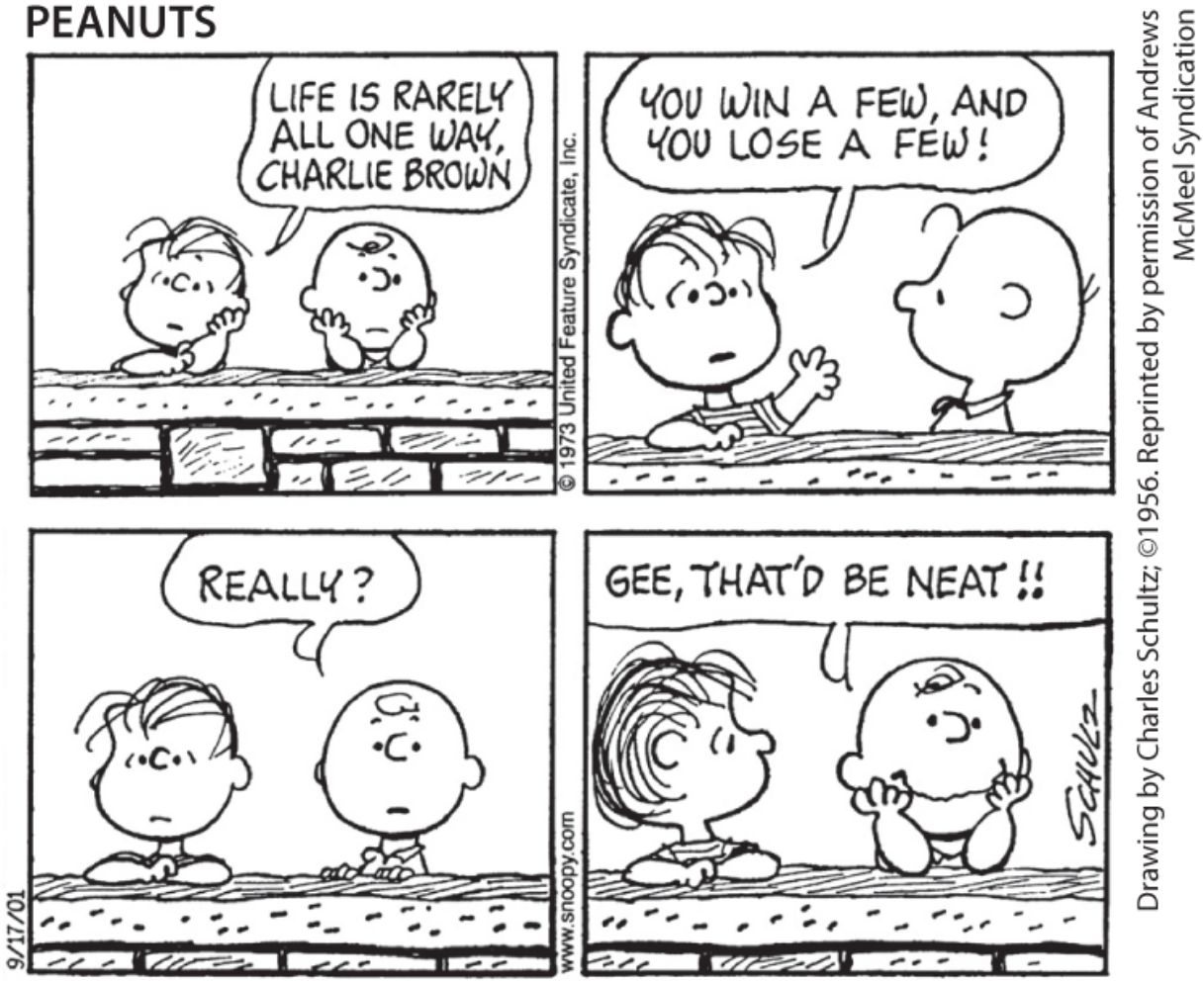


© Worth Publishers

There are two rows, each with three boxes connected by rightward arrows. Left to right in the top row, the first box is labeled, Lost job. The second box is labeled, Internal beliefs: I'm worthless. It's hopeless. The third box is labeled, Depression. Left to right in the bottom row, the first box is labeled, Lost Job. The second box is labeled, Internal beliefs: It wasn't a good fit. I deserve something better. The third box is labeled, No Depression.

Return to FIGURE 54.3 A cognitive perspective on psychological disorders

Extended description for Cartoon depicting cognitive therapy



Panel one: Charlie Brown and Linus lean their elbows on a brick wall. Linus says, “Life is rarely all one way, Charlie Brown.”

Panel two: Linus says, “You win a few and you lose a few!”

Panel three: Charlie Brown replies, “Really?”

Panel four: Charlie says, “Gee, that’d be neat!!”

Return to Cartoon depicting cognitive therapy

Extended description for Cartoon depicting psychotherapy

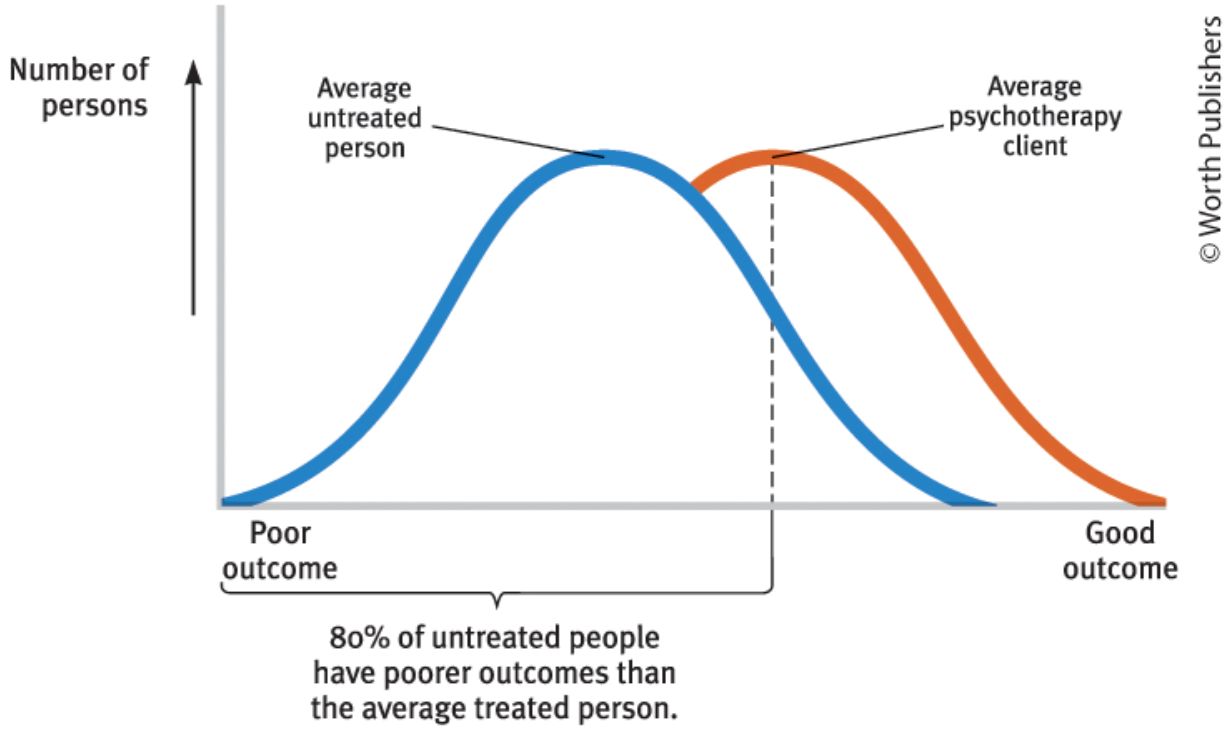


Jon Carter/Cartoon Stock

One man asks, “So how long have you wanted to be a therapist?” The other replies, “That’s what I would like to ask you.” A caption reads: Ed was in therapy for believing he was a therapist.

Return to Cartoon depicting psychotherapy

Extended description for FIGURE 55.1 Treatment worked, as shown by the outcomes of treated versus untreated clients

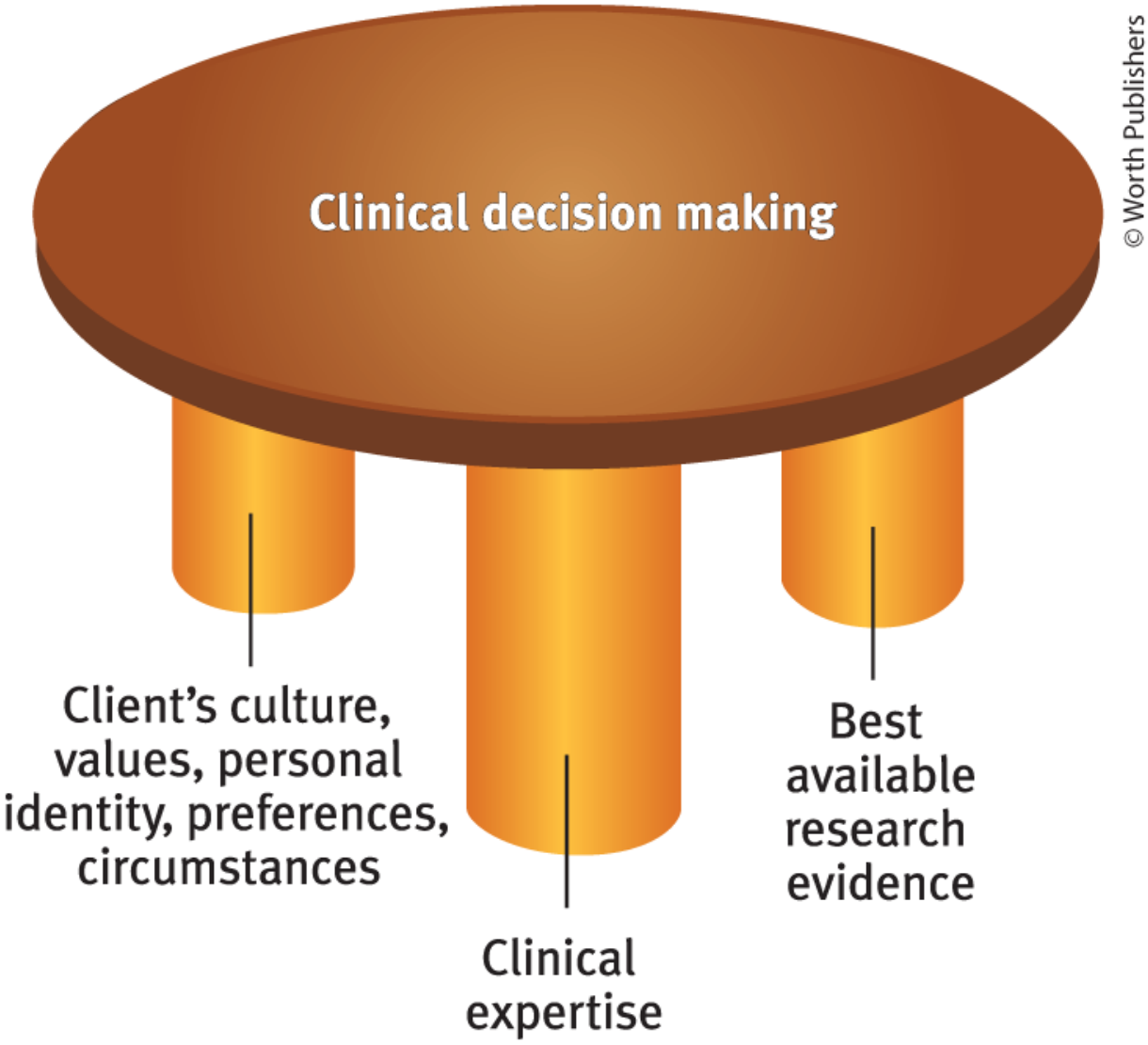


The horizontal axis ranges from Poor outcome on the left to Good outcome on the right. The vertical axis is labeled Number of persons and is accompanied by an upward-pointing arrow. The bell-shaped curve for the Average untreated person tends to the poor outcome category on the horizontal axis, while the curve for the Psychotherapy clients tends more to the good outcome category.

Text below the graph reads: 80 percent of untreated people have poorer outcomes than the average treated person. The text points to the peak in the curve for the average psychotherapy client. All data are approximate.

Return to FIGURE 55.1 Treatment worked, as shown by the outcomes of treated versus untreated clients

Extended description for FIGURE 55.2 Evidence-based practice

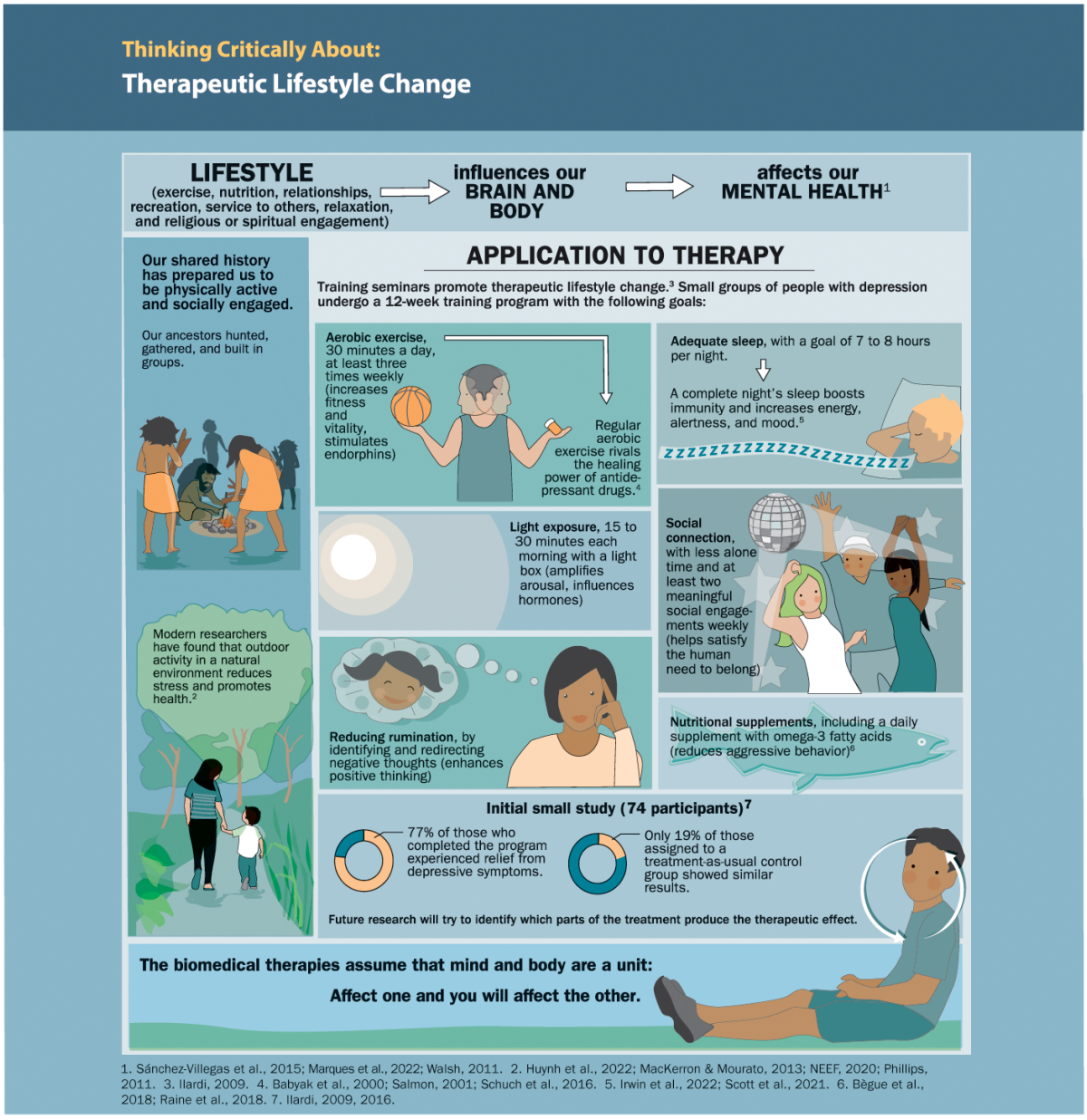


© Worth Publishers

The left leg is labeled Client's culture, values, personal identity, preferences, circumstances. The middle leg is labeled Clinical expertise. The right leg is labeled Best available research evidence.

Return to FIGURE 55.2 Evidence-based practice

Extended description for Therapeutic lifestyle change



1. Sánchez-Villegas et al., 2015; Marques et al., 2022; Walsh, 2011. 2. Huynh et al., 2022; MacKerron & Mourato, 2013; NEEF, 2020; Phillips, 2011. 3. Ilardi, 2009. 4. Babyak et al., 2000; Salmon, 2001; Schuch et al., 2016. 5. Irwin et al., 2022; Scott et al., 2021. 6. Bègue et al., 2018; Raine et al., 2018. 7. Ilardi, 2009, 2016.

© Worth Publishers

The infographic is divided into five panels. The first panel shows a text on the left reading, **LIFESTYLE** (exercise, nutrition, relationships, recreation, service to others, relaxation, and religious or spiritual engagement). A rightward arrow points to the text, **Influences our BRAIN AND BODY**. Next, another rightward arrow points to the text, **Affects our MENTAL HEALTH** (Sánchez-Villegas et al., 2015; Walsh, 2011).

The second panel is on the left side and shows text reading, Our shared history has prepared us to be physically active and **socially engaged**. Our ancestors hunted, gathered, and built in groups. An illustration shows a group of early humans around a fire with several of them bringing wood for the fire. Below, another text reads, Modern researchers have found that outdoor activity in a natural environment reduces stress and promotes health (MacKerron and Mourato, 2013; N E E F, 2015; Phillips, 2011). An illustration shows a woman holding the hand of a little boy as they walk on a path through the trees.

To the right is the third panel with the title, **APPLICATION TO THERAPY.** Text below reads, Training seminars promote therapeutic lifestyle change (Ilardi, 2009). Small groups of people with depression undergo a 12-week training program with the following goals: Text box 1: **Aerobic exercise,** 30 minutes a day, at least three times weekly (increases fitness and vitality, stimulates endorphins). An accompanying illustration shows a person with his head turned to left, looking at a basketball in his hand. On the other side of the

person is the text reading, Regular aerobic exercise rivals the healing power of antidepressant drugs (Babyak et al., 2000; Salmon, 2001; Schuch et al., 2016). The same illustration shows the same man's head turned to right, looking at a bottle of pills in his hand. Text box 2: **Light exposure**, 15 to 30 minutes each morning with a light box (amplifies arousal, influences hormones). An accompanying illustration shows a beaming light source with different rings of light intensity. Text box 3: **Reducing rumination**, by identifying and redirecting negative thoughts (enhances positive thinking). An accompanying illustration shows a woman with a thought bubble of herself as a smiling, happy child. Text box 4: **Adequate sleep**, with a goal of 7 to 8 hours per night. An arrow points down to text reading: A complete night's sleep boosts immunity and increases energy, alertness, and mood (Gregory et al., 2009; Walker and van der Helm, 2009). An accompanying illustration shows a young man sleeping with a line of Zs coming out of his mouth. Text box 5: **Social connection**, with less alone time and at least two meaningful social engagements weekly (helps satisfy the human need to belong). An accompanying illustration shows three people dancing under a disco ball. Text box 6: **Nutritional supplements**, including a daily supplement with omega-3 fatty acids (reduces aggressive behavior) (Begue et al., 2017; Raine et al., 2018).

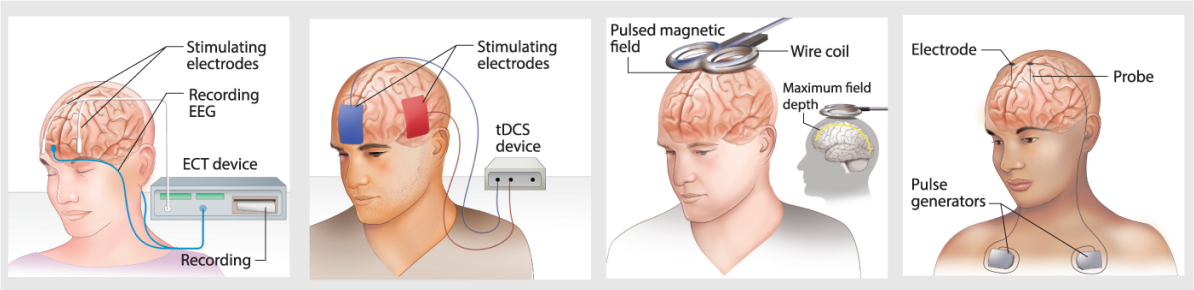
Below, a fourth panel is titled, **Initial small study (74 participants)** (Ilardi, 2009, 2016). Under the heading are two pie charts. The chart on the left shows that 77 percent of those who completed the program experienced relief from depressive symptoms. The chart

on the right shows that only 19 percent of those assigned to a treatment as usual control group showed similar results. Under these pie charts, a text reads: Future research will try to identify which parts of the treatment produce the therapeutic effect.

The fifth panel at the bottom has text that reads, **The biomedical therapies assume that mind and body are a unit: Affect one and you will affect the other.** An illustration shows a seated young man leaning against a wall. There are arrows pointing from his head to his body and from his body to his head.

Return to Therapeutic lifestyle change

Extended description for FIGURE 56.1 A stimulating experience



© Worth Publishers

Electroconvulsive therapy (ECT) Psychiatrist administers a strong current, which triggers a brain seizure in the anesthetized patient.

Transcranial direct current stimulation (tDCS) Psychiatrist applies a weak current to the scalp.

Transcranial magnetic stimulation (TMS) Psychiatrist sends a painless magnetic field through the skull to the surface of the cortex to alter brain activity.

Deep brain stimulation (DBS) Psychiatrist stimulates electrodes implanted in "sadness centers" to calm those areas.

The first illustration depicts a subject with his eyes closed and his brain exposed. Stimulating electrodes from an E C T device that records E E G are connected to the head. Accompanying text reads, **Electroconvulsive therapy (E C T)**: Psychiatrist administers a strong current, which triggers a brain seizure in the anesthetized patient.

The second illustration shows stimulating electrodes from t D C S attached to the subject's head. Accompanying text reads, **Transcranial direct current stimulation (t D C S)**: Psychiatrist applies a weak current to the scalp.

The third illustration shows a wire coil placed on top of the subject's head that creates a pulsed magnetic field. A side illustration shows

the maximum field depth till the brain. Accompanying text reads, **Transcranial magnetic stimulation (T M S)**: Psychiatrist sends a painless magnetic field through the skull to the surface of the cortex to after brain activity.

The fourth illustration shows a pulse generator on the subject's chest from which the electrode and probe are connected to his head. Accompanying text reads, **Deep brain stimulation (D B S)**: Psychiatrist stimulates electrodes implanted in "sadness centers" to calm those areas.

Return to FIGURE 56.1 A stimulating experience

Extended description for Disability and resilience



(a) (b)

Left: © Stephen Voss 2020/Redux Pictures; right: Chip Somodevilla/Getty Images

The photo on the left shows Congressman Dan Crenshaw wearing a patch over his right eye and hands folded under his chin on the left. The photo on the right shows Senator Tammy Duckworth seated in a wheelchair and holding a baby. Several people are standing nearby behind her.

Return to Disability and resilience

Extended description for History of psychology

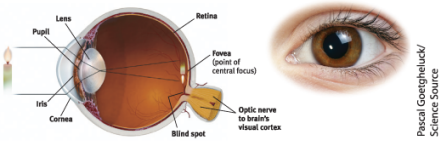
B.C.E.

387— Plato, who believed in innate ideas, suggests that the brain is the seat of mental processes.

335— Aristotle, who denied the existence of innate ideas, suggests that the heart is the seat of mental processes.

C.E.

1604— Johannes Kepler describes the inverted image on the retina.



Pascal Goetgheluck/ Science Source

Inverted image on the retina

1605— Francis Bacon publishes *The Proficiency and Advancement of Learning*.

1637— René Descartes, the French philosopher and mathematician who proposed mind–body interaction and the doctrine of innate ideas, publishes *A Discourse on Method*.

1690— John Locke, the British philosopher who rejected Descartes' notion of innate ideas and insisted that the mind at birth is a "blank slate" *(tabula rasa)*, publishes *An Essay Concerning Human Understanding*, which stresses empiricism over speculation.

1774— Franz Mesmer, an Austrian physician, performs his first supposed cure using "animal magnetism" (later called mesmerism and hypnosis). In **1777,** he was expelled from the practice of medicine in Vienna.

1793— Philippe Pinel releases the first psychiatric patients from their chains at the Bicêtre Asylum in France and advocates for more humane treatment of psychiatric patients.

1802— Thomas Young publishes *A Theory of Color Vision* in England. (His theory was later called the trichromatic theory.)

1808— Franz Joseph Gall, a German physician, describes phrenology, the false belief that the shape of a person's skull reveals mental faculties and character traits.

1813— The first private psychiatric hospital in the United States opens in Philadelphia.

1834— Ernst Heinrich Weber publishes *The Sense of Touch*, in which he discusses the "just noticeable difference (jnd)" and what we now call Weber's law.

1840— 

Dorothea Dix begins advocating for humane treatment of people in mental health institutions, persuading politicians to construct psychiatric hospitals.

Dorothea Dix (1802–1887)

All Portraits: Macmillan Learning

1844— In Philadelphia, 13 superintendents form the *Association of Medical Superintendents of American Institutions for the Insane* (now known as the American Psychiatric Association).

1848— Phineas Gage suffers massive brain damage when a large iron rod accidentally pierces his brain, leaving his intellect and memory intact but altering his personality.





Warren Anatomical Museum in the Francis A. Countway Library of Medicine. Gift of Jack and Beverly Wilgus.

Phineas Gage

1850— Hermann von Helmholtz measures the speed of the nerve impulse.

1859— Charles Darwin publishes *On the Origin of Species by Means of Natural Selection*, synthesizing much previous work on the theory of evolution, including that of Herbert Spencer, who coined the phrase "survival of the fittest."

1861— Paul Broca, a French physician, discovers an area in the left frontal lobe of the brain (now called Broca's area) that is critical for the production of spoken language.

1869— Francis Galton, Charles Darwin's cousin, publishes *Hereditary Genius*, in which he claims that intelligence is inherited. In **1876,** he coins the expression "nature and nurture" to correspond with "heredity and environment." Later, Galton proposes harmful ideas about how to improve the genetic quality of human populations (called *eugenics*) that would inform prejudiced and discriminatory policies.

1874— Carl Wernicke, a German neurologist and psychiatrist, shows that damage to a specific area in the left temporal lobe (now called Wernicke's area) disrupts ability to comprehend or produce spoken or written language.

1878— G. Stanley Hall receives from Harvard University's Department of Philosophy the first U.S. Ph.D. degree based on psychological research.

The timeline presents the following events:

B.C.E.

387: Plato, who believed in innate ideas, suggests that the brain is the seat of mental processes.

335: Aristotle, who denied the existence of innate ideas, suggests that the heart is the seat of mental processes.

C.E.

16 04: Johannes Kepler describes inverted image on the retina. A schematic shows the anatomy of eye with a photo of the same. The schematic has the following parts labeled: Lens, Pupil, Iris, Cornea, Retina, Fovea (point of central focus), optic nerve to brain's visual cortex, and the blind spot.

16 05: Francis Bacon publishes *The Proficiency and Advancement of Learning*.

16 37: René Descartes, the French philosopher and mathematician who proposed mind–body interaction and the doctrine of innate ideas, publishes *A Discourse on Method*.

16 90: John Locke, the British philosopher who rejected Descartes' notion of innate ideas and insisted that the mind at birth is a "blank slate" (tabula rasa), publishes *An Essay Concerning Human Understanding*, which stresses empiricism over speculation.

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18 02: Thomas Young publishes *A Theory of Color Vision* in England. (His theory was later called the trichromatic theory.)

18 08: Franz Joseph Gall, a German physician, describes phrenology, the false belief that the shape of a person's skull reveals mental faculties and character traits.

18 13: The first private psychiatric hospital in the United States opens in Philadelphia.

18 34: Ernst Heinrich Weber publishes *The Sense of Touch*, in which he discusses the "just noticeable difference (jnd)" and what we now call Weber's law.

18 40: Dorothea Dix begins advocating for humane treatment of people in mental institutions, persuading politicians to construct psychiatric hospitals. A portrait shows Doreatha Dix (18 02 to 18 87).

18 44: In Philadelphia, 13 superintendents form *The Association of Medical Superintendents of American Institutions for the Insane* (now known as the American Psychiatric Association).

18 48: Phineas Gage suffers massive brain damage when a large iron rod accidentally pierces his brain, leaving his intellect and memory intact but altering his personality. An illustration shows an iron rod piercing through a human skull from down along with a black-and-white photo of Phineas Gage.

18 50: Hermann von Helmholtz measures the speed of the nerve impulse.

18 59: Charles Darwin publishes *On the Origin of Species by Means of Natural Selection*, synthesizing much previous work on the theory of evolution, including that of Herbert Spencer, who coined the phrase "survival of the fittest."

18 61: Paul Broca, a French physician, discovers an area in the left frontal lobe of the brain (now called Broca's area) that is critical for the production of spoken language.

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18 78: G. Stanley Hall receives from Harvard University's Department of Philosophy the first U S P h D degree based on psychological research.

Return to History of psychology

Extended description for History of

psychology

1879 
Wilhelm Wundt establishes at the University of Leipzig, Germany, the first psychology laboratory, which becomes a mecca for psychology students from all over the world.

Wilhelm Wundt (1832–1920)

1883 G. Stanley Hall, student of Wilhelm Wundt, establishes the first formal U.S. psychology laboratory at Johns Hopkins University.

1885 Hermann Ebbinghaus publishes *On Memory,* summarizing his extensive research on learning and memory, including the "forgetting curve."

1886 Joseph Jastrow receives from Johns Hopkins University the first Ph.D. degree awarded by a U.S. Department of Psychology.

1889 
Henri-Étienne Beaunis and Alfred Binet establish France's first psychology laboratory at the Sorbonne.

Alfred Binet (1857–1911)

The first International Congress of Psychology meets in Paris.

1890 
William James, Harvard University philosopher and psychologist, publishes *The Principles of Psychology,* describing psychology as "the science of mental life."

William James (1842–1910)

1891 James Mark Baldwin establishes the first psychology laboratory in the British Commonwealth at the University of Toronto.

1892 G. Stanley Hall spearheads the founding of the American Psychological Association (APA) and becomes its first president.

1893 

Mary Whiton Calkins and Christine Ladd-Franklin are the first women elected to membership in the APA.

Mary Whiton Calkins (1863–1930)

Christine Ladd-Franklin (1847–1930)

1894 Margaret Floy Washburn is the first woman to receive a Ph.D. degree in psychology (Cornell University).

Harvard University denies Mary Whiton Calkins admission to doctoral candidacy because of her gender. She goes on to publish more than 100 scientific articles related to memory and the self.

1896 John Dewey publishes "The Reflex Arc Concept in Psychology," helping to formalize the school of psychology called functionalism.

1898 In *Animal Intelligence,* Edward L. Thorndike describes his learning experiments with cats in "puzzle boxes." In **1905,** he proposes the "law of effect."

Doctoral student Alice Lee uses published data from the *Journal of Anatomy* to debunk the popular phrenology and eugenics arguments that skull size predicts intelligence.

1900 Sigmund Freud publishes *The Interpretation of Dreams,* his major theoretical work on psychoanalysis.

1901 Ten founders establish the British Psychological Society.

1904 Ivan Pavlov is awarded the Nobel Prize for Physiology or Medicine for his studies on the physiology of digestion.

1905 Mary Whiton Calkins becomes the first woman president of the APA.


Ivan Pavlov begins publishing studies of conditioning in animals.

Ivan Pavlov (1849–1936)

Alfred Binet and Théodore Simon produce the first intelligence test for assessing the abilities and academic progress of Parisian schoolchildren.

1909 
Sigmund Freud makes his only trip to America to deliver a series of lectures at Clark University.

Sigmund Freud (1856–1939)

1913 
John B. Watson outlines the tenets of behaviorism in a *Psychological Review* article, "Psychology as the Behaviorist Views It."

John Watson (1878–1958)

1914 Lilian Gilbreth publishes *Principles of Management,* a foundational text for the field of industrial-organizational psychology.

During World War I, Robert Yerkes and his staff develop a group intelligence test for evaluating U.S. military personnel, which increases the U.S. public's acceptance of psychological testing.

All Portraits: Macmillan Learning

The timeline presents the following events:

18 79: Wilhelm Wundt establishes at the University of Leipzig, Germany, the first psychology laboratory, which becomes a mecca for psychology students from all over the world. A portrait shows Wilhelm Wundt (18 32 to 19 20).

18 83: G. Stanley Hall, student of Wilhelm Wundt, establishes the first formal U S psychology laboratory at Johns Hopkins University.

18 85: Hermann Ebbinghaus publishes *On Memory*, summarizing his extensive research on learning and memory, including the "forgetting curve."

18 86: Joseph Jastrow receives from Johns Hopkins University the first P h D degree in psychology awarded by a U S Department of Psychology.

18 89: Henri-Étienne Beaunis and Alfred Binet establish the first psychology laboratory in France at the Sorbonne; and the first International Congress of Psychology meets in Paris. A portrait shows Alfred Binet (18 57 to 19 11).

18 90: William James, Harvard University philosopher and psychologist, publishes *The Principles of Psychology*, describing psychology as "the science of mental life." A portrait shows William James (18 42 to 19 10).

18 91: James Mark Baldwin establishes the first psychology laboratory in the British Commonwealth at the University of Toronto.

18 92: G. Stanley Hall spearheads the founding of the American Psychological Association (A P A) and becomes its first president.

18 93: Mary Whiton Calkins and Christine Ladd-Franklin are the first women elected to membership in the A P A. Two portraits show Mary Whiton Calkins (18 63 to 19 30) and Christine Ladd-Franklin (18 47 to 19 30).

18 94: Margaret Floy Washburn is the first woman to receive a P h D degree in psychology (Cornell University). Harvard University denies Mary Whiton Calkins admission to doctoral candidacy because of her gender. She goes on to publish more than 100 scientific articles related to memory and the self.

18 96: John Dewey publishes “The Reflex Arc Concept in Psychology,” helping to formalize the school of psychology called functionalism.

18 98: In *Animal Intelligence,* Edward L. Thorndike, Columbia University, describes his learning experiments with cats in “puzzle boxes.” In 1905, he proposes the “law of effect.” Doctoral student Alice Lee uses published data from the *Journal of Anatomy* to debunk

the popular eugenics argument that skull size is related to intelligence.

1900: Sigmund Freud publishes *The Interpretation of Dreams*, his major theoretical work on psychoanalysis.

19 01: Ten founders establish the British Psychological Society.

19 04: Ivan Pavlov is awarded the Nobel Prize for Physiology or Medicine for his studies on the physiology of digestion.

19 05: Mary Whiton Calkins becomes the first woman president of the A P A. Ivan Pavlov begins publishing studies of conditioning in animals. A portrait shows Ivan Pavlov (18 49 to 19 36). Alfred Binet and Théodore Simon produce the first intelligence test for assessing the abilities and academic progress of Parisian schoolchildren.

19 09: Sigmund Freud makes his only trip to America to deliver a series of lectures at Clark University. A portrait shows Sigmund Freud (18 56 to 19 39).

19 13: John B. Watson outlines the tenets of behaviourism in a *Psychological Review* article, “Psychology as the Behaviorist Views It.” A portrait shows John Watson (18 78 to 19 58).

19 14: Lilian Gilbreth publishes *Principles of Management*, a foundational text for the field of industrial-organizational

psychology. During World War 1, Robert Yerkes and his staff develop a group intelligence test for evaluating U S military personnel, which increases the U S public's acceptance of psychological testing.

Return to History of psychology

Extended description for History of psychology

1920 — 

Leta Stetter Hollingworth publishes *The Psychology of Subnormal Children,* an early classic. In **1921,** she is cited in *American Men of Science* for her research on the psychology of women.

Leta Stetter Hollingworth
(1886–1939)



Francis Cecil Sumner becomes the first Black person in the U.S. to receive a Ph.D. degree in psychology (Clark University). He later co-founds the psychology department at Howard University.

Francis Cecil Sumner
(1895–1954)

John B. Watson and Rosalie Rayner report conditioning a fear reaction in a child called "Little Albert."

1921 — Hermann Rorschach, a Swiss psychiatrist, introduces the Rorschach inkblot test.

1923 — Developmental psychologist Jean Piaget publishes *The Language and Thought of the Child.*

1924 — Mary Cover Jones reports reconditioning a fear reaction in a child (Peter), a forerunner of systematic desensitization developed by Joseph Wolpe.

1927 — In *Introduction to the Technique of Child Analysis,* Anna Freud discusses psychoanalysis in the treatment of children.

1929 — Wolfgang Köhler publishes *Gestalt Psychology,* which criticizes behaviorism and outlines essential elements of the gestalt theory.

1931 — 

Margaret Floy Washburn becomes the first female psychologist (and the second female scientist in any discipline) elected to the U.S. National Academy of Sciences.

Margaret Floy Washburn
(1871–1939)

1932 — In *The Wisdom of the Body,* Walter B. Cannon coins the term "homeostasis," discusses the fight-or-flight response, and identifies hormonal changes associated with stress.

1933 — 

Inez Beverly Prosser becomes the first Black woman to receive a Ph.D. degree in psychology from a U.S. institution (University of Cincinnati).

Inez Beverly Prosser
(1895–1934)

1934 — 

Ruth Winifred Howard becomes the second Black woman in the U.S. to receive a Ph.D. degree in psychology (University of Minnesota) and spends her career doing clinical work with children and young people.

Ruth Winifred Howard
(1900–1997)

1935 — Christiana Morgan and Henry Murray introduce the Thematic Apperception Test to elicit fantasies from people undergoing psychoanalysis.

1936 — Egas Moniz, a Portuguese physician, publishes work on the first frontal lobotomies performed on humans.

1938 — B. F. Skinner publishes *The Behavior of Organisms,* which describes operant conditioning of animals.

In *Primary Mental Abilities,* Louis L. Thurstone proposes seven such abilities.

Ugo Cerletti and Lucio Bini introduce electroshock treatment with a human patient.

1939 — David Wechsler publishes the Wechsler–Bellevue intelligence test, forerunner of the Wechsler Intelligence Scale for Children (WISC) and the Wechsler Adult Intelligence Scale (WAIS).



Mamie Phipps Clark receives a master's degree from Howard University. She later earns her doctorate and, with Kenneth B. Clark, provides joint research cited in the U.S. Supreme Court's 1954 decision to end racial segregation in public schools.

Mamie Phipps Clark
(1917–1983)

Edward Alexander Bott helps found the Canadian Psychological Association. He becomes its first president in 1940.

World War II provides many opportunities for psychologists to enhance the popularity and influence of psychology, especially in applied areas.

1941 — Raymond Cattell and John Horn distinguish fluid and crystallized intelligence. Decades later, John Carroll synthesizes these ideas as a bridge between a general intelligence factor (*g*) and specific abilities, to create the Cattell-Horn-Carroll (CHC) theory of intelligence.

1943 — Psychologist Starke Hathaway and physician J. Charnley McKinley publish the Minnesota Multiphasic Personality Inventory (MMPI).

1945 — 

Karen Horney, who criticized Freud's theory of female sexual development, publishes *Our Inner Conflicts.*

Karen Horney
(1885–1952)

All Portraits: Macmillan Learning

The timeline presents the following events:

19 20: Leta Stetter Hollingworth publishes *The Psychology of Subnormal Children*, an early classic. In 19 21 she is cited in *American Men of Science* for her research on the psychology of women. A portrait shows Leta Stetter Hollingworth (18 86 to 19 39). Francis Cecil Sumner becomes the first Black person to receive a P h D degree in psychology (Clark University). He later co-founds the psychology department at Howard University. A portrait shows Francis Cecil Sumner (18 95 to 19 54). John B Watson and Rosalie Rayner report conditioning a fear reaction in a child called "Little Albert."

19 21: Hermann Rorschach, a Swiss psychiatrist, introduces the Rorschach Inkblot Test.

19 23: Developmental psychologist Jean Piaget publishes *The Language and Thought of the Child*.

19 24: Mary Cover Jones reports reconditioning a fear reaction in a child (Peter), a forerunner of systematic desensitization developed by Joseph Wolpe.

19 27: In *Introduction to the Technique of Child Analysis*, Anna Freud discusses psychoanalysis in the treatment of children.

19 29: Wolfgang Köhler publishes *Gestalt Psychology*, which criticizes behaviorism and outlines essential elements of the gestalt theory.

19 31: Margaret Floy Washburn becomes the first female psychologist (and the second female scientist in any discipline) elected to the U S National Academy of Sciences. A portrait shows Margaret Floy Washburn (18 71 to 19 39).

19 32: In *The Wisdom of the Body*, Walter B Cannon coins the term homeostasis, discusses the fight-or-flight response, and identifies hormonal changes associated with stress.

19 33: Inez Beverly Prosser becomes the first Black woman to receive a P h D degree in psychology from a U. S. institution (University of Cincinnati). A portrait shows Inez Beverly Prosser (18 95 to 19 34).

19 34: Ruth Winifred Howard becomes the second Black woman to receive a P h D degree in psychology (University of Minnesota) and spends her career doing clinical work with children and young people. A portrait shows Ruth Winifred Howard (1900 to 19 97).

19 35: Christiana Morgan and Henry Murray introduce the Thematic Apperception Test to elicit fantasies from people undergoing psychoanalysis.

19 36: Egas Moniz, a Portuguese physician, publishes work on the first frontal lobotomies performed on humans.

19 38: B F Skinner publishes *The Behavior of Organisms*, which describes operant conditioning of animals. In *Primary Mental Abilities*, Louis L Thurstone proposes seven such abilities. Ugo Cerletti and Lucio Bini use electroshock treatment with a human patient.

19 39: David Wechsler publishes the Wechsler–Bellevue intelligence test, forerunner of the Wechsler Intelligence Scale for Children (W I S C) and the Wechsler Adult Intelligence Scale (W A I S). Mamie Phipps Clark receives a master's degree from Howard University. She later earns her doctorate and with Kenneth B. Clark, provides joint research cited in the U S Supreme Court's 19 54 decision to end racial segregation in public schools. A portrait shows Mamie Phipps Clark (19 17 to 19 83). Edward Alexander Bott helps found the Canadian Psychological Association. He becomes its first president in 19 40. World War 2 provides many opportunities for psychologists to enhance the popularity and influence of psychology, especially in applied areas.

19 41: Raymond Cattell and John Horn distinguish fluid and crystallized intelligence. Decades later, John Carroll synthesizes these ideas as a bridge between a general intelligence factor (*g*) and

specific abilities, to create the Cattell-Horn-Carroll (C H C) theory of intelligence.

19 43: Psychologist Starke Hathaway and physician J. Charnley McKinley publish the *Minnesota Multiphasic Personality Inventory* (M M P I).

19 45: Karen Horney, who criticized Freud's theory of female sexual development, publishes *Our Inner Conflicts*. A portrait shows Karen Horney (18 85 to 19 52).

Return to History of psychology

Extended description for History of

psychology

1946 U.S. Congress creates the National Institute of Mental Health, making mental health a national priority.

Benjamin Spock's first edition of *The Commonsense Book of Baby and Child Care* appears; the book will influence child raising in North America for several decades.

1948 Alfred Kinsey and his colleagues publish *Sexual Behavior in the Human Male,* and they publish *Sexual Behavior in the Human Female* in **1953.**



B. F. Skinner's novel, *Walden Two,* describes a utopian community based on positive reinforcement, which becomes a clarion call for applying psychological principles in everyday living, especially communal living.

B. F. Skinner
(1904–1990)

Ernest R. Hilgard publishes *Theories of Learning,* which was required reading for several generations of psychology students in North America.

1949 Raymond B. Cattell publishes the Sixteen Personality Factor Questionnaire (16PF).

The scientist-practitioner model of training is approved at the Boulder Conference on Graduate Education in Clinical Psychology.

In *The Organization of Behavior: A Neuropsychological Theory,* Canadian psychologist Donald O. Hebb outlines a new and influential conceptualization of how the nervous system functions.

1950 Solomon Asch publishes studies of effects of conformity on judgments of line length.

In *Childhood and Society,* Erik Erikson outlines his stages of psychosocial development.

1951 Carl Rogers publishes *Client-Centered Therapy.*

1952 The American Psychiatric Association publishes the *Diagnostic and Statistical Manual of Mental Disorders,* an influential book that will be updated periodically.

1953 Eugene Aserinski and Nathaniel Kleitman describe rapid eye movements (REM) that occur during sleep.

Janet Taylor's Manifest Anxiety Scale appears in the *Journal of Abnormal Psychology.*

1954 In *Motivation and Personality,* Abraham Maslow proposes a hierarchy of motives ranging from physiological needs to self-actualization. (Maslow later updates the hierarchy to include self-transcendence needs.)

James Olds and Peter Milner, McGill University neuropsychologists, describe the rewarding effects of electrical stimulation of the hypothalamus in rats.

Gordon Allport publishes *The Nature of Prejudice.*

1956 In his *Psychological Review* article titled "The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information," George Miller coins the term "chunk" for memory researchers.

1957 Robert Sears, Eleanor Maccoby, and Harry Levin publish *Patterns of Child Rearing.*

Charles Ferster and B. F. Skinner publish *Schedules of Reinforcement.*

1958 Harry Harlow publishes "The Nature of Love," outlining his work on attachment in monkeys.

1959 Noam Chomsky's critical review of B. F. Skinner's *Verbal Behavior* appears in the journal *Language.*



Keturah Whitehurst becomes the first Black person in the U.S. to be licensed as a psychologist. She later co-founds a human development and learning laboratory that provides educational opportunities to children in need.

Keturah Whitehurst
(1912–2000)

Eleanor Gibson and Richard Walk report their research on infants' depth perception in "The Visual Cliff."

Lloyd Peterson and Margaret Peterson, in the *Journal of Experimental Psychology* article, "Short-Term Retention of Individual Verbal Items," highlight the importance of rehearsal in memory.

John Thibaut and Harold Kelley publish *The Social Psychology of Groups.*

1960 George Sperling publishes "The Information Available in Brief Visual Presentations."

1961 Georg von Békésy receives a Nobel Prize for research on the physiology of hearing.

David McClelland publishes *The Achieving Society.*

1962 Jerome Kagan and Howard Moss publish *Birth to Maturity.*



Martha E. Bernal becomes the first Latina to earn a U.S. doctoral degree (Ph.D. in clinical psychology, Indiana University).

Martha E. Bernal
(1931–2001)

Stanley Schachter and Jerome Singer publish findings that support the two-factor theory of emotion.

Albert Ellis' *Reason and Emotion in Psychotherapy* is published; it is a milestone in the development of rational-emotive therapy (RET).

1963 Stanley Milgram's "Behavioral Study of Obedience" appears in the *Journal of Abnormal and Social Psychology.*

1964



Marigold Linton becomes the first Native American to receive a doctoral degree in psychology (University of California, Los Angeles). She is a founding member of both the Society for Advancement of Chicanos and Native Americans in Science, and the National Indian Education Association.

Marigold Linton
(born 1936)

1965 Canadian researcher Ronald Melzack and British researcher Patrick Wall propose the gate-control theory of pain.

The Archives of the History of American Psychology is founded at the University of Akron.

All Portraits: Macmillan Learning

The timeline presents the following events:

19 46: U S Congress creates the National Institute of Mental Health, making mental health a national priority. Benjamin Spock's first edition of *The Commonsense Book of Baby and Child Care* appears; the book will influence child raising in North America for several decades.

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19 57: Robert Sears, Eleanor Maccoby, and Harry Levin publish *Patterns of Child Rearing*. Charles Ferster and B F Skinner publish *Schedules of Reinforcement*.

19 58: Harry Harlow outlines "The Nature of Love," his work on attachment in monkeys.

19 59: Noam Chomsky's critical review of B F Skinner's *Verbal Behavior* appears in the journal *Language*. Keturah Whitehurst becomes the first Black person in the U S to be licensed as a psychologist. She later co-founds a human development and learning laboratory that provides educational opportunities to children in need. A portrait shows Keturah Whitehurst (19 12 to 2000). Eleanor Gibson and Richard Walk report their research on infants' depth perception in "The Visual Cliff." Lloyd Peterson and Margaret Peterson, in the *Journal of Experimental Psychology* article, "Short-Term Retention of Individual Verbal Items," highlight the importance of rehearsal in memory. John Thibaut and Harold Kelley publish *The Social Psychology of Groups*.

19 60: George Sperling publishes "The Information Available in Brief Visual Presentations."

19 61: Georg von Békésy receives a Nobel Prize for research on the physiology of hearing. David McClelland publishes *The Achieving Society*.

19 62: Jerome Kagan and Howard Moss publish *Birth to Maturity*. Martha E. Bernal becomes the first Latina to earn a U S doctoral degree (P h D, Indiana University). A portrait shows Martha E Bernal (19 31 to 2001). Stanley Schachter and Jerome Singer publish findings that support the two-factor theory of emotion. Albert Ellis' *Reason and Emotion in Psychotherapy* is published; it is a milestone in the development of rational-emotive therapy (R E T).

19 63: Stanley Milgram's "Behavioral Study of Obedience" appears in the *Journal of Abnormal and Social Psychology*.

19 64: Marigold Linton becomes the first Native American to receive a doctoral degree in psychology. She is a founding member of both the Society for Advancement of Chicanos and Native Americans in Science, and the National Indian Education Association. A portrait shows Marigold Linton (born 19 36).

19 65: Canadian researcher Ronald Melzack and British researcher Patrick Wall propose the gate-control theory of pain. The Archives of the History of American Psychology is founded at the University of Akron.

Return to History of psychology

Extended description for History of

psychology

1966 Nancy Bayley becomes the first woman to receive the APA's Distinguished Scientific Contribution Award.

Jerome Bruner and colleagues at Harvard University's Center for Cognitive Studies publish *Studies in Cognitive Growth*.

William Masters and Virginia Johnson publish results of their research in *Human Sexual Responses*.

Allen Gardner and Beatrix Gardner begin training a chimpanzee named Washoe in American Sign Language at the University of Nevada, Reno. (Washoe dies in 2007.)



John Garcia
(1917–1983)

John Garcia and Robert Koelling publish a study on taste aversion in rats.

David M. Green and John A. Swets publish *Signal Detection Theory and Psychophysics*.

Julian Rotter publishes research on locus of control.

1967 Publication of Ulric Neisser's *Cognitive Psychology,* which helps to steer psychology away from behaviorism and toward cognitive processes.

Martin Seligman and Steven Maier publish the results of their research on "learned helplessness" in dogs.

1968 Richard Atkinson and Richard Shiffrin's influential three-stage memory model appears in *The Psychology of Learning and Motivation*.

Neal E. Miller's article in *Science,* describing instrumental conditioning of autonomic responses, stimulates research on biofeedback.

1969 Albert Bandura publishes *Principles of Behavior Modification*.

The Association for Women in Psychology is founded. E. Kitch Childs is instrumental in this effort, pioneering therapy techniques grounded in "intersectionality" (considering how race, class, and other aspects of identity may combine to create discrimination or disadvantage).

George Miller, in his APA presidential address, "Psychology as a Means of Promoting Human Welfare," emphasizes the importance of "giving psychology away."

1970 Psychologist Reiko Homma True lobbies successfully to open the Asian American Community Mental Health program—the first to focus on a minority population.



Reiko Homma True
(born 1933)

1971 

Kenneth B. Clark
(1914–2005)

Kenneth B. Clark becomes the first Black president of the APA. He spends his career studying racial bias in schools. His research helps desegregate U.S. schools and leads the federal government to prioritize spending to improve Black children's educational experiences.

Albert Bandura publishes *Social Learning Theory*.

B. F. Skinner publishes *Beyond Freedom and Dignity*.

1972 Elliot Aronson publishes *The Social Animal*.

Fergus Craik and Robert Lockhart's "Levels of Processing: A Framework for Memory Research" appears in the *Journal of Verbal Learning and Verbal Behavior*.

Robert Rescorla and Allan Wagner publish their associative model of Pavlovian conditioning.



Derald Wing Sue
(born 1942)



Stanley Sue
(born 1944)

Under the leadership of Derald Wing Sue and Stanley Sue, the Asian American Psychological Association is founded.

1973 APA votes to remove "homosexuality" as a psychological disorder from the *Diagnostic and Statistical Manual of Mental Disorders*.

Ethologists Karl von Frisch, Konrad Lorenz, and Nikolaas Tinbergen receive the Nobel Prize for their research on animal behavior.

1974 APA's Division 2 first publishes its journal, *Teaching of Psychology,* with Robert S. Daniel as editor.

Eleanor Maccoby and Carol Jacklin publish *The Psychology of Sex Differences*.

1975 Biologist Edward O. Wilson's *Sociobiology* is published; it will be a controversial precursor to evolutionary psychology.

1976 Sandra Wood Scarr and Richard A. Weinberg publish "IQ Test Performance of Black Children Adopted by White Families" in *American Psychologist*.



Robert V. Guthrie
(1930–2005)

Psychologist Robert V. Guthrie publishes *Even the Rat Was White,* the first history of Black psychologists in the U.S.

Saundra Murray Nettles chairs the Task Force on Black Women's Priorities, which leads to the creation of APA's Division 35, Section 1: The Psychology of Black Women.

Psychologist Carolyn Payton becomes Director of the U.S. Peace Corps, the first woman and the first Black person to serve in that role.

1978 Psychologist Herbert A. Simon, Carnegie-Mellon University, wins a Nobel Prize for pioneering research on computer simulations of human thinking and problem solving.

All Portraits: Macmillan Learning

The timeline presents the following events:

19 66: Nancy Bayley becomes the first woman to receive the A P A's Distinguished Scientific Contribution Award. Jerome Bruner and colleagues at Harvard University's Center for Cognitive Studies publish *Studies in Cognitive Growth*. William Masters and Virginia Johnson publish results of their research in *Human Sexual Responses*. Allen Gardner and Beatrix Gardner begin training a chimpanzee named Washoe in American Sign Language at the University of Nevada, Reno. (Washoe dies in 2007.) John Garcia and Robert Koelling publish a study on taste aversion in rats. A portrait shows John Garcia (19 17 to 19 83). David M Green and John A Swets publish *Signal Detection Theory and Psychophysics*. Julian Rotter publishes research on locus of control.

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19 70: Psychologist Reiko Homma True lobbies successfully to open the Asian American Community Mental Health program —the first to focus on a minority population. A portrait shows Reiko Homma True (born 19 33).

19 71: Kenneth B. Clark becomes the first Black president of the American Psychological Association. He spends his career studying racial bias in schools. His research helps desegregate U S schools and leads the federal government to prioritize spending to improve Black children's educational experiences. A portrait shows Kenneth B Clark (19 14 to 2005). Albert Bandura publishes *Social Learning Theory*. B F Skinner publishes *Beyond Freedom and Dignity*.

19 72: Elliot Aronson publishes *The Social Animal*. Fergus Craik and Robert Lockhart's "Levels of Processing: A Framework for Memory Research" appears in the *Journal of Verbal Learning and Verbal Behavior*. Robert Rescorla and Allan Wagner publish their

associative model of Pavlovian conditioning. Under the leadership of Derald Wing Sue and Stanley Sue, the Asian American Psychological Association is founded. Two portraits show Derald Wing Sue (born 19 42) and Stanley Sue (born 19 44).

19 73: A P A votes to remove homosexuality as a psychological disorder from the *Diagnostic and Statistical Manual of Mental Disorders*. Ethologists Karl von Frisch, Konrad Lorenz, and Nikolaas Tinbergen receive the Nobel Prize for their research on animal behavior.

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Return to History of psychology

Extended description for History of psychology

1979— James J. Gibson publishes *The Ecological Approach to Visual Perception.*

— Elizabeth Loftus publishes *Eyewitness Testimony,* showing that eyewitness memory is often inaccurate.

1981— David Hubel and Torsten Wiesel receive a Nobel Prize for research on single-cell recordings that identified feature detector cells in the visual cortex.

— Roger Sperry receives a Nobel Prize for research on split-brain patients.

— U.S. sociologist Harriette Pipe McAdoo publishes *Black Families,* an anthology of work done with John Lewis McAdoo on middle class Black families. Previous studies had focused on dysfunctional families, such as those in contact with prison and drug treatment programs.

— Paleontologist Stephen Jay Gould publishes *The Mismeasure of Man,* highlighting the debate concerning biological determination of intelligence.

1983— In his *Frames of Mind,* Howard Gardner outlines his theory of multiple intelligences.

1984— 44 Society for the Psychology of Sexual Orientation and Gender Diversity The APA creates Division 44 (Society for the Psychology of Sexual Orientation and Gender Diversity).

1987— Elizabeth Scarborough and Laurel Furumoto publish *Untold Lives: The First Generation of American Women Psychologists.*

— Fluoxetine (Prozac) is introduced as a treatment for depression.

— Wilbert J. McKeachie, University of Michigan, receives the first APA Award for Distinguished Career Contributions to Education and Training in Psychology.

1988— The American Psychological Society is founded. The organization changes its name to the Association for Psychological Science in **2006.**

1990— Psychiatrist Aaron Beck receives the Distinguished Scientific Award for the Applications of Psychology for advancing understanding and treatment of psychopathology, including pivotal contributions to the development of cognitive therapy.

— B. F. Skinner receives APA's first Citation for Outstanding Lifetime Contributions to Psychology and presents his last public address, "Can Psychology Be a Science of Mind?" (He died a few days later at age 86.)

1991— Martin Seligman publishes *Learned Optimism,* which foreshadows the "positive psychology" movement.

1992— Teachers of Psychology in Secondary Schools (TOPSS) is established as part of the APA.

— About 3000 U.S. secondary school students take the first Advanced Placement (AP) Examination in Psychology.

1993— Psychologist Judith Rodin is elected president of the University of Pennsylvania, becoming the first female president of an Ivy League school.

1996— Dorothy Cantor becomes the first president of the APA with a Psy.D. degree.

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2002— New Mexico becomes the first U.S. state to allow qualified clinical psychologists to prescribe certain drugs. Many U.S. states now allow nurse practitioners and other providers to prescribe psychiatric medication.

— Psychologist Daniel Kahneman, Princeton University, receives a Nobel Prize for research on decision making later summarized in his **2011** book, *Thinking Fast and Slow.*

2009— Psychologist Judy Chu becomes the first Chinese American woman elected to the U.S. Congress.

2011— Proposed by participants at the 2008 national conference at the University of Puget Sound, the document "Principles for Quality Undergraduate Education in Psychology," is approved as official APA policy.

— Melba J. T. Vasquez becomes the first Latina president of the APA.



Melba J. T. Vasquez
(born 1951)

2013— U.S. President Barack Obama announces $100 million in funding for an interdisciplinary project to advance understanding of the human brain.

2015— The *Independent Review Relating to APA Ethics Guidelines, National Security Interrogations, and Torture* is presented to the APA.

2018— Kristina Olson becomes the first psychologist to receive the National Science Foundation's Waterman Award. She also receives a 2018 MacArthur Fellowship for her work studying the social and cognitive development of transgender and gender-nonconforming youth.

2020— MacArthur Fellowship awardee and implicit bias researcher Jennifer L. Eberhardt receives multiple awards for authoring *Biased: Uncovering the Hidden Prejudice That Shapes What We See, Think, and Do.*

— Cognitive neuroscientist Damien Fair wins a MacArthur award for his work studying neurodiverse children.

2021— The APA issues an official "Apology to People of Color for APA's Role in Promoting, Perpetuating, and Failing to Challenge Racism, Racial Discrimination, and Human Hierarchy in the U.S."

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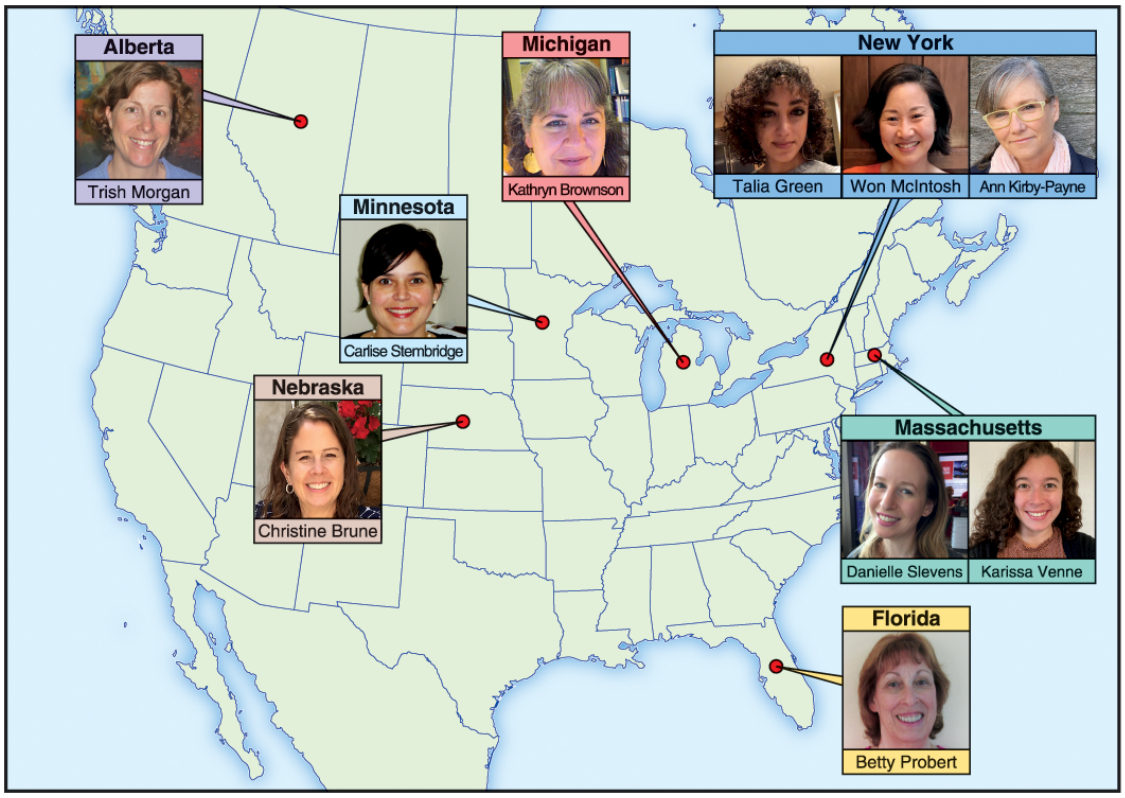
Return to History of psychology

Extended description for Collaboration across the miles

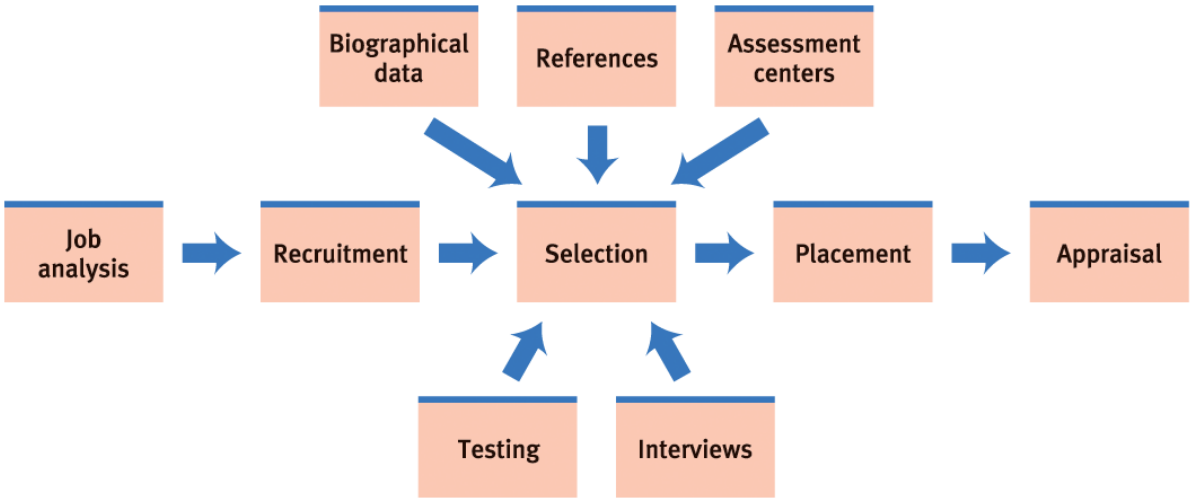


Photos top to bottom: Trish Morgan; Kathryn Brownson; Talia Green; Steven McIntosh; Dan Payne; Stephanie Ellis; Jeff Brune; Danielle Slevens; ©2022 Macmillan, Photo by Karissa Venne; Don Probert
© Worth Publishers

The members are as follows: Trish Morgan from Alberta; Christine Brune from Nebraska; Carlise Stembridge from Minnesota; Kathryn Brownson from Michigan; Talia Green, Won McIntosh, and Ann Kirby-Payne from New York; Danielle Slevens and Karissa Venne from Massachusetts; and Betty Probert from Florida.

Return to Collaboration across the miles

Extended description for FIGURE C.1 Personnel psychologists at work

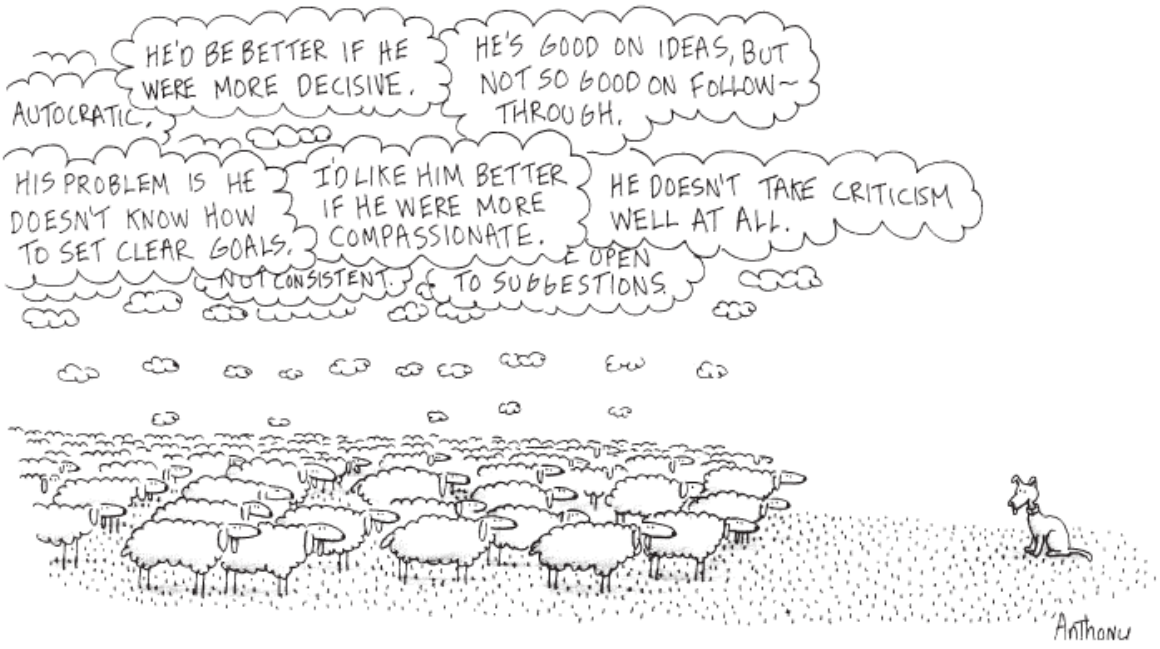


© Worth Publishers

An arrow from the Job Analysis component points to the Recruitment component, which in turn points to the Selection component. Arrows from Biographical data, References, and Assessment centers components point to the Selection component from the top while arrows from the Testing and Interviews components point to the Selection component from the bottom. An arrow from the Selection component points to the Placement component and thereafter ends at the Appraisal component.

Return to FIGURE C.1 Personnel psychologists at work

Extended description for Cartoon depicting effective leadership



Anthony Taber/Cartoon Stock

The different thought bubbles read as follows: Autocratic; He'd be better if he were more decisive; He's good on ideas but not so good on follow-through; His problem is he doesn't know how to set clear goals; I'd like him better if he were more compassionate; He doesn't take criticism well at all; Not consistent; and Open to suggestions.

Return to Cartoon depicting effective leadership

Extended description for FIGURE C.3

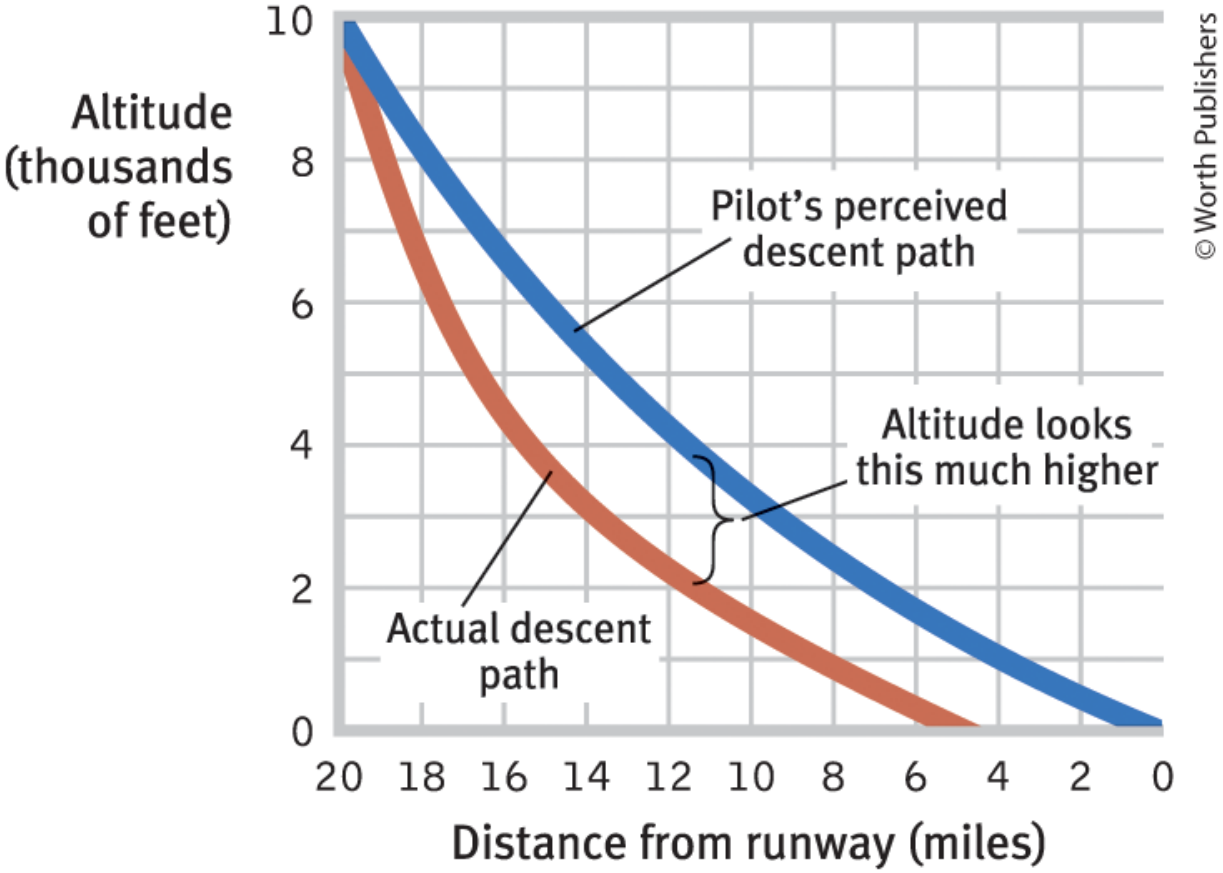
Designing products that fit people

Top: Ride On Carry On; bottom: OXO Good Grips

The photo on the top shows a baby seated on the Carry on foldable chair attachment product, which is a foldable chair attached to a small suitcase to act as a stroller. The photo on the bottom shows a transparent O X O measuring cup with a handle. The quantity measurements are marked on the cup in such a way that the user could see it from above.

Return to FIGURE C.3 Designing products that fit people

Extended description for FIGURE C.4 The human factor in accidents



The horizontal axis represents the Distance from runway in miles with values ranging from 20 to 0, in decrements of 2. The vertical axis represents Altitude in thousands of feet ranging from 0 to 10, in increments of 2. A line labeled Actual descent path starts at an altitude of 10 thousand feet in 20 miles distance from runway, drops to about 3 thousand feet at 14 miles, and then makes a drastic fall

close to 5 miles at 0 altitudes. A line labeled Pilot's perceived descent path starts at 10 thousand feet in 20 miles distance from runway and steeply drops to 0 miles at 0 altitude. An arrow pointing to the gap between the two curves is labeled, Altitude looks this much higher.

Return to FIGURE C.4 The human factor in accidents

Extended description for Back Cover



Logo: Achieve. The Achieve logo is at the top left of the page followed by text reading as follows.

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