



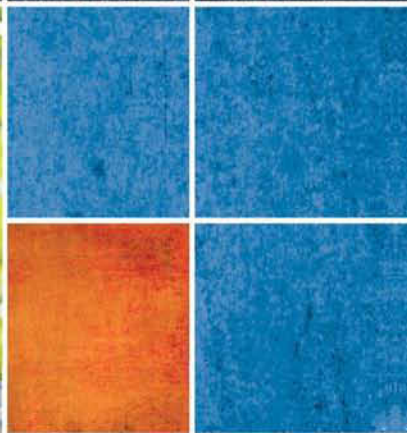
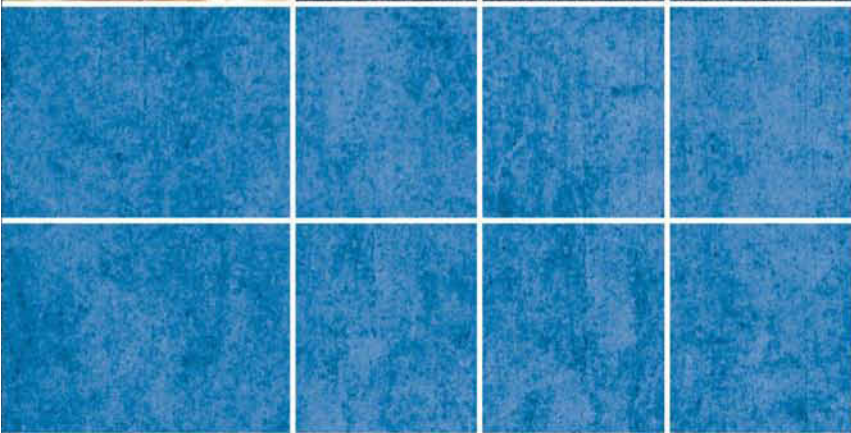
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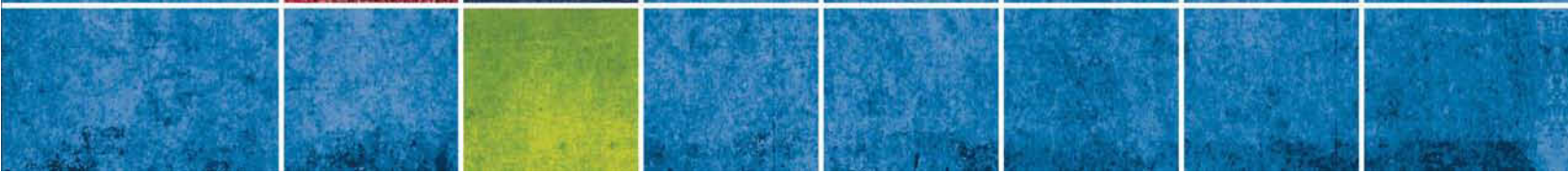
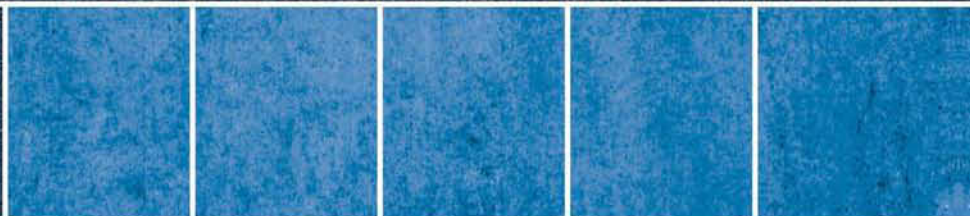
SCIENCE



MICHAEL GAZZANIGA | TODD HEATHERTON | DIANE HALPERN

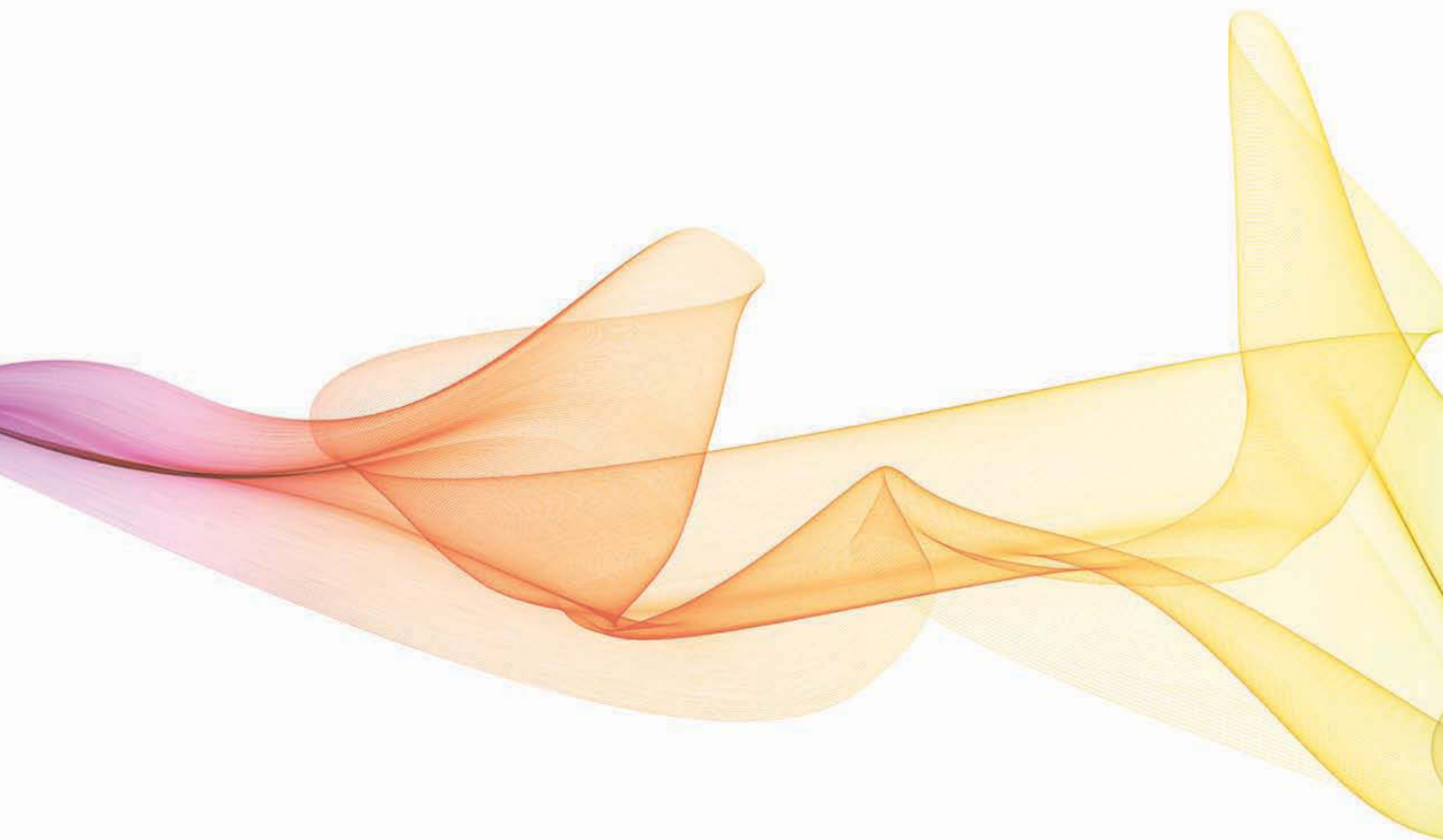


FIFTH
EDITION



5TH EDITION

Psychological Science



5TH EDITION

Psychological Science

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We dedicate this book to

Lilly, Emmy, and Garth Trethewey

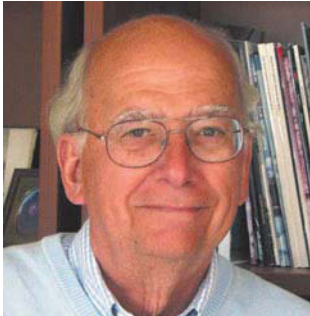
Sarah Heatherton and James Heatherton

Sheldon, Evan, Karen, Amanda, and Jason Halpern
and Jaye and Belle Halpern-Duncan.

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Meet the Authors



MICHAEL S. GAZZANIGA is Distinguished Professor and Director of the Sage Center for the Study of the Mind at the University of California, Santa Barbara. He founded and presides over the Cognitive Neuroscience Institute and is founding editor-in-chief of the *Journal of Cognitive Neuroscience*. He is past president of the American Psychological Society and a member of the American Academy of Arts and Sciences, the Institute of Medicine, and the National Academy of Sciences. He has held positions at the University of California, Santa Barbara; New York University; the State University of New York, Stony Brook; Cornell University Medical College; and the University of California, Davis. In his career, he has introduced thousands of students to psychology and cognitive neuroscience. He has written many notable books, including, most recently, *Who's in Charge?: Free Will and the Science of the Brain*.



TODD F. HEATHERTON is the Lincoln Filene Professor in Human Relations in the Department of Psychological and Brain Sciences at Dartmouth College. His recent research takes a social brain sciences approach, which combines theories and methods of evolutionary psychology, social cognition, and cognitive neuroscience to examine the neural underpinnings of social behavior. He is associate editor of the *Journal of Cognitive Neuroscience* and serves on many editorial boards and grant review panels. He was elected president of the Society of Personality and Social Psychology in 2011 and has served on the executive committees of the Association of Researchers in Personality and the International Society of Self and Identity. He received the Award for Distinguished Service on Behalf of Social-Personality Psychology in 2005, was named to Thompson Reuters' ISI HighlyCited for Social Sciences in 2010, and received the Carol and Ed Diener Award for Outstanding Mid-Career Contributions to Personality Psychology in 2011. He received the Petra Shattuck Award for Teaching Excellence from the Harvard Extension School in 1994, the McLane Fellowship from Dartmouth College in 1997, and the Friedman Family Fellowship from Dartmouth College in 2001. He is a fellow of many scientific societies, including the American Association for the Advancement of Science. He teaches introductory psychology every year.



DIANE F. HALPERN is Dean of Social Sciences at the Minerva Schools at Keck Graduate Institute. She is a past president of the American Psychological Association and the Society for Teaching of Psychology. She has won many awards for her teaching and research, including the 2013 James McKeen Cattell Award from the Association for Psychological Science and the 2013 Arthur W. Staats Award from the American Psychological Foundation. Diane has published hundreds of articles and over 20 books, including *Thought and Knowledge: An Introduction to Critical Thinking* (5th Ed., 2014), *Sex Differences in Cognitive Abilities* (4th ed.), and *Women at the Top: Powerful Leaders Tell Us How to Combine Work and Family* (coauthored with Fanny Cheung). Diane's most recent projects are the development of Operation ARA, a computerized game that teaches critical thinking and scientific reasoning (with Keith Millis at Northern Illinois University and Art Graesser at University of Memphis), and the *Halpern Critical Thinking Assessment* (HCTA), which enables test takers to demonstrate their ability to think about everyday topics using both constructed response and recognition formats. She teaches introductory psychology every year.

Preface

Why Teach with *Psychological Science*?

OUR BOOK COMBINES THE TRADITIONS OF PSYCHOLOGY WITH A CONTEMPORARY PERSPECTIVE Since the first edition of *Psychological Science*, our primary goal has been to provide students with a readable book that captures the excitement of contemporary research yet respects the rich tradition of scientific research accumulated by the field. Instead of an encyclopedic and homogenized compendium that dutifully covers worn themes and tired topics, we wanted a fresh approach that emphasizes what psychologists have learned about mind, brain, and behavior.

In planning this fifth edition, we conducted focus sessions of adopters, advisors, and potential users. Countless colleagues provided excellent advice about what was most important to them in introductory psychology courses and what they believed was of greatest value to students. Most instructors wanted a textbook that focused on material that students really needed to know at the introductory level—one not burdened with unnecessary details. Instructors especially wanted a book that reflects the current state of the field and showcases vibrant research.

In subsequently revising the book, we kept students foremost in mind. Students should be focusing on the concepts, not struggling to read the text. We worked hard to hit the right level of detail while keeping the material relevant and interesting. We maintained the integrity of content while making the explanations even clearer. We cut unnecessary terms, examples, and digressions, shortening some chapters by as much as 10 percent. We reworked complex sentences and reorganized material to maximize student understanding. We revised even the shortest sentences to increase their friendliness. In addition, we further enhanced the already strong relationship between the art and the narrative to help students form lasting associations. Thanks to the teamwork of advisors, authors, and editors, the fifth edition of *Psychological Science* is our most relevant, engaging, and accessible version yet.

OUR BOOK CROSSES LEVELS OF ANALYSIS AND BRINGS STUDENTS THE LATEST SCIENCE Although Mike Gazzaniga came to the book with a strong background in cognitive neuroscience and Todd Heatherton in social and personality psychology, our early goal was to feature cutting-edge research that crossed levels of analysis, from cultural and social contexts to genes and neurons. To really understand basic cognitive and perceptual processes, students need to appreciate that social contexts shape what people think about and how they perceive the world around them. Moreover, important differences in personality mean that people have unique interactions with those social environments. Research that crosses levels of analysis has provided new insights into many psychological constructs. For instance, many psychological disorders previously viewed as distinct—such as schizophrenia, bipolar disorder, and autism spectrum disorder—share common underlying genetic

mutations. These disorders may share other similarities that have not previously been considered. Such findings have implications for treatment and help explain why atypical antipsychotics are now the most widely prescribed medication for bipolar disorder.

Our focus on contemporary research extends well beyond brain science to include new thinking in other subfields, such as social, personality, and development. Our goal in each edition has been to highlight how recent research is providing new insights into the brain, behavior, and psychological disorders. Students need to learn about these new approaches to keep up with the rapid advances across psychology. An introductory course needs to show students the questions contemporary psychologists are addressing and help them understand the choice of methods used to answer those questions.

Since our fourth edition, psychologists have engaged in a tremendous amount of exciting research. For example, researchers across many subfields of psychology have emphasized epigenetic processes in understanding how environmental conditions can have long-term repercussions by affecting gene expression. Neuroscientists have developed new methods for studying the working brain, such as the use of optogenetic methods to activate neurons, thereby allowing researchers to test causal models of brain function. On other fronts, personality psychologists have identified the life circumstances that reliably produce changes in personality, and social psychologists have made advances in understanding the subtle vagaries of modern racism along with successful strategies to counteract it. There have also been dramatic advances in identifying the causes of psychopathologies and continued refinements in psychological treatments to help those who have them. Recent studies have also provided information that is especially pertinent for students, such as how multitasking can lead to all sorts of problems, from the classroom to the highway. We have been energized to learn about advances such as these across all areas of psychological science and are delighted to share them with our colleagues and students. About 10 percent of our total citations are from articles published in 2013 or 2014.

STUDENTS WILL LEARN THE IMPORTANCE OF PSYCHOLOGICAL REASONING Since our first edition, educators have increasingly emphasized the value of critical thinking and the need for introductory textbooks to foster it. Diane Halpern has been at the forefront of this movement and brings to our book her decades of research on best practices for teaching critical thinking skills. We continue to emphasize critical thinking at both conceptual and practical levels, with extensive discussions in the first two chapters that provide examples of the importance of critical thinking for understanding psychological phenomena and psychological research. Indeed, Chapter 2, “Research Methodology,” is organized around the importance of critical thinking and reasoning regarding the scientific method.

Students often have difficulties with critical thinking. Why are critical thinking and reasoning so difficult? Psychological science is uniquely positioned to help answer this question because psychologists have studied the situations and contexts that tend to befuddle otherwise intelligent people and lead them to erroneous beliefs and conclusions. In this edition, we introduce a new theme in Chapter 1 that focuses on psychological reasoning—that is, using psychological research to examine how people typically think, to understand when and why they are likely to draw incorrect conclusions. Psychologists have identified several fundamental errors and biases that permeate human thinking, such as confirmation biases, illusory correlations, framing effects, post-hoc explanations, self-serving biases, the misunderstanding of base rates and statistical relationships, and problems associated with heuristic processing. In each chapter, a new feature, “What to Believe? Using Psychological Reasoning,” highlights one clear example of how typical human thinking can lead people astray. For example, Chapter 14 tackles the difficult topic of the claimed link between vaccines and autism.

We walk students through the thought processes that lead people to perceive relationships that do not actually exist and then through the confirmation biases that sustain these false perceptions. This feature also discusses practical consequences of faulty psychological reasoning—for example, the global increase in infectious diseases, such as measles, due to the decline in vaccination rates.

Teaching students how to understand psychological reasoning contributes an important weapon to their critical thinking and reasoning arsenal. This understanding builds on standard critical thinking skills, such as being skeptical, but it also provides practical rules for seeing when people are likely to believe things that simply are not true.

THE CONTENT REFLECTS OUR GLOBAL, MULTICULTURAL SOCIETY Each revision of *Psychological Science* reflects a concerted effort to represent the world in its diversity. The evidence indicates that this effort has succeeded. A research team led by Sheila Kennison at Oklahoma State University examined 31 major psychology textbooks for their coverage of diversity. The team presented its findings at several meetings, including the 56th Meeting of the Southwestern Psychological Association (Tran, Curtis, Bradley, & Kennison, April 2010). We were pleased to see that *Psychological Science* had the greatest representation of diversity among all books. Our book had more than twice the average of the other 30 books. Indeed, most of the books that ours is often compared with (mid-range, science-focused) had less than one-third of our book's coverage of diversity. In the fifth edition, we have sought to increase coverage of many groups relatively neglected in psychological texts, including Latinos (Hispanic Americans), those who are transgendered, and those who face socioeconomic challenges, such as living in poverty.

Psychological Science also emphasizes the global nature of our field. It is unfortunate that many psychology textbooks focus almost completely on research from North America, because a tremendous amount of exciting psychological research takes place around the world. Students should learn about the best psychological science, and our goal has been to present the best psychological research, no matter where it originates. In the fifth edition, each chapter includes new important findings from many countries. For example, we discuss the fascinating work of researchers in Belgium and England who have been able to communicate with people in comas. We consider work from Israel demonstrating epigenetic processes whereby stress is passed along to future generations. We describe Dutch research showing reductions in brain volume over time for those with schizophrenia. We discuss theories of dehumanization developed by researchers in Australia. The fifth edition includes research from 26 countries outside of North America describing more than 200 global studies conducted during the past decade. Becoming aware of research from outside North America will not only help students learn more about psychology, it will also bring them new perspectives, encouraging a sense of themselves as global citizens.

NOTABLE CHANGES IN THE FIFTH EDITION We are grateful to the many instructors who have used our book in previous editions. Your suggestions for improving material, your compliments for the sections you especially like, and your support for the overall vision of our book has guided our revisions for this edition. As a result, we have adjusted the order of the chapters, the internal organization of some chapters, and which material is presented in which chapters. For instance, we followed the advice of many users who asked that the split-brain material be moved from the consciousness chapter to the chapter discussing brain mechanisms. In addition, many of the chapters have brand-new opening vignettes designed to appeal to students. These changes are sure to please new adopters as well. Here are the major changes in this edition:

Chapter 1, “The Science of Psychology,” has increased emphasis on critical thinking and a new section on psychological reasoning. We introduce our new feature, “What to Believe? Using Psychological Reasoning.”

Chapter 2, “Research Methodology,” has been extensively reorganized and provides a clearer roadmap for how psychologists conduct research. To emphasize the relevance of research methods, the use and misuse of cell phones, especially while driving, is the research example throughout.

Chapter 3, “Biology and Behavior,” now contains information on split-brain patients as well as new material on epigenetics and optogenetic methods.

Chapter 4, “Consciousness,” has been moved earlier in the book because of the natural bridge from brain processes discussed in the previous chapter. Coverage of attention is now presented in this chapter because we believe it is best framed in terms of conscious awareness. The dangers of multitasking are highlighted. The section on drugs has been completely reorganized and includes more-extensive coverage of drugs that are more relevant to students (e.g., ecstasy).

Chapter 5, “Sensation and Perception,” has been reorganized so that sensation and perception are considered together for each major sense, beginning with vision.

Chapter 6, “Learning,” has an increased emphasis on prediction (and prediction error) as the basis of learning. This contemporary approach has reinvigorated research on how animals learn. The biological basis of learning has been integrated rather than presented as a stand-alone section at the end of the chapter.

Chapter 7, “Memory,” has been modestly reorganized, with coverage of the biological basis of memory moved earlier in the chapter. This section also covers fascinating recent research on the epigenetics of memory.

Chapter 8, “Thinking, Language, and Intelligence,” now incorporates an expanded discussion of language. The section on thinking has been streamlined to focus on concepts that are most important to students.

Chapter 9, “Human Development,” has been reorganized so that it better integrates biological development within the life span perspective. Each stage of development is now presented in a more unitary fashion. There is an expanded discussion of the influence of gender and culture on identity formation.

Chapter 10, “Emotion and Motivation,” describes new research on the physiological basis of emotion. The emotions section has been reorganized for clarity.

Chapter 11, “Health and Well-Being,” is completely reorganized, beginning with a section on what affects health. It also has an increased emphasis on health disparities. The stress section contains new research on epigenetics of stress.

Chapter 12, “Social Psychology,” is completely reorganized and now begins with group processes and social identity theory. New material includes an expanded discussion of the biological basis of aggression, select findings from social neuroscience, and an expanded discussion of modern prejudice and ways to counteract intergroup hostility.

Chapter 13, “Personality,” is also completely reorganized and begins by considering where personality comes from. There is also new coverage of how life events and situations can alter personality traits.

Chapter 14, “Psychological Disorders,” has been updated to reflect *DSM-5*. New ways of conceptualizing psychopathology are considered, such as the idea that a general factor is constant across most psychopathology. We discuss groundbreaking research

that suggests schizophrenia, bipolar disorder, and autism spectrum disorder share underlying causes.

Chapter 15, “Treatment of Psychological Disorders,” has been updated to describe the most effective treatments for the various disorders, such as the use of atypical anti-psychotic medications for bipolar disorder.

OUR BOOK MEETS THE APA GUIDELINES In 2013, the American Psychological Association updated their guidelines for the undergraduate major in psychology. As the course that introduces students to psychology, introductory psychology should provide a solid foundation for helping departments satisfy those guidelines. The APA task force includes the content goal of establishing a firm knowledge base in the field, along with four skill-based goals that are valuable for psychology majors. Our textbook provides a strong foundation for satisfying the guidelines. On pp. xxi-xxvii, we have collated the book’s content with the guidelines. Here is a summary of how our book achieves the major goals of the APA guidelines:

1. Knowledge Base in Psychology

Our book reflects a balance between the classic studies, concepts, and principles that define the field and the latest science that builds upon the rich history of the field. For instance, although there are few strict behaviorists today, students still need to understand the processes of classical and operant conditioning. They need to know about studies conducted in the 1950s and 1960s showing that people derogate group members who do not conform and the situations under which people are obedient to authorities. We are proud of the research heritage across all subfields of psychology and believe students need to have this foundational knowledge. Yet students today will need to understand the approaches used by contemporary psychological researchers (e.g., optogenetic and gene knock-out methods, implicit measures of social attitudes, brain imaging methods that decode mental activity) in order to keep up with the field. We want students to understand that psychology is a vibrant science, with new discoveries about the mind, brain, and behavior building on known principles and establishing the future foundations of psychological science.

2. Scientific Inquiry and Critical Thinking

Our book devotes considerable coverage to critical thinking and research methods. Our new feature, “What to Believe? Using Psychological Reasoning,” encourages students to use psychological concepts to recognize flaws in peoples’ explanations and to describe common fallacies in thinking that lead people to erroneous conclusions. These skills will be especially valuable for assessing popular media reports of psychological findings. Several of our features are designed to make students better consumers of psychological research. For example, students learn to question media reports on there being “left brain” and “right brain” learners as well as media reports on the benefits of playing Mozart to young infants.

3. Ethical and Social Responsibility in a Diverse World

An independent analysis found our book to have the most diverse coverage of any textbook in psychology, and the fifth edition has further increased the presentation of diversity. Moreover, online support materials for our book include a series of “On Ethics” essays. Mike Gazzaniga’s book *The Ethical Brain* raised many questions that society needs to consider as we gain knowledge of how the mind works. To accompany *Psychological Science*, Mike has written essays that invite students to consider ethical dilemmas stemming from advances in psychological research.

4. Communication

Chapter 2 of our textbook describes the various steps psychologists take to communicate their findings with other scientists and with the general public. Several of our “What to Believe? Using Psychological Reasoning” features discuss how, because the popular press can distort scientific findings, students need to spot misunderstandings in communication. Our “Scientific Thinking” illustrations, designed to be similar to academic poster presentations, carefully and consistently lead students through the steps of some of the most interesting experiments and studies in psychological science. In the chapter on sensation and perception, “How We” figures help students understand the complex processes involved in the five senses.

5. Professional Development

We hope that our textbook inspires students to major in psychology or even to consider joining us by becoming psychologists. Our book covers many aspects of the profession, including where psychologists work; the contributions they make to understanding the mind, brain, and behavior; and how they identify and treat psychological disorders. Our book is also valuable for students who may take only one psychology course and will need to apply what they learn to whatever career they choose, whether it be teaching, medicine, business, social services, or politics. Returning from the fourth edition, the “Using Psychology in Your Life” features help students apply what they learn to their personal lives. One per chapter, these applications address the question of what students might immediately do with the information they learn. Topics include how an understanding of psychology can help in one’s career, the relationship between sleep and study habits, and the benefits of participating in psychological research.

OUR BOOK WILL PREPARE STUDENTS FOR THE MCAT Psychology has become a popular major for premed students. Beginning in the 1980s, medical schools recognized that contemporary physicians need a holistic understanding of their patients, including their lifestyles, ways of thinking, and cultural values. As students will learn in our “Health and Well-Being” chapter, the vast majority of modern health problems are related to peoples’ behavioral choices. Psychological factors influence how people think about and react to the world, and sociocultural influences influence behavior and behavioral change. In short, cognition and self-perception profoundly affect health.

In 2015, reflecting this new understanding, the Medical College Admissions Test (MCAT) began including a section that examines psychological, social, and biological foundations of behavior, along with a new section on critical analysis and reasoning skills. As a result of revisions that focus attention on psychology, psychological content now comprises nearly 25 percent of the MCAT score.

Available online is a comprehensive chart that links the specific MCAT material to be covered with the relevant page numbers in *Psychological Science*. The 2015 MCAT examines 10 foundational concept and content categories. Three of these categories, Concepts 6–8, are directly relevant to psychology. The material in these three sections is thoroughly covered in our textbook, including some of the latest science reflected in the MCAT:

1. Concept 6

This section considers foundational information about the ways in which perception and cognition influence health and illness. It covers how people detect and perceive sensory information (Chapter 5); how they attend, think, and remember and use language to communicate (Chapters 4, 6, 7, and 8); and how they process

and experience emotions and stress (Chapters 10 and 11). Specific topics in this section that are featured in our book include consciousness, cortical processing of sensory information, long-term potentiation, neural plasticity, prefrontal control and involvement in emotion, physiological signatures of emotion, and the effect of stress and emotion on memory.

2. Concept 7

This section focuses on how behaviors are produced. It covers individual influences on behavior, including biological factors such as genes and the nervous system (Chapter 3), personality (Chapter 13), psychological disorders (Chapters 14 and 15), motivation (Chapter 10) and attitudes (Chapter 12). It also includes social processes that influence behavior, such as cultural influences (Chapters 1 and 12) and socialization, group processes, and the influence of others (Chapter 12). Learning (Chapter 6) and theories of attitudinal and behavioral change (Chapter 12) are covered. In addition, much of our health psychology discussion (Chapter 11) is highly relevant for this section.

3. Concept 8

This section focuses on how we think about ourselves and how that thinking influences health. It includes a study of self and identity formation (Chapters 9 and 13) and attitudes that affect social interactions (Chapter 12); attribution theory, prejudice and bias, and stereotypes and group relations (Chapter 12); processes related to stereotype threat (Chapter 8); and how people help and hurt one another and the nature of their social relationships (Chapter 12).

While Concepts 9 and 10 cover material primarily from sociology, students will encounter relevant material in *Psychological Science*. For instance, our textbook covers the effects of growing up in poverty on health, cognitive function, and language. Also discussed are health disparities due to race and socioeconomic status, in addition to social inequalities due to race and gender and sexual orientation.

Finally, students using our textbook will be at a significant advantage for completing the section of the MCAT on critical analysis and reasoning skills. Through our emphasis on critical thinking skills and psychological reasoning, students will learn to evaluate arguments, appreciate ethical considerations, and recognize faulty psychological reasoning.

STUDENTS WILL CARE ABOUT WHAT THEY LEARN IN OUR BOOK A major goal of the fifth edition is encouraging students to care about our field. As engaged readers, students will learn more deeply, understand themselves and others more fully, and become better critical thinkers and decision makers. We have worked hard to provide resources that will enhance learning because they are based on the science of learning and the best practices for pedagogy. For example, the “What to Believe? Using Psychological Reasoning” features will provide students with important tools for applying psychological research to better understand themselves and others. The “Using Psychology in Your Life” features will keep students engaged and thinking about the material in terms of their personal lives. By making clear how psychological concepts can have real-time usefulness, these applications provide additional motivation for students to engage with the material.

This is an exciting time to work in psychological science, and we hope that our excitement is contagious. This book is written for the many undergraduate and graduate students we have the pleasure to interact with each day, with our respect for their intelligence and our admiration for their inquisitiveness.

Acknowledgments

We begin, as always, by acknowledging the unwavering support we have received from our families. Writing a textbook is a time-consuming endeavor, and our family members have been generous in allowing us the time to focus on writing.

We are also extremely grateful to the many colleagues who gave us responses and advice. Some individuals deserve special recognition. Foremost is our good friend Margaret Lynch, an award-winning instructor who teaches hundreds of students each year at San Francisco State University. Since the first edition of this textbook, Margaret has been a valuable partner in shaping the content. Reading every sentence of the fifth edition and offering comments and suggestions throughout, she reminded us never to take students for granted or underestimate them (and also admonished us never to use contractions). Ines Segert, an award-winning instructor at the University of Missouri, provided invaluable advice regarding our revision plan and also brought her extensive knowledge and keen eye to each chapter and to our new psychological reasoning theme. Ines was particularly helpful in pointing us to recent findings that required us to update our coverage. Rebecca Gazzaniga, M.D., reviewed all the chapters and pushed us to speak directly to students in our writing. As a physician, she provided especially useful advice for reorganizing the “Health and Well-Being” chapter, as well as reviewing all of our new MCAT questions.

Dennis Miller provided expert feedback and vision, plus a focus group with his students at the University of Missouri, regarding online assessment for the fourth and fifth editions. Barbara Oswald at Miami University helped us rethink the research methods chapter. Her review of the fourth edition chapter was thorough, detailed, and full of excellent advice. She subsequently provided a blueprint that guided us through the revision of that chapter, while contributing a step-by-step overview of the research cycle and a stronger critical thinking perspective, and she contributed the new MCAT questions for each chapter. As in the fourth edition, we relied on the excellent Tasha Howe to revise the development chapter, making it more contemporary and making sure we had diverse coverage. Matthias Mehl and Brent Roberts provided excellent advice for updating the personality chapter, and Christopher Chabris helped us understand how to chunk chessboards meaningfully. Josh Buckholtz provided expert advice on the MAOA gene relationship to violence and impulsivity.

Debra Mashek has been an invaluable member of the team for three editions. For the fourth edition, Debra wrote the “Using Psychology in Your Life” features. Because they were so well received, we included new or updated versions in the fifth edition. Thanks in large part to Debra’s engaging, insightful voice, students love applying the findings of psychological science to their own lives.

THE NORTON TEAM Producing a textbook requires a small army of people who are crucial at each step of the way. In the modern publishing world, where most books are produced by large multinational corporations that are focused primarily on the bottom line, W. W. Norton stands out as a beacon to academics and authors, both for remaining committed to the best-quality publications and for providing outstanding team members to help ensure that quality. Norton’s employees own the company, and therefore every individual who worked on our book has a vested interest in its success; that personal connection shows in the great enthusiasm each person brought to his or her work.

Our eternal thanks are due to Sheri Snavelly, who took over as editor during the third edition and played a central role in shaping each subsequent edition. Sheri is an amazingly talented and insightful editor who brought not only many years of expertise in science editing, but also a profound dedication to spreading the message about our book. Sheri understands our vision and has been enthusiastic about all the

right things at all the right times. There is not a better editor in psychology, and we are grateful for the attention she has given our book even as she has built one of the best overall lists in psychology today. Roby Harrington, director of Norton's college division, was a genius for hiring her, and we also express our gratitude to Roby for his support of the book.

Our innovative media and ancillaries team, led by media editor Patrick Shriner, was instrumental in producing a first-rate support package that will assist students and instructors in having a rich experience with the textbook. As every instructor knows, a well-conceived test bank is crucial to a successful course. Inadequate test banks with uneven or ambiguous items can frustrate students and instructors alike. Associate media editor Stefani Wallace and editorial assistant Scott Sugarman worked tirelessly to create the best test bank available for introductory psychology (see p. xxviii for more details). Stefani also pulled together the coursepack material so you can easily assign our material within your own course management system. Assistant media editor George Phipps skillfully managed the Integrated Instructors' Guide and a multitude of lecture presentation tools. Patrick Shriner made sure the whole package works seamlessly with your lectures and that our new edition is available with a new Ebook and W. W. Norton's InQuizitive online adaptive assessment. Somehow, in his spare time, Patrick also managed to revise all the ZAPS online psychology labs for introductory psychology, and for that we are deeply grateful.

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Instructor Resources

Psychological Science offers instructors a full set of traditional and innovative tools designed to support a broad range of course needs and teaching styles. This support features:

Test Bank

To help you build exams, all 2,500+ questions in the Test Bank for *Psychological Science* have been carefully crafted and thoroughly reviewed to ensure that they are as good as the textbook they support. Features of the Fifth Edition Test Bank include:

- extensive revisions to reflect the advice of subject-matter experts and star teachers for each chapter;
- higher question *quality* across all chapters;
- improved question *quantity*, with each chapter offering 160–200 multiple-choice questions;
- questions tagged by Bloom's taxonomy level, APA 2.0 learning goal, chapter, section, and difficulty.

Video Resources

Psychological Science offers instructors a variety of original videos as well as URLs to YouTube-type web-based videos depicting psychological concepts in everyday life and in popular culture. These URLs are usually accompanied by advice for using them in lecture, including discussion questions about the videos.

There are also two types of original videos—Demonstration Videos and Conceptual Videos:

- **Demonstration Videos** show students enacting 25 important concepts in a classroom setting and are offered in two formats: *Student versions* are suitable for showing in class or online, whereas *instructor versions* show you how to re-create the demonstrations in your class.



“Brain Hemispheres” Demonstration Video for Chapter 2.

- **Conceptual Videos** feature 20 course concepts that students traditionally struggle to understand. Each concept is depicted in a real-life setting to help students better understand the concept as well as to see how it relates to their everyday world.



“Negative Reinforcement” Conceptual Video for Chapter 6.

PowerPoint® Sets

Create your lecture files to suit your specific course needs using this rich variety of PPT slides, which support each chapter of *Psychological Science*:

- **Art PPTs** provide every figure, photo, and table from the textbook, optimized for projection in lecture halls (in JPEGs as well as PPTs).
- **Lecture PPTs** use outlines and key images from the text to thoroughly summarize the book's presentation.
- **Video PPTs** include the original Demonstration Videos and Conceptual Videos (described under “Video Resources”) to help your students better understand key course concepts.
- **Supplemental Photo PPTs** offer images depicting course concepts not found in the book.
- **Clicker Question PPTs** and **Active Learning PPTs** provide you with examples and ideas for in-class participation activities.



Additional Teaching Resources

Using our **Interactive Instructor's Guide (IIG)** website, you can easily find and quickly download hundreds of teaching tools created for *Psychological Science*. An invaluable tool for novice and veteran instructors alike, the IIG offers all of our Video Resources and PPT sets, as well as these resources for each chapter:

- chapter outlines and summaries;
- class activity ideas and handouts;
- lecture suggestions and discussion questions;
- ideas for using Norton's ZAPS online psychology labs in your course.

Coursepack Digital Content

Norton Coursepacks work with your existing Learning Management System to add rich, book-specific digital materials to your course—at no cost to you or your students. The *Psychological Science* expanded Coursepack includes:

- **Pre-Lecture Quizzes, Chapter Quizzes, and Post-Study Quizzes;**
- **Demonstration Videos and Conceptual Videos** (see “Video Resources”) with suggested activities and questions;
- **Guided Reading Activities** to help students focus on studying and reading the book;
- **Activity Kits** for the new “What to Believe?” textbook feature, which include questions, videos, and assignable quizzes.



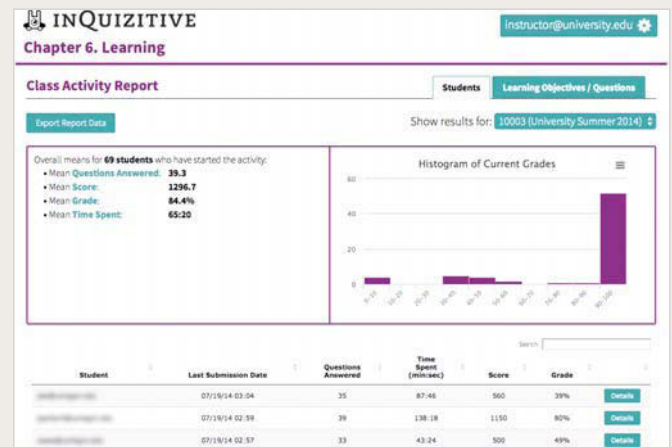
“Are You Superstitious?” Video in the “What to Believe?” Activity Kit for Chapter 6.

InQuizitive and ZAPS Instructor Tools

Psychological Science offers two great student review tools: **InQuizitive**, Norton's new online formative, adaptive learning tool, and the fully revised **ZAPS: The Norton Online Psychology Labs**. Both of these resources, fully described inside the front cover of this book, offer special capabilities that enable you to integrate them into your course.

INQUIZITIVE

InQuizitive helps your students learn by employing game-like elements and delivering answer-specific feedback. It is assignable and gradable, and—since all InQuizitive questions are assigned to section-level learning goals—gives you insights into the areas where your students need more help so you can adjust your lectures and class time accordingly.



Class Activity Reports in InQuizitive allow you to quickly learn how well your students are doing.

ZAPS

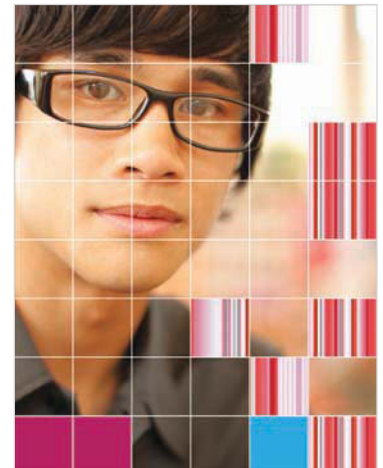
The Norton Online Psychology Labs

With ZAPS labs, your students interactively explore key psychological concepts to gain a deeper understanding of the concepts as well as of the scientific process. You can choose from one to three ZAPS labs for each chapter in *Psychological Science*. You will receive summaries of your students' performance for each lab assigned, so credit can be given. You will also receive all the data your students generate in ZAPS, which you can share with the class to help them better understand the concepts. Instructor-only notes and activity ideas for each ZAPS lab are offered through the *Psychological Science* Interactive Instructor's Guide.

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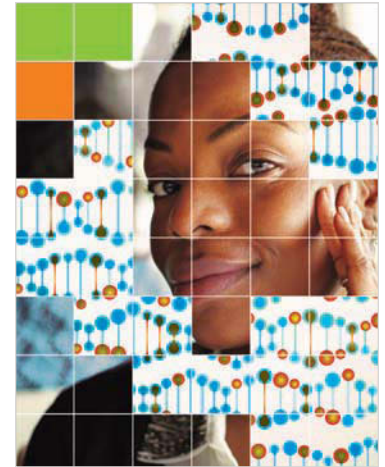
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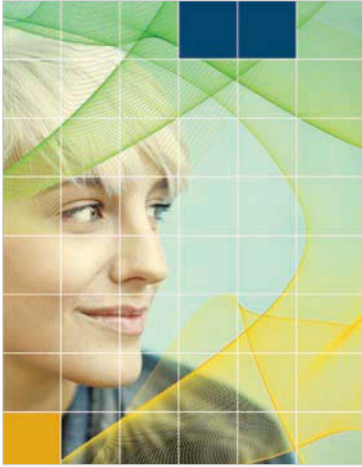
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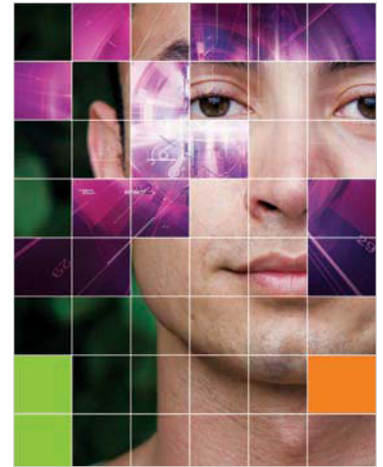


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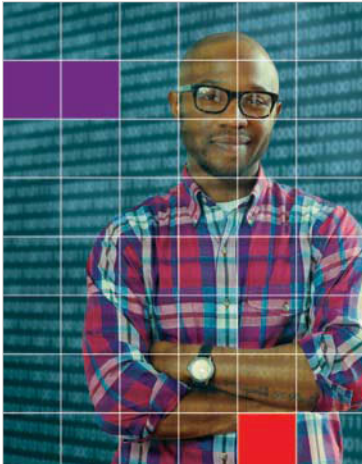


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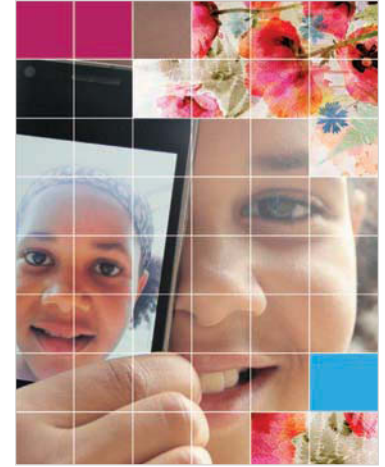
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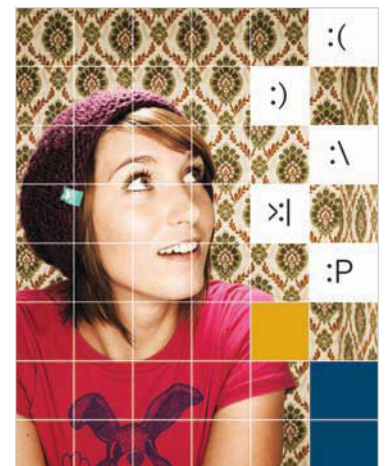
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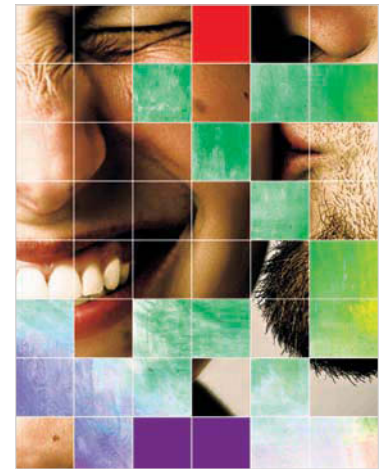


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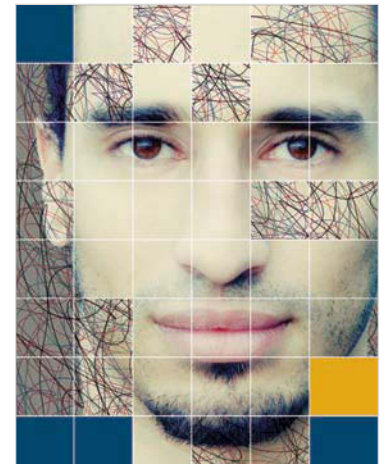


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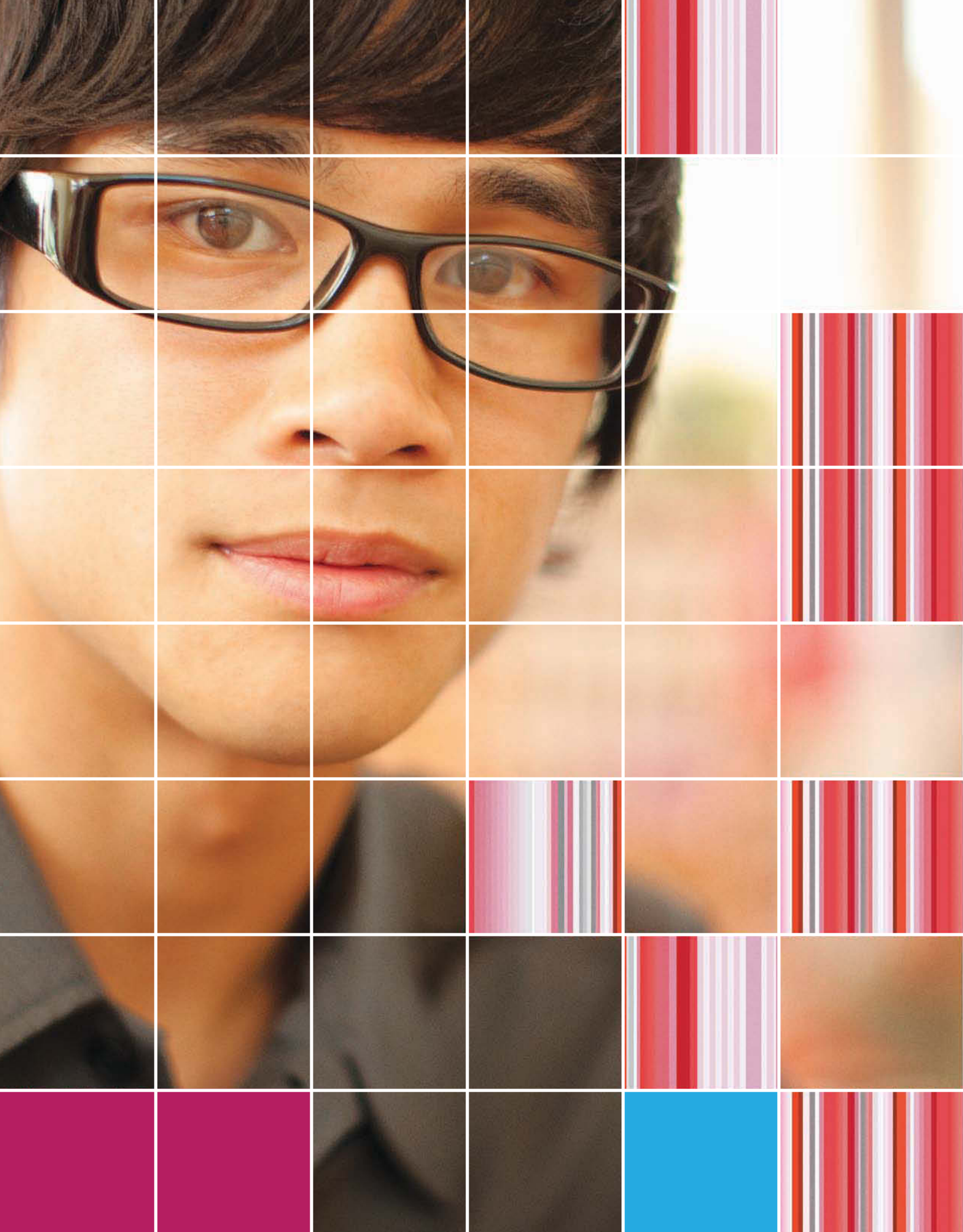


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5TH EDITION

Psychological Science



1

The Science of Psychology

Ask & Answer

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1.2 What Are the Scientific Foundations of Psychology? 12

1.3 What Are the Latest Developments in Psychology? 21

FIGURE 1.1

Digital Interaction

People stay wired to their digital media, even in social situations.

THINK OF THE ADVANTAGES THAT DIGITAL MEDIA have brought to so many lives over the past few decades. Thirty years ago, if you wanted to contact someone far away, you most likely wrote a letter. Phoning could be expensive, and email was largely unavailable. Now you might email, text, Skype, tweet, or blog. Twenty years ago, if you wanted a piece of information that was not available in your home, you might have traveled to a library. Now you would probably go straight to the Internet.

Around the world, billions of people now spend much of their time interacting through digital media (**FIGURE 1.1**). In fact, many people, especially young people, feel panicky to be away from their 24/7 connection to the electronic universe. When was the last time you willingly went a week without your phone or computer? A day? Some of you probably cannot last more than a few hours, or you become anxious when your instructor insists that cell phones be turned off in the classroom.

You might think, therefore, that our more frequent communications with others would bring many benefits to our social lives. Early proponents of social media, such as the creators of Facebook, envisioned a flatter world—that is, a world with fewer obstacles between people. In their view, technology would make us more connected and give us stronger social ties. We would stay in touch with old friends while easily making new ones. Our new friends would be people who



shared our interests, whether they lived on the next street or on some tiny island thousands of miles away.

Facebook now has over a billion users. Many Facebook users visit the site several times a day. None of these people are sad and lonely, right? All of them have become happier through social media?

On the contrary, there is evidence that the more people use Facebook, the less happy they are in their daily lives. In 2013, at the University of Michigan, the psychologist Ethan Kross and his colleagues performed a study concerning Facebook use. The researchers texted the study participants five times a day for two weeks. In those texts, they asked the participants how much they had used Facebook and how they were feeling. The researchers found that the more the participants had used Facebook at one time they were asked, the worse those people felt the next time they were asked. The more the participants used Facebook over the full two weeks, the less satisfied they were with their lives. If you are a Facebook member, would knowing these results make you quit? What if you knew that most of the study participants were college students?

Before acting on this information, you have to react to it—emotionally, mentally, or both. Your first reaction is probably to want to know more about the study. You might want details about how the study was conducted. Or you might wonder about the results. Why did the participants report feeling less happy? Is it because people who are interacting on Facebook are interacting less with others face to face? Is it because many people brag on Facebook, and other people's accomplishments can make us feel inadequate? Is it because many people look passively at Facebook without actively interacting with other users? Maybe sad and lonely people spend more time on Facebook because they have trouble making friends in real life. And how might the ages of the participants have affected their happiness? You might even wonder how the researchers measured "happiness."

The researchers address many of these issues in their paper. They do so because, like much research in psychology, this study raises questions that we want answers for. To get good answers to questions, researchers need to conduct good scientific studies and think carefully about the results. In other words, they need to perform psychological science.

Learning Objectives

- Define psychological science.
- Define critical thinking, and describe what it means to be a critical thinker.
- Identify the eight major biases in thinking, and explain why these biases result in errors in reasoning.

1.1 What Is Psychological Science?

Psychology involves the study of mental activity and behavior. The term *psychologist* is used broadly to describe someone whose career involves understanding mental life or predicting behavior. We humans are intuitive psychologists. That is, we try to understand and predict others' behavior. For example, defensive drivers rely on their intuitive sense of when other drivers are likely to make mistakes. People choose relationship partners they expect will best meet their emotional, sexual, and support needs. People try to predict whether others are kind, are trustworthy, will make good caretakers, will make good teachers, and so on. But people too often rely on apparent common sense or their gut feelings. They cannot intuitively know if many of

the claims related to psychology are fact or fiction. For example, will taking certain herbs increase memory? Will playing music to newborns make them more intelligent? Does mental illness result from too much or too little of a certain brain chemical?

The science of psychology is not simply about intuitions or common sense. **Psychological science** is the study, through research, of mind, brain, and behavior. But what exactly does each of these terms mean, and how are they all related?

Mind refers to mental activity. Examples of the mind in action include the perceptual experiences (sights, smells, tastes, sounds, and touches) we have while interacting with the world. The mind is also responsible for memories, thoughts, and feelings. Mental activity results from biological processes within the *brain*.

Behavior describes the totality of observable human (or animal) actions. These actions range from the subtle to the complex. Some occur exclusively in humans, such as debating philosophy or performing surgery. Others occur in all animals, such as eating, drinking, and mating. For many years, psychologists focused on behavior rather than on mental states. They did so largely because they had few objective techniques for assessing the mind. The advent of technology to observe the working brain in action has enabled psychologists to study mental states and has led to a fuller understanding of human behavior. Although psychologists make important contributions to understanding and treating mental disorders, most psychological science has little to do with therapeutic clichés such as couches and dreams. Instead, psychologists generally seek to understand mental activity (both normal and abnormal), the biological basis of that activity, how people change as they grow older, how people vary in response to social settings, and how people acquire healthy and unhealthy behaviors.

Psychological Science Teaches Critical Thinking

One of this textbook’s most important goals is to provide a basic, state-of-the-art education about the methods of psychological science. Even if your only exposure to psychology is through the introductory course for which *Psychological Science* is the textbook, you will become psychologically literate. With a good understanding of the field’s major issues, theories, and controversies, you will also avoid common misunderstandings about psychology. You will learn how to separate the believable from the incredible. You will learn to spot poorly designed experiments, and you will develop the skills necessary to critically evaluate claims made in the popular media.

The media love a good story, and findings from psychological research are often provocative (FIGURE 1.2). Unfortunately, media reports can be distorted or even flat-out wrong. Throughout your life, as a consumer of psychological science, you will need to be skeptical of overblown media reports of “brand-new” findings obtained by “ground-breaking” research (FIGURE 1.3). With the rapid expansion of the Internet and thousands of new research findings available for searches on just about any topic, you need to be able to sort through and evaluate the information you find in order to gain a correct understanding of the phenomenon (observable thing) you are trying to investigate.

One of the hallmarks of a good scientist—or a savvy consumer of scientific research—is *amiable skepticism*. This trait combines openness and wariness. An amiable skeptic remains open to new ideas but is wary of new “scientific findings” when good evidence and sound reasoning do not seem to support them. An amiable

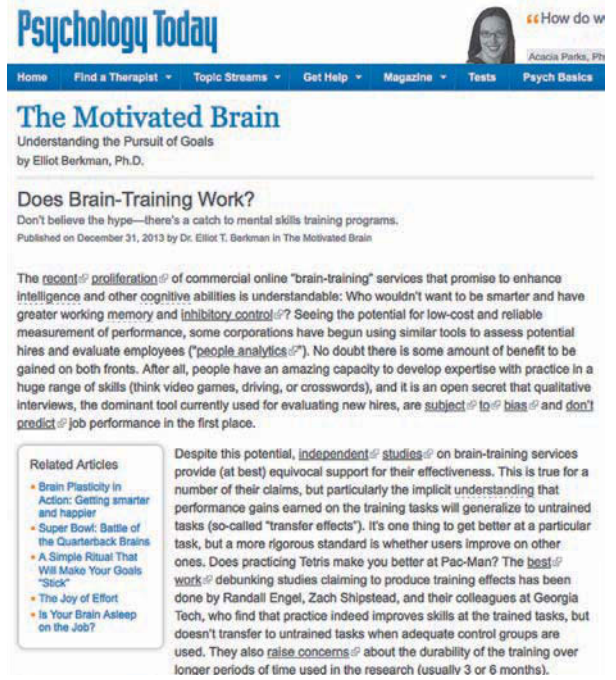


FIGURE 1.2
Psychology in the News

Psychological research is often in the news because the findings are intriguing and relevant to people’s lives.

psychological science

The study, through research, of mind, brain, and behavior.

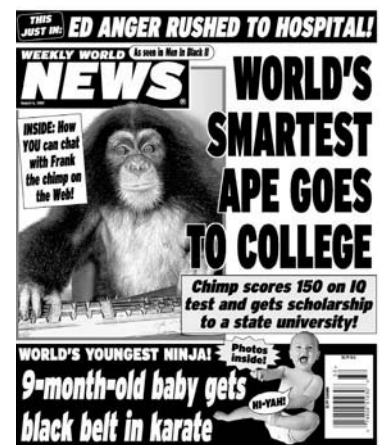
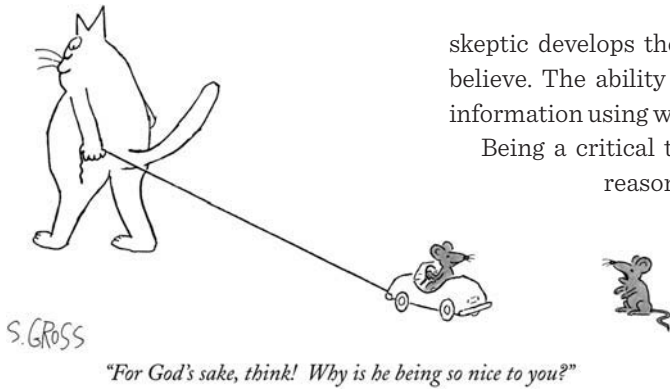


FIGURE 1.3
“Brand-New” Findings

Media reports seek to grab attention. Their claims can be based on science, but they can also be hype—or worse.



skeptic develops the habit of carefully weighing the facts when deciding what to believe. The ability to think in this way—to systematically question and evaluate information using well-supported evidence—is called **critical thinking**.

Being a critical thinker involves looking for holes in evidence, using logic and reasoning to see whether the information makes sense, and considering alternative explanations. It also requires considering whether the information might be biased, such as by personal or political agendas. Critical thinking demands healthy questioning and keeping an open mind. Most people are quick to question information that does not fit with their beliefs. But as an educated person, you need to think critically about all information. Even when you “know” something, you need to keep refreshing that information in your mind. Ask yourself: Is my belief still true? What led me to believe it? What facts support it? Has science produced new findings that require us to reevaluate and update our beliefs? This exercise is important because you may be least motivated to think critically about information that verifies your preconceptions. In Chapter 2, you will learn much more about how critical thinking helps our scientific understanding of psychological phenomena.

Psychological Reasoning Examines How People Typically Think

Critical thinking is useful in every aspect of your life. It is also important in all fields of study throughout the humanities and the sciences. The integration of critical thinking in psychological science adds to our understanding of how people typically think when they encounter information. Many decades of psychological research have shown that people’s intuitions are often wrong. Intuitions also tend to be wrong in predictable ways. Indeed, human thought is often biased in ways that make critical thinking very difficult. Through scientific study, psychologists have discovered types of situations in which common sense fails and biases influence people’s judgments. In psychology, the term *reasoning* refers to using evidence to draw conclusions. In this book, the term *psychological reasoning* refers to using psychological research to examine how people typically think, to understand when and why they are likely to draw erroneous conclusions.

Does eating too much sugar cause children to become hyperactive? Many people believe this connection has been established scientifically, but in fact a review of the scientific literature reveals that the relationship between sugar consumption and hyperactivity is essentially nonexistent (Wolraich, Wilson, & White, 1995). Some people will argue that they have seen with their own eyes what happens when children eat large amounts of sweets. But consider the contexts of such firsthand observations. Might the children have eaten lots of sweets when they were at parties with many other children? Might the gatherings, rather than the sweets, have caused the children to be very excited and active? People often let their beliefs and their biases determine what they “see.” The children’s highly active behavior, viewed in connection with eating sweets, is interpreted as sugar-induced hyperactivity. This example actually shows many of the ways that learning to use psychological reasoning can help people become better critical thinkers.

Psychological scientists have catalogued a number of ways that noncritical thinking can lead to erroneous conclusions (Gilovich, 1991; Hines, 2003; Kida, 2006; Stanovich, 2013). These errors and biases do not occur because people lack intelligence or motivation. Just the opposite is true. Most of these biases occur *because* people are motivated to use their intelligence. They want to make sense of events that involve them and happen around them. The human brain is highly efficient at

critical thinking

Systematically questioning and evaluating information using well-supported evidence.

finding patterns and making connections between things. By using these abilities, people can make errors but can also make new discoveries and advance society (Gilovich, 1991).

Our minds are constantly analyzing all the information we receive and trying to make sense of that information. These attempts generally result in relevant and correct conclusions. But sometimes we get things wrong. Sometimes we see patterns that do not really exist. We look at the clouds and see images in them—clowns, faces, horses, what have you. We play recorded music backward and hear satanic messages. We believe that events, such as the deaths of celebrities, happen in threes (**FIGURE 1.4**).

Often, we see what we expect to see and fail to notice things that do not fit with our expectations. We expect that kids who consume sugar will become hyper, and then we interpret their behavior in ways that confirm our expectations. Likewise, our stereotypes about people shape our expectations about them, and we interpret their behavior in ways that confirm these stereotypes.

Why is it important to care about errors and biases in thinking? The psychologist Thomas Gilovich answers this question insightfully in his book *How We Know What Isn't So: The Fallibility of Human Reason in Everyday Life* (1991). He points out that more Americans believe in extrasensory perception (ESP) than in evolution and that there are twenty times more astrologers than astronomers. Followers of ESP and astrology may base important life decisions on beliefs that are wrong. False beliefs can sometimes lead to dangerous actions. Some people hunt endangered animals because they believe the animals' body parts provide magical cures. Some people rely on fringe therapies to provide what they think is real medical or psychological treatment.

Knowing about psychological reasoning will also help you do better in your classes, including this one. Before they have taken a psychology course, many students have false beliefs, or misconceptions, about psychological phenomena. The psychologists Patricia Kowalski and Annette Kujawski Taylor (2004) found that students who employ critical thinking skills complete an introductory course with a more accurate understanding of psychology than students who complete the same course but do not employ critical thinking skills. As you read this book, you will benefit from the critical thinking skills that are discussed. You can apply these skills in your other classes, your workplace, and your everyday life.

Each chapter of the book draws your attention to at least one major example of psychological reasoning, in a feature called “What to Believe? Using Psychological Reasoning.” Following are some of the major biases you will encounter.

- **Ignoring evidence (confirmation bias): Don't believe everything you think.**

People show a strong tendency to place great importance on evidence that supports their beliefs. They tend to downplay evidence that does not match what they believe. When people hear about a study that is consistent with their beliefs, they generally believe the study has merit. When they hear about a study that contradicts those beliefs, they look for flaws or other problems. Think back to the Facebook study described at the beginning of this chapter. Did the study seem to have merit? Your judgment was probably influenced by your feelings about Facebook.

One factor that contributes to confirmation bias is the selective sampling of information. For instance, people with certain political beliefs may visit only Web sites that are consistent with those beliefs. However, if we restrict ourselves to evidence that supports our views, then of course we will believe we are right. Similarly, people show selective memory, tending to better remember information that supports their existing beliefs.



FIGURE 1.4
Patterns That Do Not Exist

People often think they see faces in objects. When the owner claimed to see the face of the Virgin Mary on this grilled cheese sandwich, the sandwich sold to a casino for \$28,000 on eBay.



FIGURE 1.5
Actors as “Experts”

Advertisements that feature people portraying medical professionals are successful because they create the illusion that such people have expertise.

- **Failing to accurately judge source credibility: Who can you trust?** Every day, we are besieged with new information. Particularly when we are not sure what to believe, we are faced with the issue of *whom* to believe. You can probably assume that your psychology professor is much more credible in describing the factors that influence dating success than your cousin Vinny is. But as a critical thinker, you know that sources, even experts, need to be able to justify their claims. Your professor can tell you about actual research studies. Vinny probably relies on his personal experience. At the same time, you should be wary of *appeals to authority*, such as when sources refer to their expertise rather than to the evidence. Advertisers can try to exploit our tendencies to rely on expertise. An advertisement using a person who appears to be a physician is likely to be more successful in promoting sales of a drug than one that uses a representative of the drug company (**FIGURE 1.5**). Critical thinking requires us to examine the sources of the information we receive.
- **Misunderstanding or not using statistics: Going with your gut.** People generally fail to understand or use statistics in their efforts to interpret events around them. Gamblers believe that a roulette ball that has landed on red five times in a row is now more likely to land on black. Basketball fans watch players go through hot streaks where they seem never to miss. In fact, these “patterns” do not happen more frequently than would be expected by chance. Suppose you hear that there is a strong relationship between smoking and developing cancer. You might think of your ancient aunt who has smoked for 40 years and is fine. Because of that observation, you might conclude that the relationship is untrue. But the relationship between smoking and cancer is simply that smokers are more likely to get cancer, not that every smoker will get cancer. As you will learn in Chapter 2, statistics help scientists understand the likelihood that events happen simply by chance.
- **Seeing relationships that do not exist: Making something out of nothing.** An extremely common reasoning error is the misperception that two events that happen at the same time must somehow be related. In our desire to find predictability in the world, we sometimes see order that does not exist. Believing that events are related when they are not can lead to superstitious behavior. For example, an athlete thinks she must eat a certain meal before a game in order to win, or a fan believes that wearing his favorite team’s jersey helps the team win. But many times events that appear related are just coincidence. Consider a humorous example. Over the last 200 years, the mean global temperature has increased. During that same period, the number of pirates on the high seas has decreased. Would you argue that the demise of

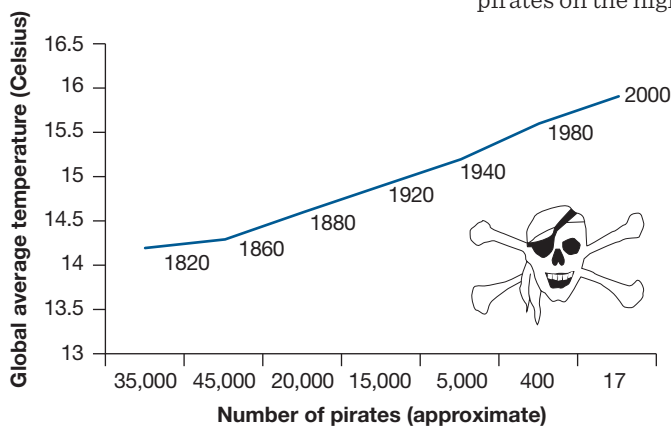


FIGURE 1.6 A Humorous Example
Sometimes things that appear related are not.

pirates has led to increased global warming (**FIGURE 1.6**)?

- **Using relative comparisons: Now that you put it that way.** When people are asked to guess the result of multiplying $8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$, the average guess is around 2250. But when people are asked to guess the result of multiplying $1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8$, the average is only 512 (Tversky & Kahneman, 1974). The real answer is 40,320. Why would starting with a larger number lead to a higher guess and starting with a smaller number lead to a lower guess? Information that comes first has a strong influence on how people make relative comparisons. How a question is framed, or presented, also changes how people answer the question. For example, people tend to prefer information that is presented positively rather

than negatively. Consider a medical treatment. People will generally feel more enthusiastic about a treatment if they are told how many lives the treatment can save. People are less enthusiastic if they are told how many people will not be saved by the same treatment. Whichever way the treatment is looked at, the outcome is the same. The framing determines people's relative comparisons.

- **Accepting after-the-fact explanations: I can explain!** Because people expect the world to make sense, they often come up with explanations for why events happen. They do so even when they have incomplete information. One form of this reasoning bias is known as *hindsight bias*. We are wonderful at explaining why things happened, but we are much less successful at predicting future events. Think about the fatal shootings in 2012 at Sandy Hook Elementary School, in Newtown, Connecticut. In hindsight, we know that there were warning signs that the shooter, Adam Lanza, might become violent (**FIGURE 1.7**). Yet none of these warning signs prompted anyone to take action. People saw the signs but failed to predict the tragic outcome. More generally, once we know the outcome, we interpret and reinterpret old evidence to make sense of that outcome. Likewise, when political pundits predict an election outcome and get it wrong, they later come out with all sorts of explanations for the election result. If they had really seen those factors as important before the election, they should have made a different prediction. We need to be wary of after-the-fact explanations because they tend to distort the evidence.
- **Taking mental shortcuts: Keeping it simple.** People often follow simple rules, called heuristics, to make decisions. These mental shortcuts are valuable because they often produce reasonably good decisions without too much effort (Kida, 2006). Unfortunately, many heuristics can lead to inaccurate judgments and biased outcomes. One example of this problem occurs when things that come most easily to mind guide our thinking. After hearing a series of news reports about child abductions, people overestimate how often such abductions happen. Parents become overly concerned about their children being abducted. As a result, people may underestimate other dangers facing children, such as bicycle accidents, food poisoning, or drowning. Child abductions are much more likely to be reported in the news than these much more common dangers. The vivid nature of the abduction reports makes them easy to remember. Similar processes lead people to drive rather than fly even though the chances of injury or death from passenger vehicles are much greater than the chances of dying in a plane crash. In Chapter 8, we will consider a number of heuristic biases.
- **Failing to see our own inadequacies (self-serving bias): Everyone is better than average.** People are motivated to feel good about themselves, and this motivation affects how they think (Kunda, 1990). For example, many people believe they are better than average on any number of dimensions. More than 90 percent of people think they are better-than-average drivers, but this percentage is illogical because only 50 percent can be above average on any dimension. People use various strategies to support their positive views, such as crediting personal strengths for their successes and blaming outside forces for their failures. In general, people interpret information in ways that support their positive beliefs about themselves. One factor that promotes overconfidence is that people often have difficulty recognizing their own weaknesses. This factor is described further in “What to Believe? Using Psychological Reasoning,” on the next page.

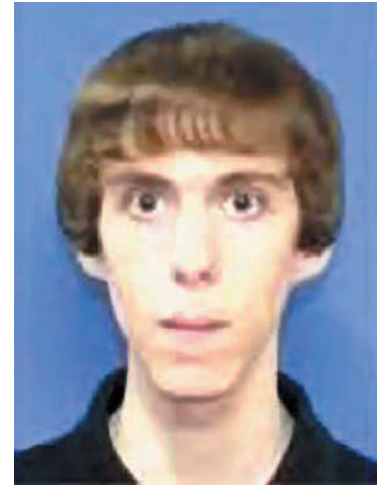


FIGURE 1.7
Sandy Hook Shootings

In hindsight, there were warning signs that the Newtown shooter, Adam Lanza, was troubled. But it is very difficult to predict violent behavior in advance.