Methods in Behavioral Research

Methods in Behavioral Research

FOURTEENTH EDITION

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METHODS IN BEHAVIORAL RESEARCH, FOURTEENTH EDITION

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Contents

Preface

Methods in Behavioral Research featuring updates from the Publication Manual of the American Psychological Association (7th ed.) guides students toward success by helping them study smarter and more efficiently. Supported by SmartBook®, McGraw-Hill Education's adaptive and personalized reading experience, Cozby and Bates provide helpful pedagogy, rich examples, and clear voice in their approach to methodological decision making.

IN THE FOURTEENTH EDITION, we strive for an accessible presentation and continue looking for opportunities to drive home foundational concepts and reinforce students' understanding of the material. We have reimagined end-of-chapter content. We chose concepts that students have traditionally found most challenging and designed exercises that ask them to reflect, recall, and organize the material. We have also aligned the fourteenth edition with the newly released the Publication Manual of the American Psychological Association (7th ed.). Focused organization combined with clear and direct writing remains a hallmark of *Methods in Behavioral Research*. Chapters follow the arc of a research investigation from planning through conducting and presenting.

ORGANIZATION

Methods in Behavioral Research moves carefully through the major concepts in behavioral research from the foundations of scientific study through practical issues in research design and implementation.

"Scientific Understanding of Behavior" grounds students in the scientific approach, emphasizing the distinction between basic and applied research. "Where to Start" discusses sources of ideas for research and the importance of library research. "Ethics in Behavioral Research" focuses on research ethics; ethical issues are covered in depth here and emphasized throughout the book. "Fundamental Research Issues" introduces validity and examines psychological variables and the distinction between experimental and nonexperimental approaches to studying relationships among variables. "Measurement Concepts" focuses on measurement issues, including reliability and validity. Nonexperimental research approaches—including naturalistic observation, cases studies, and content analysis—are described in "Observational Methods." "Asking People About Themselves: Survey Research" covers sampling as well as the design of questionnaires and interviews. "Experimental Design" and "Conducting Experiments" present the basics of designing and conducting experiments. Factorial designs are emphasized in "Complex Experimental Designs." "Single-Case, Quasi-Experimental, and Developmental Research" discusses the designs for special applications: single-case experimental designs, developmental research designs, and quasi-experimental designs. "Understanding Research Results: Description and Correlation" and "Understanding Research Results: Statistical Inference" focus on the use of statistics to help students understand research results. These chapters include material on effect size and confidence intervals. Finally, "Generalization" discusses generalization issues, meta-analyses, and the importance of replications.

FEATURES

Methods in Behavioral Research includes the following features to enhance learning:

NEW! Critical Thinking: Consumer of Research. These exercises are designed to get students out of the textbook and out of their classrooms and into the broader world in which we all move. These exercises ask students to look at examples of research—such as studies on the predictors of happiness and the causes and

effects of sitting in the front of the classroom—to compare what they've learned in class or the text with what they see. Applying the concepts they have learned will help them expand their understanding of the content.

NEW! Fully updated according to the Publication Manual of the American Psychological Association (7th ed.): This edition includes and supports new guidelines on ethical and bias-free writing, adopted the new standard for in-text citations, updated rules for manuscript formatting, and adopted APA's final resolution to the eternal question: One space or two after a period? (Answer: One!)

NEW! Updated to align with 2019 federal guidelines that govern IRBs, including new categories of exempt review.

UPDATED! Check Your Learning: Practice Exercises. In previous editions, these Check Your Learning boxes were placed within the body of the chapter. We found that students often found this placement distracting and preferred to be able to control when to complete the exercises. We now include an in-text callout to place the content; the actual exercises and answers are at the end of the chapter.

Illustrative articles. These boxes include published journal articles with questions and exercises designed to focus on chapter-related material. In addition, the articles help students become familiar with the structure and language of journal articles in psychology. We have several new articles in this edition. Most important, we have provided links to online copies of the articles whenever possible.

Solid pedagogy. Each chapter opens with a set of learning objectives that serve as reading guides and ends with a review of major concepts and key terms.

Practical examples. Thought-provoking examples help students interpret challenging concepts and complex research designs. The concept of diversity of ideas is examined through the lens of biases regarding rap music. Theory article formats are introduced though a recent study on suicide.

Decision-making emphasis. Distinguishing among a variety of research designs helps students understand when to use one type of design over another.

FLEXIBLE

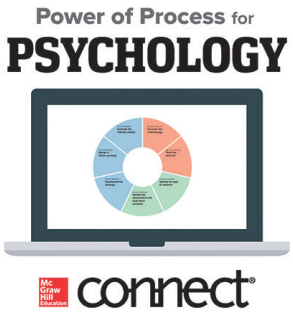
Chapters are designed to work independently, so that they can be adapted to any curriculum or syllabus. Sections are clearly defined and relevant practice exercises called out within each, making it easy to reorder or skip topics.

In addition, three appendices related to communicating research findings, ethical standards, and conducting statistical analyses can be used any time throughout the course. Appendix A includes an annotated version of a published paper and provides firm instructions for organizing research. Students can easily refer to the APA Ethics Code in Appendix B, and Appendix C includes a bank of statistical tests that can be applied to a variety of research designs.

Methods in Behavioral Research is available to instructors and students in traditional print format as well as online within McGraw Hill Connect, a digital assignment and assessment platform. Connect includes assignable and assessable videos, quizzes, exercises, and interactive activities, all associated with learning objectives

for *Methods in Behavioral Research*. These online tools make managing assignments easier for instructors, and learning and studying more motivating and efficient for students.

Power of Process, available in Connect for Research Methods, guides students through the process of critical reading, analysis, and writing. Faculty can select or upload their own content, such as journal articles, and assign analysis strategies to gain insight into students' application of the scientific method. For students, Power of Process offers a guided visual approach to exercising critical thinking strategies to apply before, during, and after reading published research.



BETTER DATA, SMARTER REVISIONS, IMPROVED RESULTS

For this new edition, data were analyzed to identify the concepts students found to be the most difficult, allowing for expansion upon the discussion, practice, and assessment of challenging topics. The revision process for a new edition used to begin with gathering information from instructors about what they would change and what they would keep.

Experts in the field were asked to provide comments that pointed out new material to add and dated material to review. Using all these reviews, authors would revise the material. But today a new tool has revolutionized that model.

McGraw-Hill Education authors now have access to student performance data to analyze and inform their revisions. These data are anonymously collected from the many students who use SmartBook, the adaptive learning system that provides students with individualized assessment of their own progress. Because virtually every text paragraph is tied to several questions that students answer while using SmartBook, the specific concepts with which students are having the most difficulty are easily pinpointed through empirical data in the form of a "heat map" report.

New to this edition, SmartBook is now optimized for mobile and tablet and is accessible for students with disabilities. Content-wise, it has been enhanced with improved learning objectives that are measurable and observable to improve student outcomes.

POWERFUL REPORTING

Whether a class is face-to-face, hybrid, or entirely online, McGraw-Hill Connect provides the tools needed to reduce the amount of time and energy instructors spend administering their courses. Easy-to-use course management tools allow instructors to spend less time administering and more time teaching, while reports allow students to monitor their progress and optimize their study time.

- The **At-Risk Student Report** provides instructors with one-click access to a dashboard that identifies students who are at risk of dropping out of the course due to low engagement levels.
- The **Category Analysis Report** details student performance relative to specific learning objectives and goals, including APA learning goals and outcomes and levels of Bloom's taxonomy.
- **Connect Insight** is a one-of-a-kind visual analytics dashboard—now available for both instructors and students—that provides at-a-glance information regarding student performance.
- **The SmartBook Reports** allow instructors and students to easily monitor progress and pinpoint areas of weakness, giving each student a personalized study plan to achieve success.

ADDITIONAL RESOURCES

Mc Graw Hill create®

Achieve simplicity in assigning and engaging your students with course materials. Craft your teaching resources to match the way you teach! With McGraw-Hill Create, you can easily rearrange chapters, combine material from other content sources, and quickly upload content you have written, such as your course syllabus or teaching notes. Find the content you need in Create by searching through thousands of leading McGraw-Hill textbooks. Arrange your book to fit your teaching style. Create even allows you to personalize your book's appearance by selecting the cover and adding your name, school, and course information. Order a Create book and you'll receive a complimentary electronic review copy (eComp) via email in about an hour. Experience how McGraw-Hill Create empowers you to teach your students *your* way: http://create.mheducation.com

Mc Graw Hill Campus

McGraw-Hill Campus provides faculty with true single sign-on access to all of McGraw-Hill's course content, digital tools, and other high-quality learning resources from any LMS. This innovative offering allows for secure and deep integration, enabling seamless access for faculty and students to any of McGraw-Hill's course solutions, such as McGraw-Hill Connect (all-digital teaching and learning platform) and McGraw-Hill Create (state-of-the-art custom-publishing platform McGraw-Hill Campus includes access to McGraw-Hill's entire content library, including eBooks, assessment tools, presentation slides, multimedia content, and other resources. McGraw-Hill Campus provides instructors with open, unlimited access to prepare for class, create tests/quizzes, develop lecture material, integrate interactive content, and more: http://www.mhcampus.com

CHANGES TO THE FOURTEENTH EDITION

The fourteenth edition of *Methods in Behavioral Research* includes numerous updates and new references. Here is a list of major changes as they appear by chapter.

Chapter 1

- Added discussion on the importance of becoming a savvy consumer of research.
- Added discussion of risky outcomes that result from researcher overreach.
- Critical Thinking: Read editorials from large national newspapers and evaluate for intuition, appeals to authority, and supporting evidence. Consider both sides of two arguments about major assertions about behavioral research studies as a discipline. Sift through data presented in an online article about eating disorders to identify cause and effect and explanation.

Chapter 2

- New discussion added to "Source of Ideas" offers clues to where one might find inspiration for a new research study.
- Added example of how practical problems in everyday life can stimulate research studies.
- New analysis of biases toward rap music within the framework of diversity of ideas.
- Refined discussion of literature reviews, where to find them and how to use them.
- New example of a recent theory article about suicide.
- New example of an article search using Web of Science.
- New Critical Thinking box: Review four different articles related to behavioral science that have recently appeared in the popular press including stress in teens and happy memories as health boosters.

Chapter 3

- Added emphasis on the exempt review of minimal risk research.
- Deeper discussion of the functions of an IRB.
- New Critical Thinking box: Consider the ethics behind three controversial research studies including Milgram. Read your college's student code of conduct and consider ways to improve upon the plagiarism section.

Chapter 4

- A fourth validity added: statistical validity.
- New Critical Thinking box: Review operational definitions and why they are important. Work through the components of research including hypothesis (both experimental and nonexperimental method) variable, cause and effect.

Chapter 5

- New study added to illustrative article on measurement concepts that aimed to reduce bias in STET ratings by adjusting language on the form.
- New Critical Thinking box: Review two personality assessments to determine their reliability and consider ways to assess construct validity.

Chapter 6

- New Critical Thinking box: Develop a research question that can best be used addressed through qualitative techniques. Locate and summarize two reviews of a recent book about Henry Molaison by his grandson.

Chapter 7

- Updated Figure 1 includes new data on annual prevalence of teenage marijuana use.
- Section of nonverbal scales has been expanded to include adult populations.
- Explanation of recently developed *Prime Panels*, a recruiting tool for unique samples.
- New Critical Thinking box: Work through a survey from evaluating the questions to analyzing the results. Briefly plan an online survey with an adult population regarding family, professional, and life satisfaction.

Chapter 8

- New Critical Thinking box: Review two different experimental designs and share ideas for how they could be improved or how specific problems could be addressed.

Chapter 9

- Refined discussion on quantifying observed behaviors.
- New illustrative article: "Conducting Experiments."
- New Critical Thinking box: Consider sample scenario in a pilot study and work through questions about the manipulations, variables, controls, and outcomes.

Chapter 10

- Revised illustrative article: "Complex Experimental Designs."
- New Critical Thinking box: Work through a 2 × 2 with independent groups and consider the effects as variables are adjusted. In a second experiment, identify the design, variables, conditions and possible interactions.

Chapter 11

- New illustrative article: "A Longitudinal Study."
- New Critical Thinking box: Look for problems and explain outcomes in five different sample research scenarios.

Chapter 12

- New Critical Thinking box: Create your own sample by asking students on campus to ask a question about the courses they are taking. Think of three variables that use a nominal scale

Chapter 13

- Added discussion on choosing a sample size.
- New Critical Thinking box: Plan parts of a research design. Analyze research on attitudes toward individuals in wheelchairs.

Chapter 14

- Added an in-depth note on the Open Science initiative and the replication crisis in psychology.
- New Critical Thinking box: Think through a sample of college students and consider what makes it a unique population.

INSTRUCTOR RESOURCES

Methods in Behavioral Research also includes the following instructor resources:

Instructor's Manual: Designed to provide a wide variety of resources for presenting the course, the instructor's manual includes learning objectives, ideas for lectures and discussions, laboratory demonstrations, and activities aligned specifically to facilitate a clearer knowledge of research methods.

Test Bank: By increasing the rigor of the test bank development process, McGraw-Hill has raised the bar for student assessment. A coordinated team of subject-matter experts methodically vetted each question and each set of possible answers for accuracy, clarity, and effectiveness. Each question is further annotated for level of page difficulty, Bloom's taxonomy, APA learning outcomes, and corresponding coverage in the text. Structured by chapter, the questions are designed to test students' conceptual, applied, and factual understanding.

Test Builder: New to this edition and available within Connect, Test Builder is a cloud-based tool that enables instructors to format tests that can be printed or administered within a Learning Management System. Test Builder offers a modern, streamlined interface for easy content configuration that matches course needs, without requiring a download.

Test Builder enables instructors to:

- Access all test bank content from a particular title
- Easily pinpoint the most relevant content through robust filtering options
- Manipulate the order of questions or scramble questions and / or answers
- Pin questions to a specific location within a test
- Determine your preferred treatment of algorithmic questions
- Choose the layout and spacing
- Add instructions and configure default settings

Lecture Presentation: Accessibility compliant, PowerPoint slides are provided that present key points of the chapter, along with supporting visuals. All of the slides can be modified to meet individual needs.

Image Gallery: The complete set of figures and tables from the text are available for download and can be easily embedded into PowerPoint slides.

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Scott C. Bates is a Professor and Department Head of the Psychology Department at Utah State University in Logan, Utah. He earned a B.S. in Psychology from Whitman College, an M.S. in Psychology from Western Washington University, and a Ph.D. in social psychology from Colorado State University. His research interests and experiences are varied. He has conducted research in areas as wide-ranging as adolescent problem behavior and problem-behavior prevention, teaching and learning in higher education, and the psychological consequences of growing and tending plants in outer space.

We are always interested in receiving comments and suggestions from students and instructors. Please email us at scott.bates@usu.edu or cozby@fullerton.edu.

1 Scientific Understanding of Behavior

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LEARNING OBJECTIVES

- Describe why it is important to understand research methods.
- Describe the scientific approach to understanding behavior, and contrast it with a pseudoscientific approach.
- Define and give examples of the four goals of scientific research: description, prediction, determination of cause, and explanation of behavior.
- Discuss the three elements for inferring causation: temporal order, covariation of cause and effect, and elimination of alternative explanations.
- Define, describe, compare, and contrast basic and applied research.

Do social media sites like Facebook and Instagram impact our relationships? What causes alcoholism? How do our early childhood experiences affect our later lives? How do we remember things, what causes us to forget, and how can memory be improved? Why do we procrastinate? Why do some people experience anxiety so extreme that it disrupts their lives, while others—facing the same situation—seem to be unaffected? How can we help people who suffer from depression? Why do we like certain people and dislike others? How can employers nurture employee well-being in a high-stress workplace?

Curiosity about questions like these is probably the most important reason many students decide to take courses in the behavioral sciences. Science is the best way to explore and answer these sorts of questions. In this book, we will examine the methods of scientific research in the behavioral sciences. In this introductory chapter, we will focus on ways in which knowledge of research methods can be useful in understanding the world around us. Further, we will review the characteristics of a scientific approach to the study of behavior and the general types of research questions that concern behavioral scientists.

CONSUMING RESEARCH

We are continuously bombarded with research results: The *New York Times* runs many articles with titles like "Parents Should Avoid Comments on a Child's Weight," "Abortion Is Found to Have Little Effect on Women's Mental Health," and "Insomniacs Are Helped by Online Therapy." The *Washington Post* declared, "Large study supports 'weekend warrior' approach to lifetime fitness." Meanwhile, over on cable news, CNN reports that "Facebook can actually make us more narrow-minded," while Fox News notes that "Alcohol ads should be banned from sporting events, says study." MSNBC told us to buy a pet—"Kids with pets have less anxiety"—but *People Magazine* tells us, hold on, "Your Beloved Cat Could Be Making Your PMS Worse!" Even Buzzfeed gets into the act, letting the bookstore owners among us know that a "New Study Finds That Filling Bookstores with the Scent of Chocolate Makes You Shop Longer," and Buzzfeed also wondered, "Is America Having a 'Friendship Slump'?"

Articles, books, websites, and social media posts make claims about the beneficial or harmful effects of particular diets or vitamins on one's sex life, personality, or health. There are frequent reports of survey results that draw conclusions about our views on a variety of topics—who we will vote for, what we think about a product, where we stand on political hot topics of the day.

The key question is: How do you evaluate such reports? Do you simply accept the findings because they are supposed to be scientific? A background in research methods will help you read these reports critically, evaluate the methods employed, and decide whether the conclusions are reasonable. Learning about research methods will help you think critically; learning about research methods will help you be a skilled consumer of research.

Why Learn About Research Methods?

Beyond learning to think critically about research findings, there are many ways that research impacts today's society, and many reasons why learning about research methods is important.

First, many occupations require the use of research findings. For example, mental health professionals must make decisions about treatment methods, assignment of clients to different types of facilities, medications, and testing procedures. Such decisions are made on the basis of research; to make good decisions, mental health professionals must be able to read the research literature in the field and apply it to their professional lives. Similarly, people working in business environments frequently rely on research to make decisions about

marketing strategies, ways of improving employee productivity and morale, and methods of selecting and training new employees. Educators must keep up with research on topics such as the effectiveness of various teaching strategies or programs to deal with special student problems. It is useful to have a knowledge of research methods and the ability to evaluate research reports in many fields.

It is also important to recognize that scientific research has become increasingly prominent in public policy decisions. Legislators and political leaders at all levels of government frequently take political positions and propose legislation based on research findings. Research may also influence judicial decisions: A classic example of this is the *Social Science Brief* that was prepared by psychologists and accepted as evidence in the landmark 1954 case *Brown v. Board of Education,* in which the U.S. Supreme Court banned school segregation in the United States. One of the studies cited in the brief was conducted by Clark and Clark (1947), who found that when allowed to choose between light-skinned and dark-skinned dolls, both Black and White children preferred to play with the light-skinned dolls (see Stephan, 1983, for a further discussion of the implications of this study).

Behavioral research on human development has influenced U.S. Supreme Court decisions related to juvenile crime. In 2005, for instance, the Supreme Court decided that juveniles could not face the death penalty (*Roper v. Simmons*), and the decision was informed by neurological and behavioral research showing that in juveniles, the level of development of their brains, social relationships, and character make juveniles less culpable than adults for the same crimes. Similarly, in 2010, in *Graham v. Florida*, the U.S. Supreme Court decided that juvenile offenders could not be sentenced to life in prison without parole for nonhomicide offenses. This decision was influenced by research in developmental psychology and neuroscience. The Court majority pointed to this research in their conclusion that assessment of blame and standards for sentencing should be different for juveniles and adults because juveniles lack adults' maturity, ability to resist pressures from peers and others, and personal sense of responsibility (Clay, 2010).

Research is also important when developing and assessing the effectiveness of programs designed to achieve certain goals—for example, to increase retention of students in school, influence people to engage in behaviors that reduce their risk of contracting HIV, or teach employees how to reduce the effects of stress. We need to be able to determine whether these programs are successfully meeting their goals.

Finally, research methods are important because they can provide us with the best answers to questions like those we posed at the outset of this chapter. Research methods can be the way to satisfy our native curiosity about ourselves, our world, and those around us.

WAYS OF KNOWING

We opened this chapter with several questions about human behavior and suggested that scientific research is a valuable means of answering them. How does the scientific approach differ from other ways of learning about behavior? People have always observed the world around them and sought explanations for what they see and experience. However, instead of using a scientific approach, many people rely on *intuition* and *authority* as primary ways of knowing.

Intuition and Anecdote

Most of us either know or have heard about a couple in a relationship who, after years of trying to conceive, adopt a child. Then very soon after adopting, the woman becomes pregnant. This observation leads to a belief that adoption increases the likelihood of pregnancy for couples who are having difficulties conceiving a child.

People usually go one step further and offer an explanation for this effect—such as, that the adoption reduces a major source of marital stress, and the stress reduction in turn increases the chances of conception (see Gilovich, 1991).

This example illustrates the use of intuition and anecdotal evidence to draw general conclusions about the world around us. When you rely on intuition, you accept unquestioningly what your own personal judgment or a single story (anecdote) about one person's experience tells you. The intuitive approach takes many forms. Often it involves finding an explanation for our own behaviors or the behaviors of others. For example, you might develop an explanation for why you keep having conflicts with your roommate, such as "He hates me" or "Having to share a bathroom creates conflict." Other times, intuition is used to explain events that you observe, as in the case of concluding that adoption increases the chances of conception among couples having difficulty conceiving a child.

A problem with intuition is that numerous cognitive and motivational biases affect our perceptions, and so we may draw erroneous conclusions about cause and effect (cf. Fiske & Taylor, 1984; Gilovich, 1991; Nisbett & Ross, 1980; Nisbett & Wilson, 1977). Gilovich points out that there is in fact no relationship between adoption and subsequent pregnancy, according to scientific research investigations. So why do we hold this belief? Most likely it is because of a cognitive bias called *illusory correlation* that occurs when we focus on two events that stand out and occur together. When an adoption is closely followed by a pregnancy, our attention is drawn to the situation, and we are biased to conclude that there must be a causal connection. Such illusory correlations are also likely to occur when we are highly motivated to believe in the causal relationship. Although this is a natural thing for us to do, it is not scientific. A scientific approach requires much more evidence before conclusions can be drawn.

Authority

The philosopher Aristotle said: "Persuasion is achieved by the speaker's personal character when the speech is so spoken as to make us think him credible. We believe good men more fully and readily than others." Aristotle would argue that we are more likely to be persuaded by a speaker who seems prestigious, trustworthy, and respectable than by one who appears to lack such qualities.

Many of us might accept Aristotle's arguments simply because he is considered a prestigious authority—a convincing and influential source—and his writings remain important. Similarly, many people are all too ready to accept anything they learn from the internet, news media, books, government officials, celebrities, religious figures, or even a professor! They believe that the statements of such authorities must be true. The problem, of course, is that the statements may not be true. The scientific approach rejects the notion that one can accept *on faith* the statements of any authority; again, more evidence is needed before we can draw scientific conclusions.

Empiricism

The scientific approach to acquiring knowledge recognizes that intuition, anecdote, and authority can be sources of ideas about behavior. However, scientists do not unquestioningly accept anyone's intuitions—including their own. Scientists recognize that *their* ideas are just as likely to be wrong as anyone else's. Also, scientists do not accept on faith anyone's pronouncements, regardless of that person's prestige or authority. Thus, scientists are very skeptical about what they see and hear. Scientific skepticism means that ideas must be evaluated on the basis of careful logic and results from scientific investigations.

If scientists reject intuition and blind acceptance of authority as ways of knowing about the world, how do they go about gaining knowledge? The fundamental characteristic of the scientific method is **empiricism**—the idea that knowledge comes from observations. Data are collected that form the basis of conclusions about the nature of the world. The scientific method embodies a number of rules for collecting and evaluating data; these rules will be explored throughout this book.

The Scientific Approach

The power of the scientific approach can be seen all around us. Whether you look at biology, chemistry, medicine, physics, anthropology, or psychology, you will see amazing advances over the past 5, 25, 50, or 100 years. We have a greater understanding of the world around us, and the applications of that understanding have kept pace. Goodstein (2000) describes an "evolved theory of science" that defines the characteristics of scientific inquiry. These characteristics are summarized below.

- **Data play a central role.** For scientists, knowledge is primarily based on observations. Scientists enthusiastically search for observations that will verify or reject their ideas about the world. They develop theories, argue that existing data support their theories, and conduct research that can increase our confidence that the theories are correct. Observations can be criticized, alternatives can be suggested, and data collection methods can be called into question. But in each of these cases, the role of data is central and fundamental. Scientists have a "show me, don't tell me" attitude.
- **Scientists are not alone.** Scientists make observations that are accurately reported to other scientists and the public. You can be sure that many other scientists will follow up on the findings by conducting research that replicates and extends these observations.
- **Science is adversarial.** Science is a way of thinking in which ideas do battle with other ideas in order to move ever closer to truth. Research can be conducted to test any idea; supporters of the idea and those who disagree with the idea can report their research findings, and these can be evaluated by others. Some ideas, even some very good ideas, may prove to be wrong if research fails to provide support for them. Good scientific ideas are testable. They can be supported or they can be falsified by data—the latter concept is called **falsifiability** (Popper, 2002). If an idea is falsified when it is tested, science is thereby advanced because this result will spur the development of new and better ideas.
- **Scientific evidence is peer reviewed.** Before a study is published in a top-quality scientific journal, it is reviewed by other scientists who have the expertise to carefully evaluate the research. This process is called **peer review.** The role of these reviewers is to recommend whether the research should be published. This review process ensures that research with major flaws will not become part of the scientific literature. In essence, science exists in a free market of ideas in which the best ideas are supported by research, and scientists can build upon the research of others to make further advances.

Integrating Intuition, Anecdote, and Authority With Skepticism

The advantage of the scientific approach over other ways of knowing about the world is that it provides an objective set of rules for gathering, evaluating, and reporting information. It is an open system that allows ideas to be refuted or supported by others. This does not mean that intuition, anecdote, and authority are unimportant, however. As noted previously, scientists often rely on intuition and assertions of authorities for ideas for research. Moreover, there is nothing wrong with accepting the assertions of an authority as long as we do not accept them as scientific evidence. In many cases scientific evidence is not obtainable—for example, when a religious figure or text asks us to accept certain beliefs on faith. Some beliefs cannot be tested and

thus are beyond the realm of science. In science, however, ideas must be evaluated on the basis of available evidence that can be used to support or refute the ideas.

There is also nothing wrong with having opinions or beliefs as long as they are presented simply as opinions or beliefs. However, we should always ask whether the opinion can be tested scientifically or whether scientific evidence exists that relates to the opinion. For example, opinions on whether exposure to violent movies, TV, and video games increases aggression are only opinions until scientific evidence on the issue is gathered.

As you learn more about scientific methods, you will become increasingly skeptical of the research results reported in the media and the assertions of scientists as well. You should be aware that scientists often become authorities when they express their ideas. When someone claims to be a scientist, should we be more willing to accept what he or she has to say? First, ask about the individual's credentials. It is usually wise to pay more attention to someone with an established reputation in the field and attend to the reputation of the institution represented by the person. It is also worthwhile to examine the researcher's funding source; you might be a bit suspicious when research funded by a drug company supports the effectiveness of a drug manufactured by that company, for example. Similarly, when an organization with a particular social-political agenda funds the research that supports that agenda, you should be skeptical of the findings and closely examine the methods of the study.

You should also be skeptical of pseudoscientific research. **Pseudoscience** is the use of seemingly scientific terms and demonstrations to substantiate claims that have no basis in scientific research. The claim may be that a product or procedure will enhance your memory, relieve depression, or treat autism or post-traumatic stress disorder. The fact that these are all worthy outcomes makes us very susceptible to believing pseudoscientific claims and forgetting to ask whether there is a valid scientific basis for the claims.

A good example comes from a procedure called *facilitated communication* that has been used by therapists working with children with autism. These children lack verbal skills for communication; to help them communicate, a facilitator holds the child's hand while the child presses keys to type messages on a keyboard. This technique produces impressive results, indicating that the children are now able to express themselves. Of course, well-designed studies revealed that the facilitators, not the children, controlled the typing. The problem with all pseudoscience is that hopes are raised and promises will not be realized. Often the techniques can be dangerous as well. In the case of facilitated communication, a number of facilitators typed messages accusing a parent of physically or sexually abusing the child. Some parents were actually convicted of child abuse. In these legal cases, the scientific research on facilitated communication was used to help the defendant parent. Cases such as this have led to a movement to promote the exclusive use of evidence-based therapies—therapeutic interventions grounded in scientific research findings that demonstrate their effectiveness (Brown, 2016; cf. Lilienfeld et al., 2004).

So how can you tell if a claim is pseudoscientific? It is not easy. In fact, a philosopher of science noted that "the boundaries separating science, nonscience, and pseudoscience are much fuzzier and more permeable than ... most scientists ... would have us believe" (Pigliucci, 2010). Here are a few things to look for when evaluating claims:

- Claims that are untestable and therefore cannot be refuted
- Claims that rely on imprecise, biased, or vague language
- Evidence that is based on anecdotes and testimonials rather than scientific data
- Evidence that is from "experts" who have only vague qualifications and do not support their claims with sound scientific evidence
- Claims based only on confirmatory evidence, ignoring conflicting evidence
- Reliance on "scientific" evidence that cannot be independently verified because the methods used to establish that evidence have not been described

Finally, we are all increasingly susceptible to false reports of scientific findings circulated via the internet. Many of these reports claim to be associated with a reputable scientist or scientific organization, and then they take on a life of their own. A recent widely covered report, supposedly from the World Health Organization, claimed that the gene for blond hair was being selected out of the human gene pool. Blond hair would be a disappearing trait! General rules to follow when reading internet sites: (1) Be highly skeptical of scientific assertions that are supported by only vague or improbable evidence, and (2) Take the time to do an internet search for supportive evidence. At internet sites like **snopes.com**, **truthorfiction.com**, and **factcheck.org/askscicheck/** you can check many of the claims that are on the internet.

Being a Skilled Consumer of Research

How much trust we should place in a study depends upon the methods that were used to conduct the study. Sometimes study authors overreach, coming to conclusions that are not justified. Four questions can be asked of any research study that will reveal a lot about how much the study should be trusted. The better the answers to these questions, the more confident you can be of the study:

1. **"What was measured?"** All studies in the behavioral sciences start with measurement: identifying the important concepts to be studied, and figuring out how to measure them. This is related to the concept of construct validity, which will be covered in depth in later chapters.
2. **"How do they know that one thing caused another?"** Often—particularly in popular media—there will be the claim that one thing causes another. A good question to ask here is: How do they know? This is related to the concept of internal validity, which will be covered in later chapters.
3. **"To what or whom can we generalize the results?"** This is related to the concept of external validity, which will be covered in later chapters.
4. **"Have other researchers found similar results?"** A single study can be interesting, but scientific progress involves the accumulation of studies. We can be more confident in a study if other studies have found the same thing.

GOALS OF BEHAVIORAL SCIENCE

Scientific research on behavior has four general goals: (1) to describe behavior, (2) to predict behavior, (3) to determine the causes of behavior, and (4) to understand or explain behavior.

Description of Behavior

The scientist begins with careful observation, because the first goal of science is to describe behavior—which can be something directly observable (such as running speed, eye gaze, or loudness of laughter) or something less observable (such as self-reports of perceptions of attractiveness). Using a written questionnaire, researchers at the Kaiser Family Foundation (Rideout et al., 2010) collected data on the use of media (e.g., television, cell phones, movies) by more than 2,000 8- to 18-year-olds. One section of the questionnaire asked about computer use. **Figure 1** shows the percentage of time spent on various recreational computer activities in a typical day. As you can see, social networking and game playing are the most common activities. This is the sort of study that benefits from replication every few years to reveal changes that occur with new technologies and attitudes.

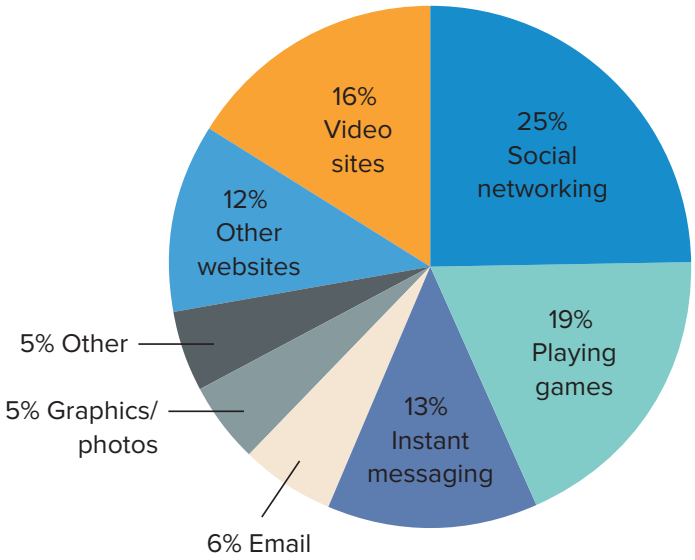

FIGURE 1 Time spent on recreational computer activities by 8-18 year olds

Researchers are often interested in describing the ways in which events are systematically related to one another. If parents place limits on their children's recreational computer use, do their children perform better in school? Do jurors judge attractive defendants more leniently than unattractive defendants? Are people more likely to be persuaded by a speaker who has high credibility? In what ways do cognitive abilities change as people grow older? Do students who study with a television set on score lower on exams than students who study in a quiet environment? Do taller people make more money than shorter people?

Prediction of Behavior

A second goal of behavioral science is to predict behavior. Once it has been observed with some regularity that two events are related to one another (e.g., that greater attractiveness is associated with more lenient sentencing), it becomes possible to make predictions. We can anticipate events. If you read about an upcoming trial of a very attractive defendant, you can predict that the person will likely receive a lenient sentence. Further, the ability to make accurate predictions can help us make better decisions. For example, if you study the behavioral science research literature on attraction and relationships, you will learn about factors that predict long-term relationship satisfaction. You may be able to then use that information when predicting the likely success of your own relationships. You can even complete a questionnaire designed to measure a number of predictors of relationship success. Measures such as RELATE, FOCCUS Pre-Marriage Inventory, and PREPARE can be completed by yourself, with a partner, or with the help of a professional counselor (Larson et al., 2002).

Determining the Causes of Behavior

A third goal of science is to determine the *causes* of behavior. Although we might accurately predict the occurrence of a behavior, we might not correctly identify its cause. Research shows that a child's aggressive behavior can be predicted by knowing how much violence the child views on television. Unfortunately, unless

we know that exposure to television violence is a *cause* of behavior, we cannot assert that aggressive behavior can be reduced by limiting scenes of violence on television. A child who is highly aggressive may prefer to watch violence when choosing television programs. We are now confronting questions of cause and effect: To know how to *change* behavior, we need to know the *causes* of behavior.

Cook and Campbell (1979) describe three types of evidence (drawn from the work of philosopher John Stuart Mill) used to identify the cause of a behavior. It is not enough to know that two events occur together, as in the case of knowing that watching television violence is a predictor of actual aggression. To conclude causation, three things must hold true (see **Figure 2**):

1. There is a temporal order of events in which the cause *precedes* the effect. This is called **temporal precedence.** Thus, we need to know that television viewing occurred first and aggression followed.
2. When the cause is present, the effect occurs; when the cause is not present, the effect does not occur. This is called **covariation of cause and effect.** We need to know that children who watch television violence behave aggressively and that children who do not watch television violence do not behave aggressively.
3. Nothing other than a causal variable could be responsible for the observed effect. This is called elimination of **alternative explanations.** There should be no other plausible alternative explanation for the relationship. This third point about alternative explanations is very important: Suppose that the children who watch a lot of television violence are left alone more than are children who do not view television violence. In this case, the increased aggression could have an alternative explanation: lack of parental supervision. Causation will be discussed again in the chapter **"Fundamental Research Issues."**

Explanation of Behavior

A final goal of science is to explain the events that have been described. The scientist seeks to understand *why* the behavior occurs. Consider the relationship between playing violent video games and aggression (APA Task Force on Violent Media, 2015). Even if we know that playing violent video games is a cause of aggressiveness, we still need to explain this relationship. Is it due to imitation or "modeling" of the game violence? Is it the result of psychological desensitization to violence and its effects? Does playing violent video games lead to a belief that aggression is a normal response to frustration and conflict? Further research is necessary to shed light on possible explanations of what has been observed. Usually additional research like this is carried out by testing theories that are developed to explain particular behaviors.

Description, prediction, determination of cause, and explanation are all closely intertwined. Determining cause and explaining behavior are particularly closely related because it is difficult ever to know the true cause or all the causes of any behavior. An explanation that appears satisfactory may turn out to be inadequate when other causes are identified in subsequent research. For example, when early research showed that speaker credibility is related to attitude change, the researchers explained the finding by stating that people are more willing to believe what is said by a person with high credibility than by one with low credibility. However, this explanation has given way to a more complex theory of attitude change that takes into account many other factors that are related to persuasion (Cooper et al., 2016; Petty et al., 2003). In short, there is a certain amount of ambiguity in the enterprise of scientific inquiry. New research findings almost always pose new questions that must be addressed by further research; explanations of behavior often must be discarded or revised as new evidence is gathered. Such ambiguity is part of the excitement and fun of science.

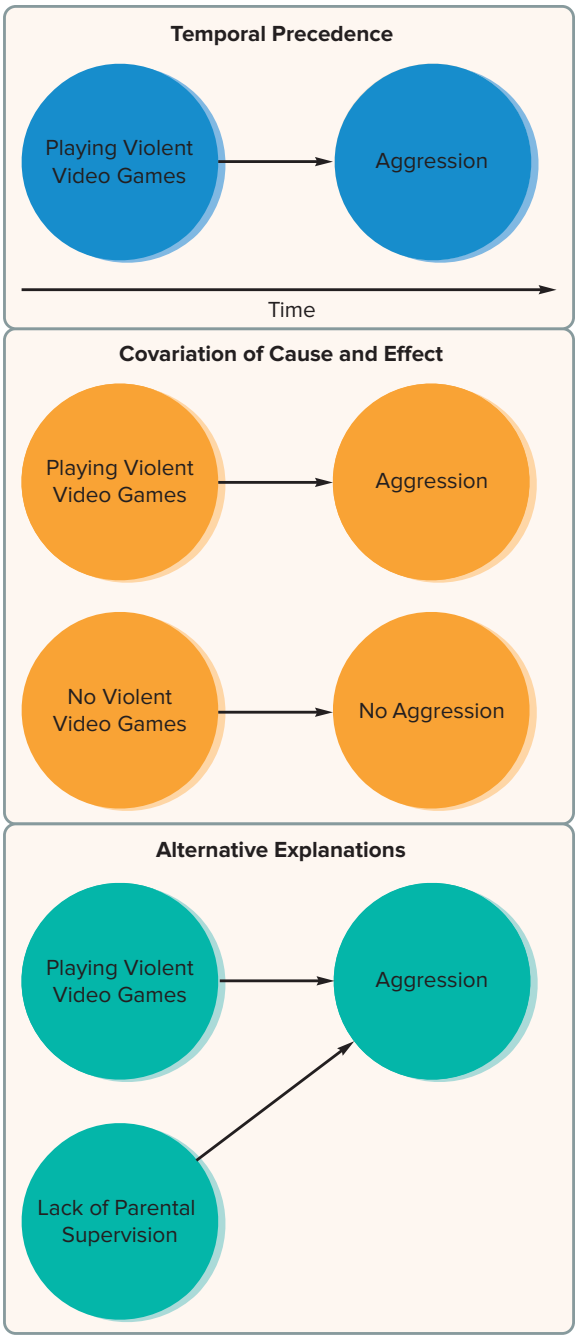

FIGURE 2 Determining cause and effect

Check Your Learning: Practice Exercise #1 gives you a chance to test your understanding of the distinctions among these four goals of science.

BASIC AND APPLIED RESEARCH

In addition to identifying the goals of scientific research (describe, predict, determination of cause, explanation), it is useful to categorize behavioral research investigations as primarily basic research or applied research. In this section we will explore the differences and similarities between basic and applied research.

Basic Research

Basic research tries to answer fundamental questions about the nature of behavior. Studies are often designed to address theoretical issues concerning phenomena such as cognition, emotion, motivation, learning, personality, development, and social behavior. Here are descriptions of a few journal articles that pertain to some basic research questions:

Brothers, T., & Traxler, M. J. (2016). Anticipating syntax during reading: Evidence from the boundary change paradigm. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *42*(12), 1894–1906. https://doi.org/10.1037/xlm0000257

When reading, you focus on text in the center of your visual field. However, you may also "preprocess" words that are just beyond the central focus; this is called the parafovea. This effect occurs even though the text lacks the clarity of the text in the center of the field of vision. The Brothers and Traxler (2016) study demonstrated that participants process not just the words in the parafovea but also their meaning. For example, sentences with valid syntax in the parafovea, such as "The admiral would not confess," were read more quickly than sentences with invalid syntax, such as "The admiral would not surgeon."

Butler, L. P., Schmidt, M. F. H., Tavassolie, N. S., & Gibbs, H. M. (2018). Children's evaluation of verified and unverified claims. *Journal of Experimental Child Psychology*, *176*(1), 73–83. https://doi.org/10.1016/j.jecp.2018.07.007

Do children as young as 3 to 5 years old distinguish between claims based on verified evidence and claims that have no supporting evidence? In their research, Butler et al. (2018) presented male and female children with a story involving two animal characters. In one of three test conditions, the characters discover a container outside their homes. One character looks inside the container and announces what's in the container; the other character declares the contents without looking in the container. The children then rated the claims on an acceptability scale ranging from "okay" to "not okay." For all the 3- to 5-year-old children, the evidence-based claim was rated more acceptable. This effect was greater for 4-year-olds than for 3-year-olds and greater still for the 5-year-olds.

Mace, J. H., McQueen, M. L., Hayslett, K. E., Staley, B. J. A., & Welch, T. J. (2019). Semantic memories prime autobiographical memories: General implications and implications for everyday autobiographical remembering. *Memory & Cognition, 47*(2), 299–312. https://doi.org/10.3758/s13421-018-0866-9

The researchers studied whether activation of a semantic memory (general knowledge) will activate related autobiographic memories (memories of personal experiences). In the first part of the experiment, participants were presented with a word familiarity task in which they might see a word such as *summer.* Later, they completed an autobiographical memory task with no limits on the topic of the memories. Compared to a control group that did not take part in the word familiarity task, the semantic priming word (e.g., *summer*) did influence the participants' autobiographical memories (summer-related personal memories).

Applied Research

The research articles listed above were concerned with basic processes of behavior and cognition rather than any immediate practical implications. In contrast, **applied research** is conducted to address issues in which there are practical problems and potential solutions. To illustrate, here are a few summaries of journal articles about applied research:

Rosen, C. C., Simon, L. S., Gajendran, R. S., Johnson, R. E., Lee, H. W., & Lin, S.-H. (Joanna). (2019). Boxed in by your inbox: Implications of daily e-mail demands for managers' leadership behaviors. *Journal of Applied Psychology*, *104*(1), 19–33. https://doi.org /10.1037/apl0000343

A common source of work stress is the overwhelming demands of incoming email messages. This study measured email demands among 48 managers enrolled in a university Executive Master of Business Administration program. Using the Experience Sampling Method (EMS), the researchers asked participants to complete two surveys each day for 10 consecutive workdays. The first survey arrived at the end of the morning and asked about the morning email demands and the manager's progress in meeting work goals up to that point in the day. Another survey at the end of the day measured the extent to which managers had engaged in behaviors reflecting outstanding leadership. As predicted, higher morning email demands were related to perceptions of lower goal progress. And the end-of-day surveys revealed that the morning demands were associated with fewer leadership behaviors.

Tauber, S. K., Witherby, A. E., Dunlosky, J., Rawson, K. A., Putnam, A. L., & Roediger, H. L., III. (2018). Does covert retrieval benefit learning of key-term definitions? *Journal of Applied Research in Memory and Cognition*, *7*(1), 106–115. https://doi.org/10.1016/j.jarmac.2016.10.004

Past research demonstrated that practicing recall of material results in superior recall in contrast with simply re-reading the same material. This study used the key-term definitions that are often found at the end of textbook chapters. The researchers were interested in whether the type of recall practice had an effect on actual recall later (as in a class exam). One group of participants studied the definitions and then used overt practice (typing the definitions). A second group used covert practice (mentally rehearsing the definitions). Another group did not practice recall; instead they simply restudied the definitions. On the final recall test taken later, participants using overt practice had higher scores than those in either of the other conditions. Typing the definitions proved superior to mental practice or restudy.

Guzzo, K. B., & Hayford, S. R. (2018). Adolescent reproductive and contraceptive knowledge and attitudes and adult contraceptive behavior. *Maternal and Child Health Journal*, *22*(1), 32–40. https://doi.org /10.1007/s10995-017-2351-7

Is knowledge about reproduction and contraception in adolescence related to adult contraceptive behavior? The researchers examined this question by using data from the National Longitudinal Survey of Adolescent to Adult Health, which surveyed the same individuals as adolescents in 1995 and as adults in 2007–2008. The adolescents who had more accurate knowledge of reproduction and contraception were found to be using more effective contraception methods as adults, and they were using contraceptives more consistently. The researchers recommend providing adolescents with more comprehensive sex education.

A major area of applied research is called **program evaluation,** which assesses the social reforms and innovations that occur in government, education, the criminal justice system, industry, health care, and mental health institutions. In an influential paper on "reforms as experiments," Campbell (1969) noted that social programs are really experiments designed to achieve certain outcomes. He argued persuasively that social scientists should evaluate each program to determine whether it is having its intended effect. If it is not, alternative programs should be tried. This is an important point that people in all organizations too often fail to remember when new ideas are implemented; the scientific approach dictates that new programs should be evaluated. Here are two sample journal articles about program evaluation:

Peterson, K., Sharps, P., Banyard, V., Powers, R. A., Kaukinen, C., Gross, D., ... & Campbell, J. (2018). An evaluation of two dating violence prevention programs on a college campus. *Journal of Interpersonal Violence*, *33*(23), 3630–3655. https://doi.org/10.1177/0886260516636069

Alarm over dating violence on college campuses has led to the development of programs designed to raise awareness and provide skills that might reduce the incidence of violence. This study compared two dating violence prevention programs presented to first-year college students. One was a 90-minute bystander education program designed to provide bystanders of violence with motivation and skills to intervene. The other program was a traditional education program focused on awareness of the problem. In addition, there was a no education control group. All students completed measures of rape myth acceptance, beliefs about the effectiveness of bystanders, and intentions to help in a dating violence situation. Both programs were superior to no education in changing attitudes and intentions; the bystander education program was superior to the traditional education program.

Schwinn, T. M., Schinke, S. P., Hopkins, J., Keller, B., & Liu, X. (2018). An online drug abuse prevention program for adolescent girls: Posttest and 1-year outcomes. *Journal of Youth and Adolescence*, *47*(3), 490–500. https://doi.org/10.1007/s10964-017-0714-4

Because drug abuse among early adolescent girls is increasing, an online program was designed to reduce drug use in this population. The program was presented online to a national sample of 788 13- and 14-year-old girls. The girls were assigned to participate in the program or a control condition with no intervention. The program consisted of nine sessions with particular attention paid to gender-specific aspects of drug use. A variety of measures were completed prior to the program, immediately after completion, and at a 1-year follow-up. These included drug/alcohol use, self-esteem, stress coping skills, and ability to refuse drug offers. The program had positive effects as measured immediately and one year later.

Much applied research is conducted in settings such as large business firms, marketing research companies, government agencies, and public polling organizations and is not published but instead is used within the company or by clients of the company. Whether or not such results are published,

however, they are used to help people make better decisions concerning problems that require immediate action.

Comparing Basic and Applied Research

Both basic and applied research are important, and neither can be considered superior to the other. In fact, progress in science is dependent on an interconnection between basic and applied research. Much applied research is guided by the theories and findings of basic research investigations. For example, one of the most effective treatment strategies for specific phobia—an anxiety disorder characterized by extreme fear reactions to specific objects or situations—is called *exposure therapy* (Chambless et al., 1996). In exposure therapy, people who suffer from a phobia are exposed to the object of their fears in a safe setting while a therapist trains them in relaxation techniques in order to counterprogram their fear reaction. This behavioral treatment emerged from the work of Pavlov and Watson, who studied the processes by which animals acquire, maintain, and, critically, lose reflexive reactions to stimuli (Wolpe, 1982). Today this work has been extended even further, as the use of virtual reality technologies to treat anxiety disorders has been studied and found to be as effective as traditional exposure treatment (Opris et al., 2012).

In recent years, many in our society, including legislators who control the budgets of research-granting agencies of the government, have demanded that research be directly relevant to specific social issues. The problem with this attitude toward research is that we can never predict the ultimate applications of basic research. Psychologist B. F. Skinner, for example, conducted basic research in the 1930s on operant conditioning, which carefully described the effects of reinforcement on such behaviors as bar pressing by rats. Years later this research led to many practical applications in therapy, education, and industry. Research with no apparent practical value ultimately can be very useful. The fact that no one can predict the eventual impact of basic research leads to the conclusion that support of basic research is necessary both to advance science and to benefit society.

At this point, you may be wondering if there is a definitive way to know whether a study should be considered basic or applied. The distinction between basic and applied research is a convenient typology but is probably more accurately viewed as a continuum. Notice in the listing of applied research studies that some are more applied than others. The study on adolescent smoking is very much applied—the data will be valuable for people who are planning smoking prevention and cessation programs for adolescents. The research on studying could be immediately used in advisement materials for students visiting a learning resource center on campus. All of these studies are grounded in applied issues and solutions to problems, but they differ in how quickly and easily the results of the study can actually be used.

Check Your Learning: In Practice Exercise #2, test your understanding of the distinction between basic and applied research.

Behavioral research is important in many fields and has significant applications to public policy. This chapter has introduced you to the major goals and general types of research. All researchers use scientific methods, whether they are interested in basic research, applied research, or program evaluation. The themes and concepts in this chapter will be expanded in the remainder of the book. They will be the basis on which you evaluate the research of others and plan your own research projects.

ILLUSTRATIVE ARTICLE: INTRODUCTION

Most chapters in this book include a chapter-closing feature called Illustrative Article, which is designed to relate some of the key points in the chapter to a published journal article. In each case, you will be asked to obtain a copy of the article using some of the skills that will be presented in our discussion in the chapter **"Where to Start."** Then, you will be asked to read the article and answer some questions that are closely aligned with the material in the chapter.

For our first illustrative article, acquire and read this article. Tip: You will find a pre-publication copy of the article using this link: https://openaccess.city.ac.uk/20979/1/FictionalMemories 19-04-18.pdf

Akhtar, S., Justice, L. V., Morrison, C. M., & Conway, M. A. (2018). Fictional first memories. *Psychological Science, 29*(10), 1612–1619. https://doi.org/10.1177/0956797618778831

After reading the article, answer the following questions (which will be familiar to you from earlier in this chapter!):

1. **"What was measured?"** All studies in the behavioral sciences start with measurement: identifying the important concepts to be studied, and figuring out how to measure them. This is related to the concept of construct validity, which will be covered in depth in later chapters.
2. **"How do they know that one thing caused another?"** Many times—particularly in popular media—there will be the claim that one thing causes another. It's always important to ask: How do they know? This is related to the concept of internal validity, which will be covered in later chapters.
3. **"To what or whom can we generalize the results?"** This is related to the concept of external validity, which will be covered in later chapters.
4. **"Have other researchers found similar results?"** A single study can be interesting, but scientific progress involves the accumulation of studies. We can be more confident in a study if other studies have found the same thing.
5. Finally, answer the following questions:
    a. Would you describe this study being applied research or basic research? Why?
    b. Which goal of science (description, prediction, causation, explanation) do you think is primarily targeted by this article? Why?

CRITICAL THINKING: BEING A SKILLED CONSUMER OF RESEARCH

1. Read several editorials in the *New York Times, Wall Street Journal, USA Today, Washington Post,* or another major metropolitan news publication and identify the sources used to support the assertions and conclusions. Did the writer use intuition, appeals to authority, scientific evidence, or a combination of these? Give specific examples.
2. Imagine a debate on the following statement: "Behavioral scientists should only conduct research that has immediate practical applications." Develop "pro" and "con" arguments—arguments that support or oppose the assertion.
3. Imagine a debate on the following statement: "Knowledge of research methods is unnecessary for students who intend to pursue careers in clinical and counseling psychology." Develop "pro"

and "con" arguments—arguments that support or oppose the assertion.

4. You read an article online that says, "Eating disorders may be more common in warm regions." It also says that a researcher found that the incidence of eating disorders among female students at a university in Florida was higher than at a university in Pennsylvania. Assume that this study accurately describes a difference between students at the two universities. Discuss the finding in terms of the issues of identification of cause and effect and explanation.

Check Your Learning: Practice Exercises

Practice Exercise #1

For the five studies briefly described below, identify the primary goal of science that seems designed to achieve: (a) description, (b) prediction, (c) determination of cause, or (d) understand/explain.

Study	Primary Goal of Science			
	Description	Prediction	Determination of Cause	Understand / Explain
1. A researcher studies sleep habits of college students in order to identify those who will graduate in four years and those who will not.				
2. A researcher uses a survey to collect information about the sleeping habits of college students in order to see if sleep has an impact on grades.				
3. A researcher conducts interviews of college students about their sleep habits in order to figure out why				

Study	Primary Goal of Science			
	Description	Prediction	Determination of Cause	Understand / Explain
college students struggle to get enough sleep.				
4. A researcher uses a survey to collect information about the sleeping habits of college students.				
5. A researcher has some college students drink a caffeinated soda at 11 p.m. and has others drink a decaffeinated version of the same soda, in order to see if sleep is affected by caffeine intake.				

Practice Exercise #2

Basic and Applied Research

Examples of research questions	Basic	Applied
1. What is the impact of being observed by others on a performance task like math problems?		
2. Do violent video games increase aggression among children and young adults?		
3. How do neurons generate neurotransmitters?		
4. Do we process visual images and sound simultaneously?		
5. How can a city increase recycling by residents?		
6. Which strategies are best for coping with climate change?		

(Answers are provided at the end of this chapter.)

CHAPTER REVIEW

Review Questions

1. Why is it important for anyone in our society to have knowledge of research methods?
2. Why is scientific skepticism useful in furthering our understanding of behavior?
3. How does the scientific approach differ from other ways of gaining knowledge about behavior?
4. Provide (a) definitions and (b) examples of description, prediction, determination of cause, and explanation as goals of scientific research.
5. Describe the three elements for inferring causation. Describe the characteristics of scientific inquiry, according to Goodstein (2000).
6. How does basic research differ from applied research?

Study Terms

Alternative explanations

Applied research

Authority

Basic research

Covariation of cause and effect

Empiricism

Falsifiability

Goals of behavioral science

Intuition

Peer review

Program evaluation

Pseudoscience

Skepticism

Temporal precedence

Check Your Learning: Answers

Practice Exercise #1

1. b; 2. c; 3. d; 4. a; 5. c

Practice Exercise #2

basic = 1, 3, 4; applied = 2, 5, 6

2 Where to Start

Don Hammond/Design Pics

LEARNING OBJECTIVES

- Discuss how research questions, hypotheses, and predictions are related.
- Describe the different sources of ideas for research, including common sense, observation, theories, past research, and practical problems.
- Identify the two functions of a theory.
- Describe the three kinds of research reports.
- Summarize the information included in the abstract, introduction, method, results, and discussion sections of research articles.
- Summarize the fundamentals of exploring past research in psychology, including the use of PsycINFO.

The motivation to conduct scientific research comes from a natural curiosity about the world. Most people have their first experience with research when their curiosity leads them to ask, "I wonder what would happen if ..." or "I wonder why ...," followed by an attempt to answer the question. What are the sources of inspiration for such questions? How do you find out about other people's ideas and past research? In this chapter, we will explore some sources of scientific ideas. We will also consider the nature of research reports published in professional journals.

RESEARCH QUESTIONS, HYPOTHESES, AND PREDICTIONS

Curiosity is expressed in the form of questions. A **research question** is the first and most general step in designing and conducting a research investigation. A good research question must be specific so that it can be answered with a research project. So, you might initially be motivated to want to answer a question like "What causes depression?" This question is much too general, given the complexity of the topic. After becoming familiar with the theories and research on depression, your interest might focus on a more specific question, such as "Is depression related to unhelpful ways of thinking about the causes of success and failure?" That is a more specific, testable question.

A hypothesis can be thought of as one of the possible answers to a research question. In research, a **hypothesis** is a tentative answer to a research question. Once a hypothesis is proposed, data must be gathered and evaluated in terms of whether the evidence is consistent or inconsistent with the hypothesis.

In our example, the hypothesis might be: "Depression is related to the types of attributions made about success and failure experiences." More specifically, the hypothesis might be that individuals who are diagnosed with depression will attribute success to good luck but will attribute failure to their personal shortcomings. Once the hypothesis is stated, the researcher can design a study to test it. This will require making decisions about how to choose the people who will participate, the nature of the tasks that they might work on, and how to devise a way to have the participants experience success or failure. There would need to be a way to measure attributions of luck versus personal factors as the cause of the success or failure.

Once the study is designed, the researcher can make a specific prediction about the outcome of the study. A **prediction** follows directly from a hypothesis, is directly testable, and includes specific variables and methodologies. The prediction in our example might be: "In comparison to those with minimal or mild depression, participants categorized as having moderate or severe depression, based on the Beck Depression Inventory score, will score higher on luck when responding to a success experience and higher on personal causes when responding to a failure experience."

If a prediction is confirmed by the results of the study, the hypothesis is supported. If the prediction is not confirmed, the researcher will either reject the hypothesis or conduct further research using different methods to study the hypothesis. It is important to note that when the results of a study confirm a prediction, the hypothesis is only supported, not proven. Researchers study the same hypothesis using a variety of methods, and each time this hypothesis is supported by a research study, we become more confident that the hypothesis is correct.

Figure 1 shows the relationships among research questions, hypotheses, and predictions, using an actual study of cell phone use. Cramer et al. (2007) had general questions about use of cell phones while driving, such as "What impact do passengers have on cell phone use while driving?" The researchers developed some specific hypotheses, such as "Having a passenger in the car reduces cell phone use." They then designed a

procedure for observing student driving on campus and made predictions about the outcome. For example, "Drivers with a passenger in the car will be less likely to be using a cell phone than those driving alone."

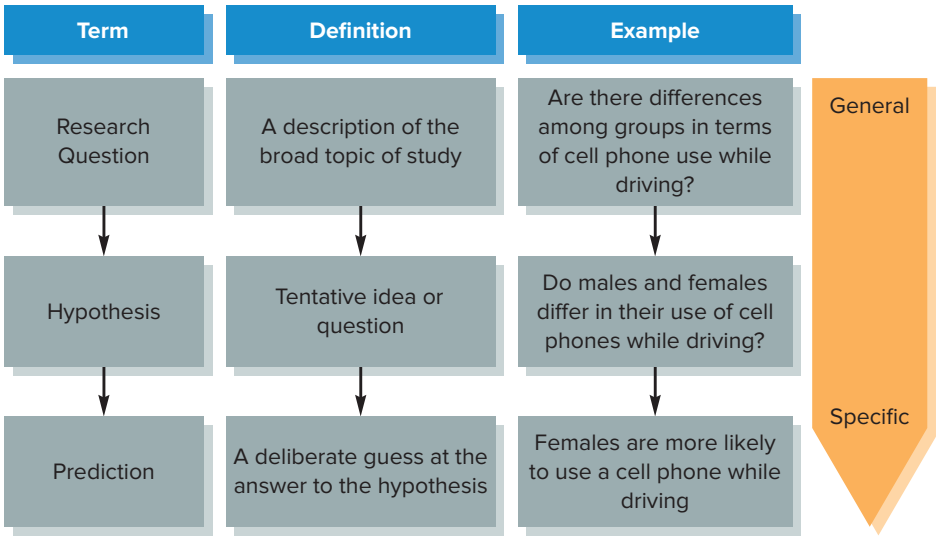

FIGURE 1 Relationships among research questions, hypotheses, and predictions

Check Your Learning: Practice Exercise #1 will help you tease apart question, hypothesis, and prediction.

SOURCES OF IDEAS

Each day seems to bring us some type of information about a phenomenon related to human behavior. This information may arrive on an internet news site, a tweet or Facebook post, a television program, or even a printed magazine. The topic might be a description of an individual's experience of trauma with a discussion of possible effects, the potential benefits of delaying age of first marriage, or an assertion that a vegetarian diet improves cognitive functioning. It is not easy to say where good ideas come from. Many people are capable of coming up with worthwhile ideas but find it difficult to verbalize the process by which they are generated. Cartoonists know this—they show a brilliant idea as a lightbulb flashing over the person's head. But where does the electricity come from? Let's consider five sources of ideas: common sense, practical problems, observation of the world around us, theories, and past research.

Common Sense

One source of ideas that can be tested is the body of knowledge called common sense—the things we all believe to be true. Do "opposites attract"? Do "birds of a feather flock together"? If you "spare the rod," do you "spoil the child"? Is "a picture worth a thousand words"? Asking questions such as these can lead to

research programs studying attraction, the effects of punishment, and the role of visual images in learning and memory.

Testing a commonsense idea can be valuable because such notions do not always turn out to be correct, or research may show that the real world is much more complicated than our commonsense ideas would have it. For example, pictures can aid memory under certain circumstances, but sometimes pictures detract from learning (see Levin, 1983). Conducting research to test commonsense ideas often forces us to go beyond a commonsense theory of behavior.

Practical Problems

Research is also stimulated by practical problems that can have immediate applications. On a larger scale, researchers have guided public policy by conducting research on obesity and eating disorders, as well as other social and health issues. Such problems may be local and highly specific; for example, groups of city planners and citizens might survey bike riders to determine the most desirable route for a bike path. Other problems may be applicable to much larger problems and populations such as early childhood education, substance abuse, domestic violence, and suicide prevention.

Observation of the World Around Us

Observations can provide many ideas for research. The curiosity sparked by your observations and experiences can lead you to ask questions about all sorts of phenomena. In fact, this type of curiosity is what drives many students to engage in their first research project.

Have you ever had the experience of storing something away in a "special place" where you were sure you could find it later (and where no one else would possibly look for it), only to later discover that you could not recall where you had stored it? Such an experience could lead to systematic research on whether it is a good idea to put things in special places. In fact, Winograd and Soloway (1986) conducted a series of experiments on this very topic. Their research demonstrated that people are likely to forget where something is placed when two conditions are present: (1) The location where the object is placed is judged to be highly memorable *and* (2) the location is considered a very unlikely place for the object. Thus, although it may seem to be a good idea at the time, storing something in an unusual place is generally not a good idea.

A more recent example demonstrates the diversity of ideas that can be generated by curiosity about things that happen around you. Case in point: biases about rap music. Dunbar et al., (2016) were interested in how rap lyrics were perceived; specifically, they asked if evaluations of rap lyrics are subject to biases from stereotypes. In other words, do some people think of rap lyrics as being more offensive because they are rap lyrics? The researchers asked subjects what they thought about a set of lyrics that were labeled as being rap lyrics, as opposed to being labeled as country music lyrics. They found that when the lyrics were labeled as rap, subjects rated them as more literal and offensive, and in greater need of regulation, than when they were labeled as country.

Observations of the world around us may even lead to an academic career. When he was an undergraduate, psychologist Michael Lynn worked in restaurants, and much of his compensation consisted of tips from customers. That experience sparked an interest in studying tipping. For many years Lynn has studied tipping behavior in restaurants and hotels in the United States and in other countries (Tipping Expert, 2013). He has looked at factors that increase tips, such as posture, touching, and phrases written on a check, and his research has had an impact on the hotel and restaurant industry. If you have ever worked in restaurants, you have undoubtedly formed many of your own hypotheses about tipping behavior. Lynn went one step further

and took a scientific approach to testing his ideas. His research illustrates that taking a scientific approach to a problem can lead to new discoveries and important applications.

Finally, we should mention the role of serendipity—sometimes the most interesting discoveries are the result of accident or sheer luck. Ivan Pavlov is best known for discovering what is called *classical conditioning*, wherein a neutral stimulus (such as a tone), if paired repeatedly with an unconditioned stimulus (such as food) that produces a reflex response (such as salivation), will eventually produce the response when presented alone. Pavlov did not set out to discover classical conditioning. Instead, he was studying the digestive system in dogs by measuring their salivation when given food. He accidentally discovered that the dogs were salivating prior to the actual feeding and then studied the ways in which the stimuli preceding the feeding could produce a salivation response. Of course, such accidental discoveries are made only when viewing the world with an inquisitive eye.

Theories

Much research in the behavioral sciences tests theories of behavior. A **theory** consists of a systematic body of ideas about a particular topic or phenomenon. Psychologists have theories relating to human behavior, learning, memory, and personality, for example. These ideas form a coherent and logically consistent structure that serves two important functions.

First, theories *organize and explain* a variety of specific facts or descriptions of behavior. Such facts and descriptions are not very meaningful by themselves, and so theories are needed to impose a framework on them. This framework makes the world more comprehensible by providing a few abstract concepts around which we can organize and explain a variety of behaviors. As an example, consider how Charles Darwin's theory of evolution organized and explained a variety of facts concerning the characteristics of animal species. Similarly, in psychology one classic theory of memory asserts that there are separate systems of short-term memory and long-term memory. This theory accounts for a number of specific observations about learning and memory, including such phenomena as the different types of memory deficits that result from a blow to the head versus damage to the hippocampus area of the brain and the rate at which a person forgets material he or she has just read.

Second, theories *generate new knowledge* by focusing our thinking so that we notice new aspects of behavior—theories guide our observations of the world. The theory generates hypotheses about behavior, and the researcher conducts studies to test the hypotheses. If the studies confirm the hypotheses, the theory is supported. As more and more evidence accumulates that is consistent with the theory, we become more confident that the theory is correct.

Sometimes people describe a theory as "just an idea" that may or may not be true. We need to separate this use of the term—which implies that a theory is essentially the same as a hypothesis—from the scientific meaning of *theory*. A scientific theory consists of much more than a simple "idea." A scientific theory is grounded in actual data from prior research as well as numerous hypotheses that are consistent with the theory. These hypotheses can be tested through further research. Such testable hypotheses are falsifiable—the data can either support or refute the hypotheses. As a theory develops with more and more evidence that supports the theory, it is wrong to say that it is "just an idea." Instead, the theory becomes well established as it enables us to explain a great many observable facts. It is true that research may reveal a weakness in a theory when a hypothesis generated by the theory is not supported. When this happens, the theory can be modified to account for the new data. Sometimes a new theory will emerge that accounts for both new data and the existing body of knowledge. This process defines the way in which science continually develops with new data that expand our knowledge of the world around us.

Evolutionary theory has influenced our understanding of sexual attraction and mating patterns (Buss, 2011). For example, Buss describes a well-established finding that males experience more intense feelings of jealousy when a partner has a sexual relationship with someone else (sexual infidelity) than when the partner has developed an emotional bond only (emotional infidelity); females, in contrast, are more jealous when the partner has engaged in emotional infidelity rather than sexual infidelity. This finding is consistent with evolutionary theory, which asserts that males and females have evolved different strategies for mate selection. All individuals have an evolutionary interest in passing their genes on to future generations. However, females have relatively few opportunities to reproduce, have a limited age range during which to reproduce, and traditionally have had to assume major child-care responsibilities. Males, in contrast, can reproduce at any time and have a reproductive advantage in that they can produce more offspring than a given female can. Because of these differences, the theory predicts that females and males will have different perspectives on infidelity. Females will be more threatened if the partner might no longer provide support and resources for childrearing by developing an emotional bond with another partner. Males are more distressed if it is possible that they will be caring for a child who does not share their genes. Although research supports evolutionary theory, alternative theories can be developed that may better explain the same findings.

Levy and Kelly (2010) suggest that attachment theory may provide a better explanation. They point out that males and females differ in their level of attachment in relationships. Also, females in general show greater attachment than males do. From the perspective of attachment theory, the amount of attachment will be related to the distress experienced by an instance of emotional infidelity. Research by Levy and Kelly found that high-attachment individuals were most upset by emotional infidelity; individuals with low attachment to the relationship were more distressed by sexual infidelity. These findings will lead to more research to test the two theoretical perspectives.

Theories are usually modified as new research defines the scope of the theory. The necessity of modifying theories is illustrated by the theory of short-term versus long-term memory. In the original conception, the long-term memory system was described as a storehouse of permanent, fixed memories. However, now-classic research by cognitive psychologists, including Loftus (1979), has shown that memories are easily reconstructed and reinterpreted. In one study, participants watched a film of an automobile accident and later were asked to tell what they saw in the film. Loftus found that participants' memories were influenced by the way they were questioned. For example, participants who were asked whether they saw "the" broken headlight were more likely to answer yes than were participants who were asked whether they saw "a" broken headlight. Results such as these have required a more complex theory of how long-term memory operates.

Past Research

Another source of ideas is past research. Becoming familiar with a body of research on a topic is perhaps the best way to generate ideas for new research. Because the results of research are published, researchers can use the body of past literature on a topic to continually refine and expand our knowledge. Virtually every study raises questions that can be addressed in subsequent research. The research may lead to an attempt to apply the findings in a different setting, to study the topic with a different age group, or to use a different methodology to replicate the results. In the Cramer et al. (2007) study on cell phone use while driving, trained observers noted cell phone use of 3,650 students leaving campus parking structures during a 3-hour period on two different days. They reported that 11% of all drivers were using cell phones. Females were more likely than males to be using a cell phone, and drivers with passengers were less likely than solitary drivers to be talking on a phone. Knowledge of this study might lead to research on ways to reduce students' cell phone use while driving.

In addition, as you become familiar with the research literature on a topic, you may see inconsistencies in research results that need to be investigated, or you may want to study alternative explanations for the results. Also, what you know about one research area often can be successfully applied to another research area.

Let's look at a concrete example of a study that was designed to address methodological flaws in previous research. Recall from the chapter **"Scientific Understanding of Behavior"** the procedure called "facilitated communication." Facilitated communication was intended to help children who are diagnosed with autism spectrum disorder (ASD). Autism spectrum disorder is characterized by a number of symptoms. In some cases, children diagnosed with ASD show severe impairments in language and communication. Parents and care providers were greatly encouraged by facilitated communication, which allowed a child with ASD to communicate with others by pressing keys on a keyboard showing letters and other symbols. A facilitator held the child's hand to facilitate the child's ability to determine which key to press. With this technique, many autistic children seemed to begin communicating their thoughts and feelings and answering questions posed to them. Most people who saw facilitated communication in action regarded the technique as a miraculous breakthrough.

The conclusion that facilitated communication was effective was based on a comparison of the child with ASD's ability to communicate with and without the facilitator. The difference is impressive to most observers. Recall, however, that scientists are by nature skeptical. They examine all evidence carefully and ask whether claims are justified. In the case of facilitated communication, Montee et al., (1995) noted that the facilitator might have been unintentionally guiding the child's fingers to type meaningful sentences. In other words, the facilitator, and not the autistic individual, might be controlling the communication. Montee et al. conducted a study to test this idea. In one condition, both the facilitator and the autistic child were shown a picture, and the child was asked to indicate what was shown in the picture by typing a response with the facilitator. This was done on a number of trials. In another condition, only the child saw the pictures. In a third condition, the child and facilitator were shown different pictures (but the facilitator was unaware of this fact). Consistent with the hypothesis that the facilitator is controlling the child's responses, the pictures were correctly identified only in the condition in which both saw the same pictures. Moreover, when the child and facilitator viewed different pictures, the child never made the correct response, and usually the picture the facilitator had seen was the one identified.

As you can see, previous research and thinking on a topic can be a critical source of ideas for a study. So, then, the next questions are: What does published work look like? What sorts of research reports are there?

TYPES OF JOURNAL ARTICLES

There are many types of journal articles (APA, 2020), but most fall into three categories: literature reviews that summarize research, theory articles that describe theories, and empirical articles that describe specific research projects.

Literature Reviews

Literature reviews provide summaries of previous research on a particular topic. The journal *Psychological Bulletin* and the *Annual Review of Psychology* specialize in publishing literature reviews. However, you will now find reviews in many different publications in all areas of research. Traditionally, literature reviews were narrative descriptions of individual research investigations along with conclusions, controversies, and directions for future research. This is one such review:

Storer, H. L. et al., (2016). Efficacy of bystander programs to prevent dating abuse among youth and young adults: A review of the literature. *Trauma, Violence, & Abuse*, *17*(3), 256–269. https://doi.org/10.1177/1524838015584361

These authors review research on "bystander" programs that are designed to prevent dating violence and abuse. Bystander programs focus on developing skills for people to intervene when they witness dating abuse or behaviors that can lead to dating abuse. This article describes bystander programs and attempts to summarize their impact on bystander attitudes and behaviors.

Today you are likely to see the terms *systematic review* or *systematic literature review* in the titles of literature review articles. These terms signify that the author used specific methods for searching past literature along with criteria for including a study in the review. Systematic reviews often use published "preferred reporting items" that provide consistency across reviews and allow others to replicate the procedures (Moher et al., 2009).

García-Vera, M. P., Sanz, J., & Gutiérrez, S. (2016). A systematic review of the literature on posttraumatic stress disorder in victims of terrorist attacks. *Psychological Reports*, *119*(1), 328–359. https://doi.org/10.1177/0033294116658243

These researchers reviewed the literature on post-traumatic stress disorder (PTSD) among victims of terrorist attacks. Having identified 35 studies of PTSD among such victims, they report that across studies, 33% to 39% of direct victims of a terrorist attack developed PTSD. They also reported rates for others (e.g., community members, emergency workers, and relatives and friends of victims). They discussed their results in the context of treatment for victims of terrorism.

Because literature reviews summarize research across many studies, they are an important part of the research landscape. A more quantitative type of review method for comparing a large number of studies in a specific research area is called **meta-analysis** (Borenstein et al., 2009). In meta-analysis, researchers analyze the results of a number of studies using statistical procedures. Thus, rather than relying solely on judgments obtained in a narrative literature review, meta-analysis allows researchers to draw statistical conclusions. In short, with meta-analysis researchers attempt to determine if a research finding is the same across multiple studies. Here is one example of a meta-analysis:

Credé, M., Roch, S. G., & Kieszczynska, U. M. (2010). Class attendance in college: A meta-analytic review of the relationship of class attendance with grades and student characteristics. *Review of Educational Research*, *80*(2), 272–295. https://doi.org/10.1016/0749-5978(91)90020-T

These authors used meta-analytic techniques to look at the relationship between college class attendance and college grades. They identified 52 published studies and 16 unpublished dissertations from 1927 to 2009 on the topic. In sum, these studies included data from 28,034 college students. You may be shocked by what they found: "Attendance is a better predictor of class grades than any other known predictor (including high school GPA, SAT scores, and study habits)."

Theory Articles

Some published research reports are the culmination of work that describes a theory. A theory, as we described earlier, consists of a systematic body of ideas about a particular topic or phenomenon. While literature reviews summarize, theory articles generally summarize and integrate research to provide a new framework for understanding a phenomenon.

The following three articles are examples of theory articles:

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179–211.

Ajzen's very influential theory of planned behavior has been cited in other articles more than 10,000 times. The article describes the theory of planned behavior, which links behavior to attitudes toward a given behavior, the social norms surrounding the behavior, and intention to engage in the behavior. Thus, an attitude like "College is good" and a social norm like "All of my friends to go college" predict intention to go to college, which in turn predicts applying to college.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*(2), 191–215. https://doi.org/10.1037/0033-295X.84.2.191

Bandura's equally influential theory article defined self-efficacy as our belief in our own ability to be successful and hypothesized that self-efficacy would predict many behavioral outcomes. If I believe that I can lose 20 pounds or stop smoking, I am more likely to be able to successfully do so.

Klonsky, E. D., & May, A. M. (2015). The Three-Step Theory (3ST): A new theory of suicide rooted in the "ideation-to-action" framework. *International Journal of Cognitive Therapy*, *8*(2), 114–129. https://doi.org/10.1521/ijct.2015.8.2.114

This more-recent theory article is related to suicide. The authors theorize that suicide ideation—as opposed to a suicide attempt—is the result of psychological pain and hopelessness, and that for people who are experiencing pain and hopelessness, connections to other people are critical to keeping them safe.

Empirical Research Articles

The empirical research article is a report of a study in which data were gathered to help answer a research question.

Empirical research articles usually have five sections: (1) an *Abstract,* such as the ones found in PsycINFO; (2) an *Introduction or literature review* that explains the problem under investigation and the specific hypotheses being tested; (3) a *Method* section that describes in detail the exact procedures used in the study; (4) a *Results* section in which the findings are presented; and (5) a *Discussion* section in which the researcher may speculate on the broader implications of the results, propose alternative explanations for the results, discuss reasons that a particular hypothesis may not have been supported by the data, and/or make suggestions for further research on the problem. In addition to the five major sections, you will find a list of all the references that were cited. Review the summary of the sections in **Figure 2** as you read about each section in greater detail.

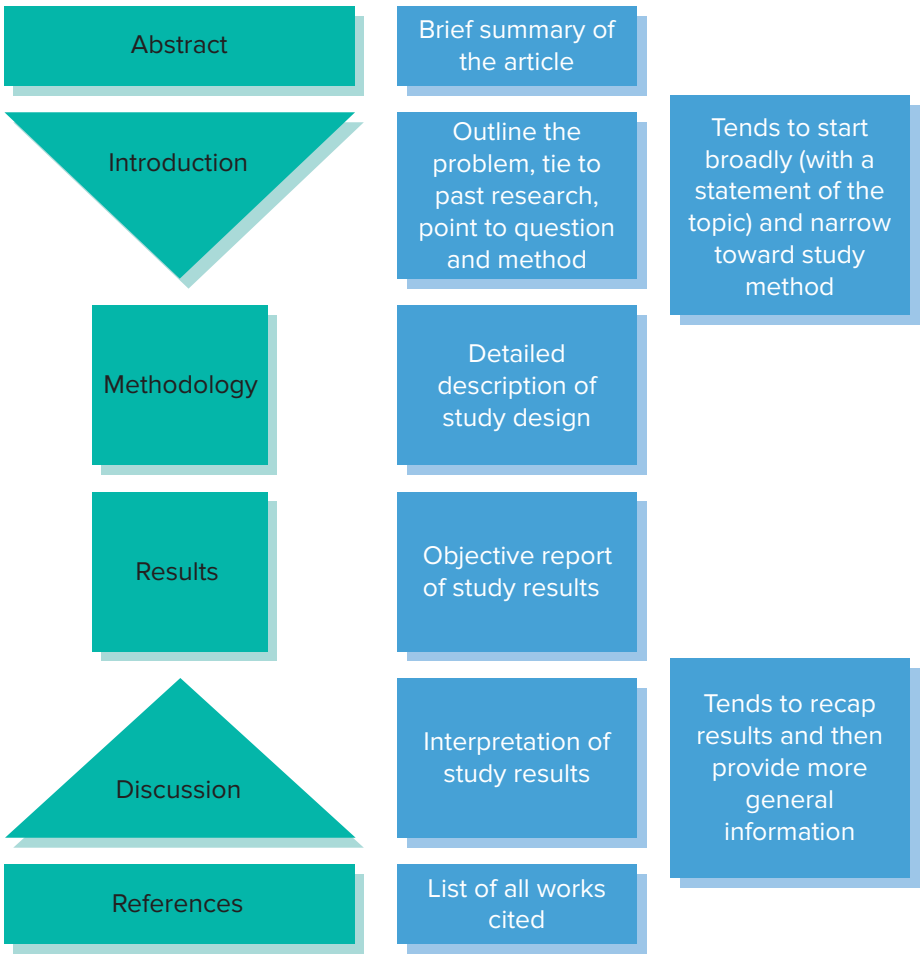

FIGURE 2 Major sections of a research article

Abstract

The *Abstract* is a summary of the research report and typically runs between 150 and 250 words in length. It includes information about the hypothesis, the procedure, and the broad pattern of results. Generally, little information is abstracted from the Discussion section of the paper.

Introduction

In the *Introduction,* the researcher outlines the problem that has been investigated. Past research and theories relevant to the problem are described in detail. The researcher's specific expectations are noted, often as formal hypotheses. In other words, the investigator introduces the research in a logical format that shows how past research and theory are connected to the current research problem and the expected results.

Method

The *Method section* is divided into subsections, with the number of subsections determined by the author and dependent on the complexity of the research design. Sometimes the first subsection presents an overview of the design to prepare the reader for the material that follows. The next subsection describes the characteristics of the participants. What was the gender composition of the participants? What was the ethnic composition of the participants? What was the average age? How many participants were included? If the study used human participants, some mention of how participants were recruited for the study would be needed. The next subsection details the procedure used in the study. In describing any stimulus materials presented to the participants, the way the behavior of the participants was recorded, and so on, it is important that no potentially crucial detail be omitted. Such detail allows the reader to know exactly how the study was conducted, and it provides other researchers with the information necessary to replicate the study. Other subsections may be necessary to describe in detail any equipment or testing materials that were used.

We have been using the term *participants* to refer to the individuals who are studied in research projects. An equivalent term in psychological research is *subjects.* The *Publication Manual of the American Psychological Association* (APA, 2020) allows the use of either *participants* or *subjects* when describing humans who are studied in psychological research. You will see both terms when you read about research; both terms will be used in this book. Other terms that you may encounter include *respondents* and *informants.* The individuals who take part in survey research are often called *respondents. Informants* are the people who help researchers understand the dynamics of particular cultural and organizational settings—this term originated in anthropological and sociological research, and is now being used by psychologists as well. Many research reports will use more specific descriptions of the participants—such as *employees* in an organization, *students* in a classroom, or *residents* of an assisted living facility.

Results

In the *Results section,* the researcher presents the findings, usually in three ways. First, there is a description in narrative form—for example, "The location of items was most likely to be forgotten when the location was both judged to be highly memorable and an unusual place for the item to be stored." Second, the results are described in statistical language. Third, the material is often depicted in tables and graphs.

The statistical terminology of the Results section may appear formidable. However, lack of knowledge about the calculations is not really a deterrent to understanding the article or the logic behind the statistics. Statistics are only a tool the researcher uses in evaluating the outcomes of the study.

Discussion

In the *Discussion section,* the researcher reviews the research from various perspectives. Do the results support the hypothesis? If they do, the author should give all possible explanations for the results and discuss why one explanation is superior to another. If the hypothesis has not been supported, the author should suggest potential reasons. What might have been wrong with the methodology, the hypothesis, or both? The researcher may also discuss how the results compare with past research results on the topic. This section may also include suggestions for possible practical applications of the research and for future research on the topic.

You should familiarize yourself with some actual research articles. **Appendix A** ends with an entire article in manuscript form. An easy way to find more articles in areas that interest you is to visit the websites of the American Psychological Association (APA) at **www.apa.org** and the Association for Psychological Science (APS) at **www.psychologicalscience.org**. All the APA journals listed in **Table 1** have links that you can find by going to **www.apa.org/journals**. When you select a journal that interests you, you will go to a page that

allows you to read the abstracts—and sometimes the full text—of recent articles published in the journal. Read articles to become familiar with the way information is presented in reports. As you read, you will develop ways of efficiently processing the information in the articles. It is usually best to read the abstract first, then skim the article to decide whether you can use the information provided. If you can, go back and read the article carefully. Note the hypotheses and theories presented in the introduction, write down anything that seems unclear or problematic in the method, and read the results in view of the material in the introduction. Be critical when you read the article; students often generate the best criticism. Most important, as you read more research on a topic, you will become more familiar with the questions being studied, the methods used to study the variables, the important theoretical issues being considered, and the problems that need to be addressed by future research. In short, you will find yourself generating your own research ideas and planning your own studies.

TABLE 1 **Some major journals in psychology**

General	
*American Psychologist** (articles on a variety of topics) *Psychological Science*** *Psychological Bulletin** (literature reviews) *Psychological Review** (theoretical articles) *Perspectives on Psychological Science***	*Psychological Methods** *Advances in Methods and Practices in Psychological Science*** *Current Directions in Psychological Science*** *Psychological Science in the Public Interest*** *History of Psychology**
Clinical and counseling psychology	
*Journal of Abnormal Psychology** *Journal of Consulting and Clinical Psychology** *Clinical Psychological Science*** *Journal of Counseling Psychology** *Behavior Analysis: Research and Practice**	*Journal of Clinical Psychology* *Behavior Therapy* *Journal of Abnormal Child Psychology* *Clinical Psychology Review* *Professional Psychology: Research and Practice**
Experimental areas of psychology	
Journal of Experimental Psychology: *General** *Applied** *Learning, Memory, and Cognition** *Human Perception and Performance** *Animal Learning and Cognition** *Animal Behavior Processes** *Behavioral Neuroscience**	*Memory & Cognition* *Cognitive Psychology* *Cognition* *Cognitive Science* *Decision** *Journal of the Experimental Analysis of Behavior* *Applied Cognitive Psychology*

*Motivation Science**	*Neuropsychology**
Psychonomic Bulletin & Review	*Emotion**
Learning and Motivation	*Applied Cognitive Psychology*
Developmental psychology	
*Developmental Psychology**	*Journal of Applied Developmental Psychology*
*Psychology and Aging**	*Developmental Review*
Child Development	*Infant Behavior and Development*
Journal of Experimental Child Psychology	*Experimental Aging Research*
Personality and social psychology	
*Journal of Personality and Social Psychology**	*Social Psychology Quarterly*
Personality and Social Psychology Bulletin	*Journal of Applied Social Psychology*
Journal of Experimental Social Psychology	*Basic and Applied Social Psychology*
Journal of Research in Personality	*Journal of Social and Personal Relationships*
Journal of Social Issues	
Applied areas of psychology	
*Journal of Applied Psychology**	*American Journal of Community Psychology*
*Journal of Educational Psychology**	*Evaluation and Program Planning*
Journal of Applied Behavior Analysis	*Environment and Behavior*
*Health Psychology**	*Journal of Environmental Psychology*
*Psychological Assessment**	*Journal of Consumer Research*
*Psychology, Public Policy, and Law**	*Journal of Marketing Research*
*Law and Human Behavior**	*Psychology of Popular Media Culture**
Educational and Psychological Measurement	*Rehabilitation Psychology**
American Educational Research Journal	*Journal of Business and Psychology*
*Psychology of Violence**	*Journal of Economic Psychology*
*Psychology of Religion and Spirituality**	
Family studies and sexual behavior	
*Journal of Family Psychology**	*Journal of Marital and Family Therapy*
*Families, Systems and Health**	*Journal of Sex Research*
Journal of Marriage and the Family	*Journal of Sexual Behavior*

Ethnic, gender, and cross-cultural issues	
*Cultural Diversity and Ethnic Minority Psychology**	*Psychology of Sexual Orientation and Gender Diversity**
Journal of Latinx Psychology	*Sex Roles*
Hispanic Journal of Behavioral Sciences	*Psychology of Women Quarterly*
Journal of Black Psychology	*Psychology of Men and Masculinities**
Journal of Cross-Cultural Psychology	*International Perspectives in Psychology: Research, Practice, Consultation**
Some Canadian and British journals	
Canadian Psychology	*British Journal of Psychology*
Canadian Journal of Experimental Psychology	*British Journal of Social and Clinical Psychology*
Canadian Journal of Behavioural Science	

* Published by the American Psychological Association. ** Published by the Association for Psychological Science.

As you can see, previous research and thinking on a topic can be a critical source of ideas for a study. So, then, the next question is: How can you find previously published research?

EXPLORING PAST RESEARCH

For most of us, accessing information has never been easier. Google alone searches as many as 50 billion websites (van den Bosch et al., 2016). Of course, having access to information is different from being able to assess its quality. Searching online for the answer to questions like "What has the impact of marijuana legalization been?" or "Is climate change real?" will generate lists of every conceivable answer, and probably some inconceivable ones, too! Anybody looking at such a list could cherry-pick the sources that they want, to tell the story that they want, and start writing—perhaps publishing what they write on the Web and contributing to the Internet's noise on a topic. So, how do you evaluate the quality of a source? How do you conduct a research project that is connected to other research?

Before conducting any research project, an investigator must have a thorough knowledge of previous research findings. Even if the researcher formulates the basic idea, a review of past studies will help the researcher clarify the idea and design of the study. Thus, it is important to know how to search the literature on a topic and how to read research reports in professional journals. In this section, we will discuss only the fundamentals of conducting library research; for further information, you should go to your college library and talk with a librarian (large libraries may have a librarian devoted to providing assistance in psychology and other behavioral sciences). Librarians have specialized training and a lot of practical experience in conducting library research.

Journals

There is an enormous number of psychology journals in which researchers publish the results of their investigations. After a research project has been completed, the study is written as a report, which then may be

submitted to the editor of an appropriate journal. The editor solicits reviews from other scientists in the same field and then decides whether the report is to be accepted for publication; this is the process of peer review, in which experts in the field assess the quality of the research. Because each journal has a limited amount of space and receives many more papers than it has room to publish, many papers are not accepted; rejection may be based on many factors, including overall study quality, potential impact on the field, a small or biased sample size, inappropriate analyses of results, or not the right fit for that particular journal. Papers that are accepted are published about a year later, although sometimes online editions are published more quickly.

Most psychology journals specialize in one or two topic areas. Even so, the number of journals in many areas is so large that it is almost impossible for anyone to read them all. **Table 1** lists some of the major journals in several areas of psychology; the table does not list any journals that are published only on the internet, and it does not include the many journals that publish in areas closely related to psychology or in highly specialized areas within psychology.

Clearly, it would be difficult to read all of the journals listed, even if you restricted your reading to a single research area in psychology, such as learning and memory. If you were seeking research on a single specific topic, it would be impractical to look at every issue of every journal in which relevant research might be published. Fortunately, you do not have to.

Online Scholarly Research Databases

You are probably thinking that you should be able to find information on your topic with an internet search tool such as Google. Instead of looking through printed journals and books, you already have access to a very large database of information. Unfortunately, a search of websites may find some scholarly information but it will also likely access information that is not relevant and may even be inaccurate. In this section we will explore search tools that specialize in access to databases of scholarly research in psychology and related fields. These include PsyclNFO, Web of Science, and SCOPUS. We also describe a specialized Google search tool for scholarly information called Google Scholar.

PsycINFO

The American Psychological Association began the monthly publication of *Psychological Abstracts,* or *Psych Abstracts,* in 1927. The abstracts are brief summaries of articles in psychology and related disciplines indexed by topic area. Today the abstracts are maintained in a digital database called **PsycINFO,** which is accessed via the internet and is updated weekly. The exact procedures you will use to search PsycINFO will depend on how your library has arranged to obtain access to the database. In all cases, you will obtain a list of abstracts that are related to your particular topic of interest. You can then find and read the articles in your library or, in many cases, link to full text that your library subscribes to. If an important article is not available in your library, ask a librarian about services to obtain articles from other libraries.

Conducting a PsycINFO Search

The exact look and feel of the system you will use to search PsycINFO will depend on your library website. Your most important task is to specify the search terms that you want the database to use. These are typed into a search box. How do you know what words to type in the search box? Most commonly, you will want to use standard psychological terms. The *Thesaurus of Psychological Index Terms* lists all the standard terms that are used to index the abstracts, and it can be accessed directly with most PsycINFO systems.

Suppose you are interested in the topic of academic performance in STEM courses (Science, Technology, Engineering, Math). A search on the terms *academic performance* and *STEM* will result in a listing of articles that used these terms. The reference citation for one of the articles (Herrmann et al., 2016) is shown in **Figure 3**. Note that we have identified the elements of a reference in this figure. The reference citation provides everything you need to know about a given source.

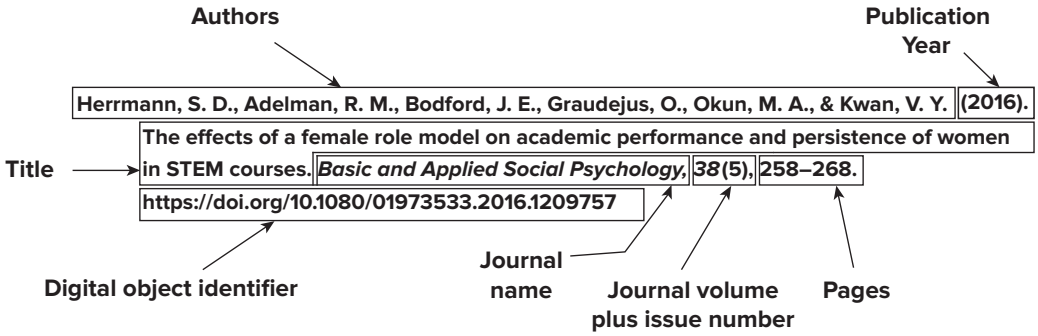

FIGURE 3 Anatomy of a standard reference

Go to **Check Your Learning:** Practice Exercise #2 to see if you can identify the parts of a citation.

Below is the PsycINFO output for this article. The exact appearance of the output you receive will depend on your library's search system. The default output includes the citation information you will need, along with the abstract itself. Notice that the output is organized into "fields" of information. The full name of each field is included here; many systems allow abbreviations. You will almost always want to see the *title, author, source/publication title*, and *abstract*. Note that you also have fields such as publication type, keywords to briefly describe the article, and age group. When you do the search, some fields will appear as hyperlinks to lead you to other information in your library database or to other websites. Systems are continually being upgraded to enable users to more easily obtain full-text access to the articles and find other articles on similar topics. The *digital object identifier* (DOI) is particularly helpful in finding full-text sources of the article and is now provided with other publication information when journal articles are referenced.

PsycINFO output for Herrmann et al. (2016) appears as follows:

Title:	**The effects of a female role model on academic performance and persistence of women in STEM courses.**
Authors:	Herrmann, Sarah D., Arizona State University, Tempe, AZ, US, sarah.herrmann@asu.edu Adelman, Robert Mark, Arizona State University, Tempe, AZ, US Bodford, Jessica E., Arizona State University, Tempe, AZ, US Graudejus, Oliver, Arizona State University, Tempe, AZ, US Okun, Morris A., Arizona State University, Tempe, AZ, US Kwan, Virginia S. Y., Arizona State University, Tempe, AZ, US
Address:	Herrmann, Sarah D., Department of Psychology, Arizona State University, 950 South McAllister Avenue, P.O. Box 871104, Tempe, AZ, US, 85287-1104, sarah.herrmann@asu.edu
Source:	Basic and Applied Social Psychology, Vol 38(5), Sep, 2016. pp. 258–268.
Page Count:	11
Publisher:	United Kingdom: Taylor & Francis
Other Publishers:	US: Lawrence Erlbaum
ISSN:	0197-3533 (Print) 1532-4834 (Electronic)
Language:	English
Keywords:	female role model, academic performance, STEM courses
Abstract:	Women are more likely to leave science, technology, engineering, and mathematics compared to men, in part because they lack similar role models such as peers, teaching assistants, and instructors. We examined the effect of a brief, scalable online intervention that consisted of a letter from a female role model who normalized concerns about belonging, presented time spent on academics as an investment, and exemplified overcoming challenges on academic performance and persistence. The intervention was implemented in introductory psychology (Study 1, N = 258) and chemistry (Study 2, N = 68) courses. Relative to the control group, the intervention group had higher grades and lower failing and withdrawal rates. (PsycINFO Database Record (c) 2016 APA, all rights reserved)
Subjects:	*Academic Achievement; *Human Females; *Role Models; *STEM
PsycINFO Classification:	Academic Learning & Achievement (3550)
Population:	Human Female