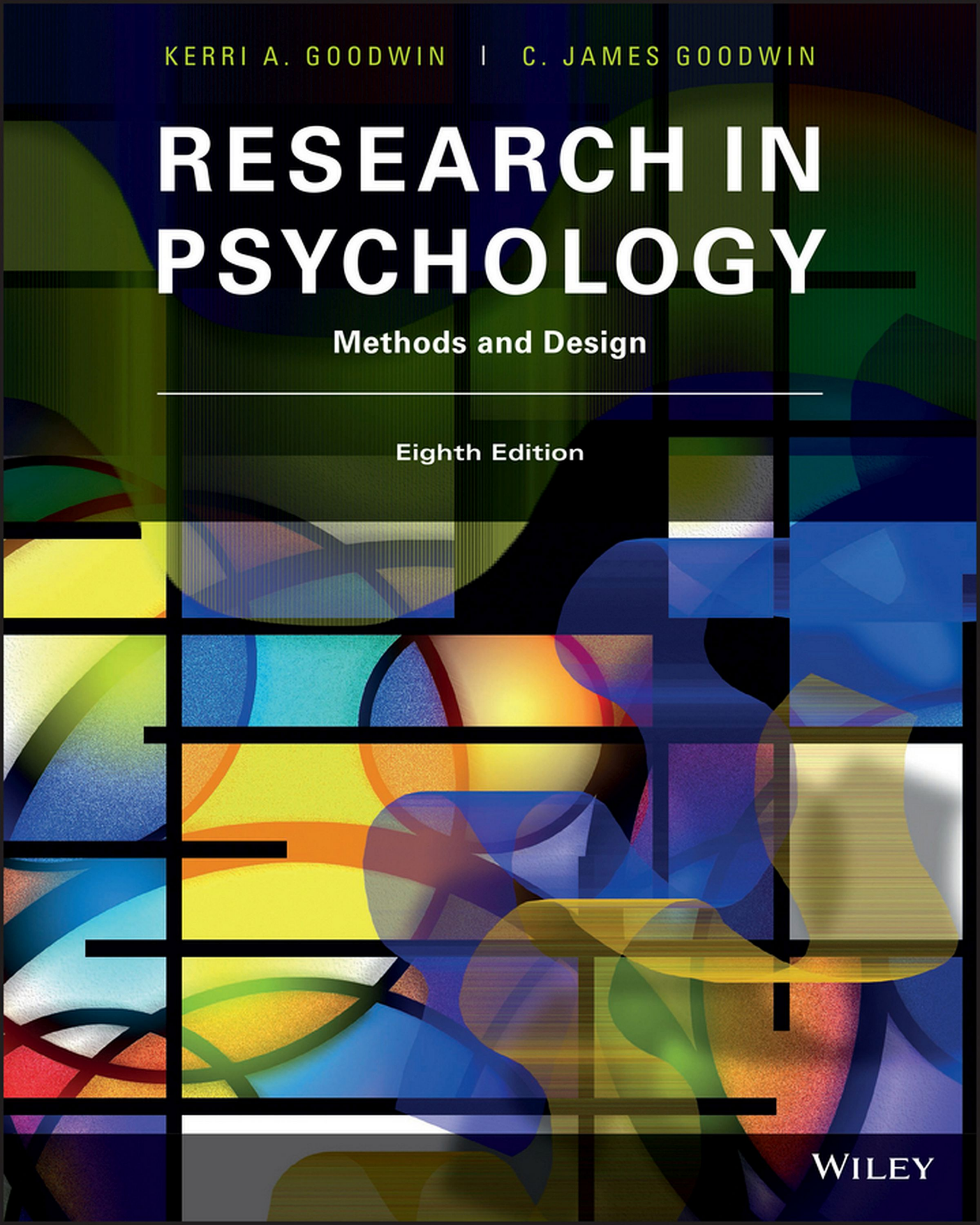
KERRI A. GOODWIN | C. JAMES GOODWIN

RESEARCH IN PSYCHOLOGY

Methods and Design

Eighth Edition



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Research in Psychology

EIGHTH EDITION

METHODS AND DESIGN

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WILEY

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KAG: To Dave, Jack, and Jimmy

CJG: To Susan

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PREFACE

THE PHILOSOPHY OF THE TEXT

Several strong beliefs have guided the writing of this book over its eight editions. First, it is important for students to develop a clear understanding of how psychologists think and how they do their work. Thus, students using this book will encounter thorough discussions of the nature of psychological science and how it differs from pseudoscience, the logic of scientific thinking, and the manner in which psychological scientists (a) develop ideas and shape hypotheses for research, (b) design their studies, (c) carry them out, (d) analyze them, and (e) draw proper conclusions from them. Second, students should understand that psychologists use a variety of methods in their attempts to understand psychological phenomena. Although the book's main focus is on the experimental method, it thoroughly discusses numerous other research designs as well. Third, because researchers must always be aware of the ethical dimensions of their research, students must also have a thorough understanding of research ethics. Thus, an ethics chapter appears early in the book (Chapter 2) and additional discussions of ethics (Ethics Boxes) appear in *every* subsequent chapter. Fourth, because nobody can understand psychology's present without knowing something of its past, we have incorporated certain aspects of the history of experimental psychology into the text. Recognizing that the text is for a methods course and not for a history course, however, we have included only historical information that illuminates important methodological concepts. Fifth, and perhaps most important, although we both believe that doing psychological science is a joyful activity, it has been our experience that some students enter the course with a sense of dread. They believe it will be boring, difficult, and not especially relevant for them. To counter this, we have taken pains to write a student-friendly book that is appealing (lots of interesting descriptions of real research), understandable (clear writing in an interactive, conversational style), and valuable (sharpening important critical thinking skills).

THE ORGANIZATION OF THE TEXT

The book includes 12 chapters, a brief epilogue, and 2 appendices. By thoroughly explaining the scientific way of thinking and contrasting it with nonscientific and pseudoscientific thinking, the opening chapter lays the groundwork for all that follows. Chapter 2 is devoted to research ethics and concerns how the American Psychological Association's most recent code of ethics applies to research with both human participants and animal subjects. The problem of scientific fraud is also discussed. Chapter 3 examines how ideas for research originate and explains the continually evolving relationship between theory and research. It also helps students learn to use psychology's most important electronic database (PsycINFO) and provides tips for reading empirical journal articles. Issues related to sampling, the measurement of psychological phenomena, and the statistical analysis of data are the focus of Chapter 4. The next four chapters deal primarily with the experimental method, psychology's most important method because of the kind of conclusion (causal) that can be drawn from it. There is a basic introduction to the experimental method (Chapter 5), a discussion of control problems in experimental research (Chapter 6), and two chapters devoted to experimental design (Chapter 7 on single-factor designs and Chapter 8 on factorial designs).

While much of the content and general organizational structure of the textbook remains the same as in past editions, we have altered the organization of the final four chapters of the text. Because we devoted two chapters to specific experimental methods (Chapters 7 and 8), we created two comparable non-experimental methods chapters focused on survey methods, correlation, and regression (Chapter 9) and observational and archival methods (Chapter 10). Chapter 11 is devoted to applied research, including program evaluation, and Chapter 12 describes small *N* designs, including the case study method and applied behavior analysis. In the current edition, both experimental and non-experimental chapters include descriptions of data analysis for specific experimental and nonexperimental designs. For example, in Chapter 8 we describe analysis of variance as a statistical tool for evaluating data from factorial designs, and in Chapter 10 we describe meta-analysis as an example of an archival research tool.

The two appendices describe how to prepare the (in)famous APA-style research report and provide feedback for some of the end-of-chapter applications exercises. Note the word *some*. So that you as instructors can use some of these materials for homework assignments, we have given students feedback on about half of the exercises in Appendix B. Answers to the remaining exercises can be found in the electronic Instructor's Resources.

At various points in the text are boxed sections of three general types. *Origins* boxes supply interesting information about the historical roots of psychological research and show how research concepts and methods (e.g., the Hawthorne effect) were created and have evolved over the years. *Classic Studies* boxes describe famous experiments (e.g., Bandura's Bobo doll studies) that illustrate particular research designs and/or methodological issues. Finally, the previously mentioned *Ethics* boxes reflect our belief that a consideration of research ethics should occur in more than just a single chapter. The ethics boxes address such topics as informed consent, the operation of subject pools, and the proper use of surveys.

It is not uncommon for methods texts to begin with simple descriptive methods (observation, survey, etc.), move through non-experimental methods, and eventually reach the experimental method. There is certainly some logic to this organizational structure, but it is not the structure we have chosen. Rather, when teaching the course, we have been disturbed by how late in the semester students were encountering such things as factorial designs—who wants to be figuring out interactions while digesting the Thanksgiving turkey? Such complex topics seem rushed within the course of a semester, so for us, it seemed better to teach about experimental designs earlier in the semester in order to spend sufficient time on them if students run into trouble. Also, because many of the course's lab activities used experimental designs, it seemed important for students to have some understanding of the studies they run during the semester. So the chapter organization reflects the way we teach the course—getting to experiments as soon as possible. Reviewers of the text have been divided on the issue, with most liking the current organization, but some preferring to start with non-experimental methods. It has been good to learn, however, that a number of reviewer/colleagues who like to begin the course with non-experimental methods have been using this text anyway, and simply changing the chapter sequence to suit themselves. Thus, it is worth noting that the text is to some degree modular and can be taught using several arrangements of chapters.

PEDAGOGICAL FEATURES OF THE TEXT

For the student, this text has several features designed to facilitate learning. These include:

- At the start of each chapter, a brief **Preview** of what is to be found in the chapter and a set of specific **Learning Objectives** for the chapter.
- Throughout each chapter, periodic **Self Tests**, set off in small boxes, enabling the student to test comprehension for a portion of a chapter just completed.

- At the end of each chapter, a comprehensive **Summary** of important points, a set of **Review Questions**, a set of **Applications Exercises**, and answers to the Self Tests. The review questions are short essay questions for discussion and reflection. These review questions are not just definitional; they ask students to apply concepts learned in the chapter and to think critically about them. The applications exercises include thought questions and problems to solve that require using the concepts learned in the chapter. Appendix B contains feedback on about half of these exercises. The online Instructor's Manual includes feedback for the remaining exercises, which enables instructors to assign some of the end-of-chapter exercises as graded homework.
- Key terms and concepts appear in **boldface** print throughout the textbook and they are collected in a Glossary which is found at the end of the book. To make it easier to find where the descriptions of the Glossary terms appear in the text, we have structured the Index so the text page where a glossary term is first defined is boldfaced.
- Throughout the text, numerous concrete examples of real research are used to illustrate methodological points and to enhance critical thinking. These include 41 detailed descriptions (Research Examples) and dozens of briefer descriptions. Of the Research Examples, 11 are new to this edition.

ELECTRONIC RESOURCES

Several electronic resources are available for students and instructors; these can be found here:

www.wiley.com/college/goodwin

Simply go to the site, find the textbook and click on Student or Instructor Companion Sites. Students can get to the materials directly; instructors must register with Wiley because some of the materials are password-protected. Here's what can be found.

For the Instructor:

- An Instructor's Manual, organized by chapter, which provides numerous ideas for in-class exercises, lecture elaborations, homework, and so on (many taken from psychology's best journal for teachers, *Teaching of Psychology*). It also includes the answers for those end-of-chapter Applications Exercises students won't find in Appendix B.
- A Test Bank for each chapter that includes both objective (multiple choice, fill-in-the-blank) items and written questions (short essays and comprehensive, integrative essays).
- A set of PowerPoint slides to accompany the chapters.
- A Laboratory Manual—a set of materials and instructions that will enable you to collect data for 20 research projects.

For the Student:

- An electronic Study Guide that includes concept questions for students to answer as they work their way through chapters, sample objective test items (fill-ins, matching, and multiple choice) with detailed feedback, and applications exercises similar to the ones found at the ends of chapters in the main text.
- The Student Statistics Guide includes important aids for statistical analysis:
  - Detailed descriptions for calculating various statistical analyses by hand (e.g., *t* tests, ANOVA).
  - Step-by-step SPSS instructions because many departments rely on SPSS for statistical analysis.

ACKNOWLEDGMENTS

KAG: When I was a little girl, I used to love it when my dad would bring me to his office and I could play in the "playroom" with interesting toys and, sometimes, another child. Little did I know that my leisurely play was being observed by students in a classroom on the other side of a two-way mirror in a developmental psychology laboratory. I did not know then I would parallel my father's journey into teaching and research, and I am indebted to him and to my mom for instilling in me a sense of curiosity from an early age. As I grew older and more curious, I found myself majoring in psychology where I discovered a love for perception and cognition. I want to thank Dr. Janet Larson for giving me an initial road map into the world of experimental psychology. Even further down the road, I found I liked to share ideas of research with others and with students in particular. My graduate mentors, Dr. Mike Toglia and Dr. Colleen Kelley, remind me of the importance of life-long learning via teaching and research and the nobility in sharing ideas with others. Finally, I am most grateful to my husband, Dave. He has taken me on an off-shore journey of sorts, and I am forever indebted to his unique perspectives and loving support. Since our first date almost 20 years ago when we capsized a small sailboat, he has been the wind behind my sails and my anchor when at port.

CJG: This project would not have been started, much less completed and evolved into an eighth edition, without the encouragement and support of many people, most notably my dear wife of almost 50 years (Susan, retired now, but a former corporate internal auditor good at keeping me on task, yet willing to let me sneak out for an occasional round of mountain golf) and my children (Kerri, a university professor, cognitive psychologist, assistant department chair, mother of two, all-around wonder woman, and now the lead author of this text), and Charles (a geologist working as project manager for an environmental consulting firm). The hundreds of students who passed through my research methods course were my principal source of inspiration in starting the first edition of this book back in the 1990s. During those early years, many of them told me to stop complaining about the textbook being used at the time and write my own.

To Darryl Bruce, my dissertation director, I owe a great debt. He first showed me how exciting research in psychology could be during my grad school days in Tallahassee. And he taught me how to write. I still have the first draft of my master's thesis – his edits (accompanied by occasional exclamation points) decorated virtually every page. Up until just a few years ago, I would still send him drafts of my writing and he would reliably red pencil the daylights out of them. When Darryl died a few years ago, I lost a mentor and a close friend.

Finally, the editors, production team, and marketing staff at Wiley have very supportive. We are especially grateful for the support of Victoria Visentin, Gladys Soto, and Chris Johnson and for the skillful production work of Amy Jolin and Arun Surendar.

Scientific Thinking in Psychology

1

PREVIEW & CHAPTER OBJECTIVES

Welcome to what might be the most important course you will take as a psychology student. This opening chapter begins by trying to convince you that a research methods course is essential to your education, whether or not you have a future as a research psychologist. The chapter then proceeds with an introduction to the ways in which we come to know things in our world. Some of what we know comes from our reliance on authority figures, other knowledge results from our ability to reason, and we have often heard that experience is the best teacher. All these avenues to knowledge have merit, but each is flawed. Research psychologists rely on scientific thinking as a way to discover truth, and this opening chapter carefully examines the general nature of science, describes the scientific way of thinking, and contrasts it with pseudoscientific thinking. Distinguishing science from pseudoscience is especially important for psychology, because some things that are promoted as "psychological truth" (e.g., the ability to assess personality by examining someone's handwriting) are actually examples of pseudoscience rather than true science. The chapter closes by discussing the goals for a scientific psychology, and brief introductions to the work of two of experimental psychology's legendary stars, Eleanor Gibson and B. F. Skinner. They both showed the passion and commitment that psychological scientists have for their work. When you finish this chapter, you should be able to:

- Defend the need for a research methods course for psychology students.
- Explain how the overall purpose of a methods course differs from other psychology courses.
- Identify and evaluate nonscientific ways of knowing about things in the world—authority, reasoning, and experience.
- Describe the attributes of science as a way of knowing, which assumes determinism and discoverability; makes systematic observations; produces public, data-driven, but tentative knowledge; asks answerable questions; and develops theories that attempt to explain psychological phenomena.
- Distinguish science from pseudoscience and recognize the attributes of pseudoscientific thinking.
- Describe the main goals of research in psychology and relate them to various research strategies to be encountered later in the book.

In the preface to his weighty two-volume *Principles of Physiological Psychology*, published in 1874, the German physiologist Wilhelm Wundt boldly and unambiguously

declared that his text represented "an attempt to mark out a new domain of *science*" (Wundt, 1874/1904; italics added). Shortly after publishing the book, Wundt established his now famous psychology laboratory at Leipzig, Germany, attracting students from all over Europe as well as from the United States. American universities soon established their own laboratories, about 20 of them by 1892 (Sokal, 1992). In that same year the American Psychological Association (APA) was founded, and before long it ratified a constitution identifying its purpose as "the advancement of Psychology as a *science*. Those who are eligible for membership are engaged in this work" (Cattell, 1895, p. 150; italics added). Thus, for psychology's pioneers, both in Germany and in the United States, the "new psychology" was to be identified with laboratory science. It gradually forged an identity separate from the disciplines of physiology and philosophy to become the independent discipline it is today.

For early psychologists, the new psychology was to be a science of mental life, the goal being to understand exactly how human consciousness was structured and/or how it enabled people to adapt to their environments. In order to study the mind scientifically, however, generally agreed-upon methods had to be developed and taught. Hence, students of the new psychology found themselves in laboratories learning the basic procedures for studying mental processes. Indeed, one of psychology's most famous early texts was a highly detailed laboratory manual published right after the turn of the 20th century by Cornell's eminent experimental psychologist, E. B. Titchener, a student of Wundt's. The manuals were in use in lab courses well into the 1930s and they were instrumental in training a generation of research psychologists (Tweney, 1987).

Although the particular research methods have changed considerably over the years, today's psychology departments continue this long tradition of teaching the tools of the trade to psychology students. From the very beginning of psychology's history, teaching research methodology has been the heart and soul of the psychology curriculum. Of course, students understandably tend to be suspicious of the argument that they are required to take a research methods course because "we've always done it that way." There should be other reasons to justify taking the course. There are.

Why Take This Course?

The most obvious reason for taking a course in research methods is to begin the process of learning how to do research in psychology. Our ideal scenario would be for you to become fascinated by research while you are taking this course, decide that you would like to do some, get your feet wet as an undergraduate (e.g., collaborate with a professor and perhaps present your research at a research conference), go to graduate school and complete a doctorate in psychology, begin a career as a productive researcher, get lots of publications and win lots of grants, achieve tenure, and eventually be named recipient of the APA's annual award for "Distinguished Scientific Contributions"! Of course, we are also realists and know that most psychology majors have interests other than doing research, most do not go on to earn doctoral degrees, most who earn doctorates do not become productive researchers, and very few productive scholars win prestigious grants or awards. If you won't be a famous research psychologist someday, are there still reasons to take this course? Certainly!

For one thing, a course in research methods (accompanied by a statistics course) provides a solid foundation for understanding the information you will encounter in other psychology courses in more specific topic areas (social, cognitive, developmental, etc.). Research has shown

that students who do well in statistics and methods courses go on to have higher GPAs in their other psychology courses than students doing poorly, and that methodology course grades in particular are good predictors of the overall knowledge about psychology gained by students during their careers as psychology majors (Freng, Webber, Blatter, Wing, & Scott, 2011). Thus, it is no surprise that your psychology department requires you to take statistics and methodology courses, and usually wants you to take them early in your career as a psychology major. The difference between the methods course and other courses in the psychology curriculum is essentially the difference between *process* and *content*. The methods course teaches a *process* of acquiring knowledge about psychological phenomena that is then applied to all the specific *content* areas represented by other courses in the psychology curriculum. A social psychology experiment in conformity might be worlds apart in subject matter from a cognitive psychology study on eyewitness memory, but their common thread is research methodology—the manner in which researchers gain their knowledge about these phenomena. Fully understanding textbook descriptions of research in psychology is much easier if you know something about the methods used to arrive at the conclusions.

To illustrate, take a minute and look at one of your other psychology textbooks. Chances are that virtually every paragraph makes some assertion about behavior that either includes a specific description of a research study or at least makes reference to one. For example, Myers's (1980) social psychology text includes the following description of a study about the effects of violent pornography on male aggression (Donnerstein, 1980). Myers wrote that the experimenter "showed 120 . . . men either a neutral, an erotic, or an aggressive-erotic (rape) film. Then the men, supposedly as part of another experiment, 'taught' a male or female confederate some nonsense syllables by choosing how much shock to administer for incorrect answers. The men who had watched the rape film administered markedly stronger shocks – but only toward female victims" (Myers, 1990, p. 393). While reading this description, someone unfamiliar with experimental design might get the general idea, but someone familiar with methodology would also be registering that the study was at the very least a 2 (sex of the confederate) x 3 (film condition) between-subjects factorial design resulting in a type of interaction effect that takes precedence over any main effects; that the two independent variables (film type, victim gender) were both manipulated variables, thereby strengthening the causal interpretation of the results; and that the "victims" were not really shocked but were clued in to the purposes of the study (i.e., they were confederates). Also, the thoughts "I wonder what would happen if there was more of a delay between viewing the film and the learning part of the study?" or "I wonder how female participants would react in a replication of the study?" might also float through the mind of someone in tune with the kind of "what do we do for the next experiment?" thinking that accompanies knowledge of research methodology. By the end of this course, you will be familiar with all the language found in the aggression study we just described and you will also be asking those "next step" kinds of questions that researchers ask.

A second reason for taking experimental psychology is that even if you never collect a single piece of data after completing this course, knowledge of research methods will make you a more informed and critical thinker. Any good course in psychology will improve your critical thinking skills, but a methodology course will be especially effective at enhancing your skills in evaluating research and claims about psychology that appear to be based on research. Bensley (2008) defines critical thinking in psychology as a form of precise thinking "in which a person reasons about relevant evidence to draw a sound or good conclusion" (p. 128). This requires being able to judge the quality of the evidence used to support a claim, being fair and unbiased when examining conflicting claims, and drawing reasonable conclusions based on the evidence at hand. A research methods course will help you do all of these things better.

The need for critical thinking about psychology is clear. We are continually exposed to claims about behavior from sources ranging from the people around us who are amateur psychologists

to media accounts ranging from the sublime (an account in a reputable magazine about research on the relationship between video-game playing and aggressiveness) to the ridiculous (the tabloid headlines you read while waiting in line to pay for groceries). While the latter can be dismissed without much difficulty (for most people), a professional writer unaware of the important distinction between experimental and correlational research might have penned the video game study. Consequently, the article might describe a correlational study hinting at cause and effect more than is justified, a mistake you'll have no difficulty recognizing once you have finished Chapter 9. Another example might be a claim that while under hypnosis, people can be transported back to the moment of their birth, thereby gaining insight into the origins of their problems. When you learn about "parsimonious" explanations in Chapter 3, you will be highly suspicious about such a claim and able to think of several alternative explanations for the reports given by patients about their alleged birth experiences. Similarly, you will learn to become skeptical about the claims made by those who believe the "subliminal" messages in the recordings they just downloaded are the cause of the weight they just lost, or by those who believe that their child's IQ can be raised by listening to classical music (the so-called "Mozart effect").

Third, there is a very practical reason for taking a research methods course. Even if you have no desire to become a research psychologist, you might like to be a psychology practitioner someday. Like researchers, practitioners must earn an advanced degree, either a master's degree or a doctorate. Even for future clinical psychologists, counselors, and school psychologists, graduate school almost certainly means doing some research, so a course in methodology is an obvious first step to learning the necessary skills. Furthermore, your chances of getting into *any* type of graduate program in the first place are improved significantly if you (a) earned good grades in undergraduate research methods and statistics courses and (b) were involved in doing some research as an undergraduate. As Kuther (2006) put it in *The Psychology Major's Handbook*, graduate admissions committees "want applicants who are interested in the program, have research experience, and have a background in statistics, methodology, and science" (p. 206). Furthermore, Norcross, Hanych, and Terranova (1996) examined the undergraduate courses most likely to be required for admission to graduate school, and found that the methods course was ranked second, just behind statistics, while specific content courses (e.g., developmental and abnormal psychology) lagged far behind and were not even required by many programs.[1]

Should you become a professional psychologist, your research skills will be essential. Even if you don't become an active researcher, you will need to keep up with the latest research in your area of expertise and to be able to read and critically assess research. Furthermore, good clinical work involves essentially the same kind of thinking that characterizes the laboratory scientist—hypotheses about a client's problems are created and tested by trying out various treatments, and the outcomes are systematically evaluated. Also, if you work for a social service agency, you may find yourself dealing with accreditation boards or funding sources and they will want to know if your psychological services are effective. As you will discover in Chapter 11, research evaluating program effectiveness touches the lives of many professional psychologists.

Only a minority of psychology majors become professional psychologists with advanced degrees, yet a research methods course can help develop the kinds of skills that employers look for in bachelor's level job applicants. By the time you have completed this course, for example, you should be better at critical and analytical thinking, precise writing, and logical argument. In addition, you will know how to analyze, summarize, and interpret empirical data, search for information in libraries and electronic databases (e.g., PsycINFO), and present the results of your research in a clear and organized fashion. Your computer skills will also improve—you will either learn or increase your existing skill with some statistical software package (e.g., SPSS) and you

[1] In an analysis of 1554 graduate programs, it was found that 85.2% "required" or "preferred" statistics. The percentages were 66.0% for the research methods course, 35.9% for "childhood/developmental," and 32.5% for "abnormal/psychopathology."

might also become more familiar with presentation software (e.g., PowerPoint). To learn more about the kinds of skills you will begin to develop in the methods course, you might take a peek ahead to the Epilogue and the section called "what I learned in my research methods course."

Finally, a course in research methods introduces you to a particular type of thinking. As mentioned above, other psychology courses deal with specific content areas and concentrate on what is known about topic X. The methods course, however, focuses more on the process by which knowledge of X is acquired. That process is centered on scientific thinking, and it is deeply ingrained in all research psychologists. Before detailing the features of the scientific way of thinking, however, let us first describe some of the other ways in which we arrive at our knowledge of the world.

Ways of Knowing

Take a moment and reflect on something that you believe to be true. The belief could be something as simple as the conviction that lobster should be eaten only in Maine, or it could be something as profound as the belief in a personal God. How do we arrive at such beliefs? Have we learned it from others we view as experts, or did we use logical reasoning, or did we base our knowledge of our beliefs on our own experiences? These three alternatives represent three ways of knowing described below: authority, reason, and empiricism. And none are without their flaws.

Authority

Whenever we accept the validity of information from a source that we judge to be an expert, then we are relying on **authority** as a source of our knowledge. As children we are influenced by and believe what our parents tell us (at least for a while), as students we generally accept the authority of textbooks and professors, as patients we take the pills prescribed for us by doctors and believe they will have beneficial effects, and so on. Of course, relying on the authority of others to establish our beliefs overlooks the fact that authorities can be wrong. Some parents pass along harmful prejudices to their children, textbooks and professors are sometimes wrong or their knowledge may be incomplete or biased, and doctors can miss a diagnosis or prescribe the wrong medicine. An important aspect of the attitude of a critical thinker is the willingness to question authority.

On the other hand, we do learn important things from authority figures, especially those who are recognized as experts in particular fields. Thus, we read *Consumer Reports*, we watch the Weather Channel, and we (sometimes) pay attention when the medical community cautions us about our chronic lack of exercise and poor eating habits. Also, it doesn't stretch the concept of authority to consider the giants in the arts and literature as authority figures who can teach us much about ourselves and others. Who can read Shakespeare or Dickens or Austen without gaining valuable insights about human nature?

Use of Reason

We sometimes arrive at conclusions by using logic and reason. For example, given the statements (sometimes called premises):

Primates are capable of using language.

Bozo the chimp is a primate.

It is logical for us to conclude that Bozo the chimp has the ability to use language. Can you see the problem here? The logic is flawless, but the conclusion depends on the truth of the first

two statements. The second one might be OK and easy to verify, but the first one could be subject to considerable debate, depending, among other things, on how language is defined. Psycholinguists have been arguing about the issue for years. The key point is that the value of a logically drawn conclusion depends on the truth of the premises, and it takes more than logic to determine whether the premises have merit.

The American pragmatist philosopher Charles Peirce pointed out another difficulty with the use of reason and logic—it can be used to reach opposing conclusions. Peirce labeled the use of reason, and a developing consensus among those debating the merits of one belief over another, the **a priori method** for acquiring knowledge. Beliefs are deduced from statements about what is thought to be true according to the rules of logic. That is, a belief develops as the result of logical argument, *before* a person has direct experience with the phenomenon at hand (*a priori* translates from the Latin as "from what comes before"). Peirce pointed out that the *a priori* method was favored by metaphysical philosophers, who could reason eloquently to reach some truth, only to be contradicted by other philosophers who reasoned just as eloquently to the opposite truth. On the question of whether the mind and the body are one or two different essences, for instance, a "dualist" philosopher might develop a sophisticated argument for the existence of two fundamentally different essences, the physical and the mental, while a "monist" might develop an equally compelling argument that mental phenomena can be reduced to physical phenomena (e.g., the mind *is* the brain). The outcome of the *a priori* approach, Peirce argued, is that philosophical beliefs go in and out of fashion, with no real "progress" toward truth.

Empiricism

Another important way of coming to know things is through our experiences in the world. This is **empiricism**—the process of learning things through direct observation or experience, and reflection on those experiences. You will see shortly that asking "empirical questions" is an important component of scientific thinking, and there is certainly some truth in the old saying that "experience is the best teacher." Yet it can be dangerous to rely uncritically and solely on one's experiences when trying to determine the truth of some matter. The difficulty is that our experiences are necessarily limited and our interpretations of our experiences can be influenced by a number of what social psychologists refer to as "social cognition biases." One of these biases is the **confirmation bias**: a tendency to seek and pay special attention to information that supports one's beliefs, while ignoring information that contradicts a belief (Wason & Johnson-Laird, 1972). For instance, persons believing in extrasensory perception (ESP) will keep close track of instances when they were "thinking about Mom, and then the phone rang and it was her!" Yet they ignore the far more numerous times when (a) they were thinking about Mom and she didn't call, and (b) they weren't thinking about Mom and she did call. They also fail to recognize that if they talk to Mom about every two weeks, their frequency of "thinking about Mom" will increase near the end of the two-week interval, thereby increasing the chances of Mom actually calling. Confirmation bias often combines with another preconception called **belief perseverance** (Lepper, Ross, & Lau, 1986). Motivated by a desire to be certain about one's knowledge, it is a tendency to hold on doggedly to a belief, even in the face of evidence that would convince most people that the belief is false. It is likely that these beliefs form when the individual hears some "truth" being continuously repeated, in the absence of contrary information. Thus, many college students in the 1960s strongly believed in the idea of a generation gap and accepted as gospel the saying "Don't trust anyone over the age of 30." (Of course, these same people are now pushing 70 and some of them are deeply suspicious of anyone younger than 30). Strongly held prejudices include both belief perseverance and confirmation bias. Those with racist attitudes, for example, refuse to consider evidence disconfirming the prejudice and seek out and pay attention to information consistent with the prejudicial belief. They will argue that experience is indeed the best

teacher and that their experience has taught them about the superiority of their own group and the inferiority of members of another group.

Another social cognition bias is called the **availability heuristic**, and it occurs when we experience unusual or very memorable events and then overestimate how often such events typically occur (Tversky & Kahneman, 1973). Thus, people who watch a lot of crime shows on TV misjudge their chances of being crime victims, and because spectacular plane crashes are given more attention in the media than car accidents, some people cannot believe the fact that air travel is considerably safer than travel by automobile. An example of an availability heuristic of relevance to students is what happens when students change their answers on multiple-choice tests. Many students believe that the most frequent outcome of answer changing is that an initially correct answer will be changed to a wrong one. Students tend to hold that belief because when such an event does occur, it is painful and hence memorable (availability heuristic), perhaps making the difference between an A and a B on a test. Also, once the belief starts to develop, it is strengthened whenever the same kind of outcome does occur (confirmation bias), and it doesn't take too many instances before a strong belief about answer changing develops (belief perseverance begins). It is not uncommon to hear students tell others not to change answers but to "go with your initial gut feeling," a phenomenon that Kruger, Wirtz, and Miller (2005) call the "first instinct" fallacy. The problem is that students overlook cases when they change from one wrong multiple-choice alternate to another wrong one, or when they change from a wrong alternative to the correct one. It is only the memorable situation, changing from a right to a wrong answer that damages their score ("I had it right! And I changed it!").

When Kruger et al. (2005) asked students (n = 1,561) to estimate the percentages of the various outcomes of answer changing on a multiple-choice test, these were the results:

Changing from wrong to right	→	33%
Changing from right to wrong	→	42%
Changing from wrong to wrong	→	24%

But when Kruger and his colleagues calculated the actual percentages, measured by looking at erasures on multiple choice tests taken by the same students, these were the results:

Changing from wrong to right	→	51%
Changing from right to wrong	→	25%
Changing from wrong to wrong	→	23%

This of course is a huge difference—students were holding onto a strong belief ("Don't change answers—go with your first instinct!"), a belief they thought was based solidly on their direct experience, and yet the belief was completely false.[2] If you are saying to yourself there is no way this can be true, and I suspect you might indeed be saying that to yourself, then you have some idea of the strength of the combined forces of confirmation bias, belief perseverance, and the availability heuristic. Our experiences can be an indispensable and important guide to life's difficulties, but we also need to be aware of their limits. Social cognition biases such as the ones described here (not to mention several others—check out any social psychology textbook) can work together to distort the beliefs about and our interpretations of experiences in the world.

[2] People who should know better also fall prey to this first instinct fallacy. Kruger et al. (2005) opened their article by quoting from a well-known GRE test preparation guide (*Barron's*)—"Exercise great caution if you decide to change an answer. Experience indicates that many students who change answers change to the wrong answer" (p. 725). They also referred to an earlier study by Benjamin, Cavell, and Shallenberger (1984), which showed that the majority of *faculty* at Texas A&M University surveyed also endorsed the first instinct fallacy.

The Ways of Knowing and Science

The most reliable way to develop a belief, according to Charles Peirce, is through the method of **science**. Its procedures allow us to know "real things, whose characters are entirely independent of our opinions about them" (Tomas, 1957, p. 25). Thus, Peirce believed that the chief advantage of science is in its objectivity—for Peirce, to be objective meant to avoid completely any human bias or preconception. Modern philosophers of science recognize that, because scientists are just as human as everyone else, the ideal of a pure objectivity among scientists is impossible. To some degree, they rely on authority, they often logically argue with each other in an *a priori* fashion, and they are prone to social cognition biases in the process of learning from their experiences.

Concerning bias, scientists sometimes hold on to a pet theory or a favored methodology long after others have abandoned it, and they occasionally seem to be less than willing to entertain new ideas. Charles Darwin once wrote half seriously that it might be a good idea for scientists to die by age 60, because after that age, they "would be sure to oppose all new doctrines" (cited in Boorstin, 1985, p. 468). On the other hand, the historian of science Thomas Kuhn (1970) argued that refusing to give up on a theory, in the face of a few experiments questioning that theory's validity, can have the beneficial effect of ensuring that the theory receives a thorough evaluation. Thus, being a vigorous advocate for a theory can ensure that it will be pushed to its limits before being abandoned by the scientific community. The process by which theories are evaluated, evolve, and sometimes die will be elaborated in Chapter 3.

Research psychologists can also be influenced by authority. The "authorities" are usually other scientists, and experts are certainly more likely to be reliable sources than not. Nonetheless, researchers know better than to assume automatically that something is true simply because a reputable scientist said it was true. Rather, scientists are normally guided by the motto engraved on the entrance to the headquarters of the British Royal Society—"Nullius in Verba"—which encourages them to "take nobody's word for it; see for yourself" (cited in Boorstin, 1985, p. 394). Of course, "seeing for yourself" opens up the dangers of uncritically relying on experience, but scientists tend to be rather good at critical thinking.

Peirce's *a priori* method (the use of reason) is frequently found in science to the extent that scientists argue with each other, trying to reach a rational consensus on some issue, but often failing to do so (e.g., whether the computer provides a useful metaphor for memory). As you will see in Chapter 3, they also rely on the rules of logic and inductive/deductive reasoning to develop ideas for research and to evaluate research outcomes. Although scientific thinking includes elements of the nonscientific ways of knowing described thus far, it has a number of distinct attributes. It is to the nature of science that we now turn.

Self Test 1.1

1. Even if you never get involved in research after taking the research methods course, why is taking a research methods course valuable?
2. If you fail to question anything in this textbook, you will be relying too heavily on _____ as a way of knowing.
3. Some students think they should never change answers on multiple-choice tests. What does this have to do with the availability heuristic?

Science as a Way of Knowing

The way of knowing that constitutes science in general and psychological science in particular involves a number of interrelated assumptions and characteristics. First, researchers assume **determinism** and **discoverability**. Determinism simply means that events, including psychological ones, have causes, and discoverability means that by using agreed-upon scientific methods, these causes can be discovered with some degree of confidence. In psychology, we ultimately would like to know what causes behavior (determinism), and it is with the tools of science that we can discover those causes (discoverability). Even with the best of methods, research psychologists do not expect to predict psychological phenomena with 100% certainty, but they have faith that psychological phenomena occur with some regularity and that the regularities can be investigated successfully. Let us examine the determinism assumption in more detail. This will be followed by a discussion of the other attributes of science as a way of knowing.

Science Assumes Determinism

Students are often confused after reading that psychologists regard human behavior as "determined." They sometimes assume this means "predestined" or "predetermined," or that "determinism" is contrasted with "free will." These are not the definitions of determinism that scientists use. A believer in absolute predestination thinks that every event is determined ahead of time, perhaps by God, and develops a fatalistic conviction that one can do little but accept life as it presents itself. However, the traditional concept of determinism, as used in science, contends simply that all events have causes. Some philosophers have argued for a strict determinism, which holds that the causal structure of the universe enables the prediction of all events with 100% certainty, at least in principle. Most scientists, influenced by 20th-century developments in physics and the philosophy of science, take a more moderate view that could be called probabilistic or **statistical determinism**. This approach argues that events can be predicted, but only with a probability greater than chance. Research psychologists take this position and use this definition of determinism in their science.

The concept of determinism, even the "less than 100%" variety, is troubling because it seems to require that we abandon our belief in free will. If every event has a cause, so the argument goes, then how can one course of action be freely chosen over another? The psychologist would reply that if determinism is not true at least to some degree, then how can we ever know anything about behavior? Imagine for a moment what it would be like if human behavior was completely unpredictable. How could you decide whether to marry Ned or Ted? How could you decide whether or not to take a course from Professor Jones?

Of course, there are multiple factors influencing behavior, and it is difficult to know for sure what someone will do at any one moment. Nonetheless, behavior follows certain patterns and is clearly predictable. For example, because we know that children will often do things that work effectively for them, it is not hard to predict a tantrum in the toy department of a crowded store if that behavior has yielded toys for a child in the past. And because behavior learned in one setting tends to "generalize" to similar environments, it isn't hard to predict a tantrum in Wal-Mart for the child whose tantrums have worked effectively in Target.

Most research psychologists believe that the issue about the existence of free will cannot be settled one way or the other by science. Rather, whether the choices we make in life are freely made or not is a philosophical matter, and our personal belief about free will must be an individual decision, arrived at through the use of reason (perhaps supplemented with reflection on our experiences and/or the ideas of authority figures). The best that psychologists can do is to