chapter 1

Psychology as a Science

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In an article in *Wired* magazine, journalist Amy Wallace described her visit to the annual conference sponsored by Autism One, a nonprofit group organized around the belief that autism is caused by mandatory childhood vaccines:

> I flashed more than once on Carl Sagan's idea of the power of an "unsatisfied medical need." Because a massive research effort has yet to reveal the precise causes of autism, pseudoscience has stepped into the void. In the hallways of the Westin O'Hare hotel, helpful salespeople strove to catch my eye . . . pitching everything from vitamins and supplements to gluten-free cookies . . . hyperbaric chambers, and neuro-feedback machines.
>
> (Wallace, 2009, p. 134)

The "pseudoscience" to which Wallace refers is the claim that vaccines generally do more harm than good and specifically cause children to develop autism. In fact, an extensive statistical review of epidemiological studies, including tens of thousands of vaccinated children, found *no evidence* of a link between vaccines and autism. But something about this phrasing doesn't sit right with many people; "no evidence" rings of scientific mumbo jumbo, and a "statistical review" pales in comparison with tearful testimonials from parents that their child developed autistic symptoms shortly after being vaccinated. The reality is this: Research tells us that vaccines bear no relation to autism, but people still believe that they do. Because of these beliefs, increasing numbers of parents are forgoing vaccinations, and many communities are seeing a loss of herd immunity and a resurgence of rare diseases including measles and mumps.

So what does it mean to say that "research" has reached a conclusion? Why should we trust this conclusion over a parent's personal experience? One of the biggest challenges in starting a course on research methods is learning how to think like a scientist—that is, to frame questions in testable ways and to make decisions by weighing the evidence. The more personal these questions become, and the bigger their consequences, the harder it is to put feelings aside. But, as we will see throughout this course, it is precisely in these cases that listening to the evidence becomes most important.

There are several reasons to understand the importance of scientific thinking, even if you never take another psychology course. First, at a practical level, critical thinking is an invaluable skill to have in a wide variety of careers and in all areas of life. Employers of all types appreciate the ability to reason through the decision-making process. Second, understanding the scientific approach tends to make you a more skeptical consumer of news reports. If you read in *Newsweek* that the planet is warming, or cooling, or staying the same temperature, you will be able to decipher and evaluate how the author reached this conclusion and possibly reach a different one on your own. Third, understanding science makes you a more informed participant in debates about public policy. If we want to know whether the planet is truly getting warmer, this conclusion should come from carefully weighing the scientific evidence rather than trusting the loudest pundit on a cable news network.

Where does psychology fit into this picture? Objectivity can be a particular challenge in studying our own behavior and mental processes because we are intimately familiar with the processes we are trying to understand. The psychologist William C. Corning captured this sentiment over 40 years ago: "In the study of brain functions we rely upon a biased, poorly understood, and frequently unpredictable organ in order to study the properties of another such organ; we have to use a brain to study a brain" (Corning, 1968, p. 6). (Or, in the words of comedian Emo Philips, "I used to think that the brain was the most wonderful organ in my body. Then I realized who was telling me this.") The trick, then, is learning to take a step back and apply scientific thinking to issues you encounter and experience every day.

This textbook provides an introduction to the research methods used in the study of psychology. It will introduce you to the full spectrum of research designs, from observing behavior to manipulating conditions in a laboratory. We will cover the key issues and important steps for each type of design, both qualitative and those that observe, predict, and explain behavior, as well as the analysis strategies most appropriate for each type. In this chapter, we begin with an overview of the different areas of psychological science. We then introduce the research process by discussing the key features of the scientific approach and then cover the process of forming testable research questions, developing hypotheses and theories, and searching the literature. In the final two sections, we cover writing a research proposal and discuss the importance of adhering to ethical principles at all stages of the research.

Research: Making an Impact

The Vaccines and Autism Controversy

In a 1998 paper published in the well-respected medical journal *The Lancet*, British physician Andrew Wakefield and his colleagues studied the link between autism symptoms and the measles, mumps, and rubella (MMR) vaccine in a sample of twelve children (Wakefield et al., 1998). Based on a review of these cases, the authors reported that all twelve experienced adverse effects of the vaccine, including both intestinal and behavioral problems. The finding that grabbed the headlines was the authors' report that nine of the twelve children showed an onset of autism symptoms shortly after they received the MMR vaccine.

Immediately after the publication of this paper, the scientific community criticized the study for its small sample and its lack of a comparison group (i.e., children in the general population). Unfortunately, it turned out these issues were only the tip of the iceberg (Godlee, Smith, & Marcovitch, 2011). The British journalist Brian Deer conducted an in-depth investigation of Wakefield's study and discovered some startling information (Deer, 2004). First, the study had been funded by a law firm that was in the process of suing the manufacturers of the MMR vaccine, resulting in a real threat to the researchers' objectivity. Second, there was clear evidence of scientific misconduct; the data had been falsified and altered to fit Wakefield's hypothesis—many of the children had shown autism symptoms before receiving the vaccine. In his report, Deer stated that every one of the twelve cases showed evidence of alteration and misrepresentation.

Ultimately, the *Lancet* withdrew the article in 2010, effectively removing it from the scientific record and declaring the findings no longer trustworthy. But in many respects, the damage was already done. Vaccination rates in Britain dropped to 80% following publication of Wakefield's article, and these rates remain below the recommended 95% level recommended by the ***(continued)***

Research: Making an Impact *(continued)*

World Health Organization (Godlee et al., 2011). That is, even though the article was a fraud, it made parents afraid to vaccinate their children. Vaccinations work optimally when most members of a community get the vaccines because this minimizes the opportunity for an outbreak. When even a small portion refuses to vaccinate their children, the entire community is at risk of infection (National Institute of Allergy and Infectious Diseases, n.d.). Thus, it should be no surprise that many communities are seeing a resurgence of measles, mumps, and rubella: In 2008, England and Wales declared measles to be a prevalent problem for the first time in 14 years (Godlee et al., 2011).

This scenario highlights the importance of conducting science honestly. While disease outbreaks are the most obvious impact of Wakefield's fraud, they are not the only one. In a 2011 editorial in the *British Medical Journal* condemning Wakefield's actions, British doctor Fiona Godlee and colleagues captured this rather eloquently:

> But perhaps as important as the scare's effect on infectious disease is the energy, emotion, and money that have been diverted away from efforts to understand the real causes of autism and how to help children and families who live with it. (p. 7452)

1.1 Research Areas in Psychology

Psychology is a diverse discipline, encompassing a wide range of approaches to asking questions about why people do the things that they do. The common thread among all of these approaches is the *scientific study* of human behavior. So, while psychology might not be the only field to speculate on the causes of human behavior—philosophers have been doing this for millennia—psychology is distinguished by its reliance on the scientific method to draw conclusions. We will examine the meaning and implications of this scientific perspective later in the chapter. In this section, we discuss the major content areas within the field of psychology, along with samples of the types of research questions asked by each one. For further reading about these areas, the American Psychological Association (APA) has an excellent collection of web resources: http://www.apa.org/topics/index.aspx.

Biopsychology

Biopsychology, as the name implies, combines research questions and techniques from both biology and psychology. It is typically defined as the study of connections between biological systems (including the brain, hormones, and neurotransmitters) and our thoughts, feelings, and behaviors. As a result, the research conducted by biopsychologists often overlaps research in other areas—but with a focus on biological processes. Biopsychologists are often interested in the way interactions between biological systems and thoughts, feelings, and behaviors impact the ability to treat disease, as seen in the following questions: What brain systems are involved in the formation of memories? Can Alzheimer's be cured or prevented through early intervention? How does long-term exposure to toxins such as lead impact our thoughts, feelings, and behaviors? How easily can the brain recover after a stroke?

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A study investigating changes in the brain anatomy of new mothers explores the connection between a biological system and the emotions, thoughts, and behaviors involved in caring for a newborn child.

In one example of this approach, Kim and colleagues (2010) investigated changes in brain anatomy among new mothers for the first 3 months following delivery. These authors were intrigued by the numerous changes new mothers undergo in attention, memory, and motivation; they speculated that these changes might be associated with changes in brain structure. As expected, new mothers showed increases in gray matter (i.e., increased complexity) in several brain areas associated with maternal motivation and behavior. And, the more these brain areas developed, the more positively these women felt toward their newborn children. Thus, this study sheds light on the potential biological processes involved in the mother–infant bond.

Cognitive Psychology

Whereas biopsychology focuses on studying the brain, **cognitive psychology** studies the mind. It is typically defined as the study of internal mental processes, including the ways that people think, learn, remember, speak, perceive, and so on. Cognitive psychologists are interested primarily in the ways that people navigate and make sense of the world, including questions such as the following: How do our minds translate input from the five senses into a meaningful picture of the world? How do we form memories of emotional versus mundane experiences? What draws our attention in a complex environment? What is the best way to teach children to read?

In one example of this approach, Foulsham, Cheng, Tracy, Henrich, & Kingstone (2010) were interested in what kinds of things people pay attention to in a complex social scene. The world around us is chock-full of information, but we can pay attention only to a relatively thin slice of it. Foulsham and colleagues were particularly interested in where our attention is directed when we observe groups of people. They answered this question by asking people to watch videos of a group discussion and using tools to track eye movements. It turned out that people in this study spent most of their time looking at the most dominant member of the group, suggesting that we are wired to pay attention to those in positions of power. Thus, this study sheds light on one of the ways that we make sense out of the world.

Developmental Psychology

Developmental psychology is defined as the systematic study of physical, social, and cognitive changes over the human life span. Although this field initially focused on

childhood development, many researchers now study changes and key stages over the entire life span. Developmental psychologists study a wide range of phenomena related to physical, social, and cognitive change, including, How do children bond with their primary caregiver(s)? What are our primary needs and goals at each stage of life? Why do some cognitive skills decline in old age? At what ages do infants develop basic motor skills?

In one example of this approach, Hill and Tyson (2009) explored the connection between children's school achievement and their parents' involvement with the school. In other words, Do children perform better when their parents are actively involved in school activities? The authors addressed this question by combining results from several studies into one data set. Across 50 studies, the answer to this question was yes—children do better in school if their parents are involved. Thus, this study sheds light on a key predictor of academic achievement during an important developmental period.

Social Psychology

Social psychology attempts to study behavior in a broader social context. It is typically defined as the study of the ways our thoughts, feelings, and behaviors are shaped by other people. As you might imagine, this broad perspective allows social psychologists to tackle a wide range of research questions, including the following: What kinds of things do we look for in selecting romantic partners? Why do people stay in bad relationships? How do other people shape our sense of who we are? When and why do people help in emergencies?

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Social psychologist Norman Triplett's study of cyclists led to conclusions about how people influence one another.

Norman Triplett conducted the first published social psychology study at the end of the 19th century (Triplett, 1898). Triplett had noticed that professional cyclists tended to ride faster when racing against other cyclists than when competing in solo time trials. He tested this observation in a controlled laboratory setting, asking people to do a number of tasks either alone or next to another person. His results (and countless other studies since) revealed that people worked faster in groups, suggesting that other people can have definite and concrete influences on our behavior.

Clinical Psychology

Finally, the area of **clinical psychology** is an applied field focused on understanding the best ways to treat psychological disorders. It is typically defined as the study of best practices for understanding, treating, and preventing distress and dysfunction. Clinical

psychologists engage in both the assessment and the treatment of psychological disorders, as seen in the following research questions: What is the most effective treatment for depression? How can we help people overcome posttraumatic stress disorder following a traumatic event? Should anxiety disorders be treated with drugs, therapy, or a combination? What is the most reliable way to diagnose schizophrenia?

One example of this approach is found in a study by Kleim and Ehlers (2008), which attempted to understand the risk factors for posttraumatic stress disorder, a prolonged reaction to a severe traumatic experience. Kleim and Ehlers found that assault victims who tend to form less specific memories about life in general might be more likely to develop a disorder in response to trauma than victims who tend to form detailed memories. People who tend to form vague memories may have fewer resources to draw on in trying to reconnect with their daily life after a traumatic event. Thus, this study sheds light on a possible pathway contributing to the development of a psychological disorder.

1.2 Scientific Thinking and Paths to Knowledge

One of the easiest ways to understand the scientific approach is to contrast it with other ways of understanding the world. While science offers us the most objective and rigorous approach to decision making, it is by no means the only approach. Some of the following paths to knowledge have been popular and acceptable during different historical periods. Other approaches are currently in use by different academic disciplines. To showcase the distinctions among them, the following examples illustrate how each perspective might approach the link between vaccines and autism.

Authority

In a number of contexts, people understand the world based on what authority figures tell them. Parents dictate curfews to children; cities assign speed limits within their borders; and churches interpret the meaning of holy texts. In each case, the rules and knowledge are accepted because there is trust in the source of the knowledge. In the debate over vaccines and autism, this perspective would be evident in those who trust their doctor's advice to vaccinate their children. It would also be evident in those who trust celebrity spokesperson Jenny McCarthy's testimony that vaccines gave her son autism.

Phenomenology

Many academic disciplines take a phenomenological approach to studying the world around us. This approach focuses on each individual's intuition and subjective experience and treats truth as a subjective concept. In other words, if you believe that your alcoholism stems from a bad relationship with your father, there is some "truth" to this belief (regardless of the objective truth). In the debate over vaccines and autism, this perspective would be evident in those who are swayed by a parent's testimony, despite all evidence to the contrary. If Jenny McCarthy believes vaccines gave her child autism, then there must be some "truth" to her belief.

Rationalism

For several centuries, scientific inquiry was guided by a rationalist approach, and this approach is still dominant in many of the humanities disciplines. **Rationalism** involves making decisions based on logical arguments; if something "makes sense," it must be the right answer. In the debate over vaccines and autism, this perspective would be evident in the narrowly constructed argument that because autism symptoms appear shortly after vaccination, vaccines must be the cause. (This reasoning ignores the rules about the kinds of evidence needed to make statements about causation, which we will cover in later chapters.)

Empiricism

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Rather than relying on reason and logic, empiricism focuses on what one can learn through observations and sensory experiences.

The scientific approach, which is our focus in this book, makes decisions based on evidence. This approach, also called **empiricism**, focuses on the role of observation and sensory experience over the role of reason and logic alone. It is all well and good to come up with a creative idea about how the world works, but this idea does not carry scientific weight until it has been supported through carefully collected observations of the world around us. These observations form the basis of science, which set it apart from the other paths to knowledge. In the debate over vaccines and autism, scientific evidence leads to the unambiguous conclusion: There is no link between vaccines and autism. But if the opposite picture were true, scientists would gladly change their minds. One of the key advantages of science is that it is not bound to a particular ideology (e.g., a political point of view or prejudice) but is dedicated to the belief in the superiority of observable evidence. Although the experimenter's values are certain to enter the picture, they can be a powerful motivating force to uncover the truth rather than a source of bias.

In summary, scientific inquiry offers us one of many ways to understand the world. In theory, these perspectives are not incompatible, although in practice, differing perspectives can lead to drastically different conclusions. (The writer Stephen Jay Gould famously made this argument about science and religion, arguing that they are essentially suited to answering different types of questions. You can read an essay by Gould at the following website: http://www.stephenjaygould.org/library/gould_noma.html.) And, on a particularly practical note, the scientific approach is the one that we will adopt throughout this class. So when you are asked to evaluate research results on your exams, your interpretation will need to be based on weighing the evidence; it is not acceptable to claim that a finding "just makes sense."

The Research Process

So what does it mean to draw conclusions based on science? Scientists across all disciplines use the same process of forming and testing their ideas. The overall goal of this research process—also known as the **scientific method**—is to draw conclusions based on empirical observations and experiments (e.g., random assignment and manipulation) designed to test causal theories. In this section, we cover the four steps of the research process—*h*ypothesize, *o*perationalize, *m*easure, and *e*xplain, abbreviated with the acronym HOME.

Step 1—Hypothesize

The first step in the research process is to develop a testable prediction, or **hypothesis**. A hypothesis is a specific and falsifiable statement about the relationship between two or more **variables** (more on that "falsifiable" bit in a minute . . .). For example, if we study the link between smoking and cancer, our hypothesis might be that smoking causes lung cancer. Or, if we are studying a new drug for treating depression, we might hypothesize that drug X will lead to a reduction in depression symptoms. We will cover hypotheses in more detail in the next section, but for now it is important to understand that the way we frame our hypothesis guides every other step of the research process. Even the most promising theories will not be testable if you do not clearly define the variables, or if many contradictory outcomes are possible (e.g., depression can lead to weight gain or weight loss).

Step 2—Operationalize

Once we have developed a hypothesis, the next step is to decide how to test it. The process of **operationalization** involves choosing measurable variables to represent the components of our hypothesis. In the preceding depression drug example, we would need to decide how to measure both cause and effect; in this case, we define the cause as the drug and the effect as reduced symptoms of depression. That is, what doses of the drug should we investigate? How many different doses should we compare? Also, how will we measure depression symptoms? Will it work to have people complete a questionnaire? Or do we want to have a clinician interview participants before and after they take the drug? An additional complication for psychology studies is that many of our research questions deal with abstract concepts. There is an art to turning these concepts into measurable variables. For example, the concept of "happiness" could be operationalized as a person's score on a happiness scale, or as the number of times a person smiles in a 5-minute period, or perhaps even as a person's subjective experience of happiness during an interview. We will cover this process in more detail in Chapter 2 (Section 2.2), where we discuss guidelines for making these important decisions about the study.

Step 3—Measure

Now that we have developed both our research question and our operational definitions, it is time to collect some data. We will cover this process in great detail; Chapters 3 through 5 are dedicated to the three primary approaches to data collection: descriptive designs (including qualitative approaches, although quantitative studies can be descriptive as well), survey designs, and experimental designs. The goal of the data collection stage is to gather empirical observations that will help address our hypothesis. As we discuss in Chapter 2, these observations can range from questionnaire responses to measures of brain activity, and they can be collected in ways ranging from online questionnaires to carefully controlled experiments.

Step 4—Explain

After the data has been collected, the final step is to analyze and interpret the results. The goal of this step is to return full circle to our research question and determine whether the results support our hypothesis. Let's go back to our hypothesis that drug X should reduce depression symptoms. If we find at the end of the study that people who took drug X showed a 70% decrease in symptoms, this would be consistent with the hypothesis. But the explanation stage also involves thinking about alternative explanations and planning for future studies. What if depression symptoms dropped simply due to the passage of time? How could we address this concern in a future study? As it turns out, there is a fairly easy way to fix this problem, which we'll cover in Chapter 5.

In summary, the research process involves four stages: forming a hypothesis, deciding how to test it, collecting data, and interpreting the results. This process is used regardless of whether our research questions involve depression drugs, reading speed, or the speed of light in a vacuum.

Examples of the Research Process

To make these steps a bit more concrete, let's walk through two examples of how they could be applied to specific research topics.

Example 1—Depression and Heart Disease

Depression affects approximately 20 million Americans, and 16% of the population will experience it at some time in their lives (National Institute of Mental Health [NIMH], 2007). Depression is associated with a range of emotional and physical symptoms, including feelings of hopelessness and guilt, loss of appetite, sleep disturbance, and suicidal thoughts. This list has expanded even further to include an increased risk of heart disease. Individuals who are otherwise healthy but suffering from depression are more likely to develop and to die from cardiovascular disease than those without depression. According to one study, patients who experience depression following a heart attack experience a fourfold increase in 5-year mortality rates (research reviewed in Glassman et al., 2011).

One intriguing idea that comes from these findings is that it might make sense to treat heart attack patients with antidepressant drugs. The goal of the HOME method is to take this idea, turn it into a testable question, and conduct a study that will test it.

Step 1 is to form a testable hypothesis from this research question. In this case, we might predict that people who have had heart attacks and take prescribed antidepressants are more likely to survive in the years following the heart attack than those who do not take antidepressants. What we've done here is to take a general idea about the benefits of a drug and state it in a way that can be directly tested in a research study.

Step 2 is to decide how we want to operationalize the concepts in our study. In this case, we would first decide who qualified as a heart attack patient: Would we include only those hospitalized with severe heart attacks or include anyone with abnormal cardiac symptoms? As we will discuss in later chapters, this decision will have implications for how we interpret the results. We would also need to decide on the doses of antidepressant drugs to use and the time period to measure survival rates. How long would we follow patients?

Step 3 is to measure these key concepts based on the decisions we made in step 2. This step involves collecting data from participants and then conducting statistical analyses to test our hypothesis. We will cover the specifics of research designs beginning in Chapter 2 (Section 2.1), but essentially we would want to give antidepressants to half of our sample and compare their survival rates with the half not given these drugs.

Step 4 is to explain the results and tie the statistical analyses back into our hypothesis. In this case, we would want to know whether antidepressant drugs did indeed benefit heart attack patients and increase their odds of survival for 5 years. If so, our hypothesis is supported. If not, we would go back to the drawing board and try to determine whether something went wrong with the study or antidepressant drugs really don't have any benefit for this population. As we'll discuss, answering these kinds of questions usually involves conducting additional studies. Either way, the goal of this final step is to return full circle to our research question and discuss the implications of antidepressant drug treatment for heart attack patients.

Example 2—Language and Deception

In 1994, Susan Smith appeared on television claiming that her two young children had been kidnapped at gunpoint. Eventually, authorities discovered she had drowned her children in a lake and fabricated the kidnapping story to cover her actions. Before Smith was a suspect in the children's deaths, she told reporters, "My children wanted me. They needed me. And now I can't help them" (Lee and Vobejda, 1994). Normally, relatives speak of a missing person in the present tense. The fact that Smith used the past tense in this context suggested to trained FBI agents that she already viewed them as dead (Adams, 1996).

One intriguing idea that comes from this story is that people may communicate in different ways when they are lying than when they are telling the truth. The goal of the HOME method is to take this idea, turn it into a testable question, and conduct a study that will test it.

Step 1 is to form a testable hypothesis from this research question. This example is somewhat more challenging because "communicating differently" can be defined in many ways. Thus, we need a hypothesis that will narrow the focus of our study. One hypothesis, based on research literature, might be that liars show more negative emotion (e.g., anger, fear) in the way that they communicate than truth-tellers do (e.g., Newman, Pennebaker, Berry, & Richards, 2003). What we've done here is to take a general idea and state it in a way that can be directly tested in a research study.

Step 2 is to decide how we want to operationalize the concepts in our study. In this case, we would need to decide what counts as "showing negative emotion." We might take the approach used in a previous study (Newman et al., 2003) and scan the words people use, looking for those reflecting emotions such as anger, anxiety, and fear. The logic here is that the words people use reflect something about their underlying thought processes and that people who are trying to lie will be more anxious and fearful as a result of the lie.

Step 3 is to measure these key concepts based on the decisions we made in step 2. This step involves collecting data from participants and then conducting statistical analyses to test our hypothesis. In this example, the challenge comes in determining whether and when people are lying. In Susan Smith's case, the truth was ultimately discovered, so we can

say with some certainty that her language was deceptive. One way to do this in a research study is to tell people to lie, tell others to be truthful, and compare differences in the way they use language.

Step 4 is to explain the results and tie the statistical analyses back into our hypothesis. In this case, we want to know whether people who were instructed to lie did indeed use more words suggestive of negative emotion. If so, this supports our hypothesis. If not, we would go back to the drawing board and try to determine whether something went wrong with the study or people really don't use more negative emotion when they lie. Either way, the goal of this final step is to return full circle to our research question and discuss the implications for understanding indicators of deception.

Goals of Science

In addition to sharing an overall approach, all forms of scientific inquiry tend to adopt one of four overall goals. This section provides an overview of these goals, with a focus on their application to psychological research. We will encounter the first three goals throughout the course and use them to organize our discussion of different research methods.

Description

One of the most basic research goals is to describe a phenomenon, including descriptions of behavior, attitudes, and emotions. Basic research is the foundation on which all subsequent research will be laid and therefore should be built solidly. You are probably very familiar with this type of research because it tends to crop up in everything from the nightly news to your favorite magazine. For example, if CNN reports that 60% of Americans approve of the president, they are describing a trend in public opinion. Descriptive research should always be the starting point when studying a new phenomenon. That is, before we start trying to explain why college students binge drink, we need to know how common the phenomenon really is. So we might start with a simple survey that asked college students about their drinking behavior, and we might find that 29% of them show signs of dangerous binge drinking. Now that we have described the phenomenon, we are in a better position to conduct more sophisticated research. (See Chapter 3 for more detail on descriptive research.)

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Before a phenomenon can be explained, it must first be described. For example, a survey might be used to collect information used to describe the phenomenon of binge drinking.

Prediction

A second goal of research is to attempt to predict a phenomenon. This goal takes us from describing the occurrence of binge drinking among college students to attempting to understand when and why they do it. Do students give in to peer pressure? Is drinking a way to deal with the stress of school? These questions could be addressed through a more detailed survey that asked people to elaborate on the reasons that they drink. The goal of this approach is to understand the factors that make something more likely to occur. (See Chapter 4 for more detail on the process of designing surveys and conducting predictive research.)

Explanation

A third, and much more powerful, goal of research is to attempt to explain a phenomenon. This goal takes us from predicting relationships to testing possible causal links. Whereas predictive research attempts to find associations between two phenomena (e.g., college student drinking is more likely when students are under stress), explanatory research attempts to make causal statements about the phenomenon of interest (e.g., stress causes college students to drink more). This distinction may seem subtle at this point, but it is an important one and is closely related to the way that we design our studies. (See Chapter 5 for more detail on explanatory research.)

Change

The fourth and final goal of research is generally limited to psychology and other social science fields: When we are dealing with questions about behaviors, attitudes, and emotions, we can conduct research to try to change the phenomenon of interest. Researchers who attempt to change behaviors, attitudes, or emotions are essentially applying research findings with the goal of solving real-world problems. In the 1970s, Elliot Aronson, a social psychologist at the University of Texas at Austin, was interested in ways to reduce prejudice in the classroom. Research conducted at the time was discovering that prejudice is often triggered by feelings of competition; in the classroom, students competed for the teacher's attention. Aronson and his colleagues decided to change the classroom structure in a way that required students to cooperate in order to finish an assignment. Essentially, students worked in small groups, and each person mastered a piece of the material. (You can read the details on this website: http://www.jigsaw.org/). Aronson found that using this technique, known as the "jigsaw classroom," both enhanced learning and decreased prejudice among the students (e.g., Aronson, 1978).

Aronson's work also illustrates the distinction between two categories of research. The first three goals we have discussed fall mainly under the category of **basic research**, in which the primary goal is to acquire knowledge, with less focus on how to apply the knowledge. Scientists conducting basic research might spend their time trying to describe and understand the causes of binge drinking but stop short of designing interventions to stop binge drinking. This fourth goal of research is more often seen in **applied research**, in which the primary goal is to solve a problem, with less focus on why the solution works. Scientists conducting applied research might spend their time trying to stop binge drinking but not get caught up in the details of why these interventions are effective. But Aronson's research is a great example of how these two categories should work together. The basic research on sources of prejudice informed his applied research on ways to reduce prejudice, which in turn informed further basic research on why this technique is so effective.

One final note on changing behavior: Any time you set out with the goal of changing what people do, your values enter the picture. Inherent in Aronson's research was the assumption that prejudice was a bad thing that needed to be changed. Although few people would disagree with him, the risk is that he might have trouble remaining objective throughout the research project. As we suggested earlier, the more emotionally involved you are in the research question, the more you have to be aware of the potential for bias, and the more you have to force yourself to pay attention to the data.

Quantitative Versus Qualitative Research

Imagine for a moment that you are a city planner interested in studying traffic patterns at different times of the day. You might approach this research question in one of two ways. You could fly over the city in a helicopter, take snapshots of a random set of busy intersections, and conduct statistical analyses on cars moving in different directions at different times. This would give you a broad understanding of traffic patterns in the city. Alternatively, you could spend your resources studying the busiest intersection in the middle of downtown, trying to understand everything from driver behaviors to the effects of weather conditions. This would give you a very deep understanding of traffic in the middle of your city.

These two approaches illustrate the differences between quantitative research and qualitative research, respectively. **Quantitative research** is a systematic and empirical approach that attempts to generalize results to other contexts. By taking "samples" of different intersections and by conducting inferential statistics, our hypothetical city planner could learn a little bit about traffic in general. **Qualitative research**, in contrast, is a more descriptive approach that attempts to gain a deep understanding of particular cases and contexts. By studying the busiest intersection in detail, our hypothetical city planner could learn a great deal about the traffic patterns at that intersection.

The two approaches have traditionally been popular with different social science fields. For example, much of the current research in psychology is quantitative because the goal is to gain generalizable knowledge about behavior and mental processes. In contrast, much of the current research in sociology and political science tends to be qualitative because the goal is to gain a richer understanding of a particular context. If you want to understand why college students around the country suffer from increased depression, quantitative methods are the better choice. If you want to understand why the citizens of Egypt revolted against their government, then qualitative methods are more appropriate. Overall, qualitative research is especially useful when behavior has multiple causes that researchers may not anticipate or when researchers have only a limited understanding of the subjects' cultural point of view.

Table 1.1 presents a comparison of quantitative and qualitative methods, their descriptions, purposes and approaches, and the researcher's roles. (See also the Centers for Disease Control and Prevention [CDC] website for further comparison: http://www.cdc.gov/healthcommunication/CDCynergy/Appendix.html#H)

Table 1.1: Comparing quantitative and qualitative research methodologies

	Quantitative	Qualitative
Description	Aim is *to classify features, count them, and construct statistical models in an attempt to explain what is observed*	Aim is a *complete, detailed description*
	Researcher knows clearly in advance what he/she is looking for	Researcher may only know roughly in advance what he/she is looking for
	All aspects of the study are carefully designed before data are collected	The design emerges as the study unfolds
	Researcher uses tools, such as closed-ended questionnaires, rating scales, tests, etc. or equipment to collect numerical data	Researcher uses observations, interviews (open-ended questions), and written documents (historical records, official publications, other articles, photographs, etc.)
	Data take the form of numbers and statistics and are measurable	Data take the form of words, pictures, or objects and are not as easy to measure
	Focus is on objective assessment: seeking precise measurement and analysis of target concepts, e.g., uses closed-ended surveys, questionnaires, etc.	**Focus is on subjective assessment: individuals' interpretation of events is important, e.g., uses participant observation, in-depth interviews, etc.**
	Data are more efficient, able to test hypotheses, and can be generalized	Data are more detailed, time-consuming, and less able to be generalized
	Researcher is objectively separated from the subject matter	Researcher is immersed in the subject matter
Purpose	Generalizability	Contextualization
	Prediction	Interpretation
	Causal explanations	Understanding actors' perspectives
Approach	**Begins with hypotheses and theories**	**Ends with hypotheses or grounded theory**
	Manipulation and control of variables	Little control over variables
	Uses formal instruments of measurement	Researcher as instrument
	Experimentation	Naturalistic observation
	Deductive reasoning	Inductive reasoning
Researcher's Role	Detachment and impartiality	Personal involvement and partiality
	Objective portrayal	Empathic understanding

In an ideal world, a true understanding of any phenomenon requires the use of both methods. That is, we can best understand depression if we both study statistical trends and conduct in-depth interviews with depressed people. We can best understand binge drinking by conducting both surveys and focus groups. And we can best understand the experience of being bullied in school by both talking to the victims and collecting school-wide statistics. Thus, researchers do not have to choose one method over another but can combine elements of both quantitative and qualitative approaches to produce **mixed methods designs**. Mixed methods designs are often used when one method does not provide a complete picture of the phenomenon being investigated. In this text, the focus is primarily on quantitative methods, reflecting current trends in the field of psychology. We will primarily cover qualitative methods in Chapter 3 (on descriptive research) and quantitative methods in Chapters 4 (predictive research) and 5 (experimental research). A more thorough discussion on mixed methods designs will also be discussed in Chapter 5.

1.3 Research Problem and Questions

Before conducting research, whether it be through qualitative or quantitative methods, a researcher must first identify a problem to investigate and then develop a research question or questions to ask about that particular problem. Theory and hypothesis play a crucial role, as do research, observation, and top-down and bottom-up thinking, informed by a thorough literature search.

While we often think we understand problems, we really do not. For example, a teacher might notice that a student is easily distracted and inattentive in the classroom, leading the teacher to believe, initially, that the student has an attention problem or attention-deficit/hyperactivity disorder (ADHD). Upon further examination and possibly after testing has occurred, the results might instead show that the student has a learning disability in reading, writing, or math, and is being inattentive because he or she does not understand the material or have the necessary skills to complete the assignment.

In another example, a teacher observes that a student is sleeping excessively during the first two periods of school. The teacher may assume that the student stays up late playing on the computer or texting with his or her friends. After speaking to the parents, the teacher learns that the parents have recently gone through a divorce and that the student is working a part-time job in the evenings to help out with the finances. Thus, the student has been staying up late at night to complete his or her homework for the next school day. As we can see, in some cases our initial beliefs or thoughts about a problem may not be correct and may lead to inaccurate recommendations and treatments. Therefore, it is absolutely crucial that we accurately identify the problem that we want to study.

Research Problems

A **research problem** is the topic or phenomenon that we want to address, investigate, and research, either through quantitative, qualitative, or mixed methods. It is the heart of any research project and is crucial to the success of the overall research effort (Leedy & Ormrod, 2010). Problems needing more research are everywhere; however, finding a research problem that interests you may take some work.

Sources of Research Problems

There are several different methods for identifying a good research problem. These include reviewing theories about a topic, reviewing current professional literature on a topic, attending professional conferences, and having discussions with colleagues on the issue. A selective reading of the literature is probably the most advantageous method, as it can provide a theoretical base to generate research questions and hypotheses and assist in the selection of research methodologies and measurement methods. Later on, it can help you to interpret the results in comparison with other literature in the field. Attending professional conferences also provides advantages because there, researchers can explore the most popular topics in their field as well as meet with experts who have been researching a given problem.

Charles (1995; as cited in Houser, 2009) provides several helpful suggestions for researchers when identifying research problems. These include (1) having personal interest in the topic, (2) selecting an important topic that will answer the "So what?" question we ask when evaluating others' research, (3) selecting a topic that is feasible and can be completed in a reasonable amount of time, and (4) selecting a topic that can be completed with the amount of money allotted to studying it. Thus, it is important that we select something that we are interested in and have some knowledge about, as we may not want to see the study through if the topic has no interest to us or relevance in our lives.

Stating the Research Problem

Once a research problem is identified, the next step is to narrow the topic so that it can be measurable and presented in a clear problem statement. For example, having a research problem of "Lack of student success in online classrooms" is extremely broad and could take many directions. For instance, would the research include students' experiences with online learning, number and quality of student-to-teacher interactions, quality of student-to-student interactions, or another area? Developing a **problem statement**, or aim of the study, will help to clearly describe the intent of the study.

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Investigating lack of student success in online classrooms requires a researcher to develop a clear and focused problem statement.

Problem statements should be clearly and specifically stated and should describe the main goal of the total research project. For example, using the preceding example, "Lack of student success in online classrooms" lacks clarity and does not provide an understanding of what the researcher plans to do. Developing this into a complete sentence that describes a researchable problem would entail the following: "To determine the relationship between instructor involvement and student success during students' first online course in college."

This latter statement is clear regarding the intent of the study and the population that will be included. Clearly defining a problem is key to the design and implementation of a research study. Without a clear and specific problem statement, the researcher may find him- or herself going on a "wild goose chase" and wasting unnecessary time trying to investigate a vague problem or phenomenon.

The following guidelines adapted by Leedy and Ormrod (2010) will assist you in formulating a clear, precise, and accurate problem statement:

- Is the problem stated in complete and grammatically correct sentences?
- Is it clear what the study will focus on?
- Is it clear that the results could go either way? Thus, does the statement suggest an open mind to the research findings, or does it show a particular expected outcome?
- Does the answer to the problem provide important and useful information regarding the topic?
- Is the problem statement focused enough for the research to be completed in a reasonable amount of time and within budget?

Dividing the Research Problem Into Subproblems

If your research problem covers more than one concept, you will want to break down your research problem into subparts or subproblems, each of which represents only one concept. For example, if we were to reword our problem statement as "To evaluate the influences that instructor involvement and student-to-student interactions have on students' success during their first online course in college," there would be two concepts being evaluated: instructor involvement and quality of student-to-student interactions. To break this problem statement into two subproblems, it would look like the following:

> **Problem Statement**: To evaluate the influences that instructor involvement and quality of student-to-student interactions have on students' success during their first online course in college.
>
> **Subproblem 1**: Evaluate the influences of instructor involvement on students' success during their first online course in college.
>
> **Subproblem 2**: Evaluate the influence that quality of student-to-student interactions has on students' success during their first online course in college.

Thus, your problem statement should comprise all of the subproblems, while the subproblems should not introduce any new ideas or concepts that are not covered in the problem statement.

When developing subproblems, you will want to adhere to these guidelines: (1) Each subproblem should be a problem that can be researched on its own; (2) each subproblem should be set forth as a statement and not as a question; and (3) the total number of subproblems should be between two and six (Leedy & Ormrod, 2010). Viewing a problem statement through its subproblems will give you a better idea of how to approach the overall research project (Leedy & Ormrod, 2010).

The Purpose Statement

The **purpose statement**, similar to the problem statement, takes the goal of the study one step further. It not only includes the intent of the study but identifies what population will be studied, what type of research will be conducted (e.g., a comparison between variables), and what the **dependent** and **independent variables** will be. Using our research problem, "Lack of student success in online classrooms," a purpose statement might look like the following: "The present study was conducted to determine the relationship between instructor involvement and student success during students' first online course in college."

In most quantitative research as this, problem statements are often replaced with hypotheses, which will be discussed later in the chapter. In contrast, qualitative research methods generally employ either problem statements or research questions. With any research method, however, the purpose statement should show that the purpose and problem are researchable.

Researchers utilizing quantitative methods generally include in their purpose statement whether the study involved a comparison among groups or a relationship between two or more variables, or a descriptive examination of one or more variables. Including this information not only guides the researchers in selecting the appropriate data analyses but also provides information on the type of study being conducted (Houser, 2009). For instance, Kerrigan (2011) provides an example of a purpose statement that includes a comparison study:

> The purpose of this comparative quasi-experimental study was to compare the effect of coaching on comfort levels, as measured by an adapted questionnaire, and blood sugars levels, as recorded on individuals' glucometers, between two groups of individuals with diabetes who had attended a formal diabetic education program (p. 7).

Researchers examining the types of relationships between two or more variables are interested in how well the variables correlate. For example, Cerit and Dinc (2013) conducted a study that focused on a relationship between variables. They discussed their purpose statement as follows: "The aim of this study was to investigate the correlation between nurses' professional behaviours and their ethical decision-making in a different cultural context by adapting the Nursing Dilemma Test (NDT) into Turkish" (p. 202). Both examples provide the reader with information regarding the type of study utilized (i.e., comparison or correlation) as well as what the dependent and independent variables were.

On the other hand, when examining a phenomenon, characteristic, or event in great detail, some researchers may choose to use qualitative or descriptive methods rather than quantitative methods. In these cases, the purpose statement will focus more on describing and clarifying the phenomena or event than on comparing groups or identifying relationships between variables (Houser, 2009). Here is an example of a qualitative purpose statement, provided by Bradshaw, Sudhinaraset, Mmari, and Blum (2010):

> The primary goals of the current study were to (a) describe the transition-related stressors experienced by mobile military students; (b) describe the efforts employed to help these students cope with their stress; and (c) identify strategies that schools can use to ease the transition process for

> mobile military students. To address these three goals, we conducted separate focus groups with adolescents in military families, military parents, and school staff in military-affected schools at select U.S. military bases. (pp. 86–87)

The most important term in this purpose statement is the word *describe*, as it indicates that the study is employing qualitative or descriptive methods rather than quantitative ones. Regardless of whether a researcher is utilizing quantitative or qualitative methods, the purpose statement is generally included at the end of the Introduction, usually in the last paragraph before the Literature Review section.

Research Questions

As we have learned, it is important to narrow down one's topic or ideas into a researchable problem. Examining existing literature will provide information about what is unclear in the field of study and whether any gaps exist. Doing so will also help to further clarify the research focus or aim of the study as well as assisting in the development of research questions.

Identifying a research problem, stating the problem, and providing a purpose statement are all steps toward describing the aim or goal of the overall study. **Research questions** are then developed to guide researchers toward their objectives. In quantitative studies, research questions generally take the form of hypotheses, which are specific predictions or educated guesses about the outcome of the study. However, some quantitative researchers choose to include hypotheses *and* research questions that are related to the research problem. Generally, quantitative research questions focus on the Who, What, and When of specific variables and are closed-ended questions that provide cause-and-effect answers.

In qualitative studies, research questions guide data collection and interpretation but do not include speculations or predictions about the outcome. Qualitative research questions tend to focus on the Why and How of a phenomena or event, providing more descriptive and open-ended answers.

Both hypotheses and research questions provide the researcher with a starting point to explore a problem, as well as assist the researcher to "stay on topic" and answer those questions he or she initially wanted to address.

Developing Research Questions

How you conduct a research study depends largely on the research questions you develop. Let us look back on our previous research problem statement involving online learning: "To determine the relationship between instructor involvement and student success during students' first online course in college." Some researchable questions might include the following:

1. Are there relationships between instructor involvement and students' success with respect to students' participation in the online classroom and students' quality of work completed?
2. Does the amount of instructor involvement have an influence on student involvement?

Notice how these questions provide specific information about what will be examined. For example, the first research question identifies how student success will be defined by measuring the amount of participation in the classroom and the quality of work submitted. Operationally defining, or clearly identifying, how student success is going to be measured (i.e., through number of weekly participations and graded work) ensures that all researchers and reviewers have a clear understanding of what "student success" means *in this study*. **Operational definitions**, such as this one, establish the meaning of a concept or variable in relation to a particular study. Without operationally defining student success for this study, it would be unclear how that variable would be assessed or measured. The second research question tells us that the researcher is going to measure the level of instructor involvement and see how it relates to student involvement in the course. Thus, we also need to operationally define how we are going to identify and measure "level of instructor involvement." Will it be measured by number of times an instructor responds to a student each week, by the length and quality of the responses, or both? Both research questions not only inform how the research will be conducted but also serve as guides throughout the research project endeavor.

It is important to mention that, although research questions should be developed at the beginning of a project, they can change as you design your study. Designing your study involves making several careful decisions about your research questions in order to prevent your study from foundering. Ask yourself, What types of data will be collected, and what methods will be used to collect the data? Where and for how long will the research be conducted, and what participants or groups will be included? Are the data collection procedures consistent with the research questions? Once the project has started, if you find that your research questions were not appropriate for the research problem or that the data collection and analysis methods were not consistent with the research questions, your study results may be unusable, forcing you to start the project over again.

1.4 Hypotheses and Theories

The use of hypotheses is one of the key distinguishing features of scientific inquiry. Rather than making things up as they go along, scientists develop a hypothesis ahead of time and design a study to test this hypothesis. In this section, we cover the process of turning rough ideas about the world into testable hypotheses. We cover the primary sources of hypotheses as well as several criteria for evaluating hypotheses.

Sources of Hypotheses

Hypotheses can be generated from the bottom up or the top down. From the bottom up, hypotheses are built on real-world observations, using inductive reasoning. From the top down, hypotheses begin with big ideas, or theories, which are then tested through deductive reasoning.

Bottom-Up: From Observation to Hypothesis

Research hypotheses are based on observations about the world around us. For example, you may have noticed the following tendencies as you observe the people around you:

- Teenagers do a lot of reckless things when their friends do them.
- Close friends and couples tend to dress alike.
- Everyone faces the front of the elevator.
- Church attendees sit down and stand up at the same time.

Based on these observations, you might develop a general hypothesis about human behavior—that people will conform to, or go along with, what the group is doing. This process of developing a general statement out of a set of specific observations is called **induction** and is perhaps best understood as a "bottom-up" approach. In this case, we have developed our hypothesis about conformity from the ground up, based on observing behavioral tendencies.

The process of induction is a very common and very useful way to generate hypotheses. Most notably, this process is a great source of ideas that are based in real-world phenomena. Induction also helps us to think about the limits of an observed phenomenon. For example, we might observe the same set of conforming behaviors and speculate whether people will also conform in dangerous situations. What if smoke started pouring into a room and no one else reacted? Would people act on their survival instinct or conform to the group and stay put (Latané & Darley, 1969)? Your prediction about how this experiment might turn out forms your hypothesis for the experiment.

The process of qualitative research is an excellent example of induction, in that the researcher builds abstractions, concepts, hypotheses, and theories from details and observations in the world. Hypotheses are not established *a priori* but may emerge from the research data and findings. Thus, qualitative approaches often lead to hypothesis-generating research, which can lay the groundwork for future quantitative studies.

Top-Down: From Theory to Hypothesis

The other approach to developing research hypotheses is to work down from a bigger idea. The term for these big ideas is a **theory**, which refers to a collection of ideas used to explain the connections among variables and phenomena. For example, the theory of evolution organizes our knowledge about how species have developed and changed over time. One piece of this theory is that life originated in Africa and then spread to other parts of the planet. However, this idea in and of itself is too big to test in a single study. Instead, we move from the "top down" and develop a specific hypothesis out of a more general theory; this process is known as **deduction**.

When we develop hypotheses using a process of deduction, the biggest advantage is that it is easier to place the study—and our results—in the larger context of related research. Because our hypotheses represent a specific test of a general theory, our results can be combined with other research that tested the theory in different ways. For example, in the evolution example, you might hypothesize that older fossils would be found in Africa than would be found in other parts of the world. If this hypothesis were supported, it

would be consistent with the overall theory about life originating in Africa. And, as more and more researchers develop and test their own hypotheses about the origins of life, our cumulative knowledge about evolution continues to grow.

Most research involves studying constructs that have been investigated extensively. In such situations, particular theories will guide decisions about the research. Some of these theories may be new and will have had only limited studies conducted on them. Others will be more mature, having hundreds of research studies validating their predictions. In some cases, a study may provide validation for more than one theory. To illustrate this concept, consider a study on the causes of childhood obesity. The following are only some of the many theoretical ideas that could contribute to such a study:

- Parents do not provide healthy eating choices at home.
- Children from low-income neighborhoods do not have access to healthier food choices or cannot afford them.
- Busy families do not have time to cook and rely on fast food.
- Obesity is genetic. Thus, children with obese parents are 80% more likely to be obese themselves.
- Media encourages the consumption of fast food.
- Cultural and ethnic differences exist regarding what is considered a healthy or an unhealthy weight.
- Children are spending more time watching TV and playing video games, and consuming junk food while doing so.
- Schools are not providing healthy food options.
- Children are not exercising enough at school or at home.

This example only scratches the surface of the role of theory in a study such as this. Possible hypotheses that could be formulated from these theories include the following: Children exposed to a school-based intervention to reduce time spent watching television and playing video games will have significantly reduced body mass index (BMI); or, Exposure to fast food, soft drink, and cereal advertising on television increases children's food consumption behaviors and, in turn, their BMI.

Table 1.2 compares the two sources of research hypotheses, showcasing their relative advantages and disadvantages.

Table 1.2: Comparing sources of hypotheses

Deduction	Induction
"Top-down," from theory to hypothesis	"Bottom-up," from observation to hypothesis
Easy to interpret our findings	Can be hard to interpret without prior research
Helps science build and grow	Helps our understanding of the real world
Might miss out on new perspectives	Great way to get new ideas

Evaluating Theories

While experiments are designed to test one hypothesis at a time, the overall progress in a field is measured by the strength and success of its theories. If we think of hypotheses as being like individual combat missions on the battlefield, then our theories are the overall battle plan. So how do we know whether our theories are any good? In this section, we cover four criteria that are useful in evaluating theories.

Explains the Past; Predicts the Future

One of the most important requirements for a theory is that it either supports, refutes, or provides additional perspectives on existing knowledge. If a physicist theorized that everything on earth should float off into space, this would conflict with millennia's worth of evidence showing that gravity exists. And if a psychologist argued that people learn better through punishment than through rewards, this would conflict with several decades of research on learning and reinforcement. A theory should offer a new perspective and a new way of thinking about familiar concepts, but it cannot be so creative that it clashes with what we already know. Related to this, a theory also has to lead to accurate predictions about the future, meaning that it has to stand up to empirical tests. There are usually multiple ways to explain existing knowledge, but not all of them will be supported as we test their assumptions in new circumstances. At the end of the day, the best theory is the one that best explains both past and future data.

Research: Thinking Critically

Controversy Grows Over Study Claiming Liberals and Atheists Are Smarter

By Daniela Perdomo

There's a lot of buzz over a controversial study released in the journal *Social Psychology Quarterly*, titled "Why Liberals and Atheists Are More Intelligent," that compares IQ levels among liberals and conservatives, atheists and religious believers. The widely circulated study claims that "more intelligent individuals may be more likely to acquire and espouse evolutionarily novel values and preferences (such as liberalism and atheism . . .) than less intelligent individuals." The study was written by Satoshi Kanazawa (2010), a social scientist at the London School of Economics who employs evolutionary psychology to analyze the social sciences, such as economics and politics, and who has a history of attracting ire over his studies and opinions.

But before drawing any conclusions about Kanazawa's latest study, it's worth expanding on the data he bases his claims on. First of all, quantifying intelligence on a societal level—and even from person to person—is incredibly tricky, if not impossible. As an evolutionary psychologist, Kanazawa likely recognizes this, and that may be why he decided to limit his intelligence measures to IQ points, a convenient and notoriously narrow way of assessing cognitive abilities.

(continued)

Research: Thinking Critically *(continued)*

The first problem in the study comes with Kanazawa's use of IQ as an accurate measure of intelligence. P. Z. Myers, a leader in the field of evolutionary developmental biology (and an avowed atheist and progressive), is not surprised. He calls Kanazawa the "great idiot of social science" and points to a 2006 paper in which Kanazawa took the mean IQ of various countries and used those to draw conclusions on their dedication to health care.

For example: Ethiopia has a mean IQ of 63. This low IQ explains why Ethiopia's health care system is awful, according to Kanazawa. Talk about simplistic. Not only does this ignore the fact that IQ might better measure cognitive capabilities in the developed world, where it was designed, but it completely tunes out the fact that Ethiopia has been embroiled in wars for many years, which would appear to be a better explanation for why the health care system there hasn't developed to Western levels yet. "Intelligence is such a complex phenomenon—there are multiple parameters," Myers says. "And IQ is extremely sensitive to social conditions. Kanazawa wants to reverse it and say that IQ is causing problematic social conditions."

In this more recent study, not only does Kanazawa gloss over structural inequalities that may lead to varying IQ levels in American society, but even the disparities he finds in this imperfect measure of intelligence are relatively minuscule. For the most part, he is not speaking of a difference of more than six IQ points between liberals and conservatives, atheists and believers—a negligible difference one would never notice in real person-to-person interactions.

Kanazawa isn't the first to study the intelligence–religiosity nexus. Other studies have also found a three- to six-point IQ difference between atheists and religious believers, in the atheists' favor. But those studies didn't claim that atheists were more evolved, as Kanazawa presumes, but merely concluded that they are more skeptical owing to a certain kind of schooling and cultural exposure (which might also account for why some people perform well on IQ tests).

Then there's the issue of Kanazawa's definition of liberalism, which he writes is the "contemporary American" denotation: "the genuine concern for the welfare of genetically unrelated others and the willingness to contribute larger proportions of private resources for the welfare of such others." Practically speaking, this means Kanazawa's "liberalism" is defined as a willingness to pay a higher tax rate and donate money to charity.

This definition of liberalism, says Ilya Somin, a legal scholar whose expertise includes popular political participation, does not actually distinguish it from, say, conservatism or libertarianism. Somin writes:

> [A] libertarian who believes that free market policies best promote the welfare of genetically unrelated others and contributes a great deal of his money to charities promoting libertarian causes counts as a liberal under this definition. The same goes for a Religious Right conservative who believes that everyone will be better off under socially conservative policies and contributes lots of money to church charities.

(continued)

Research: Thinking Critically *(continued)*

On this last point, it should be noted that recent research shows American political conservatives actually give more money to charity (and donate more blood) than their politically liberal counterparts.

The problem inherent in Kanazawa's vague definition of liberalism is further compounded by the fact that he gleans his data on intelligence and attitudes toward topics of religion, politics, and charity from two massive national surveys—the National Longitudinal Study of Adolescent Health and the General Social Survey.

These large-scale studies are greatly compromised by self-reporting. Most Americans don't even really know where they fall on the left–right political continuum. Polling shows, for example, that more African Americans self-identify as conservative than liberal, but when it comes to actual votes, data indicate that Blacks overwhelmingly vote for traditionally defined liberal causes and candidates.

And libertarians—estimated to be about 15% of the U.S. population—don't neatly identify as liberals or conservatives, or even centrists, depending on whether they more closely identify as economic conservatives or social liberals. Even progressives shy away from identifying themselves as liberals, a term that carries a negative connotation for many of them.

A particularly problematic idea presented by the study is how Kanazawa defines certain values and preferences as "evolutionarily novel." While he does not come out and say being atheist is a sign of having evolved more than those who are religious, he does infer this, not only by referring to the slightly higher mean IQ levels of American atheists but also by pointing out that atheism goes against the grain of general human history. (Kanazawa doesn't even touch upon the idea that beliefs are more likely colored by one's cultural background than one's genetics.)

Personal values do play a positive role in motivating researchers to get to the bottom of situations they care about. However, as we can see from this scholarship, there are dangers in narrowing one's cultural point of view and allowing one's political bias to influence the interpretation of data. In the end, Kanazawa's study reinforces long-standing prejudices against conservatives and religious believers. To think that conservatives or religious people "are dumber than you and me," says Myers, "fosters this tribalism that we're out to replace people rather than to educate and inform them." And that's not very smart.

Perdomo, D. (2010, March 5). Controversy grows over study claiming liberals and atheists are smarter. Alternet. *Retrieved from* http://www.alternet.org/story/145903/controversy_grows_over_study_claiming_liberals_and_atheists_are_smarter

Think about it:

1. What general theory is Kanazawa trying to test? How does the theory differ from his specific hypothesis?
2. How did Kanazawa operationalize liberalism and intelligence in his research? Are there problems with the way these constructs were operationalized? Explain.
3. What were Kanazawa's main findings? Evaluate the strength of the evidence for and against his hypothesis. How is the strength of this evidence influenced by his research methods?
4. Why do you think this research is controversial? If Kanazawa's methodology were more rigorous, would it still be controversial?

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The theory of evolution is falsifiable, meaning that it could be disproved under the right conditions—for example, if fossil evidence that contradicted the theory was discovered.

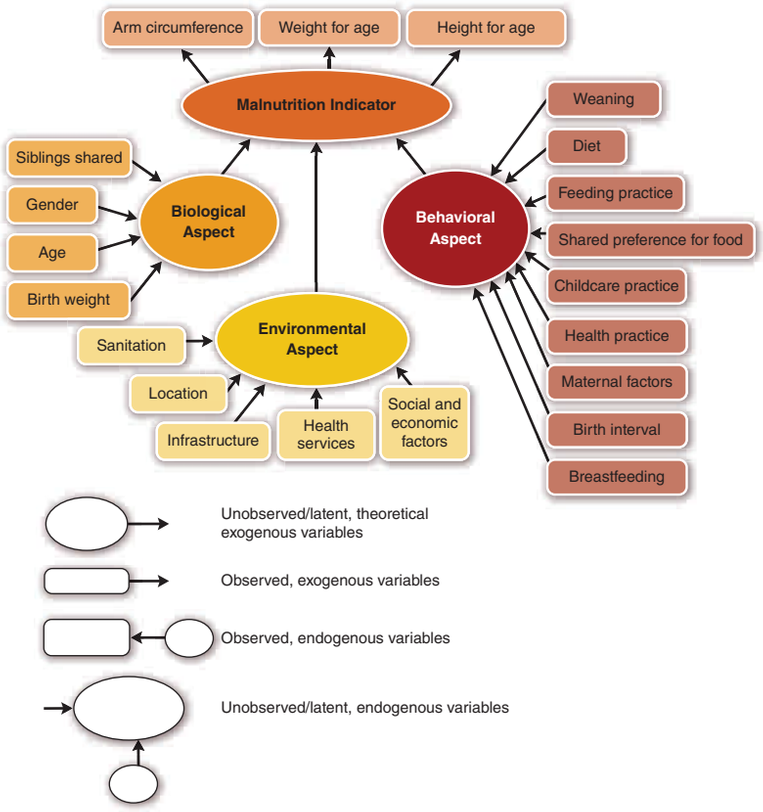
Testable and Falsifiable

Second, a theory needs to be stated in such a way that it leads to testable predictions. More specifically, a theory should be subject to a standard of **falsifiability**, meaning that the right set of conditions could prove it wrong (Popper, 1959). Calling something "falsifiable" does not mean it is false, only that it would be possible to demonstrate its falsehood if it were false. The Darwinian theory of evolution offers a great example of this criterion. One of the primary components of evolutionary theory is the idea that species change and evolve from common ancestors over time in response to changing conditions. So far, all evidence from the fossil record has supported this theory—older variants of species always appear farther down in a fossil layer. However, if conflicting evidence ever did appear, it would deal a serious blow to the theory. The biologist J. B. S. Haldane was once asked what kind of evidence could possibly disprove the theory of natural selection, to which he replied, "fossil rabbits in the Pre-Cambrian era"—that is, a modern version of a mammal in a much older fossil layer (Ridley, 2003).

Parsimonious

Third, a theory should strive to be **parsimonious**, or as simple and concise as possible without sacrificing completeness. (Or, as Einstein famously quipped during a lecture at Oxford, "Everything should be made as simple as possible, but no simpler" [Einstein, 1934, p. 165]). One helpful way to think about this criterion is in terms of efficiency. Our theories need to spell out the components in a way that represents everything important but doesn't add so much detail that it becomes hard to understand. This means that our theories can lack parsimony either because they are too complicated, or because they are too simple. At one end of this spectrum, Figure 1.1 presents a theoretical model of the causes of malnutrition (Cheah, Zabidi-Hussin, & Wan Manan, 2010.). This theory does a superb job of summarizing all of the predictors of child malnutrition across multiple levels of analysis. However, the potential problem is that it becomes too complicated to test. At the other end of the spectrum, Figure 1.2 presents the overall theoretical perspective behind behaviorism. In the early part of the 20th century, the behaviorist school of psychology argued that everything organisms do could be represented in behavioral terms, without any need to invoke the concept of a "mind." The overarching theory looked something like Figure 1.2, with the "black box" in the middle representing mental processes. However, the cognitive revolution of the 1960s eventually displaced this theory, as it became clear that behaviorism was too simple. The ideal balance, then, is to lay out your theory in a way that includes the necessary pieces and nothing unnecessary.

Figure 1.1: Predictors of malnutrition



A complex theoretical model of the causes of malnutrition.

Adapted from Cheah, W.L., Zabidi-Hussein, Z., Wan Manan, W.M. (2010). A structural equation model of the determinants of malnutrition among children in rural Kelantan, Malaysia. Rural and Remote Health 10: *1248 (Online).*

Figure 1.2: The behaviorist model

The overall theoretical perspective behind behaviorism. The "black box" in the middle represents mental processes.

Promotes Research

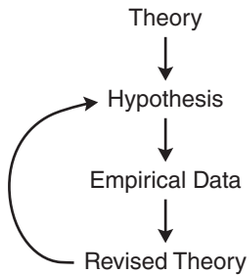
Finally, science is a cumulative field, which means that a theory is really only as good as the research it generates. Or to state it more bluntly, the theory that you are so attached to is useless if no one follows up on it. Thus, one of the best bases for evaluating a theory is whether it encourages new hypotheses. Consider the following example, drawn from real research in social psychology. Since the early 1980s, Bill Swann and his colleagues have argued that we prefer consistent feedback to positive feedback, meaning that we would

rather hear things that confirm what we think of ourselves. One provocative hypothesis that comes out of this theory is that people with low self-esteem are more comfortable with a romantic partner who thinks less of them than anyone who might think well of them. This hypothesis has been tested and supported many times in various contexts and continues to draw people in because it is *exciting*. (For a review of this research, see Swann, Rentfrow, & Guinn, 2005.)

The Cycle of Science

Let's take a step back and look at the big picture. We have now covered the processes of developing theories, developing hypotheses, and evaluating all of them. But of course, none of these pieces occurs in isolation; science is an ongoing process of updating and revising our views based on what the data show. This overall process works something like the cycle depicted in Figure 1.3. We start with an overall theory about how concepts relate to one another and use this to generate specific, testable, and falsifiable hypotheses. These hypotheses then form the basis for research studies, which generate empirical data. Based on these data, we may have reason to suspect that the overall theory needs to be refined or revised. And so we develop a new hypothesis, collect some new data, and either confirm or don't confirm our suspicion. But it doesn't end there: Other researchers may see a new perspective on our theory and develop their own hypotheses, which lead to their own data and possibly to a revision of the theory. If this is making your head spin, you're not alone. The scientific approach may be a slow and strange way to solve problems, but it is the most objective one available.

Figure 1.3: The cycle of science



In the 1960s, social psychologists were beginning to study the ways that people explain the behavior of others (e.g., when someone cuts you off in traffic, you tend to assume he is a jerk). One early theory, called "correspondent inference theory," argued that people would come up with these explanations in a rational way. For example, if we read a persuasive essay but then learned that the author was assigned her position on the topic, we should refrain from drawing any conclusions about her actual position. However, research findings have demonstrated that people make systematic errors in logical thinking. In a landmark 1967 study, participants actually ignored information about whether authors had chosen their own position on the issue, assuming instead that whatever they wrote reflected their true opinions (Jones & Harris, 1967). In response to these data (and similar findings from other studies), the theory was gradually revised to account for what was termed the "fundamental attribution error"—people tend to ignore situational influences and assume that behavior reflects the person's own disposition. These authors developed a theory, came up with a specific hypothesis, and collected some empirical data to test it. But because the data ran counter to the theory, the theory was ultimately revised to account for the empirical evidence. Theories of attribution continue to be refined to explain the way observers make sense of people's behavior.

Proof and Disproof

While we are on the subject of adjusting our theories, let's take a look at the notions of "proof" and "disproof." Because science is a cumulative field, decisions about the validity of a theory are ultimately made based on results of several studies from several research laboratories. This means that a single research study has rather limited implications for an overall theory. This also means that you, as a researcher, have to use the concepts of proof and disproof in the correct way. We will elaborate on this as we move through the course, but for now we can rely on two very simple rules:

1. If the data from one study are consistent with our hypothesis, we *support the hypothesis* rather than "proving" it. In fact, we almost never prove a theory, but our statistical tests can at least tell us how confident to be in our support.
2. If the data from one study are not consistent with our hypothesis, we *fail to support the hypothesis*. As we will discuss throughout the course, many factors can cause a study to fail; however, these often result from flaws in the design rather than flaws in the overall theory.

Sources of Ideas

Where do all of these great ideas come from in the first place? Students are often nervous about starting a career in research because they might not be able to come up with great ideas to test. In reality, though, ideas are easy to come by, once you know where to look. In this section, we offer a few tips and suggest handy sources for developing research ideas.

Real-World Problems

A great deal of research in psychology and other social sciences is motivated by a desire to understand—or even solve—a problem in the world. This process involves asking a big question about some phenomenon and then trying to think of answers based on psychological mechanisms. For example, according to the National Center for Education Statistics, approximately 42 million Americans are unable to read, and 20% of high school seniors are unable to read when they graduate. These statistics might lead you to think about ways to improve reading instruction in the school system. And that might lead you to the hypothesis that individual tutoring will significantly improve children's reading skills.

Courtesy: CSU Archives/Everett Collection

Adolf Eichmann claimed he was just "following orders" in his role as a Nazi Lieutenant Colonel of Holocaust Logistics during World War II.

In 1961, Adolf Eichmann was on trial in Jerusalem for his role in orchestrating the Holocaust. Eichmann's repeated statements that he was only "following orders" caught the attention of Stanley Milgram, a young social psychologist who had just earned a PhD from Harvard University and who began to wonder about the limits of this phenomenon. To understand the power of obedience, Milgram designed a well-known series of studies that asked participants to help with a study of "punishment and learning." The protocol required them to deliver "shocks" to another participant (actually an accomplice of the researcher) every time he got an answer wrong. Milgram discovered that two thirds of participants would obey the researcher's commands to deliver dangerous levels of shocks, even after the victim of these shocks appeared to lose consciousness. These results revealed that all people have a frightening tendency to obey authority, even to the point of violating their own conscience. We will return to this study in our later discussion of ethics; you can read more about Milgram and his work on this website: http://explorable.com/stanley-milgram-experiment.

To take one more example, you might notice that criminal-trial juries often seem to make really poor decisions. This might lead you to wonder about the process of making decisions in a group. And that might lead you to the hypothesis that juries are more interested in getting along with the group than in finding the truth. The possibilities here are endless but, as we discussed earlier, you must always be cautious when you design a research project to solve a problem. Sometimes your desire to make a difference can bias your interpretation of the data.

Reconciliation and Synthesis

New ideas can also spring from resolving conflicts between existing ideas. The process of resolving an apparent conflict involves both **reconciliation**, or finding common ground among the ideas, and **synthesis**, or merging all the pieces into a new explanation. In the late 1980s, psychologists Jennifer Crocker and Brenda Major noticed an apparent conflict in the prejudice literature. Based on everything then known about the development of self-esteem, members of racial and ethnic minority groups would be expected to have lower-than-average self-esteem because of the prejudice they faced. However, study after study demonstrated that, in particular, African American college students had equivalent or higher self-esteem than European American students. Crocker and Major offered a new theory to resolve this conflict, suggesting that the existence of prejudice may sometimes grant access to a number of "self-protective strategies." For example, minority group members can blame prejudice when they receive negative feedback, making the feedback much less personal and therefore less damaging to self-esteem. The results of this synthesis were published in a 1989 review paper that launched a vibrant new research area on the targets of prejudice (Crocker & Major, 1989).

Learning From Failure

Kevin Dunbar, a professor at Dartmouth University, has spent much of his career studying the research process. That is, he interviews scientists and sits in on lab meetings in order to document how people actually do research in the trenches. In a 2010 interview with the journalist Jonah Lehrer, Dunbar reported the shocking statistic that approximately 50% to 75% of research results are unexpected (some of these could have been null

results due to lack of statistical power). Even though scientists plan their experiments carefully and use established techniques, the data are often surprising. But even more surprising was the tendency of most researchers to discard the data if they did not fit their hypothesis. "These weren't sloppy people," Dunbar says. "They were working in some of the finest labs in the world. But experiments rarely tell us what we think they're going to tell us. That's the dirty secret of science." The trick, then, is knowing what to do with data that make a particular study seem like a failure (Lehrer, 2010).

The secret to turning failure into opportunity is twofold: First, question your assumptions about why the study feels like a failure in the first place. Perhaps the data contradict your hypothesis but can be explained by a new one. Or perhaps the data suggest a dramatic shift in perspective. Second, seek new and diverse perspectives to help in interpreting your results. Perhaps a cognitive psychologist can shed light on reactions to prejudice. Or perhaps an anthropologist knows what to make of the surprising results of your aggression study. Some of the best and most fruitful research ideas have sprung from combining perspectives from different disciplines. Sometimes, all that your strange dataset needs is a fresh set of eyes.

Research: Thinking Critically

Does 9 Just Sound Cheap?

By William Poundstone

We have all heard of calculating prodigies, those rare souls able to perform astounding feats with numbers. For many of these individuals, numbers have colors, flavors, sounds, or other qualities alien to the rest of us. Mental calculator Salo Finkelstein detested the number zero and adored 226. The Russian mnemonist S. V. Shereshevskii associated the number 87 with a visual image of a fat woman and a man twirling his mustache. This is known as *synesthesia*, the association of sensory qualities with seemingly inappropriate objects. A recent study suggests that most people may have a bit of number synesthesia. It might help explain the mysterious appeal of "charm" prices ending in the digit 9—beloved by discounters everywhere.

At least since the 19th century, retailers have been using prices like 99 cents (rather than an even $1.00) or $295 (rather than $300). There's evidence that these prices induce shoppers to buy more than the corresponding round prices do. There's been a lot of debate among marketers, psychologists, and even cognitive scientists about why these prices trick people into buying something they wouldn't have bought at a round price that is hardly much higher. In fact, in some experiments, more bought at a 9-ending price than at a price that was *lower*.

New research by Keith Coulter and Robin Coulter, published in *The Journal of Consumer Research*, implies that certain numbers just sound bigger than others. This in turn can affect the perception of discounts.

Coulter and Coulter begin by citing decades of research claiming that sounds pronounced with the front of the mouth (long *a, e*, and *i*; fricatives like *f, s*, and *z*) trigger associations with smallness. (Think of words like *tiny* and *wee*.) The vowels pronounced at the back of the mouth, like the "oo" in foot or goose, are linked to largeness. (Think *huge* or crowds *oohing* and *ahhing* something really big.) Crazy? Well consider how it applied to discounts in the study. Subjects were given "regular" and "sale" prices and asked to estimate the percentage discount. The guesstimated discounts were skewed by the sound effect. For instance, people estimated that a $3 product marked down to $2.33

(continued)

Research: Thinking Critically *(continued)*

was about a 28% discount. But when the product was marked down to $2.22, the estimated saving was only 24%. It was a bigger discount, really, but it didn't seem that way. One explanation: *Three*, with a long *e*, sounds small, and *two*, with a back-of-the-mouth vowel, sounds large.

That doesn't prove the sounds were responsible. In one of the crucial experiments, Coulter and Coulter tested perceptions of the prices $7.01 and $7.88 with English and Chinese speakers. In English *one* is pronounced with the back of the mouth, and *eight* with the front. In Chinese, this is reversed. So were the perceptions of how big or small discounts were. The researchers use this to argue that it is indeed "phonetic symbolism" at work.

"Nine" has a long *i*, so it's one of the small-sounding digits. Assuming the hypothesis is right, prices ending in 9 would seem a little smaller than they would otherwise, enhancing the quick, largely unconscious perception of a good deal. But 9 isn't unique: It would seem that all the digits from 3 on up have a vowel or consonant sound supposedly associated with smallness. (Ironically, the truly bigger digits sound small. Zero is a problematic case: The fricative *z* might put it in the small category, but most people say "o" when reciting a phone number, and zeros at the end of a price aren't pronounced at all: $70 is "seventy dollars," not "seven-zero dollars.")

Obviously, retailers would want to charge the largest "small-sounding" price (the sound they care about is *ka-ching*). From that perspective, the use of 9 makes sense.

This study adds more fuel to the debate about how 9-ending prices "work." Coulter and Coulter believe that shoppers must "rehearse" prices—say them to themselves, at least silently—for the sounds to affect them. In the experiments, participants were told to repeat the sale prices to themselves. It's not clear whether this would apply to silent reading of a fast-food menu. Still, the experiment hints at what unexpected layers of meaning we may attach to simple numbers—including the ones with dollar signs.

Poundstone, W. (2010, January 26). Does 9 just sounds cheap? The poetry of prices might trump the math. Psychology Today. *Retrieved from* http://www.psychologytoday.com/node/37553

Think about it:

1. What hypothesis are Coulter and Coulter trying to test? Try to state this as succinctly as possible.
2. How was "perception of discounts" operationalized in their studies?
3. How were the key variables measured?
4. How do Coulter and Coulter explain their findings? Are there other possible alternative explanations?
5. Are these studies primarily aimed at description, explanation, prediction, or change? Explain.

1.5 Searching the Literature

Regardless of how you develop your hypothesis, an important step in the process is to connect it with what has been done before. Scientific knowledge accumulates one study at a time, so the best studies will build on earlier studies—by extending, correcting, or contradicting them. And, on a practical note, it would be a waste of your time to struggle over the best way to measure something when another researcher figured

it out 20 years ago. So, rather than reinvent the proverbial wheel, one of the first steps in a research project is to consult published relevant articles. In this section, we will cover the process of finding these articles, followed by an overview of how to read these articles effectively.

Searching for Articles

Beginning a search for relevant research articles can seem like a daunting task, largely due to the sheer number of available sources. Should you ask a librarian? Search Wikipedia? Browse the Web? Fortunately, you can use a few tricks to make sure that your reference sources are both *objective* and *scholarly*. First, it is important to understand the difference between primary and secondary sources.

Primary sources contain full reports of a research study, including information on the participants, the data collected, and the statistical analyses of these data. These types of sources appear in professional academic journals and are evaluated by a set of experts in the field before they are published—a process known as **peer review**. Thus, primary sources are a reliable way to determine what has been done in a particular field.

Secondary sources, in contrast, consist only of summaries of primary sources. These types of sources include textbooks, some academic books, and review articles in journals such as *Psychological Bulletin*. As an analogy, think of the difference between telling your friends about your adventurous weekend (primary source) and one of your friends repeating the story to her roommate (secondary source). While some secondary sources undergo a process of review and evaluation (academic books), others do not (e.g., websites, friends retelling stories).

In this day and age, people are becoming more and more comfortable searching for information via the Internet. Thus, it is particularly important to point out that websites are often not objective in their summaries of research. The vaccine/autism scare discussed at the beginning of the chapter is a great example of this point. If you search in Google for the terms *vaccine* and *autism*, you will get more than 4 million hits, sorted in order of popularity. As of summer 2011, the top hit was a summary by the Centers for Disease Control, arguing in favor of vaccines. At another time, the top hit might have been Jenny McCarthy's website arguing that vaccines gave her child autism. In January 2013, it was reported that the federal Vaccine Injury Compensation Program had awarded millions of dollars to compensate children who developed autism after vaccination, confusing the matter even more (Kirby, 2013). And this came after news of a recent study that found no link between currently recommended vaccines and autism. The bottom line is that search results in Google (or other Internet search engines) are not peer reviewed, are not listed in order of reliability, but are customized to your browsing history, confirming your biases. As a result, a Google search is a poor choice when it comes to finding trustworthy information about academic research.

Another popular but untrustworthy source of information is Wikipedia. Wikipedia is a tempting resource, given its marketing as a "free online encyclopedia." But unlike more authoritative or printed encyclopedias, Wikipedia can be edited by anyone with access to the Internet. On the upside, this means that errors can be identified and corrected at any time. On the downside, this means that errors can be *made*—either accidentally or

deliberately—at any time. The upshot is that there is no way to be sure that you are drawing information from a page at a time when it sticks to the facts, and the content is always evolving.

Jupiterimages/©Getty Images/Thinkstock

University libraries provide students access to hard copies and digital copies of relevant research articles.

So what's a researcher to do? Fortunately, there are two reliable ways to access primary sources (research articles), which allow you to draw your own conclusions based on the patterns of data. First, Google Scholar (http://scholar.google.com) is a free resource that is managed by Google and that works exactly like Google but is limited to peer-reviewed academic articles. Thus, Google Scholar provides one pipeline to access primary sources. Second, many university libraries have access to centralized databases of peer-reviewed articles. The best-known database for psychology articles is PsycINFO; this database contains abstracts and citations for articles in psychology and related fields, maintained by the American Psychological Association. PsycINFO is updated monthly and covers approximately 2,500 different primary-source academic journals.

Searching in PsycINFO (or Google Scholar) is as easy as typing key terms into a text box—sometimes labeled "Find" or "Keywords." But, that said, the process of choosing the best key words for your particular search can be a complex process. If your search terms are too general, the search might yield too many hits to be useful. If your search terms are too specific, the search might yield only one or two articles and fail to fully represent prior studies.

As an example, the following list of numbers represents different combinations of search terms related to the topic of self-esteem:

"self-esteem" (in all fields)	35,847 hits
"self-esteem" (title only; peer reviewed)	4,977 hits

It's clear we need to narrow the field a bit—you have better things to do than review almost 5,000 abstracts! What aspect of self-esteem do we find most interesting? Perhaps we want to learn more about self-esteem and sexual behavior?

"self-esteem" and "condom use"	2 hits

It seems we may have overdone the limits—two articles may not be very helpful in giving you a sense of previous research. So let's try one more combination, using a more general search term:

"self-esteem" and "sexual behavior"	133 hits

This number is a bit more manageable; we could tinker a bit more, but it no longer seems overwhelming to skim through the search results and find the most useful articles. No two searches will be the same, so the real take-home point is to try several combinations of search terms in order to strike a balance in your number of results.

Reading Research Articles

Now that you have assembled a collection of research articles relevant to your hypothesis, the next step is to read them. This may sound painfully obvious, but psychological journal articles are written in a very formulaic way, which can be confusing at first glance. However, once you know what to look for, the format ultimately makes these articles easy to read (and easy to write). As a matter of fact, the format of a journal article is designed to follow the steps of the scientific method, with a section devoted to each of the four steps—hypothesize, operationalize, measure, and explain. In this section, we examine each part of a journal article to give you a sense of what to expect of each one. This overview is based on a fantastic article by Jordan and Zanna (1999); the goal of both is to let you appreciate the stories without getting bogged down in the details.

The Title and the Abstract

At the top of every journal article (as well as in the search results in PsycINFO), you will see both the title and an **abstract**, or a short summary of the article. While neither of these is a section per se, both provide you with a valuable first impression of the contents of the article. If your search query results in a large number of hits, you can usually scan the titles to determine which ones are most likely to be useful. For example, if your research question concerns the links between depression and alcohol consumption among college students, you might search a database for the terms "alcohol" and "depression." Most of the results are likely to be relevant and useful, but you could most likely skip ones with a title like "Fetal Alcohol Syndrome and Postpartum Depression," since it is likely to focus on a different population.

Once you narrow the list to the most useful titles, the abstract provides additional information about the content of the article. A journal article abstract follows a standard formula of stating the objectives of the study, followed by information on the methodology, results, and conclusions. Generally, an abstract has to fit all of this information in about 150 words; as a result, it provides a nice concise summary that is worth reading carefully.

The Introduction

The first main section of a journal article is the introduction, corresponding to the first step (i.e., hypothesize) of our four-step research process. As the name implies, the goal of this section is to introduce the research question, review background research, and state the hypothesis that was investigated. When you are diving into a new research area for the first time, it is a good idea to read the entire introduction carefully. This section provides the context for the rest of the paper, as well as a valuable introduction to previous work in the area.

The Method Section

The second main section of a journal article is the method section, corresponding to the second step (i.e., operationalize) of our four-step research process. The goal of this section is to explain how the hypothesis was translated into a set of specific measurable variables and how the researchers gathered data to test their hypothesis. An additional—perhaps even more important—goal of this section is to provide enough detail about the study that someone could read the article and repeat the study.

The method section is typically divided into three parts: The *participants* section describes the people who provided data for the study, including information about their age, gender, and other relevant information. For example, in a study on treating depression, the authors would specify whether the participants were "normal" college students or patients who had been hospitalized for treatment of severe, clinical levels of depression. The *materials* section describes any questionnaires or equipment used in the study, including both standardized measures and ones that the researchers created. The third and related section, *procedure*, provides all of the details regarding the execution of the experiment. What did participants experience, and in what order? If specific instructions were given before a task, what were they?

The materials and procedure sections are crucial for two reasons. First, they provide the necessary detail for someone else to recreate the study. In reading these sections, you should focus on understanding the key variables and how they were defined. Second, they allow readers to envision the study from the perspective of the participants and to decide whether the authors' interpretation of the results is the only one. For example, the authors might claim that participants were placed under stress and that the results showed a drop in concentration because of the stress. But, in reading over the procedure section, the "stress" part of the study might seem more likely to invoke boredom. This would give you an idea for a follow-up study: Perhaps people actually lose concentration when they are bored. . . .

The Results Section

The third main section of a journal article is the results section, corresponding to the third step (i.e., measure) of our four-step research process. The goal of this section is to describe how the data were analyzed and to report the results of these analyses. The results section consists primarily of statistical analyses and, as Jordan and Zanna put it, "statistics can be intimidating" (1999, p. 356). When you first start to read journal articles, the statistics can indeed seem overwhelming, but there are two reasons not to get discouraged. First, statistical results are always followed by a translation into plain English and almost always by tables and graphs of the data. As we move through this course, you will have the opportunity to practice interpreting results in both statistical and graphical form. And this brings us to the second reason: You will be surprised to learn how quickly the statistics *stop* being intimidating. The more you read journal articles and place them in the context of your own ideas, the more you become comfortable with interpreting statistical analyses. In fact, as you become savvier with interpreting statistics, you may be surprised by how often authors make mistakes in either their analyses or their interpretations of them!

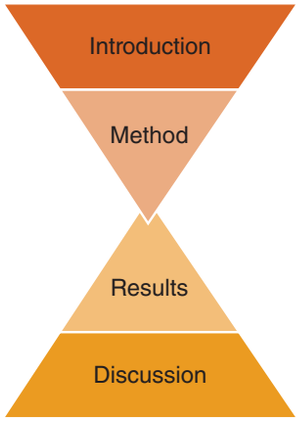
The Discussion Section

The fourth and final section of a journal article is the discussion section, corresponding to the fourth (i.e., explain) step of our four-step research process. The goal of this section is to summarize the main findings and provide an evaluation of the hypothesis. Thus, the first few paragraphs of the discussion are often a great summary of the entire article. Authors state whether their predictions were confirmed and speculate on the meaning of the findings. If some of the predictions were not confirmed, authors suggest explanations for this and either acknowledge or defend potential flaws in the study. In addition, to encourage others to follow up on the study, authors tie their findings into those of previous literature and make suggestions for future research.

Evaluating Articles

So, in sum, a journal article will follow a predictable structure: Authors first describe the problem and state their hypothesis (introduction), then explain their approach to testing the hypothesis (method), then report the findings of this test (results), and finally discuss the meaning of these findings relative to the hypothesis (discussion). These four sections are often described as following an hourglass structure—that is, the paper starts broadly in the introduction, narrows to the specific details of the study, and ends broadly in the discussion by tying everything back into the overall problem (e.g., Bem, 1987). This structure is shown in Figure 1.4.

Figure 1.4: Structure of journal articles



Before we move on, let's review some general guidelines for evaluating journal articles. After reading the paper in its entirety, the following five questions can be helpful in forming an overall evaluation of what you've read.

1. **What am I being asked to believe?** What is the author's main argument? Before critiquing in detail, make sure you have mastered the argument and can summarize it in a few sentences.
2. **What evidence supports this claim?** How does the author support the main argument? If it is an empirical paper, look to the data; if it is a theoretical paper, look at the literature the author summarizes.
3. **Are there alternative explanations?** Be creative here. Based on your reading of the article, what else seems plausible? But, to make your critique a good one, you should be able to test it.
4. **What additional evidence would help us test alternatives?** This question is one of the keys to doing good science. Once you identify something wrong with the original study, how can you test your alternative?
5. **What conclusions are reasonable?** Return to step 1 with your critiques in mind. What should the author reasonably conclude, given the problems with the study?

1.6 Writing a Research Proposal

After reviewing the literature and putting considerable thought into planning a study, the next step is to prepare a **research proposal**. The goal of any research proposal is to present a detailed description about the research problem and the methods with which you think that the research should be conducted. Research proposals are extremely important because they are key to unlocking the research project (Leedy & Ormrod, 2010). They may determine whether you receive approval or funding, so they need to clearly articulate the purpose of the research and persuade the audience it is worthwhile. If research proposals do not clearly and specifically define the research problem and methods, the project might not be accepted. Therefore, it is imperative that the research proposal include "a clearly conceived goal and thorough, objective evaluation of all aspects of the research endeavor" (Leedy & Ormrod, 2010, p. 117).

Research proposals can range from three pages for some grant applications to more than 30 pages (e.g., for a dissertation or federal grant). They may or may not require an abstract and will have a different format for institutional review board (IRB) approval (see Section 1.7, Ethics in Research). For our purposes, in general, research proposals follow a standard format. The following is an example you might use:

1. Title/Cover Page
2. Abstract
3. Introduction or Statement of the Problem
   a. The research problem
   b. The statement of the problem and possible subproblems
   c. The purpose statement
   d. Hypotheses and/or research questions
   e. Independent and dependent variables
   f. The assumptions
   g. The importance of the study
4. Review of the Literature
5. Method
   a. Research methodology
   b. Participants and participant selection
   c. Data collection procedures
   d. Data analysis techniques
6. Discussion
   a. Strengths and limitations
   b. Ethical considerations
7. References
8. Appendixes

Research proposals are written like research articles in APA style, which is favored in academia. The language must be clear and precise, in paragraph format, and written in a

professional, academic manner. Unlike stories or memoirs, proposals are not intended to be creative literary works; rather, they should set down certain facts. Organized with headings and subheadings, the proposal should clearly and specifically explain the research problem, who the participants will be and how they will be selected, what data collection methods will be used, and how the data will be analyzed and interpreted. Research proposals are required for all theses and dissertations. If you are currently working on a master's thesis or doctoral dissertation, your university or committee chair may have a specific format for you to follow that may differ slightly from the format presented in this book. An example of an APA formatted proposal is provided in Appendix A.

Formatting the Research Proposal

As mentioned previously, research proposals are written in APA style and follow an organized format. Although there are different ways to format a proposal, most follow a similar format to the one that is discussed in this book. The following sections will discuss the specifics of formatting of your proposal as well as the content that should be included within each section.

Headings and Subheadings

Writing a proposal in APA style may seem complicated at first; however, the format is similar to a research paper or any academic paper that is required to be written in APA style. APA style uses a unique heading and subheading system that separates and classifies sections of research papers. The *Publication Manual of the American Psychological Association Sixth Edition* (2010) utilizes five heading levels; although all heading levels may not be used, it is important to follow them in sequential order:

- Level 1: **Centered, Boldface, Uppercase and Lowercase Heading**
- Level 2: **Left-aligned, Boldface, Uppercase and Lowercase Heading**
- Level 3: **Indented five spaces, boldface, lowercase heading with a period.** **For** Level 3 headings, the body text begins after the period.
- Level 4: ***Indented five spaces, boldface, italicized, lowercase heading with a period.*** For Level 4 headings, the body text begins after the period.
- Level 5: *Indented five spaces, italicized, lowercase heading with a period*. For Level 5 headings, the body text begins after the period.

Section headings such as Review of the Literature, Methods, and so forth, are Level 1 headings. Subsection headings such as Participants, Data Collection, and so on, that follow under the section heading Methods, for example, are Level 2 headings. Subsections of subsection headings are Level 3 through Level 5. The following is an example of the various heading levels you might use in your research proposal:

Introduction (Level 1)

The Research Problem (Level 2)
Purpose of the Study (Level 2)
Hypotheses and/or Research Questions (Level 2)
Independent and Dependent Variables (Level 2)
Assumptions (Level 2)
Importance of the Study (Level 2)

Review of the Literature (Level 1)

The Cognitive Profile of Learning Disabilities in Reading (Level 2)
The Cognitive Profile of Attention Deficit/Hyperactivity Disorder (Level 2)

Method (Level 1)

Research Methodology (Level 2)
Participants (Level 2)
Data Collection (Level 2)
Instrumentation. (Level 3)
WISC-IV. (Level 4)
WISC-IV PI. (Level 4)
Data Analysis (Level 2)

Discussion (Level 1)

Strengths and Limitations (Level 2)
Ethical Considerations (Level 2)

References (Level 1)

Appendix (Level 1)

An important guideline to remember is that you should be consistent in your use of heading levels throughout the research proposal. Thus, all headings with equal importance should follow the same heading level.

The Title Page

A title page is required for all research proposals as its first page. In general, title pages include a running head with the page number, as well as the abbreviated title of the paper, the student's name, and the university or institution name. Although some universities may have specific requirements regarding how the title page is formatted, the following is formatted according to APA style:

Running head: PREMORBID COGNITIVE ABILITIES 1

Estimation of Premorbid Cognitive Abilities in
Children with Traumatic Brain Injury

Graduate Student

Research University

The running head is a shortened version of the full title and is included in the top margin of the page. The running head is set flush left with the abbreviated title in all capital letters. On the same line of the running head, the page number is set flush right. The title of the paper, the student's name, and the university affiliation are centered approximately in the middle of the page and formatted in uppercase and lowercase letters. It is recommended that titles include no more than 12 words.

The Abstract Page

The abstract page is page two of your paper. An abstract is a summary of your proposal and should include the research problem, the participants, data collection methods, and any hypotheses or research questions. Abstracts for research proposals are generally between 150 and 250 words in length.

The abstract should contain your running head title from the title page as well as the page number. As shown in the example, the first word of the abstract is not indented. Thus, the entire abstract is set flush left. Please keep in mind that the title "running head" is dropped after page one and only the abbreviated title and page number are included, as shown below:

PREMORBID COGNITIVE ABILITIES 2

Abstract

The present study will review currently available methods for estimating premorbid intellectual abilities in children. It examines the potential of the *Wechsler Intelligence Scale for Children–Fourth Edition* (WISC–IV; Wechsler, 2003) as an estimate of premorbid IQ in children with traumatic brain injury (TBI). Archival data will be obtained from a sample of 2,200 children aged 6:0–16:11 who participated in the standardization phase of the WISC–IV and 43 children aged 6:0–16:11 with a history of moderate or severe TBI who participated in a WISC–IV special group study. First, demographic variables including sex, ethnicity, parent education level, and geographic region will be entered into a regression analysis to determine a demographic-based *premorbid* prediction equation for the *WISC–IV* Full Scale Intelligence Quotient (FSIQ). Second, a logistic regression analysis will be used to investigate which WISC–IV subtest–scaled scores improve the differential diagnosis of TBI versus a matched control group. Third, **analysis of variance (ANOVA)** will be used to examine which subtests yielded the lowest mean scores for the TBI group. It is expected that parental education will be the strongest predictor of premorbid IQ and that individuals with TBI will have lower scores on Processing Speed and Working Memory indices.

The Introduction Section

The Introduction section begins on page three of your proposal. The primary purpose of the Introduction section is to introduce the reader to the nature of the study by including necessary background that describes and supports your research problem. The introduction

generally includes a statement of the research problem, any potential subproblems, the purpose statement, hypotheses and/or research questions, identification of the variables, assumptions of the study, and importance of the study. The introduction typically begins with a statement of the research problem area and is followed by a justification for your proposed study. Only research needed to explain the purpose of or need for your study should be included in this section.

As discussed previously, the purpose statement should include the focus, population, and methodology of the study. Depending upon whether your research is quantitative or qualitative, you will want to include your hypotheses and/or research questions next and discuss how your hypotheses and/or research questions relate to your research problem and purpose statement. You should next review the key independent and dependent variables, followed by a discussion of the assumptions you will make about the research and how the research will be expected to contribute to the field.

The length of the introduction can vary based on your university, committee chair, or instructor's requirements. In general, the introduction section ranges anywhere from 3 to 5 pages to 15 to 25 pages. The more detailed information you include in your proposal, the closer you will be to completing your thesis or dissertation.

The Literature Review Section

The primary purpose of the literature review is to provide theoretical perspectives and previous research findings on the research problem you have selected (Leedy & Ormrod, 2010). As a researcher, you should investigate your topic extremely well so that you have a thorough understanding about the research problem area. Thus, your literature review should contain both breadth and depth, and clarity and rigor, in order to support the need for your research to be conducted. Any reader of your literature review should be able to comprehend the importance of your research problem and the difference the research will make to the field. Keep in mind that a literature review is not simply a collection of summaries, abstracts, or annotated bibliographies but rather a thorough analysis and synthesized review of the research and how each piece of research builds upon the other.

According to Levy and Ellis (2006), a literature review should go through the following steps: (a) methodologically analyze and synthesize quality literature, (b) provide a firm foundation to a research topic, (c) provide a firm foundation to the selection of research methodology, and (d) demonstrate that the proposed research contributes something new to the overall body of knowledge or advances the research field's knowledge base (p. 182). Remember: Your literature review should provide a theoretical foundation and justification for your proposed study.

A good literature review does not simply report the literature but evaluates, organizes, and synthesizes it (Leedy & Ormrod, 2010). When reading and reviewing existing literature, it is important to critically evaluate what has already been done and what the findings showed. Do not just take what the authors say at face value; instead, evaluate whether the findings support the methods that were used and the analyses that were conducted.

In addition to evaluating the literature, you must organize it. This means grouping the literature according to your subproblem areas, research questions, or variables being assessed. For example, if conducting a study on the demographic predictors of special

education, you would want to group your literature based on the various demographic variables and the influences that they may have on placement in special education. Finally and most importantly, you must synthesize the diverse perspectives and research results you've read into a cohesive whole (Leedy & Ormrod, 2010). Leedy and Ormrod (2010) discuss several approaches to synthesizing information, including the following:

- comparing and contrasting the literature
- showing how the literature has changed over time
- identifying trends or similarities in research findings
- identifying discrepancies or contradictions in research findings
- locating similar themes across the literature

The following example shows a paragraph synthesizing the literature. Note that the review does not include summaries of the articles but rather displays similarities found in the research:

> Several studies have examined the relationship between demographic variables and cognitive functioning. Research has shown that demographic variables such as socioeconomic status and education level are closely related to scores on cognitive tests and contribute significantly to variance in IQ scores (Crawford, 1992; Kaufman, 1990). Utilizing this close relationship, Wilson et al. (1978) developed the first regression equation to predict premorbid IQ using the WAIS standardization sample. The equation included age, sex, race, education, and occupation and accounted for 53% of the variance in the Verbal IQ, 42% of the variance in the Performance IQ, and 54% of the variance in the Full Scale IQ. Cross-validation studies have confirmed the Wilson et al. equation to be a useful predictor of premorbid IQ. The equation has been used to predict outcome from closed head injury (Williams, Gomes, Drudge, & Kessler, 1984), to estimate British WAIS scores (Crawford, Stewart et al., 1989), and to estimate premorbid functioning among healthy adults (Goldstein, Gary, and Levin, 1986). Although the use and application of Wilson's formula has tended to overpredict high scores and underpredict low scores, the formula appears to provide adequate predictions for those within the average range of functioning.

An example of a compare-and-contrast synthesized review would look like the following:

> As with all regression-based methods, a number of limitations are present in the use of demographic-based prediction models. As Karzmark, Heaton, Grant, and Matthews (1985) found in their use of the Wilson et al. formula to predict WAIS IQ scores, demographic equations tend to overestimate and underestimate IQ scores for individuals who are one standard deviation or more from the population mean. Research has shown strong correlations between specific demographic variables and measured IQ scores, but Bolter, Gouvier, Veneklasen, and Long (1982) found the Wilson et al. equation to be limited in its ability to predict groups of head injured individuals and controls.

> On the other hand, Wilson, Rosenbaum, and Brown (1979) compared the hold method of the Deterioration Index developed by Wechsler in 1958 against Wilson's 1978 demographic equation and found the Wilson et al. formula to have a 73% accuracy of classification, while the Wechsler method resulted in only 62% accuracy. Although the demographic-based method may have mixed results at an individual level, cross-validation studies have shown them to do an adequate job of predicting mean IQ scores at the group level (Vanderploeg, 1994).

Remember that writing a literature review takes time and organization. It is important that you thoroughly review the relevant literature you uncovered in your key term search. This can be a painstaking endeavor, but the search should not conclude until you are reasonably sure you have researched all the critical viewpoints of your research problem. It is also helpful to develop an outline of topics you plan on addressing.

Finally, note that a good literature review is *not* plagiarized or copied and pasted from other sources, as the Internet makes so tempting. When reviewing literature, be sure you summarize the information *in your own words* and give credit where credit is due. It is sometimes helpful to read the literature and then develop summaries of the articles in your own words. You can then use these summaries to develop your literature review. Keep in mind that your literature review is a working draft that will be modified and perfected throughout the research process.

The Method Section

The method section includes a detailed description of the method of inquiry (quantitative, qualitative, or mixed design approach); research methodology used; the sample; data collection procedures; and data analysis techniques. The key purpose of the method section is to discuss your design and the specific steps and procedures you plan to follow in order to complete your study. A detailed description of methods is essential in any research proposal because it allows others to examine the efficacy of the study as well as replicate it in the future.

Research Methodology

This section discusses whether quantitative, qualitative, or a mixed design approach was used and the rationale for choosing this method of inquiry. It also includes specific information on the selected research methodology. For example, will your study be utilizing experimental methods, quasi-experimental methods, or observational methods? And what is the purpose for selecting that method or methods? Remember that you should be making an argument and justifying the type of research methodology you plan to use, regardless of the type of inquiry.

Participants

The participant section describes the population of interest and the sample that will be used. In quantitative studies, the sample is intended to represent the larger population and tends to be larger in size than for qualitative studies. In qualitative studies, the sample may be a small number of participants or even only one participant and is not intended to represent the larger population. In both quantitative and qualitative studies, this section should discuss the sample in detail: the population you want to learn about; where

participants will be recruited or studied; how the participants will be notified about the study; how the participants will be selected (e.g., what type of sampling method will be used, such as random sampling, snowball sampling, etc.); what criteria will be required for inclusion in the study (e.g., age, level of education obtained, marital status, employment position); and the overall proposed size of the sample. For quantitative studies, when discussing the sample, it is also important to include which demographic information (e.g., age, gender, ethnicity, level of education, socioeconomic status) you will need to create a representative sample of the entire population. A representative sample ensures that the results can be generalized to the entire population as a whole.

Data Collection Procedures

The data collection section describes how the data will be collected, step by step. This section should detail how informed consent will be obtained from the participants, when the data will be collected and for how long, and what methods or measures will be used to collect the data. Remember: Providing detailed information is crucial to ensure that others can follow your study and replicate it in the future. Thus, this section should include a step-by-step description of each of the procedures you will follow to carry out the data collection. Describe the data collection forms you will use, as well as any survey, research, or testing instruments you may use or develop to collect the data, and the rationale for utilizing such procedures. Copies of any forms or instruments used should be included in the Appendix section of your research proposal.

Data Analysis

The data analysis section includes a brief step-by-step description of how the data will be analyzed as well as what statistical methods or other methods of analysis and software will be utilized. If you are doing quantitative method research, you will want to discuss how the data will be entered into a statistical software program, how the data will be kept confidential, and what statistical analyses will be run. If using qualitative methods, you will want to discuss the type of qualitative method used, the interview type, interview questions, sample type (e.g., random, convenience), how the data will be reviewed (e.g., how interviews or observations will be reviewed or transcribed), and how the data will be coded.

The Discussion Section

As emphasized throughout this chapter, one of the most important characteristics of a research proposal is to make a strong case for or justify the need to study your research problem. In doing so, you will want to discuss the strengths of your research study as well as any limitations and ethical issues that will need to be considered. *It should be noted that some universities require this information to be included in the Method section. In those cases, you would include strengths, limitations, and ethical considerations after the Data Analysis heading in the Method section.*

Strengths and Limitations

This section is fairly straightforward. It should discuss the implications for future research, practice, and theory as well as any potential limitations that might impact the research process or results. Some limitations may include difficulty in obtaining participants, difficulty in obtaining a representative sample, or time and financial constraints.

Ethical Considerations

This section should include any potential issues that might be considered ethical dilemmas. For example, if studying minors, how will you obtain consent and ensure confidentiality? If studying certain employees, how will you keep information from their supervisors? Or if your study may trigger emotional trauma, such as memories about abuse, how will you reduce any stress or negative feelings that occur during the study?

The References Section

This section should include all references that were cited within your proposal in alphabetical order and using APA style. Only references used within your proposal should be included on the References page; conversely, there should be no references listed on the References page that were not cited in your proposal.

It is important to list all references in correct APA format. The following examples show how to correctly cite journal articles, websites, and books according to the *APA Publication Manual Sixth Edition:*

Example of a journal article with the document ID number included:

Brownlie, D. (2007). Toward effective poster presentations: An annotated bibliography. *European Journal of Marketing, 41*, 1245–1283. doi:10.1108/03090560710821161

Example of a journal article with no document ID assigned to it:

Kenneth, I. A. (2000). A Buddhist response to the nature of human rights. *Journal of Buddhist Ethics, 8*. Retrieved from http://www.cac.psu.edu/jbe/twocont.html

Example of a print (or hardcopy) journal article:

Harlow, H. F. (1983). Fundamentals for preparing psychology journal articles. *Journal of Comparative and Physiological Psychology, 55*, 893–896.

Example of a textbook:

Calfee, R. C., & Valencia, R. R. (1991). *APA guide to preparing manuscripts for journal publication*. Washington, DC: American Psychological Association.

Example of a chapter in a textbook:

O'Neil, J. M., & Egan, J. (1992). Men's and women's gender role journeys: A metaphor for healing, transition, and transformation. In B. R. Wainrib (Ed.), *Gender issues across the life cycle* (pp. 107–123). New York, NY: Springer.

Example of a website:

Keys, J. P. (1997). Research design in occupational education. Retrieved from http://www.okstate.edu

The Appendix Section

The Appendix section should include a copy of any forms that will be used during your research. These include consent forms, instructions for participants, and any additional tables or figures that might supplement study information but not provide additional data (e.g., a table of subtests included within an instrument you plan to use).

1.7 Ethics in Research

In the summer of 1971, psychologist Phillip Zimbardo conducted an experiment at Stanford University to test the power of social roles. Zimbardo hypothesized that people would take on the characteristics and behaviors of whatever role was assigned to them, and he tested this hypothesis by creating a simulated prison in the basement of the psychology building. A group of 24 psychologically healthy young men were selected from the San Francisco Bay Area and randomly assigned to play the role of either "prisoner" or "guard." Zimbardo appointed himself the role of "warden." The researchers gave each participant pieces of a uniform meant to reinforce their role—smocks for the prisoners, khakis and mirrored sunglasses for the guards. Almost immediately, and without instructions from the researchers, participants began to act out their roles. The guards took it upon themselves to establish control and dominate the prisoners by withholding privileges and devising clever ways to humiliate them. The prisoners, in turn, accepted all of this without much protest since it was part of their prisoner role. The experiment was scheduled to run for 14 days but was stopped after only 6 because things had gotten out of hand—prisoners were going on hunger strikes and being locked in solitary confinement, and one even suffered a serious mental breakdown (Zimbardo, 2013). This study is known as the Stanford Prison Experiment; you can learn more about it and view video clips on a website designed by Zimbardo and his colleagues: http://www.prisonexp.org/.

If this experiment reminds you of the real-life prisoner abuse at Abu Ghraib prison, you're not alone. Zimbardo was even called to testify about the power of social roles during the trial of one of the Abu Ghraib guards. If this experiment strikes you as ethically dubious, you are not alone. When the research was published, it raised serious questions about the amount of distress that can be inflicted in the name of research. Although the proposal for this study was approved under ethics standards of the time, it could not be run under today's more stringent standards. But how do we balance the distress of the "prisoners" with the valuable knowledge gained from the study? Should the Stanford Prison

Associated Press

Psychologist Philip Zimbardo conducted an experiment on the power of social roles that raised ethical concerns in the scientific community about how research is conducted.

Experiment ever have been run? Does the knowledge outweigh the distress? Before we move on to the nuts and bolts of research designs in the next four chapters, it is important to spend some time on the ethics of conducting research.

At the most basic level, all deliberations about the ethics of a particular study come down to the balance between avoiding all unnecessary discomfort for participants and creating a realistic situation that will provide a valid test of the hypothesis. But in practice, achieving this balance can be complicated. In this section, we first examine an overview of some of the potential threats to participants' well-being and then discuss how avoidance of these threats has been formalized into rules for researchers to follow. Finally, we evaluate a set of ethical dilemmas that represents the types of issues likely to arise in psychological studies.

Threats to Participants

To help you appreciate the need for ethical guidelines, this section introduces some of the possible threats to participants' welfare in the context of research studies.

Physical Harm

Let's start with a form of extreme threat: Sometimes a research paradigm, or worldview, can place participants at risk for physical harm. For the most part, these types of studies are limited to the medical field. For example, if you are testing a new medication for heart attack survivors, there is a risk that an unexpected side effect could hasten the death of participants. Or, perhaps the participants could have benefited more from another, more established medication, but they were not taking it because they were participating in your study. Because of these risks, medical researchers are required to perform preliminary testing—often using cell cultures and then animals—before administering drugs to a clinical population. Occasionally, psychological research can pose a physical threat to participants, albeit a more minor one. For the past 25 years, Sheldon Cohen has been conducting studies in which he exposes participants to the common cold virus and measures their cold symptoms for several days. This work is designed to explore the link between individuals' social environment and their susceptibility to illness; you can read more about it on Cohen's website: http://www.psy.cmu.edu/~scohen/.

Extreme Stress

More common among psychological studies are those that introduce high levels of mental or emotional stress for participants. As we will discuss later, the key to evaluating whether a stressful research paradigm is ethical is to think about whether—and to what extent—it exceeds the stress that participants encounter in everyday life. In the Stanford Prison Experiment, it is easy to see how stress experienced by the "prisoners" would exceed normal levels. In 1924, Carney Landis conducted the first studies of facial expression and emotion. His goal was to map specific emotional states to specific expressions—work that is now associated with Paul Ekman (and popularized by the television show *Lie to Me*). Landis photographed his participants as they reacted to a variety of stimuli, such as smelling ammonia and viewing pornography. But the most shocking and controversial task was the final one. To measure responses to "disgust," Landis asked his participants to either decapitate a live rat (a task they lacked the training to perform humanely)

or watch Landis behead the rat. In this case, the discomfort could not even be balanced by the knowledge gained from it; Landis found no support for his hypotheses regarding common facial expressions. Of course, this study is beyond anything deemed ethically acceptable by today's standards.

In reality, most research (and particularly, psychological research) presents a much more minor degree of stress to participants. For example, in some of my own research, I observe college students' reactions as they are asked to prepare and give a speech. Most people become anxious at the thought of public speaking, but this anxiety is mild and very much temporary. In fact, among studies that receive approval from **institutional review boards (IRBs)**, the effects of the research on overall well-being are likely to be mild and temporary.

Deception

Finally, at the low end of the threat spectrum, many psychological studies involve deceiving participants about the purpose of the research—at least until the study is finished. This deception is a way to ensure people's honest reactions to the experimental setting. For example, if Milgram's participants had known he was studying obedience, they would have reacted very differently and there would have been no point to doing the study. As we will discuss in later chapters, people tend to change their behavior when they figure out your research question (as well as when they *think* they figure it out).

Deception is described here as a threat because of the potential for abuse. The history of science is rife with examples of medical research conducted on unsuspecting (and unwilling) participants. In one of the most infamous, researchers in Tuskegee, Alabama, conducted a study of the natural progression of syphilis among poor African-American farmers. The study began in 1932 under the supervision of the Public Health Service and continued until 1972. Where's the deception? Well, it turns out that penicillin was discovered to be a reliable cure for syphilis—in 1947. The researchers not only lied about the purposes of the study (participants were never told they had syphilis), but they deliberately withheld treatment in order to continue the study. (You can read more about the study on this website: http://www.cdc.gov/tuskegee/timeline.htm.)

On the one hand, these types of studies are vastly different from research that could be approved today, much less the type of research conducted in psychology. On the other hand, every researcher must be mindful at all times that he or she does not abuse the trust of participants. We now return to the issue of deception in the discussion of evaluating a set of research scenarios.

APA and Other Ethical Guidelines

In response to public outcry over the Tuskegee Syphilis Study, the U.S. Congress formed a panel to develop guidelines that would ensure that all human subjects were treated ethically. This committee published the Belmont Report in 1979, laying out a set of basic ethical principles for the use of human subjects. (The full report is available at http://www.hhs.gov/ohrp/humansubjects/guidance/belmont.html.) Essentially, the Belmont Report guidelines argue for treating participants with respect, minimizing harm, and avoiding exploitation. Starting in 1981, these principles were formalized into a set of federal laws referred to as the **Common Rule**, a baseline standard of ethics for all federally funded research.

One critical part of the Common Rule was the creation of review boards to evaluate the ethics of every proposed research study. The Common Rule mandated that any institution receiving federal money must have an institutional review board (IRB), which reviews and monitors all research involving humans in order to protect the welfare of research participants. The IRB is tasked with determining whether a study is consistent with ethical principles, and it has the authority to approve, reject, or require modification of any research proposal. To put it another way, the IRB serves a gatekeeper role for research, ensuring that something like the Tuskegee Syphilis Study, or Landis's "facial expression" studies could not be run today.

An important piece of IRB review is to assess the degree of risk that a study poses for participants. Based on these assessments, each proposed study undergoes one of three categories of review. The lowest-risk studies are subject to **exempt review**, in which an IRB representative simply verifies the low risk and approves the study. In order to qualify for exempt review, a study has to fit into one of six predefined categories, including research done in educational settings (e.g., testing a new way to teach reading skills) and reanalysis of existing data (e.g., looking for patterns in poll data) (Mayo Foundation, 2013). (The full set of guidelines is available online at http://mayoresearch.mayo.edu/mayo/research/irb/policy_manual.cfm.)

Studies classified as medium risk—including the majority of psychological studies—are subject to **expedited review**, in which an IRB representative conducts a full review of the proposed study's procedures, ensuring that participants' welfare and identity are protected. Expedited review also requires that a study fit into one of seven predefined categories (US HHS, 1998). These categories encompass most of the research that psychologists conduct, even when these studies include collection of personal information and biological specimens. The key to meeting expedited review criteria is that the risk of harm and distress and the release of information are kept to a minimum.

Finally, studies classified as high risk are subject to **full-board review**, in which all members of the IRB review the proposed study's procedures and then meet as a group to discuss the degree of risk and protection. This category includes studies involving medical procedures, children, prisoners, or pregnant women. Any time there is potential for physical harm, release of confidential information, or undue pressure on people to participate (e.g., prisoners), the IRB pays careful attention to the procedures for minimizing these risks.

The APA has its own version of an ethical code, written specifically for the kinds of dilemmas faced by psychologists in both research and therapeutic settings. The APA ethics code lays out five specific rules for research that involves human participants (APA, 2013a). These rules take their inspiration from the Belmont guidelines: Treat people with respect, minimize harm, and avoid exploitation. (You can view the full APA ethics code here: http://www.apa.org/ethics/code/index.aspx.)

1. Informed Consent

First and foremost, research participants must be "informed of all features of the study that would reasonably affect their decision to participate," known as **informed consent**. Before people agree to take part in your study, they need to know whether it involves anything painful or uncomfortable or might reveal sensitive or embarrassing information. Participants need to be informed of the risks and benefits of participating. And they

need to know how you will protect the information that they provide. What if your study involves deception? This is where the "reasonably affect their decision" phrase comes in. If you are pretending to study perception but are actually studying conformity, you are under no obligation to reveal this. However, if your study involves, say, running on a treadmill or taking drugs, people need to know in order to make informed decisions about their overall health.

2. Free Consent

Researchers are forbidden from placing "undue pressure" on people to either participate in or remain in a study. One lesson from the Milgram studies is that people are willing to obey seemingly strange commands from an experimenter wearing a lab coat. As researchers, we therefore have an obligation not to abuse this tendency to obey. You probably don't need me to tell you that it's wrong to recruit participants at gunpoint, but there are quite a few gray areas when it comes to **free consent**. For example, many psychology departments require students to participate in research studies or offer extra credit for doing so. (There are always alternative ways to earn the credit.) Could students who are failing the class feel more compelled to agree to participate in a research study? What about students who wait until the last minute and have fewer options? Free consent also becomes an issue when prisoners or soldiers serve as research subjects. Do these populations really feel free to say no to a request to participate? The answer to all of these questions depends on the context.

3. Protection From Harm

Participants cannot be exposed to physical or emotional risk "beyond what they would encounter in real life." But where should we draw the line regarding "real life" harm? Is it acceptable to make people feel stupid or embarrassed? Is it okay to reject people from a group in order to observe their reactions? The answer, once again, depends on the context and, more specifically, on the balance of costs and benefits. If participants experience mild rejection for the sake of understanding how to cope with it, that's probably fine. But if participants experience severe verbal abuse for the sake of learning whether people like abuse, then that's less acceptable. (If that one sounds made-up, check out this study of stuttering from the 1930s: http://www.spring.org.uk/2007/06/monster-study.php.)

4. Confidentiality

It is critical that all personal information collected during the research study be protected and prevented from being released to anyone not authorized to view it. If you were to ask people about their history of drug use, this information could compromise their political or job prospects. If you ask employees to report attitudes toward their employers, the employers who saw that information could retaliate against unfavorable ratings. There are two related options for protecting personal information.

Whenever possible, responses should be **anonymous**, meaning that you do not collect identifying information from participants. There is no risk of retaliation or other backlash if your participants cannot be individually identified. But in some cases, anonymity is not possible, such as when you need to track people for a period of time and then link their data. In these situations, identifying information should be kept **confidential**,

meaning that the information is collected but kept secret. One common way to do this is for researchers to maintain and closely guard a master list of participants matched to code numbers and identifiers, which are used during the study instead of names.

5. Debriefing

Finally, as mentioned, many experiments cannot avoid using some degree of deception. In its list of ethical rules, the APA suggests a compromise regarding deception. First, it should be done only when necessary, meaning that you should never create an elaborate cover story just for its own sake. Second, participants should always be **debriefed**, or informed of the true purpose once the study is concluded. In Milgram's obedience studies, participants went through a long debriefing that involved meeting the "victim" and understanding that they had not done any actual harm to another human being. If participants have been under the illusion that your conformity study focused on "perceptual processing," then tell them the truth at the end. If your study involved having participants be rejected from the group at random, then tell them this decision was random. The goal of this disclosure is to remove possible negative effects of the study procedure and to explain why the deception was necessary. If done well, a debriefing also educates the participants, who may be psychology students themselves. It can also make them feel appreciated and give them a chance to ask questions. In this way, researchers can learn from their reactions to procedures and assess whether they have experienced any unexpected negative effects.

Ethical Dilemmas

To give you a feel for what these guidelines look like in everyday research studies, let's walk through a pair of experimental scenarios and evaluate whether they meet the APA guidelines.

Scenario 1

A cognitive psychologist tells students she is interested in their reading comprehension when in reality she is recording the speed of their responses rather than their comprehension.

Evaluation: There is no risk of physical harm or extreme stress, but participants have been deceived about the purpose of the study. Rule 5 is most relevant, but any IRB is likely to approve the study, provided that participants are given a full debriefing at the end of it.

Scenario 2

In a field experiment designed to test whether people would help more when they are alone or with others, male subjects walking alone or in a group were exposed to a simulated rape (Harari, Harari, & White, 1995). As subjects walked along, a male and female confederate acted out the rape. The man grabbed the woman around the waist, put his hand over her mouth, and dragged her into the bushes as she screamed for help. Observers stationed at various points recorded the number of subjects who offered help. Before they could actually intervene, a researcher stopped them and told them the "rape" was part of a study.

Evaluation: This study is likely to have induced extreme stress in participants and quite likely presented emotional risks beyond what participants normally encounter (Rule 3). In addition, participants did not give their consent to be in the study (Rule 1) until after their data were collected. However, this study was approved by a modern-day IRB, which means that at least one group of reviewers felt that these threats were outweighed by the benefits of the study.

Ethics in Animal Research

Our discussion so far has focused on ethical issues in dealing with human participants. However, a significant portion of psychological research involves nonhuman animals. Studying the behavior of nonhuman animals provides an additional important avenue for understanding basic principles of behavior and ultimately for improving the welfare of both humans and animals.

Many people object to the use of animals in scientific research, arguing that animals should have the same rights and protections as human subjects. However, the majority of scientists reject this view, arguing that the benefits of animal research outweigh the costs. One of the most salient examples involves testing the effectiveness of drugs to cure cancer, depression, and other diseases. The first stage in testing these drugs is to examine chemical reactions in isolation, using test tubes and petri dishes. Before moving on to research involving humans, however, researchers are required to conduct safety testing of these drugs on nonhuman animals. Thus, any discomfort experienced by the animals is justified by the fact that these drugs can save human lives. Most scientists are in favor of the continued use of this practice, provided that the nonhuman animals are treated humanely (Plous, 1996).

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In certain fields of research, studying animal behaviors helps researchers learn more about human behaviors.

To this end, the APA has also developed a set of guidelines to govern research with nonhuman animals, overseen by the **Committee for Animal Research and Ethics (CARE)**. (The CARE guidelines are available at http://www.apa.org/science/leadership/care/guidelines.aspx.) The upshot of these guidelines is to ensure that animals are *treated humanely* at all stages of the study by *well-trained personnel*, and that there is a strong *justification for their use* (APA, 2013b). And, just as research with human subjects is reviewed by an IRB, all research with nonhuman animals is reviewed by the **Institutional Animal Care and Use Committee (IACUC)** to ensure that the benefits of the research outweigh any discomfort the animals experience.

Scientific Misconduct

Before we leave the subject of ethical conduct, there is one more important topic to cover that has less to do with protecting participants' welfare and more to do with the overall ethics of research. Because science is a cumulative discipline, every research study contributes to the body of knowledge in that discipline. Our understanding of the development of aggression, the process of forming memories, and the mechanisms for coping with trauma all come from knowledge gained one study at a time. And so, when researchers do not accurately represent their data and publish dishonest results, this seriously threatens the cumulative body of knowledge. These types of violations are captured under the umbrella of **scientific misconduct**, defined as intentional or negligent distortion of the research process. To give you a better sense of how this happens, this section describes two real cases of scientific misconduct: one probably "negligent" and the other very much intentional.

Negligent Misconduct: Race Differences in Skull Size

In the 19th century, physician Samuel Morton argued that he could measure the intelligence of a racial group by measuring its average skull size—bigger skulls would mean bigger brains and, therefore, more intelligence. (We now know that intelligence is much more complicated than this, but the science was young in the 1830s.) Morton's work is often credited with kick-starting more than a century's worth of racially tinged science by a subgroup of researchers who attempted to show that some races were superior to others. In his 1996 book, *The Mismeasure of Man*, Stephen Jay Gould dissects and discredits this entire line of work, and it is now taken for granted that this work was terribly biased and fundamentally flawed. (For a short audio program that explains the context of this work, see http://www.uh.edu/engines/epi429.htm.)

Gould was able to obtain access to all of Samuel Morton's laboratory notes, and the latter turns out to be a fascinating example of negligent misconduct. Morton's method of quantifying skull sizes was to pour lead shot into the hole in the bottom and then measure the volume of lead shot that each skull held. But he was hardly consistent in his pouring: As he held a known European skull in his hand, he might pack it full of lead shot to make sure it was full. And as he held a known African skull, he might declare it full when there was still space at the top. Morton also discarded data from skulls that didn't seem to fit the patterns and occasionally guessed at the race of a skull based on its size! The incredible thing is that he did not try to hide any of this. Gould's interpretation is that Morton believed so strongly in his hypothesis that his so-called data collection was biased every step of the way. While Morton's intentions may have been good, the danger of this type of misconduct is that it can happen without our knowledge.

Intentional Misconduct: Reactions to Discrimination

In the late 1990s, social psychologist Karen Ruggiero was interested in the way people responded to instances of discrimination and prejudice. Other researchers had documented a strange discrepancy among targets of prejudice: People perceive more discrimination directed at their group as a whole than at themselves as individuals (Taylor, Wright, Moghaddam, & LaLonde, 1990). Ruggiero argued that this indicated a reluctance to admit

to personal discrimination because it would mean acknowledging a lack of control over one's own outcomes. That is: I haven't personally seen any sexism because I'm in charge of my own destiny, but it's a big problem for other women.

In a compelling 1999 paper, Ruggiero showed that members of high-status groups were more likely to blame discrimination in a single situation because there were fewer implications for one's degree of long-term control. Fascinating, right? But there's just one problem: These data were completely fabricated. Not one of the 240 supposed participants actually existed; Ruggiero had written a piece of fiction and passed it off as a scientific journal article. This was her most egregious offense, but others surfaced as well. She fabricated partial data for another paper; she discarded participants that did not fit her hypothesis; she used federal grant money to pretend to collect these data; and she used these fake data to apply for future funding. Ruggiero was eventually caught and forced to submit retractions to several scientific journals to correct the fabricated publication. She was also forced to resign from her faculty position and barred from working on federally funded research for 5 years (National Institutes of Health, 2001). (You can read the official report of the investigation here: http://grants.nih.gov/grants/guide/notice-files/NOT-OD-02-020.html.)

Dr. Ruggiero had completed her PhD at McGill University and began a prestigious faculty position at Harvard University before being wooed away to the University of Texas with a $100,000 start-up package for setting up her laboratory. In short, she had given every sign of being a rising star in the field. So why would she take such a big risk? One of her fellow graduate students, interviewed for a 2002 article in *The Chicago Tribune*, suggested that she was motivated by a sincere belief in the work she was doing: "She was invested in proving people were denying discrimination. . . . She knew what the answer ought to be." Another possible motivation has to do with the way incentives work for academic research. Science works one slow step at a time, but people are often rewarded for making a big, counterintuitive splash. Ruggiero was certainly rewarded for her efforts, at least in the short term, but it couldn't last.

This case is fascinating because it sheds real light on the scientific process and its corrective effect. The reason her deception was ultimately uncovered was that other people tried to recreate her experiments. Again, this is how science works—one finding doesn't really mean much until other people can repeat it in their own laboratories. However, because these data were fictional, there was no way to replicate them. So people started talking at conferences, which eventually led to official questions, and the rest is history.

The silver lining to the Ruggiero story is that it illustrates the strength of the scientific approach. Ultimately, this approach is self-correcting, and people who attempt to cheat the system eventually will get caught. An interesting website that tracks retractions of journal articles is http://retractionwatch.wordpress.com/. This blog highlights problematic research, including faked experiments and plagiarized articles.

Summary

This chapter has provided an introduction to the scientific approach to problem solving. We first discussed what it means to think "scientifically" and contrasted this approach to other ways of making decisions, such as reliance on authority or individual experiences. We then covered the four steps of the research process: forming a research question, deciding how to test it, collecting data, and interpreting the results. The key distinguishing feature of scientific thinking is that our decision-making process is based on empirical evidence. If our data run counter to our initial predictions—especially if this happens over and over again—then we have to conclude that our prediction was wrong. Science means that we draw conclusions about even the most important questions based on facts. Do vaccines cause autism? Is the planet getting warmer? What is the best way to improve children's reading skills? In every case, we would collect the appropriate set of data and then decide, regardless of whether the answer fits our preconceived notions or what we want to be true.

The first and most important step of the research process is to form a testable and falsifiable research hypothesis. We covered the process of developing hypotheses and of placing them in the broader context of research in the field. Broadly speaking, hypotheses can be developed in one of two ways. Induction is a bottom-up process that involves trying to generalize from our observations about the world. Deduction is a top-down process that involves trying to generate a specific prediction from a broader theoretical perspective. One of the key points from this section is that science is a cumulative discipline, meaning that our knowledge in a particular field grows and accumulates with each study. The theory of evolution sprang not from a single fossil discovery but from the combined evidence of thousands of fossils and ethological studies. Thus, it is particularly important that each study be placed in the proper context of prior studies, and this requires the ability to find and digest peer-reviewed journal articles that are relevant to your research question.

We subsequently covered how to do a thorough literature search, critique the existing literature, and follow the step-by-step process for writing a research proposal in APA style. The final section of this chapter emphasized the importance of ethics in conducting research. Whenever research involves human or nonhuman animals, we have to protect the rights of these participants. The history books are full of abuses of human participants, such as deceiving people about the diseases they had, subjecting them to extreme stress, and the horrors inflicted by Japanese and Nazi doctors on prisoners during World War II. In response to these and countless other less egregious abuses, the federal government has mandated that all research treat participants with respect, minimize harm, and avoid exploitation. The APA has established its own guidelines governing psychological research studies: Participants must give both informed and free consent; they must be protected from undue harm; their personal information must be protected; and they must be told the full purpose of the study at its conclusion. Finally, we covered the subject of scientific misconduct, which includes negligent or intentional distortions of the research process. The beauty of the scientific process is that those who attempt to commit fraud don't get away with it forever.

Key Terms

abstract A summary of a journal article, appearing both at the top of the article and in search results.

analysis of variance (ANOVA) A statistical procedure that tests for differences by comparing the variance explained by systematic factors to the variance explained by error.

anonymous data Data collected without identifying information from participants.

applied research Research in which the primary goal is to solve a problem, with less focus on why the solution works.

basic research Research in which the primary goal is to acquire knowledge, with less focus on how to apply the knowledge.

biopsychology The study of connections between biological systems (including the brain, hormones, and neurotransmitters) and our thoughts, feelings, and behaviors.

clinical psychology An applied field focused on understanding the best ways to treat psychological disorders; the study of best practices for understanding, treating, and preventing distress and dysfunction.

cognitive psychology The study of internal mental processes, including the ways that people think, learn, remember, speak, and perceive.

Committee for Animal Research and Ethics (CARE) APA committee responsible for guidelines governing animal research; the upshot of these guidelines is to ensure that animals are treated humanely at all stages of the study by well-trained personnel and that there is a strong justification for the animals' use.

Common Rule A set of federal laws, starting in 1981, that established the baseline standard of ethics for all federally funded research.

confidential data Data collected in such a way that identifying information is protected and kept secret.

debriefing A practice of disclosure that upholds the ethical principle stating that participants should be informed of the study's true purpose when it is concluded.

deduction The process of developing a specific hypothesis out of a more general theory; best understood as a "top-down" approach to reasoning.

dependent variable Outcome variable that is measured by the experimenter.

developmental psychology The systematic study of physical, social, and cognitive changes over the human life span; initially focused on childhood development, though many researchers now study changes and key stages over the entire life span.

empiricism A scientific approach to decision making that focuses solely on the role of observation and sensory experience over the roles of reason and logic.

exempt review Category of IRB review reserved for low-risk studies falling into a set of predefined categories; involves having an IRB representative simply verify the low risk and approve the study.

expedited review Category of IRB review used for medium-risk studies falling into a set of predefined categories; involves having an IRB representative conduct a full review of the study procedures and ensure that participants' welfare and identity are protected.

falsifiability A concept applied to theories and hypotheses meaning that the right set of conditions could prove it wrong; calling something falsifiable does not mean it is false, only that it would be possible to demonstrate its falsehood if it were false.

free consent Ethical principle stating that those involved in studies must agree to do so without coercion; thus, researchers are forbidden from placing undue pressure on people to participate in or remain in a study.

full-board review Category of IRB review used for high-risk studies, which contain an inflated risk to participants' welfare or the potential for release of confidential information; involves having all members of the IRB review the study procedures and then meet as a group to discuss the degree of risk and protection.

hypothesis A specific and falsifiable statement about the relationship between two or more variables.

independent variable Variable in an experimental design that is manipulated by the experimenter.

induction The process of developing a general hypothesis out of a set of specific observations; best understood as a "bottom-up" approach to reasoning.

informed consent Ethical principle stating that research participants must be informed of all features of the study that would reasonably affect their decision to participate.

Institutional Animal Care and Use Committee (IACUC) Review panel that monitors all research involving nonhuman animals in order to protect the welfare of research subjects; tasked with ensuring that the benefits of the research outweigh any discomfort experienced by the animals.

institutional review board (IRB) Review panel that monitors all research involving humans in order to protect the welfare of research participants; tasked with determining whether a study is consistent with ethical principles and has the authority to approve, reject, or require modification from each research proposal.

mixed methods design Research design that combines or associates both quantitative and qualitative methods.

operational definitions Define the meaning of a concept or variable in relation to a study.

operationalization The process of choosing measurable variables to represent the components of a hypothesis.

parsimonious Term applied to theories meaning that our concepts should be as simple as possible without sacrificing completeness.

peer review A process that involves having experts in the field evaluate the merits of research articles before they are published.

primary source Full firsthand reports of a research study, including information on the participants, the data collected, and the statistical analyses of these data; these appear in professional academic journals.

problem statement (Aim of the study), provides a clear description of the intent of the study.

purpose statement Similar to the problem statement, not only includes the intent of the study but identifies what population will be studied, what type of research will be conducted (e.g., comparison between variables, examination of the relationships between variables, a descriptive examination of one or more variables), and what the dependent and independent variables will be.

qualitative research A descriptive approach that attempts to gain a deep understanding of particular cases and contexts.

quantitative research A systematic and empirical approach that attempts to generalize results to other contexts.

rationalism An approach to decision making that relies on making logical arguments.

reconciliation and synthesis The process of resolving an apparent conflict by finding common ground among the ideas and then merging all the pieces into one new explanation.

research problem The topic or phenomenon to be addressed, investigated, and researched, either through quantitative or qualitative methods.

research proposal Provides a detailed description about the research problem and the planned research methods to be used in a study.

research questions Questions developed to make the research problem testable. Generally take the form of hypotheses, which are specific predictions or educated guesses about the outcome of the study; some researchers may choose to include hypotheses and research questions that are related to the research problem.

scientific method A means of approaching problems and drawing conclusions based on empirical observations. Consists of four steps: *h*ypothesize, *o*perationalize, *m*easure, and *e*xplain, abbreviated as HOME.

scientific misconduct Intentional or negligent distortion of the research process.

secondary source Secondhand summary of primary source articles; these include textbooks and academic books, as well as less than trustworthy websites.

social psychology The study of the ways our thoughts, feelings, and behaviors are shaped by other people.

theory A collection of ideas used to explain the connections between variables and phenomena.

variable In the context of an experiment, a factor that is subject to change and that is measured or studied.

Apply Your Knowledge

1. For each of the following broad theoretical statements, think of a specific research hypothesis that would test the theory. There are many possibilities for each one, but remember that your hypothesis needs to be both testable and falsifiable. The first one is provided as an example.

   Theory: Infants look cute and helpless so that adults will take care of them.
   Hypothesis: Parents will be more attentive to cute infants than to less cute infants.

Theory: People are inherently social and value the approval of others.
Hypothesis:

Theory: People prefer to feel good about themselves.
Hypothesis:

2. a. Read the abstract of a published research study (Langer & Rodin, 1976) found here, http://www.ncbi.nlm.nih.gov/pubmed/1011073, and identify the four components of the research process.

Hypothesis:
Operationalization (how they defined variables):
Measure (how they conducted the study and collected the data):
Explain:

b. Read the abstract of a published research study (Swim & Hyers, 1999) found here, http://www.ingentaconnect.com/content/ap/js/1999/00000035/00000001/art01370, and identify the four components of the research process:

Hypothesis:
Operationalization (how they defined variables):
Measure (how they conducted the study and collected the data):
Explain:

3. Read the following description of a research study, and then evaluate whether it meets the five APA ethical guidelines:

A researcher told students that their responses to an online survey on cheating were anonymous. One question asked students for their email address to use in a raffle drawing. Instead, the researcher used this to locate GPAs in school files so he could correlate frequency of cheating and GPA.

Informed consent?
Free consent?
Protection from harm?
Confidentiality?
Debriefing?

Based on this evaluation, is the study likely to be approved by an institutional review board? Why or why not?

Critical Thinking & Discussion Questions

1. You have been asked to help determine whether watching violent television leads people to become more violent. Explain how you would approach this task using the four steps of the research process (Hint: HOME).
2. Take a second to review the guidelines for evaluating theories. Using these criteria, evaluate Freud's theory of unconscious drives. Hint: The key to this theory is that much of our behavior is driven by internal conflicts that exist outside our awareness.