The Practice of Psychological Research

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LEARNING OBJECTIVES: FAST FACTS

**Reading and Writing Research**

- In reading and writing research, always consider the distinction between experimental and non-experimental approaches. Only with an experimental approach can independent variable(s) be directly manipulated, a key point of consideration for establishing causality, the so-called gold standard to which research aspires. Nonexperimental research is correlational in nature, vitally important for studies in psychology that often cannot directly manipulate variables of critical interest, such as exposure to traumatic experiences, as well as individual characteristics of intelligence, personality, or clinical diagnosis.

(Continued)
• Writing in psychology is a discipline-specific form of scientific reporting that is based on empirical evidence. Opinions, anecdotes, and personal testimonies, however compelling, are not empirical evidence and, therefore, are “inadmissible” in psychological writing. In writing and reading research, go to the primary sources.

• Statistical analyses serve two principal goals, identified as descriptive and inferential. Descriptive statistics summarize and present data in a meaningful way but, importantly, do not allow for testing hypotheses and to generalize results to the larger population. By contrast, inferential statistics are a set of techniques that allow for testing of hypotheses about a population from data collected from a sample. Inferential statistics provide the techniques and procedures to determine the probability that the results that you obtained in your analysis of the aggregated data can be generalized to the larger population from which your sample was drawn.

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Try your hand at these questions. Don’t worry about not knowing the correct response, as you haven’t read the chapter yet! But research shows that a pretest such as this can enhance learning (e.g., Kornell, Hays, & Bjork, 2009). So here is the answer. You come up with the question.

1. A researcher wants to hold constant certain factors that could potentially confound a study’s results.
   a. What are control variables?
   b. What are independent variables?
   c. What are dependent variables?
   d. What are heuristic biases?

2. Specifies how a concept will be coded, measured, or quantified
   a. What is a conceptual definition?
   b. What is measurement?
   c. What are inferential statistics?
   d. What is an operational definition?

3. A specific testable statement that can be evaluated by empirical observations or data
   a. What is a variable?
   b. What is a statistic?
   c. What is a sample?
   d. What is a hypothesis?

4. Used to summarize and to present data in a meaningful way
   a. What are data?
   b. Who are research participants?
   c. What are descriptive statistics?
   d. What are inferential statistics?

5. A set of techniques that allows for testing of hypotheses about a population from data collected from a sample
   a. What are data?
   b. Who are the research participants?
   c. What are descriptive statistics?
   d. What are inferential statistics?

6. Provides the strongest evidence of cause-and-effect relationship between independent and dependent variables
   a. What is a correlational approach?
   b. What is a nonexperimental approach?
   c. What is an experimental approach?
   d. What are descriptive statistics?

7. Not empirical evidence and therefore considered “inadmissible” in the court of psychology writing
   a. What are data?
   b. What are anecdotes and personal testimonies?
   c. What are descriptive statistics?
   d. What are inferential statistics?

8. A broad statement that cannot be directly tested but rather needs to be translated into one or more hypotheses
   a. What is an experiment?
   b. What is a generalization?
   c. What is an independent variable?
   d. What is a dependent variable?
9. Unwanted influences of a third variable on the relationship between an independent variable and dependent variable
   a. What are controls?
   b. What are measures?
   c. What are confounds?
   d. What are hypotheses?

10. The extent to which a study or experiment approximates the actual real-life phenomenon under investigation
    a. What is ecological validity?
    b. What is an alternative explanation?
    c. What is temporal precedence?
    d. What is covariation of cause and effect?

ANSWER KEY:
(1) a; (2) d; (3) d; (4) c; (5) d; (6) c; (7) b; (8) b; (9) c; (10) a

ARE YOU A MAXIMIZER OR A SATISFICER?

Let’s begin this chapter by responding to a set of statements just as you would do if you were completing a survey. How much do you agree or disagree with each of the following 13 statements? Indicate your response by recording a number between 1 and 7 after each statement, where 1 means that you disagree completely with the statement and 7 means that you agree completely with the statement; of course, a response of 4 would indicate that you neither agree nor disagree with the statement.

1. Whenever I’m faced with a choice, I try to imagine what all the other possibilities are, even ones that aren’t present at the moment. _________

2. No matter how satisfied I am with my job, it’s only right for me to be on the lookout for better opportunities. _________

3. When I am in the car listening to radio, I often check other stations to see if something better is playing, even if I am relatively satisfied with what I’m listening to. _________

4. When I watch TV, I channel surf, often scanning through the available options even while attempting to watch one program. _________

5. I treat relationships like clothing: I expect to try a lot on before finding the perfect fit. _________

6. I often find it difficult to shop for a gift for a friend. _________

7. Renting videos is really difficult. I’m always struggling to pick the best one. _________

8. When shopping, I have a hard time finding clothing that I really love. _________

9. I’m a big fan of lists that attempt to rank things (e.g., the best movies, the best singers, the best athletes, the best novels, etc.). _________

10. I find that writing is very difficult, even if it’s just writing a letter to a friend, because it’s so hard to word things just right. I often do several drafts of even simple things. _________
11. No matter what I do, I have the highest standards for myself. 

12. I never settle for second best. 

13. I often fantasize about living in ways that are quite different from my actual life. 

Now add up your scores. Congratulations! You have just completed the “Maximization Scale” designed by the psychologist Barry Schwartz (2004).

The Maximization Scale is intended to distinguish people who are “maximizers” from people who are “satisficers.” Maximizers always shoot for the best, whereas satisficers are okay with settling for “good enough.” When maximizers search for a job, they will shoot for the highest possible income or other rewards; satisficers will be happy with a certain income that’s “good enough.” From finding a TV channel to picking a restaurant, maximizers generally try to exhaust all possibilities before making their final choice. By contrast, satisficers set standards for themselves and choose the first option that meets that standard. Your responses to each of the statements in the Maximization Scale help determine how close you are to the maximizer or the satisficer end of the continuum.

Schwartz and colleagues gave this set of 13 statements to thousands of people. They considered people to be maximizers if their average score was higher than 52 (the scale’s midpoint, determined as the middle item score of 4 multiplied by 13—the number of items). People whose average ratings were lower than the midpoint were considered to be satisficers (Schwartz, 2004). Which category did your score place you in? If you scored above 52 (i.e., the scale’s midpoint), Schwartz would consider you to be a person who always has to perform an exhaustive check of all the available choices to make sure you pick the best.

Now let’s consider the impact of being a maximizer or a satisficer on the outcomes of job searches. Do you think maximizers or satisficers are more likely to make the “best” choice of a job and be most satisfied with that choice? Sheena Iyengar, Rachael Wells, and Barry Schwartz (2006) investigated this question by categorizing 548 graduating students as either maximizers or satisficers in the fall of their senior year and then following them during the next year as they searched for jobs. When interviewed again the following summer, the maximizers had found jobs that paid 20% more on average than the satisficers’ jobs, but the maximizers were less satisfied with the outcome of their job search and were more pessimistic, stressed, tired, worried, overwhelmed, and depressed. The maximizers felt worse even though they had done better than the satisficers! The researchers reasoned that this was because considering so many choices led maximizers to have unrealistic expectations; these unrealistic expectations in turn increased the likelihood of feelings of regret, disappointment, dissatisfaction, and sadness. In fact, the researchers reported that maximizers were more likely to fantasize about jobs that they hadn’t applied for and to wish that they had pursued even more jobs than they did.

The Research Objective

You have a different objective as a researcher. No longer interested in your individual score, you now focus on the aggregated or group data collected from your class. Let’s imagine that your class produced 62 scores on the Maximization Scale, and these constitute our raw data. But from these raw data alone, you would have difficulty in understanding what these scores might mean without performing some kind of statistical analyses.
Statistical analyses serve two principal goals, which are commonly identified as descriptive and inferential. With descriptive statistics, the aim is to summarize and present data in a meaningful way. Descriptive statistics reveal important objective features of a set of aggregated data, such as, for example, overall mean score for the class on the Maximization Scale. Descriptive statistics may also point to potentially emerging patterns in the data that could be subjected to further analyses. However, and importantly, we cannot draw conclusions on the basis of descriptive statistics, nor can we test a hypothesis. Rather, descriptive statistics are simply a way to describe your data. A critical limitation of descriptive statistics is that they do not allow you to generalize results to wider general population.

On the other hand, inferential statistics are a set of techniques that allow for testing of hypotheses about a population from data collected from a sample. In other words, inferential statistics provide the techniques and procedures to determine the probability that the results that you obtained in your analysis of the aggregated data can be generalized to the larger population from which your sample was drawn.

As a first step in answering our research question, we need to decide on our statistical approach. Because the research question asks only for the percentages of maximizers and satisficers for our class, our data analysis plan can be confined to the use of descriptive statistics. However, descriptive statistics would not be sufficient if the research question asked whether men and women in college differed on their scores on the Maximization Scale. Here, in addition to using descriptive statistics to characterize the distribution of Maximization scores for men and women, you would need inferential statistics to analyze group differences. That is, inferential statistics are required to answer the question as to whether any differences you find between men and women in their Maximization scores are unlikely to be due to chance. We will return to inferential statistics later in this book, but for now let us turn our attention to descriptive statistics.

In the “Stat Corner” you will see how to apply descriptive statistics in our research study on maximization. Descriptive statistics summarize and describe a distribution of values and, in our case, the distribution of scores for the class on the Maximization Scale. Two important features of a distribution are central tendency and variability. Central tendency is summarized and described with one of three statistics: mode, median, and mean/average. These statistics provide ways of describing the central position for a set of data. Three different descriptive statistics are used to summarize variability of a distribution of numerical values: range, variance, and standard deviation. Each of these three statistical measures of variability provides a quantitative index to summarize the spread of numerical values for a given variable.

In our example, note how stats are used to describe (a) sample size; (b) basic demographics, such as the number of males and females participants, their age, as well as their educational level; (c) group mean and standard deviation on the Maximization Scale; and (d) percentages of maximizers and satisficers. We would encourage you to think of statistics, in general, and these numbers, in particular, as a way a scientist tells a “story.” Storytelling and statistics are often thought as two very different intellectual cultures or mind-sets, one literary (storytelling) and the other scientific (statistics) (e.g., Paulos, 2010b). However, for our purposes, you can see in our simple exercise how numbers in the form of descriptive statistics can indeed help us tell the story of our in-class maximization study!
by Iyengar et al. (2006) used a nonexperimental approach to examine the relationship among three variables: (1) maximizer/satisficer, (2) income, and (3) feeling of well-being. In a nonexperimental approach like this, variables are carefully measured, and the relationship between the variables is examined. Your score on the Maximization Scale measured your value on the maximizer/satisficer variable. If you had been a participant in the research of Iyengar et al. (2006), your job income and feeling of well-being would also have been measured.

A nonexperimental approach is often described as correlational in nature. As we will learn, a correlation is a statistic that is computed by a specific formula; this statistic indicates how closely related two variables are. Correlational research allows you to look at the way one set of measurements goes up or down in tandem with another set of measurements. In this way, Iyengar and colleagues could determine that those with higher maximizer scores tended to enter jobs with higher incomes but were less satisfied with those jobs.

The chief advantage of correlational research is that it allows for the quantitative comparison of variables that cannot be manipulated directly. The researcher does not make respondents into maximizers or satisficers; she or he just measures her or his value on the Maximization Scale. In the same way, researchers in correlational research measure the income people receive in a job and their satisfaction with it; they don’t take any action to change their income or job satisfaction.

In research that uses an experimental approach, the researcher manipulates the value of cases on the independent variable. That is, the researcher determines which value of the independent variable each research participant is exposed to. To illustrate, consider a study to determine whether a drug is effective. The independent variable is receipt of the drug. The treatment group/condition, which is also known as the experimental group/condition, receives the drug under study. The control group/condition receives nothing. Often in drug research, there is also a placebo group, which receives an inert substance, such as a sugar pill, so that the participants in the placebo group think that they are receiving the drug treatment even though they are not. In many drug studies, the placebo group also serves as the control group or control condition. The control group provides a baseline to compare with the treatment group and, in some studies, with the placebo group. The independent variable, receipt of the drug, therefore has two or three values: (1) receipt of the treatment, (2) receipt of nothing, and, in some studies, (3) receipt of the placebo.

In a true experiment, random assignment is used to determine which value of the independent variable each research participant receives. Random assignment ensures that each participant has an equal chance to be assigned to a particular group, condition, or level of an independent variable. Flipping a coin is a simple technique that researchers often use to randomly assign participants. For example, a researcher would assign participants with “heads” to one group and “tails” to the other group. If participants are randomly assigned, the groups exposed to different values of the independent variable should be the same at the outset, on average. This means that any differences between groups on the dependent variable after the participants have been exposed to the independent variable can be directly attributable to the manipulation of the independent variable. This randomized design therefore provides the strongest evidence of a cause–effect relationship between an independent variable and a dependent variable.

In medical research, when research participants are randomly assigned to receive either the drug under investigation or a placebo, the study is referred to as a randomized clinical trial (RCT). An RCT also often uses a double-blind procedure, whereby both the researcher and the participants are “blind” to who receives the “real” drug and who receives the placebo. Double-blind procedure and placebo are used to control for the potential confound of unwanted effects of expectations of both participants and researchers that might act as unwanted influences on the results of the study. That is why federal regulations require that the value of new drugs be determined in RCTs: This design makes it highly unlikely that the apparent effect of the drug could really be due to something else.

To summarize, in comparison with a nonexperimental approach, an experimental approach allows for rather strict control over the independent variable or variables that are assumed to be the causal agent(s)
producing the predicted effect. In the RCT example, the researcher directly manipulates by randomly assigning participants to receive either the real drug or the placebo. The experimental approach of the RCT allows for a direct test of the hypothesis that the drug will cause symptoms to be ameliorated. That is, the hypothesis is that the independent variable of treatment, specifically the drug, will cause the dependent variable, specifically the symptoms of the disease, to be eliminated. On the other hand, a nonexperimental approach cannot establish a cause-and-effect relationship between an independent variable and a dependent variable. Rather, a nonexperimental approach is descriptive in nature, using statistical correlational techniques to quantify relationship among variables. We will cover experimental approaches in Chapters 6 and 7. We cover different nonexperimental approaches in Chapters 4 (psychometrics), 5 (survey design), 8 (quasi-experiments), 9 (single case), and 11 (qualitative). Exhibit 2.1 introduces some of the different types of methods commonly used in psychological research, as well as some of the different types of study design. We likened this to a “research toolbox.”

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**Description**

The principal objective of research is to provide a scientific understanding of the topic of investigation. Scientific understanding entails two distinct but related processes: description and explanation. We first describe the phenomenon that we intend to study. This may seem obvious, but careful and precise definitions of key concepts and the measures we develop for those concepts are critical for scientific understanding.

Generally, researchers describe and define terms both conceptually and operationally. A **conceptual definition** provides the meaning, often rather broad in scope, of an abstract term, such as intelligence, anxiety, or emotion. Very similar to what you would find in a dictionary, a conceptual definition demarcates a semantic or linguistic meaning of a psychological term, that is, its usage in words, texts, and language. For example, intelligence as a concept may be defined as the general ability that enables an individual to comprehend the world and to deal effectively with its challenges (Wechsler, 1997).
For the Iyengar et al. (2006) study, maximizer and satisficer represent two key terms that require clear conceptual definitions. How would you define these terms in plain English? How would you categorize them? Borrowing from Schwartz (2004), we define conceptually maximizer and satisficer as two distinct choice-making strategies. (1) The choice-making strategy of a maximizer is defined as one that seeks out the absolute best option, usually only after an exhaustive search. (2) The choice-making strategy of a satisficer is defined as one that seeks the “good enough” choice, searching until finding an option that meets a standard of acceptability. Note that the concept is referred to as choice-making strategies. The idea is that choice strategies comes in two types: maximizer and satisficer.

Operational definitions follow from conceptual definitions. An operational definition indicates how a concept is coded, measured, or quantified. It may be as simple as an operational definition of gender in which female is coded as 1 and male as 2 (or vice versa). No single operational definition can capture fully the concept it is intended to measure. An operational definition is among several possible objective and measurable indicators of a concept.

For the Iyengar et al. (2006) study, the Maximization Scale provided the key operational definition. Why? Because as we have learned the scale provided an objective score that can range from a low of 13 to a high of 91 (91 = 13 × 7—if you rated each of the 13 statements as strongly agree). The operational definition of a maximizer is a score greater than 52. The operational definition of a satisficer is a score less than 52. Thus, we can see that this simple scale of 13 items provided the operational definition of maximizer and satisficer. So now you could describe the choice-making strategies of people in a group by reporting their scores on the Maximization Scale.

**Explanation**

Explanation is the other goal of science. In a scientific sense, explaining something means identifying its cause. For example, we might explain people’s happiness with their jobs with their maximization score. Variation in maximization, the independent variable, accounts for at least some of the variation in happiness with the job. Maximization has a causal influence; job happiness is the effect. We can also think of explanation as involving prediction: If we know someone’s maximization score, we can predict their level of job happiness.

Causality, however, is not a simple matter. In fact, philosophers since the time of Aristotle have debated the true essence of causality. For our purposes, let’s think of causality as requiring three kinds of evidence, as described by Cook and Campbell (1979). The first kind of evidence is that of temporal precedence. This evidence establishes that the cause precedes the effect. Thus, one step toward demonstrating causality is temporal precedence: Smoking cigarettes occurred first, and lung cancer, tragically, followed.

The second type of evidence needed to establish causality is covariation of the cause and effect. This means that when the cause is present, the effect is more likely to occur, and when the cause is absent, the effect is less likely to occur. Thus, we need to know that people who smoke cigarettes are more likely to contract lung cancer than those who do not smoke.

Third, causality requires the elimination of alternative explanations. In other words, a researcher must show that nothing other than the identified causal variable could be responsible for the observed effect—that is, there is no other plausible explanation for the relationship. In our smoking example, suppose a third variable, such as social class, could explain the relationship of smoking and lung cancer. This alternative explanation could come into play if, for example, people with lower socioeconomic status were more likely to smoke and also were more likely to be victims of cancer. Both the smoking and the cancer could be consequences of lower socioeconomic status; this would lead to a relationship between socioeconomic status and smoking, but that relationship would not reflect a causal effect of smoking on lung cancer.

These three requirements of causality are difficult standards to meet in human psychological research. This holds even with an experimental approach, which ostensibly allows the researcher to test whether
changes in an independent variable cause changes in the dependent variable. The problem is that it is impossible in human studies to control for all extraneous, confounding (see Chapter 1), or so-called third variables that could account for the observed effect. Consider the often-cited finding that cities with a greater number of churches have a higher crime rate. On the face of it, does this finding mean that having more churches causes higher crime rates? Can you imagine a headline, “Churches Cause More Crimes”? A classic example of a mistaken causal relationship, you would shout! Why? Because the author of the headline failed to recognize the confounding effects of a third variable, population size, on the reported relationship of increased number of churches and elevated rates of crime. More churches do not lead to more crime; instead, the third variable of population leads to both more churches and more crime. Note that a third variable is by definition correlated with each member of the pair under study. The confounding arises from the correlation of the third variable with each of the other two variables. In this example, we can see that densely populated areas have more churches and higher crime. To put it in more precise statistical terms, as the density of population areas increases, both the number of churches and the rates of crime also increase. The headline should read “Densely Populated Areas Have More Churches and Higher Crime.” But then that would not be newsworthy.

**Practical Knowledge**

Scientific understanding through the process of description and explanation often leads to interesting practical applications. Research that is conducted because of potential practical applications is termed applied research. By contrast, basic research addresses fundamental questions about the nature of abstract psychological processes and ideas, such as emotion, intelligence, reasoning, and social behavior. Applied research addresses important questions that are thought to be of immediate relevance in solving practical problems. What television advertisements are most effective in reducing illicit drug use in children? What is the most effective teaching method for learning math? Do early intervention programs, such as Head Start, lead to better outcomes?

Such questions are investigated and studied in applied research. In fact, a major area of interest and study in applied research is called program evaluation. Program evaluation studies the effects on behavior of large-scale policy changes as well as social reforms and innovations occurring in settings such as government agencies, schools, courts, prisons, businesses, health care, and housing. In reality, these distinctions often blur, and the basic and applied research designation is probably most accurately viewed as falling along a continuum. Both basic and applied research are essential and of equal importance, with scientific progress depending on the combined efforts and fruits of basic and applied research. Moreover, basic research often has exceptionally important practical applications that are impossible to predict.

**Research Strategies**

In conducting research, we are attempting to connect theory with empirical data—evidence we obtained through scientific studies. As we have learned, researchers may make this connection by starting with a psychological theory and testing some of its implications with data. This is the process of deductive research; it is most often the strategy used in experimental studies. We deduce a hypothesis from a theory and then collect data with which to test the hypothesis. Alternatively, researchers may develop a connection between psychological theory and data by first systematically collecting data, identifying patterns in the
data, and then developing a theory that explains the patterns. This **inductive research** approach is most often used in nonexperimental studies, such as those that use naturalistic observation methods. A particular research study can draw on both inductive and deductive strategies.

So the two most important elements of all scientific research strategies are (1) data and (2) theory. Data are the empirical observations that allow for evaluating a theory. A theory is a set of propositions that explains a variety of occurrences. A theory performs three major functions: (1) organization, (2) explanation, and (3) prediction. A good theory is one that is parsimonious and precise as well as powerful in its breadth and depth of explanation. It can explain a variety of occurrences with the fewest theoretical assertions. Exhibit 2.2 depicts the link between theory and data. As you can see, a deductive research strategy will begin with a theory from which particular statements are drawn and then tested by collecting data. By contrast, an inductive strategy first examines the data and then derives a theory to explain the patterns found in the data.

**Exhibit 2.2** The Links Between Theory and Data

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<td>Reality: What we observe</td>
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**Inductive Research**

Inductive research entails reasoning from particular data or empirical observations to a general theory. Perhaps the best suited for an inductive research approach is the **naturalistic observation** method. Often used in **qualitative research** (which will be discussed in Chapter 11), a naturalistic observation design studies people in their natural settings so that their behaviors and words can be put into their proper context. Such descriptive study of people is also sometimes referred to as **ethnography**. Here, observation, it is important to emphasize, does not mean the casual “seeing” of everyday life that leads to haphazard impressions. To the contrary, for this research methodology to be effective, observation must be controlled or **systematic**, which means that it must be conducted carefully, with precise description that allows for consistent or reliable cataloging of data and the orderly classification and analysis of that information (Adler & Adler, 1994).
While qualitative researchers use naturalistic observation methods that tend to avoid predetermining categories of action that can be precisely measured, they, like their quantitative counterparts, make sure their studies yield reliable and valid data. In short, the aim of qualitative research is to understand context—the what, how, when, and where of an event or an action. It yields data regarding meanings, concepts, definitions, characteristics, metaphors, symbols, and descriptions of events or actions (Berg, 2004). As such, it is ideally suited for an inductive research approach.

Consider a simple but interesting study by Hussain and Griffiths in the Psychology Division at Nottingham Trent University. Hussain and Griffiths (2009) were interested in the attitudes, experiences, and feelings of online gamers (see Exhibit 2.3). Although MMORPGs (massively multiplayer online role-playing games) have become very popular and there have been some studies of these online gamers, there has been little qualitative research exploring gamers’ accounts of their own activities and attitudes. To start to fill this gap, Hussain and Griffiths (2009) recruited 71 online gamers through posts on online gaming forums and in World of Warcraft games. The researchers “interviewed” these 71 participants online, either through online chat or by e-mail. Most of the interview questions were open-ended. The researchers explained why they used this approach:

The unstructured nature of the interviews allowed gamers to develop their own narrative by exploring their experiences of MMORPGs. The researcher allowed gamers to speak for themselves (i.e., the emergent themes were participant led rather than researcher led). This allowed gamers to take control of the interview process and prevented researchers’ subjective bias entering the analytic stage. (p. 748)

The researchers read through the interviews and identified the main themes that were expressed in them. For example, many comments had to do with the psychosocial impact of online gaming. Although the “vast majority” of the gamers highlighted positive effects of the activity, some pointed to potentially adverse effects:

I’ve lost my IRL [in real life] friends because I couldn’t find the time to be with them; I quit school. Whenever someone asks me to do something on the weekends, I always think “ooh, but we’re raiding, I really shouldn’t go out,” and that’s a way of thinking which I really dislike. (Hussain & Griffiths, 2009, p. 750)

The researchers conclude by noting not only how gamers use gaming to alleviate negative feelings but also how they may experience personal problems due to the online gaming. They raise questions about the difference between socializing online and offline, and they focus attention on the problem of addiction. Although Hussain and Griffiths do not attempt to develop their own theory of online gaming, the patterns that they find and the questions that emerge from their research provide a foundation that others could use in developing such a theory. The researchers urge more generalizable research about online gamers using quantitative methods, and they recommend policies that could reduce the likelihood of problems due to online gaming.

To recap, using the Hussain and Griffiths (2009) study as an example illustrates two important points. First, an inductive approach starts with data and then develops a theory that explains the patterns in the data. Note that Hussain and Griffiths first systematically collected and then analyzed their data—comments by the gamers about their attitudes and experiences, and from these data, offered some theoretical inferences the interests and motives of gamers. The second point is to call your attention to this new approach to collecting interesting information on psychological processes through the Internet! This we would recommend as a convenient, accessible methodology for perhaps a study that you can conduct as part of your research methods course (see Activity Questions at the end of this chapter). It is a good example of how adopting a scientific perspective can address interesting questions about everyday activities and add value to them.
Deductive Research

In deductive research, reasoning proceeds from a general theory to particular data. Theories, however, are not directly testable. Thus, hypotheses must be derived from a theory. These hypotheses are then tested, and the ensuing results are used to evaluate how well the theory works—that is, how well it describes, explains, and predicts the nature of the phenomenon under study. A hypothesis is defined as a specific testable statement that can be evaluated by empirical observations or data. It is different from generalizations that are embedded in a theory. A generalization is a broad statement that cannot be directly tested but rather needs to be translated into one or more hypotheses. That is, a theory will consist of a host of generalizations, and each generalization can lead to one or more hypotheses.

Only hypotheses are directly testable. This is so because a hypothesis proposes a specific relationship between two or more variables that must be measurable. And as we know, one of these variables will be the independent variable that is hypothesized to predict, influence, or cause variation in the dependent variable. In deductive research, then, the investigators formulate one or more hypotheses and develop particular methods and procedures of measurement and/or experimentation. This yields data that serve as a direct test of a given hypothesis.

Let us examine the Iyengar et al. (2006) maximization study as an example of deductive research. As we learned earlier in this chapter, Iyengar et al. designed their study to examine the theory originally proposed by Herbert Simon (1956) that maximizer and satisficer represent two distinct decision-making strategies. Iyengar and colleagues tested the hypothesis that in comparison with satisficers, maximizers would make more money but be less happy. Their study therefore measured three key variables: (1) maximization/satisficer score, (2) salary, and (3) well-being. In this study, there is one independent variable, the maximization/satisficer score, and two dependent variables, salary and well-being. And the hypothesis is that these two decision-making strategies, maximizers versus satisficers, would influence both salary and happiness but in opposite directions.
The lesson here for us is twofold. First is the question as to why the Iyengar et al. (2006) study is a good example of deductive research. The answer is because the study began with the Simon theory of the two decision-making strategies, followed by the testing of the specific hypothesis that maximizers would make more money but be less happy than satisficers. That is, in deductive research the sequence is theory, followed by hypothesis, and then data collection.

The second lesson to be gleaned here pertains to understanding the key variables of the study and their predicted relationships between them. Why is the score on the Maximization Scale used as the independent variable? Why are salary and well-being used as the two dependent variables? The answer is because the independent variable, decision-making strategy of either maximizer or satisficer, was predicted to influence the two dependent variables, salary and well-being. That is, the researchers used the scores on the Maximization Scale to categorize participants as either maximizers or satisficers. They then compared satisficers and maximizers on the two dependent variables of salary and well-being.

We plead guilty to belaboring this point, but learning the distinction between independent and dependent variables is critical for understanding research in psychology. Recall from Chapter 1 that we likened variables to the language of research. Exhibit 2.4 provides additional practice for learning the distinction between independent and dependent variables. As you can see in Exhibit 2.4, hypotheses can be worded in several different ways, and identifying the independent and dependent variables is sometimes difficult. When in doubt, try to rephrase the hypothesis as an “if–then” statement: “If the independent variable increases (or decreases), then the dependent variable increases (or decreases).” Exhibit 2.4 (examples of hypotheses) presents several hypotheses with their independent and dependent variables and their “if–then” equivalents.

Exhibit 2.4 demonstrates another feature of hypotheses: direction of association. When researchers hypothesize that one variable increases as the other variable increases, the direction of the association is positive (Hypotheses 1 and 2). When one variable decreases as the other variable decreases, the direction of association is also positive. But when one variable increases as the other decreases, or vice versa, the

<table>
<thead>
<tr>
<th>Original Hypothesis</th>
<th>Independent Variable</th>
<th>Dependent Variable</th>
<th>IF-THEN Hypothesis</th>
<th>Direction of Association</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Deeper encoding of words, better memory</td>
<td>Levels of encoding</td>
<td>Recall of words</td>
<td>IF encoding level increases, THEN memory increases</td>
<td>+</td>
</tr>
<tr>
<td>2. Older age, reduced motor speed</td>
<td>Age</td>
<td>Motor speed</td>
<td>IF age increases, THEN, motor speed decreases</td>
<td>−</td>
</tr>
<tr>
<td>3. Higher SAT scores, better GPAs</td>
<td>SAT</td>
<td>GPA</td>
<td>IF SATs are higher, THEN GPAs are higher</td>
<td>+</td>
</tr>
<tr>
<td>4. Exam grades are higher for students who study in the library versus dorm</td>
<td>Place of study</td>
<td>Exam grade</td>
<td>IF place of study is the library THEN exam grades are higher compared with those who study in dorm</td>
<td>NA</td>
</tr>
</tbody>
</table>
direction of the association is negative or inverse. Hypothesis 2 states a negative or inverse association between increased age and reduced motor speed. Hypothesis 4 is a special case in which the independent variable is categorical (which we will discuss in Chapter 4), as in this example, where students study for an exam, either in the library or in their dorms. This qualitative variable cannot be said to increase or decrease. In this case, the concept of direction of association does not apply, and the hypothesis simply states that one category or level of the independent variable is associated with higher values of the dependent variable.

The Research Circle

In reality, the process of conducting research designed to test explanations for psychological phenomena involves a dynamic interplay of moving from theory to data and then back to theory. This process can be characterized as a research circle. As Exhibit 2.5 shows, deductive and inductive research processes can be closely intertwined. With deductive research, theory gives birth to hypotheses, which are then tested by data. With inductive research, data give birth to an empirical generalization—a statement that describes patterns found in the data, from which a theory is formulated. The goals of inductive and deductive research approaches are identical: to develop and formulate theories, a set of general propositions that serve to organize and interpret data or to generate predictions for events and actions for which no data have yet to be obtained. We will now break down the research circle into specific steps using our maximization study as an example.
Getting Started

Getting started in research is tough. Often what works is to find a research study that interests you. In this book, we have introduced several research studies, all of which we hope you find interesting. We selected these studies because of the simplicity of their methods and their potential teaching value. So, for example, we covered the Kahneman studies in Chapter 1, and now in Chapter 2, we have delved into research of Iyengar and collaborators (2006). In so doing, we have reviewed the research pertaining to these particular topics, whether heuristic biases of the Kahneman ilk, online gaming by Hussain and Griffiths (2009), or the maximization study by Iyengar and colleagues (2006). So the first step in the research process is to identify a topic of interest. But how, you may ask.

Psychology is a staple of contemporary culture. And your interests may be piqued through various media accounts of psychological research (e.g., a “Research in the News” of this book). We suggest that a potential wealth of inspiration for new ideas may be found in the popular science literature, often written by eminent scientists who aim to explain science for a general audience. An example of an outstanding work of popular science is the 2011 book by the psychologist and winner of the Nobel Prize in economic science, Daniel Kahneman, Thinking, Fast and Slow.

Closely related to popular science is science journalism, which often focuses on recent developments in science that are judged newsworthy. Pieces in both popular science and science journalism are often exceptionally well-written works of literary distinction: lively, clear, and engaging and free of technical jargon. The downside is that some popular literature (not Thinking, Fast and Slow) can sometimes lack the critical sense of proportionality, cautiousness, and tentativeness that is fundamental to the scientific method. In the popular press, scientific findings can be oversold, if not downright sensationalized.

We emphasize these works of journalism only as a source of ideas that might inspire and motivate you to pursue a formal line of investigation using the scientific method. These journalistic pieces represent important secondary sources, that is, secondhand media accounts of scientific work. They are best used as clues to lead you to the primary source, the firsthand report published in a peer-reviewed journal.

In research, you must go to the primary source. In our example, you would read the Iyengar et al. (2006) study published in Psychological Science. You will find that Psychological Science is considered a top-tier peer-reviewed periodical. For a study to be published in Psychological Science, it must past the muster of reliability and validity as evaluated through the rigors of peer review. So your first general criterion for evaluating a study is to consider the source: where an empirical report such as the Iyengar et al. study is published. A credible source requires peer review. In reading a primary source, the goals of the study should be clearly defined and articulated, and the methods and design of the study should be sufficient to achieve its goals. Ask yourself, “If I had to design this study to test this hypothesized relationship, what would I do?” In other words, you want to evaluate whether the study provides the best method for achieving the goals of the research. Here, a mental template might be helpful: Begin with the broad distinction of whether you would classify a study as either experimental or nonexperimental. Consider whether the research question can be adequately addressed by either an experimental or a nonexperimental approach.

Staking Out the Research Literature

The formal research literature can also serve as a fountain for new ideas. These ideas may come to us when we consider empirical findings of various peer-reviewed studies that are published in scientific journals. These journals constitute the scientific literature. Exhibit 2.6 presents a partial list of major peer-reviewed publications in psychology. In looking at this list, you see that the peer-reviewed publications fall into one of two categories: (1) empirical articles and (2) review articles. An empirical article reports on a particular study and is written in a certain format divided into sections: Abstract, Introduction (which will contain a review of the relevant literature that is the focus of the study), Method, Results, and Discussion (see Chapter 12).
A review article examines several studies of a particular phenomenon, such as heuristics and biases (Tversky & Kahneman, 1974). It evaluates the methodology used across different studies; examines the degree to which findings are robust across various conditions, settings, and procedures; and comments on the extent to which the empirical findings allow for general theoretical conclusions.

### Exhibit 2.6  Some Important Peer-Reviewed Journals for Psychological Research

<table>
<thead>
<tr>
<th>Empirical Articles</th>
<th>Review Articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavior Therapy</td>
<td>American Psychologist</td>
</tr>
<tr>
<td>Child Development</td>
<td>Annual Review of Psychology</td>
</tr>
<tr>
<td>Cognitive Psychology</td>
<td>Psychological Bulletin</td>
</tr>
<tr>
<td>Developmental Psychology</td>
<td>Psychological Review</td>
</tr>
<tr>
<td>Journal of Abnormal Psychology</td>
<td>Science</td>
</tr>
<tr>
<td>Journal of Applied Psychology</td>
<td></td>
</tr>
<tr>
<td>Journal of Educational Psychology</td>
<td></td>
</tr>
<tr>
<td>Journal of Experimental Child Psychology</td>
<td></td>
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<tr>
<td>Journal of Experimental Psychology: General</td>
<td></td>
</tr>
<tr>
<td>Journal of Experimental Psychology: Learning, Memory, and Cognition</td>
<td></td>
</tr>
<tr>
<td>Journal of Experimental Psychology: Human Perception and Performance</td>
<td></td>
</tr>
<tr>
<td>Journal of Personality and Social Psychology</td>
<td></td>
</tr>
<tr>
<td>Proceedings of the National Academy of Sciences</td>
<td></td>
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<tr>
<td>Psychological Assessment</td>
<td></td>
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<tr>
<td>Psychological Science</td>
<td></td>
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<tr>
<td>Neuropsychology</td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td></td>
</tr>
</tbody>
</table>

### The Power of Observation

Suppose you have no formal experience in research but you have always been curious about the human face. In many ways, you have chosen a wonderful topic for research that can be studied by the power of simple observation. Science often begins with simple observation, which can serve as a source of both evidence and ideas. Charles Darwin, for example, generated the theory of evolution by natural selection exclusively on the basis of simple observation. In his later book *The Expression of the Emotions in Man and Animals*, and again relying exclusively on observation, Darwin (1872/1988) would make the case that all mammals regularly display emotion on their faces. For us mere mortals, we might look for the “agony of defeat and the thrill of victory” etched on the faces of the athletes when watching our favorite sport.
Paul Ekman is a world-renowned psychologist who has devoted his career to studying facial expressions of emotions (see Exhibit 2.7). Inspired by Darwin, Ekman began his research by observing facial expressions of emotions of people from various cultures. Malcolm Gladwell, in a delightful 2002 New Yorker piece of science journalism, described how Ekman first traveled to places like Japan, Brazil, and Argentina, carrying photographs of men and women posing various distinctive faces. As recounted by Gladwell, everywhere Ekman went in the developed world, people agreed on what those expressions meant. But because these people all lived in developed countries, they, Ekman knew, could have picked up the same cultural rules watching the same movies and television shows. The indefatigable Ekman, armed with his trusty photographs, next traveled to the most remote villages in the jungles of Papua New Guinea, and there he found, lo and behold, that these tribe folk also had no problem interpreting various facial expressions of emotions. In this very important sense, then, as you recall from Chapter 1, Ekman began his work as a true cultural psychologist.

Over the next half-century, Paul Ekman would build a program of psychological research around his breakthrough discovery that facial expressions of emotions were not socially learned but rather are the universal products of evolution. His nonexperimental studies of facial expression across cultures, which began with naturalistic observations, would be extended to elegant experimental studies by him and other researchers (see also, e.g., Leppanen & Nelson, 2009; Mandal & Ambady, 2004). Together, this research established the human face as an exquisite and efficient organ of emotional communication.

Also important is that observations often act to restrict our attention, and oftentimes they may be subject to bias. However, sometimes with our observant eye, we might stumble on an important discovery that may not have been of primary interest to us. This is why we want to emphasize that during the earlier phases of research when we are trying to generate ideas, narrowing the focus of observation may be counterproductive, stifling perhaps our imagination and creativity. Here you might be better served by a frame of mind in
which your attention and observation act not so much as a narrow spotlight of illumination of a particular area of interest but as a lantern casting a diffuse radiance over the panoply of experience (Lehrer, 2009b).

**Searching the Literature**

The Internet has been described as a godsend for researchers and scholars, especially for those who like to work in their pajamas (Tuhus-Dubrow, 2008)! Tracking down a published peer-reviewed article on the Internet can often be done in a matter of seconds, all from the comfort of your home. In addition, many researchers have very accessible and highly informative websites that include articles that can be identified by typing their name into a search engine, such as Google, and then easily downloaded free of charge. Internet traveling, so to speak, from hyperlink to hyperlink may also lead to an online serendipity of stumbling onto an unexpected article that could add a new dimension to your thinking or perhaps lead you down a very different path from your original idea.

A branch of Google called Google Scholar (http://scholar.google.com) specializes in searches of the scholarly and scientific literature: Just type a researcher's name, such as “Paul Ekman,” and within seconds you will have access to a corpus of scholarly and scientific work on facial expression of emotion. Two excellent websites for major psychological organizations are American Psychological Association (www.apa.org) and Association for Psychological Science (www.psychologicalscience.org). PsycINFO and PsycLIT are specialized, noncommercial search engines sponsored by the American Psychological Association (APA) to serve as databases for citations and abstracts of the world’s literature in psychology and related fields. So too is the Social Sciences Citation Index (SSCI), which includes articles from not only psychology but also related fields, such as sociology and criminology. With SSCI, you can identify a “key article” on your topic. SSCI will then provide you with a list of articles that have cited your key article. This list will give you a start in developing a bibliography of articles relevant to your topic.

These websites are not free and are proprietary, open only to subscribers. For example, websites of scientific journals are generally proprietary, meaning that only paid subscribers can access their contents of peer-reviewed articles. Most college and university libraries have subscriptions to a number of proprietary websites that can be accessed through the library system. Consulting with the library staff of your college or university will help you learn how to access proprietary websites of scholarly information.

**Let the Searcher Beware!**

Elizabeth Kirk (2002) offers some excellent guidelines for evaluating information from the Internet that are available on the Johns Hopkins University webpage: www.library.jhu.edu/researchhelp/general/evaluating. Kirk’s main take-home point is that you should never use information that cannot be verified by other independent sources. To make her point about the dangers of accepting Internet information as gospel, she cites the famous Latin phrase *caveat lector*: Let the reader beware. She lists several criteria against which all information should be evaluated. Among these are authority (e.g., Who wrote it?), publishing body (e.g., Who is the sponsor of the site?), point of view or bias (e.g., Does the website advocate a point of view or sell media products, such as books, pamphlets, videos, etc.), connection to the scientific literature (e.g., Does it cite references to peer-reviewed articles?), verifiability and transparency (e.g., Is the methodology open to public scrutiny and able to be reproduced?), and timelines (e.g., What is the date, and does the information get updated?).

Keep in mind that general search engines such as the family of Google search tools can be very useful, but they are commercially based and derive a portion of their revenues through advertisement. As such, they may shape scholarship in unforeseen ways (Evans, 2008). Other scholars, such as the anthropologist Alex Bentley of Durham University in England, quoted in the *Boston Sunday Globe* of November 23, 2008, by the journalist Rebecca Tuhus-Dubrow, have warned that the Internet “makes academic research a
popularity contest” dominated by search engines that order or prioritize information in ways that may have little to do with scientific merit or impact.

The common lesson is that the tremendous benefits of the Internet, especially in the early phases of generating ideas, may also come with some potential costs. As we know from Chapter 1, we are all prone to confirmatory bias, which may lead us to only search for information on the Internet that supports our positions and ideas. We should always remain cognizant that the Internet and the search tools used to navigate the electronic world have limitations that may affect how we search and gather information in ways we may not fully appreciate.

Reading the Research Literature

Once you have a topic of interest, the next step is to review the research literature relevant to your topic. For our purposes, think of the relevant research literature as consisting of primary sources, that is peer-reviewed empirical articles and review articles (see Exhibit 2.6). It is easy to become overwhelmed by the breadth and depth of the research literature on any given topic. Thus, an important challenge is to narrow your focus and to demarcate the boundaries of your literature review.

To illustrate, let us use the Iyengar et al. (2006) study on maximization. Let us imagine that we learned about the study through a science journalism piece. In fact, this is pretty much what happened when we came across this headline of a science journalism piece summarizing the study: “Are you a grumpy maximizer or a happy satisficer?” (Jarrett, 2006). So now we have a topic—maximization and its relationship to well-being. With appetites whetted, we are off to find the primary source, published in Psychological Science, authored by Iyengar et al. (2006) titled “Doing Better but Feeling Worse: Looking for the 'Best' Job Undermines Satisfaction.”

We carefully read the seven-page article. Included in the article is a reference list of 20 citations. These 20 citations form the Iyengar et al. (2006) literature review. Which of those citations do you think would be relevant to your literature review? Go to those primary sources, meaning read those articles that you have deemed relevant to your literature review. You are now on your way to developing a relevant research review. So a very simple tactic is as follows. Find a key article—in this example, Iyengar et al.—and read it carefully. Check the article’s reference page, found at end of the manuscript. Think of the reference page as the “blueprint” for the research literature review; that is, it defines the scope of the research reviewed for that article.

You have now assembled a set of articles to review. Now the question is how to review them. In reading the research literature, adopt a skeptical mind-set. With a skeptical mind-set, all knowledge is constantly questioned, and all empirical evidence is subjected to rigorous scrutiny. What does this mean in practice? It means simply that you want to develop a set of benchmarks against which you can review the literature.

Let’s begin with our first benchmark, which pertains to the principles of reliability and validity introduced in Chapter 1. A reliable study, as we learned in Chapter 1, is one that can be replicated; the findings can be consistently demonstrated across independent research studies. For a useful reminder, think of the headline borrowed from Kosslyn and Rosenberg (2001): “Reliability: You Can Count on It!” For validity, a useful headline reminder might read, “Validity: What Does It Really Mean?” (Kosslyn & Rosenberg, 2001). So the lesson is clear: Apply these principles of reliability and validity as benchmarks in reviewing the literature.

A second benchmark pertains to the theoretical underpinnings of the research under review. Ask yourself, “Is there a dominant theory that ties the various reviewed studies, and if so how do the researchers define it?” This is no easy task. But for clues as to how to do this, let’s look again at the Iyengar et al. (2006) study. They described their work as emanating from the seminal theory of Herbert Simon (1956), which identified two distinct decision-making strategies, maximizer and satisficer.

We have learned earlier in this chapter the importance of conceptual definitions that come from a specific theory. Now we can apply this to our literature review. To wit, ask yourself, “Are conceptual
definitions provided for key terms, and do I consider these as theoretically sound?” So now we have a second benchmark for you to apply in reviewing the literature: the clarity and quality of the theory. In short, be mindful of these theoretical considerations in evaluating research literature; if absent or not clearly defined, a different topic might be in order!

In this book, you will learn about various research designs (see Exhibit 2.1). What this means is that different studies use different kinds of methods. These methods generally follow the experimental/non-experimental division that we presented earlier in this chapter. In reading the scientific literature, you may find that researchers have used different methods to investigate your topic of interest. And in some studies, the researcher may have even combined both experimental and nonexperimental methods to investigate a given topic. Overall, be mindful of the diversity of methods used within a particular study as well as across different studies. Do different methods of investigation yield similar results?

For example, Dunn and colleagues, in a 2008 study published in *Science*, combined both experimental and nonexperimental methods to address the age-old question as to whether money can buy happiness. For their nonexperimental study, Dunn, Aknin, and Norton (2008) conducted a nationally representative survey study asking 632 Americans about their happiness, charitable donations, and annual incomes. For their experimental study, research participants were given either 5 or 10 dollars, which they were instructed either to spend on themselves or to donate to charity.

Results from both the national survey and the experiment painted a similar picture: On the survey, happier people reported donating more money to others. Similarly, research participants who were randomly assigned in the experiment to spend money on others also experienced greater happiness than those assigned to spend money on themselves.

Thus, we see that Dunn and colleagues employed two different methodologies: (1) nonexperimental survey of a nationally representative sample of Americans and (2) experimental manipulation of randomly assigning participants to spend money on others or themselves. Both methodologies yielded similar results. These similar results offer converging evidence. The lesson for reading and reviewing research literature with a critical, scientific eye is clear. We can now also state clearly our third benchmark for how to review scientific literature as follows: Look for diversity in the methods used to investigate a given topic and whether these yield converging results.

To recap, use prior studies listed in the reference section of a peer-reviewed paper to help demarcate a body of relevant literature. Adopt a skeptical mind-set in reading and reviewing the relevant literature, that is, the set of studies that you have assembled based on prior research. Read and review the literature against three benchmarks for evaluating research: (1) reliability and validity, (2) theoretical underpinnings, and (3) converging evidence.

**Communication of Research Products**

There is perhaps no more difficult task for both students and professors alike than writing a research paper in psychology. To do so requires psychological writing, a discipline-specific form of scientific reporting that is based on APA publication style. The most recent version of the *APA Style Manual* (discussed in detail in Chapter 12) is widely recognized as the gold standard for scientific writing in psychology. It articulates the principles of *clarity, concise wording,* and *accuracy,* with the aim of producing writing that will facilitate the flow of communication from author to reader (Carson, Fama, & Clancy, 2008).
In psychological writing, our main objective is to produce a scholarly paper that describes and explains psychological concepts. The goal of description and explanation is to provide an understanding of psychological concepts within the context of empirical investigation (Thaiss & Sanford, 2000). We rely exclusively on peer-reviewed primary sources for gathering empirical evidence (see Exhibit 2.6).

Empirical evidence is the cornerstone of psychology and psychological writing (e.g., Bem, 2003; Carson et al., 2008). As we have learned, empirical evidence is derived from observation or experimentation conducted under controlled conditions. As Carson et al. (2008) describe in Writing for Psychology, different academic disciplines have different views on what is considered evidence. For example, the humanities, but not psychology, consider logic and rhetoric as evidence. In a similar vein, psychology writing does not consider opinions as evidence, regardless of whether these personally held convictions are based on controlled observation. Nor, as we recall from our discussion of pseudoscience, would anecdotes and personal testimonies, however compelling, be considered as evidence in psychological writing.

You should also consider the quantity of the empirical evidence in your psychological writing (Carson et al., 2008). In psychology, as in all sciences, you will find empirical studies that report contradictory results. Your writing should take into account these contradictory results, as you aim to provide an accurate description as concisely as possible of the research literature. And as you have learned in the above sections on reading and critiquing research, make clear in your writing whether findings have been replicated; converging evidence is more convincing than results from a single study, and this should be communicated in concise wording to your reader.

In addition to the quantity of empirical evidence cited in support of a conclusion, you must also evaluate the quality of that evidence gathered from primary sources (Carson et al., 2008). Always remember that the highest value sources of empirical evidence are peer-reviewed journals (Carson et al., 2008). As shown in Exhibit 2.6, review articles and empirical journal articles are the two most important primary sources of evidence that are used in psychological writing. Each type of article calls on a different critical eye: For a review article, you want to discern the author’s major argument and how other empirical studies are used to support that argument; for an empirical article, your evaluation is more directly targeted to specific elements of the reported study, such as theoretical rationale, hypothesis, methodology, statistical analyses, and conclusions (Carson et al., 2008).

**Writing a Literature Review**

All psychological research presented in peer-reviewed journals generally begins with a literature review. Some psychology journals are exclusively devoted to publishing literature reviews of particular topics of interest. Consider, for example, what the prestigious Psychological Bulletin seeks to publish, as described on their webpage:

Integrative reviews or research syntheses focus on empirical studies and seek to summarize past research by drawing overall conclusions from many separate investigations that address related or identical hypotheses. A research synthesis typically presents the authors’ assessments of the (a) state of knowledge concerning the relations of interest; (b) critical assessments of the strengths and weaknesses in past research; and (c) important issues that research has left unresolved, thereby directing future research so it can yield a maximum amount of new information. (APA, n.d.)

As you can see from this description, literature reviews serve an extremely important function in developing a scientific understanding of a topic. A sound literature review creates and evaluates a body of knowledge that is drawn from a synthesis of empirical findings across independent studies.
A critical reading of any literature review, however, should pay close attention to several factors. First, how were the empirical studies selected for review? A major limitation is that authors of reviews are relatively free to select studies and can choose on their own those empirical findings viewed as relevant. Two independent reviewers of the very same topic could reach very different conclusions. We know from Chapter 1 the problems of confirmatory bias. It is not hard to imagine how confirmatory bias may influence a reviewer to seek only empirical findings that fit with a certain school of thought.

Second, most traditional reviews lack an objective benchmark to evaluate the strength of different empirical findings gleaned across various studies. How does one weigh the importance of one empirical finding over the other? Third, literature reviews are limited by publication bias. That is, reviews are based on studies that have been published. Studies often are unpublished because of negative findings, such as failing to replicate a certain phenomenon or effect. A review generally does not take into consideration unpublished studies, instead focusing exclusively on empirical findings that have been reported in peer-reviewed journals. Publication bias can be a particular problem for studies examining the effectiveness of a particular drug. In fact, all drug studies, often referred to as “trials,” must now be filed with the Food and Drug Administration, including negative trials in which the drug failed to show the predicted effect. The Food and Drug Administration requires this to limit the effects of publication bias in its reviews of drug studies.

Because of these difficulties reviews now often incorporate meta-analysis as a method to provide a more unbiased evaluation of the literature. Meta-analysis is a statistical tool that provides an objective metric to weigh the strength of results from individual studies. The metric used provides an estimate of effect size (strength or magnitude of the demonstrated findings) for the results of each study included in the review. The effect size statistic allows for studies to be directly and objectively compared with each other. The average effect size across studies can be computed to provide an objective indicator of the overall strength of the empirical findings. This, in turn, might also provide an index of the degree generalizability of the empirical findings, as the review includes many studies varying in settings, samples, procedures, and time periods. Meta-analysis provides a statistical means to combat the biases of any reviewer.

In summary, keep in mind that a large portion of the research process requires evaluating prior studies with a thoughtful skepticism that is informed by the scientific method. Keep in mind writing your literature review, the importance of including both negative and positive studies, and the problem of publication bias.

Writing an Empirical Paper

Writing an empirical paper represents one of the major academic challenges for students in research methods courses. The eminent research psychologist Daryl Bem (2003) used the shape of an hourglass as a metaphor for how an empirical paper be composed. That is, visualize the shape of an hourglass with its two connected vertical glass bulbs fused together at their common “neck” (see Exhibit 2.8). Now apply that same image to the shape of your empirical paper. Like the outline of an hourglass, the contour of your paper will begin broadly, become progressively narrow in the middle sections, and then broaden out again by the latter parts.

In other words, an empirical paper is organized into the following sections: Abstract, Introduction, Method, Results, Discussion, and References (see Exhibit 2.9). The top of the hourglass in Exhibit 2.8 shapes the introduction with its broad beginning, followed by its neck in the narrowing down to specifics in the method and results, and then with the lower bulb reflecting the broadening out again in the discussion. Bem (2003) made clear this analogy to the hourglass when he explained that an empirical paper “begins with broad statements, progressively narrows down to the specifics of your study, and then broadens out again to more general considerations” (p. 4).
Your study’s methods and results

Exhibit 2.8 Hourglass Shape of a Research Report

Introduction and literature review

Your study’s methods and results

Discussion of your findings and relating it to the larger context

Exhibit 2.9 The Key Ingredients of a Short Research Report

<table>
<thead>
<tr>
<th>The introduction begins broadly with an opening topical statement:</th>
<th>“Individuals differ considerably from one and another in the strategies they use in making decisions.”</th>
</tr>
</thead>
<tbody>
<tr>
<td>It quickly becomes specific by presenting the theory that provides the conceptual framework of the study:</td>
<td>“Schwartz (2004) identified two distinct decision- or choice-making strategies: (1) satisficer and (2) maximizer.”</td>
</tr>
<tr>
<td>It gets more specific with clear conceptual definitions:</td>
<td>“The choice strategy of a maximizer is defined as one that seeks out the absolute best option, usually only after an exhaustive search. The choice strategy of a satisficer is defined as one that seeks the ‘good enough’ choice, searching until finding an option that meets a standard of acceptability.”</td>
</tr>
<tr>
<td>Close introduction by describing your study in conceptual terms:</td>
<td>“In this pilot study, we examined the percentages of maximizers and satisficers in a college student sample.”</td>
</tr>
<tr>
<td>The method and results sections are the most specific—the “neck” of the hourglass:</td>
<td>Method: “Sixty-two UMB college students (23 males/39 females) ranging in ages from 18 to 38 years completed the 13-item Maximization Scale.” Results: “In the current pilot study, 13 of the 62 students (21%) scored higher than 61.75 and were classified as maximizers. Forty-nine of the 62 (79%) students scored lower than 61.75 and were classified as satisficers.”</td>
</tr>
<tr>
<td>The discussion section leads with statement of major findings:</td>
<td>“In the current pilot study, the principal results revealed that 79% of the students were classified as satisficers and 21% were classified as maximizers.”</td>
</tr>
</tbody>
</table>

(Continued)
It becomes broader by drawing implications from theory presented in introduction:  

“Previous studies using much larger samples of thousands of participants have reported higher base rates of about 33% maximizers (Schwartz et al., 2004).”

And more so:  

“Decision-making strategies may have a bearing on people's well-being, with some studies suggesting that the greatest maximizers are the least happy with the fruits of their labor (e.g., Iyengar et al., 2006).”

Note: UMB = University of Massachusetts Boston.

Abstract

The abstract summarizes the major points of the study. In writing an abstract, state concisely the problem under investigation, the procedures used to study the problem, the results, the conclusions, and the implications of the research findings.

Introduction

The introduction identifies the problem to be investigated and why it is important. Be sure to cast the problem and rationale in a psychological theory, which should serve as a framework for the study, defining its key concepts and terms. Two general questions are helpful guides for reading an introduction: What is the study about, and why does it matter? More formal questions are as follows: What is the theory and the hypothesis, and how are they related?

Method

The empirical paper differs from the literature review in organization. That is, the empirical paper must have a method section and a results section. The method section details the operations and procedures that the researcher used in the study.

Two helpful hints in writing the method: First, the method section should provide sufficient detail so that another researcher can reproduce the study. Second, you as a reader should be able to put yourself in the shoes of a participant and understand exactly what the participant actually was instructed to do in the study. How participants were recruited and how the study sample was formed should be clearly stated in the method. Was the sample generated via a random process? In reading the method, look for any signs of sample bias that occur when participants are not randomly selected. Also, consider how representative the sample is, as this will affect the generalizability of the study results. Last, the method section should make clear operational definitions for both independent and dependent variables. What was the experimental task? Was random assignment used to create the independent variable?

Results

The results section presents the major statistical findings of the study. The results include both descriptive statistics and inferential statistics. Descriptive statistics summarize the data, usually in the form of averages/means and standard deviations (a statistical measure of variability or range of scores). Inferential statistics in the form of tests of significance tell the probability of whether the observed differences found in the study were produced by random, or chance, factors. Also important for inferential statistics is an estimate of what is known as effect size. The effect size refers to the strength of the predicted or hypothesized relationship between the independent variable and the dependent variable.
Discussion

In the discussion section, the major findings of the study are often restated, but typically only in narrative form, and the theoretical meaning of the results is discussed. Important questions to consider in reading the discussion are as follows: Do the empirical findings support the inferences and explanations? Does the discussion section duly express tentativeness and exercise cautiousness, which are essential to the scientific method? Are alternative interpretations carefully considered?

Perhaps the most important question for the discussion section is whether the limitations of the study are thoughtfully and explicitly discussed. These limitations may be related to the extent to which the operations and procedures adequately capture the intended phenomena. Is the experiment too unrealistic, too contrived—clever but lacking any real application to life? The extent to which a study or experiment approximates the actual real-life phenomenon under investigation refers to ecological validity. Related to but different from questions of ecological validity are those that pertain to the generalizability of the study and how representative or culturally diverse is the sample. These considerations fall under the general or broader category of external validity (ecological validity is one particular aspect of external validity, which is covered in Chapter 4).

STAT CORNER

Story Telling With Numbers and Graphs

Our in-class exercise generated a distribution of scores on the Maximization Scale based on a sample of 62 students. In your short research report, descriptive statistics are included in both method and results sections. In the method section, the descriptive statistics summarize key features of your sample, including number of participants, their age, years of education, as well as number of males and females. For example, in our method section, we described the age and education of our sample.

Participants had a mean age of 22.71 years (SD = 4.50) and a mean education completed of 14.17 years (SD = 1.10).

Often in the results, a graph plotting key data can be very instructive. For the sake of illustration, let us consider two figures that were routinely used in plotting descriptive data. First, the frequency distribution on the Maximization Scale represents continuous data that can be appropriately and effectively depicted in a histogram (see Exhibit 2.10). The results are also well suited for a bar chart (see Exhibit 2.11). A bar chart is similar to a histogram. But whereas a histogram is used for continuous data that can take on any value within a range, the bar chart is used for data that are in categories. In other words, a histogram is used for continuous data that can be quantified or measured, such as scores on a test; a bar chart (also known as a bar graph) is used for data that can be counted, such as number of women in a study. As you see, a histogram is used to plot scores for the Maximization Scale that can range from a low of 13 to a high of 91 (see Exhibit 2.10). By contrast, for plotting the frequency or number of students classified as either a maximizer or a satisficer, a bar chart is used (see Exhibit 2.11). Refer to the following websites for instructional videos on constructing bar graphs and histograms in Microsoft Excel: bar graph: http://www.youtube.com/watch?v=aBVZvTFi84; histogram: http://www.youtube.com/watch?v=UASCe-3Y1to.

(Continued)
(Continued)

**Exhibit 2.10** Histogram of Maximization Scale Scores

**Exhibit 2.11** Bar Chart of Frequency of Participants Classified as Maximizers and Satisficers
A Short Research Report

Exhibit 2.9 provides an outline for writing a short research report (laboratory report). In this pilot study, students first served as research participants, completing the Maximization Scale, and then they switched hats and became investigators, analyzing the data and producing a short research report. The research question for this pilot study is simply this: What are the percentages of maximizers and satisficers in the class sample? The sample consists of their fellow classmates.

Note that our rationale for this in-class exercise is to engage you in psychological writing. We choose a laboratory report/short research report format as our starting point. Our main learning objective is to introduce you to the organization, content, and style of an empirical paper via this short research report format. In Chapter 12, we cover in detail the APA-style formatting rules used in writing research reports. But for now let us focus on organization and content in writing a short research report titled “Base Rates of Maximizers and Satisficers in a Research Methods Course.”

Introduction

1. Introduce the reader to the nature of the problem being investigated. The following opening statement is intended to be broad, written in plain English, without psychological jargon.

   Right: Individuals differ considerably from one and another in the strategies that they use in making decisions.

   By contrast, the following as an opening statement would be too technical, and the information is presented too soon. Avoid plunging into technical research in your opening statement. It is better to present research findings later in the introduction. As a general rule, your opening statement should be about people, not psychologists or their research (Bem, 2003). The following is a perfectly appropriate sentence for the introduction but not for an opening statement.

   Wrong: Simon (1956) was the first to distinguish two types of decision-making strategies, maximizers and satisficers.

2. Move to more specificity by presenting a theoretical background of your research report.

   Right: Schwartz (2004) identified two distinct decision- or choice-making strategies: (1) satisficer and (2) maximizer.

   By contrast, the following statement would be wrong on at least two counts. First, it is presented in the first person as an opinion. Although accurate, the wording of the statement is inappropriate for our short research report. Also, do not write in the first person. Second, the statement does not present the particular theory (i.e., Schwartz, 2004) that provides the conceptual framework for our pilot study.

   Wrong: I think that some people always aim to make the best possible decision whereas other people aim for “good enough” decisions.

3. Provide conceptual definitions of key terms.

   Right: The choice strategy of a maximizer is defined as one that seeks out the absolute best option, usually only after an exhaustive search. The choice strategy of a satisficer is defined as one that seeks the “good enough” choice, searching until finding an option that meets a standard of acceptability.

(Continued)
By contrast, the following statement is wrong because it provides operational definitions of the key terms. It belongs in the method section. The reader at this point has not been presented with enough information for this sentence to be informative.

**Wrong:** Based on the averages from thousands of subjects, a total score of 61.75 or greater is classified as a maximizer, and a score lower than 61.75 is classified as a satisficer.

4. Close the introduction by describing your study in conceptual terms.

**Right:** In this pilot study, we examined the percentages of maximizers and satisficers in a college student sample.

By contrast, the following statement would be wrong for the introduction because it defines the study sample. It belongs in the method section.

**Wrong:** A total of 62 college students completed the Maximization Scale, the 13-item scale presented at the beginning of this chapter.

**Method**

The method section of the empirical report is divided into separate subsections. For our short research report, our method section has three subsections: (a) Sample, (b) Measures, and (c) Procedure.

1. **Sample:** The sample subsection should include the number of research participants, their key demographics, and how participants were recruited.

   a. The following simple statement informs the reader of the exact sample size and key demographics.
      
      **Right:** Sixty-two University of Massachusetts, Boston, college students (23 males/39 females) ranging in ages from 18 to 38 years participated in this pilot study.
      
      By contrast, the following statement would be wrong because it is too vague; size of sample and key demographics (e.g., age, gender breakdown) must be presented in the method section.
      
      **Wrong:** Students in my research methods class participated in our study.

   b. The method should present specific statistics to describe important characteristics of the study sample.
      
      **Right:** Participants had a mean age of 22.71 years (SD = 4.50) and a mean education completed of 14.17 years (SD = 1.10).
      
      By contrast, the following statement is wrong because age and education need to be quantified.
      
      **Wrong:** Our sample consisted of college-age students.

   c. A summary statement is helpful to close the sample subsection of the method.
      
      **Right:** Participants were students enrolled in an introductory research methods course. All students participated as part of an in-class exercise.
      
      By contrast, the following statement would be wrong because it is too imprecise and too casual or colloquial.
      
      **Wrong:** Anyone who came to class that day participated in the study.
2. **Measures:** This subsection describes the key measures used in the study, including operational definitions.

   a. The following statement describes the Maximization Scale used in the pilot study as consisting of 13 statements that participants were instructed to rate from 1 to 7, *completely disagree* to *completely agree*.

   **Right:** Participants completed the Maximization Scale. The scale consists of 13 statements designed to measure satisficer/maximizer decision-making strategies. Participants were instructed to read each statement and rate themselves from 1 to 7, *completely disagree* to *completely agree*, on each statement.

   By contrast, the following statement would be wrong because it is too vague.

   **Wrong:** Participants rated 13 statements from 1 to 7, *completely disagree* to *completely agree*.

   b. The measurement subsection identifies the Maximization Scale as the tool used to define operationally the variable of decision-making strategy.

   **Right:** The 13-item scale provided the operational definition to measure choice strategies of maximizer and satisficer.

   By contrast, the following statement would be wrong for the measures subsection of the method because it provides a conceptual definition (see above; already provided in the introduction) instead of an operational definition.

   **Wrong:** The choice strategy of a maximizer is defined as one that seeks out the absolute best option, usually only after an exhaustive search. The choice strategy of a satisficer is defined as one that seeks the "good enough" choice, searching until finding an option that meets a standard of acceptability.

   c. It is important to specify the criterion, specifically the exact cutoff score, used to categorize participants as either maximizers or satisficers.

   **Right:** Based on the averages from thousands of participants who had taken the Maximization Scale, a total score of 61.75 or greater is classified as a maximizer, and a score lower than 61.75 is classified as a satisficer.

   By contrast, the following statement would be wrong because it fails to specify how the Maximization Scale was used to categorize participants as either maximizers or satisficers.

   **Wrong:** Research participants completed the Maximization Scale.

### Procedure

1. The procedure subsection describes what exactly the research participants did.

   **Right:** Participants enrolled in an introductory research methods course at the University of Massachusetts Boston completed the Maximization Scale during class.

   By contrast, the following statement would be uninformative.

   **Wrong:** My classmates and I filled out a questionnaire about lots of different things.
Results

1. The results section presents the data and the statistics used to address the research question of the percentages of maximizers and satisficers in this sample.

   a. The following statement presents in numerical form the scores on the Maximization Scale.

   \[ \text{Right: The mean Maximization Scale score for the sample of 62 students was 55.35 (SD = 10.19), ranging from a low of 35 to a high of 80.} \]

   By contrast, the following statement would not belong in the results section because it both is in the first-person and lacks quantification, that is, exact percentages of satisficers and maximizers.

   \[ \text{Wrong: As I predicted, there were more satisficers than maximizers.} \]

   b. The results section must include the data bearing on the research question.

   \[ \text{Right: In the current pilot study, 13 of the 62 students (21\%) scored higher than 61.75 and were classified as maximizers. Forty-nine of the 62 (79\%) students scored lower than 61.75 and were classified as satisficers.} \]

   By contrast, the following statement would not be appropriate for the results section (or for the paper in general).

   \[ \text{Wrong: I thought my score on the 13-item Maximization Scale was not valid.} \]

Discussion

1. The discussion begins with a restatement of the major findings of the study. You want to avoid redundancies in your writing. However, a restatement of the major findings helps you stick to the empirical facts and to prioritize for the reader the relevance of the obtained findings in reference to the research question.

   \[ \text{Right: In the current pilot study, the principal results revealed that 79\% of the students were classified as satisficers and 21\% were classified as maximizers.} \]

   By contrast, the following statement would be wrong for an empirical report, in general, and the discussion section, in particular. Opinions are not “admissible” in the court of psychological writing!

   \[ \text{Wrong: As both research participant and research investigator, I learned a lot from our in-class exercise using the Maximization Scale.} \]

2. The discussion is the section of the paper where you provide an interpretation of the results of your study. Set the stage for interpretation by returning to previous research reviewed in the introduction.

   \[ \text{Right: Previous studies (Schwartz, 2004) using much larger samples of thousands of participants have reported higher percentages with about 33\% versus the current 21\% of participants classified as maximizers in this investigation.} \]

   The following statement would be wrong because it offers an interpretation that goes well beyond the current study, which did not address (measure) differences between maximizers and satisficers in the quality of their decisions.

   \[ \text{Wrong: Our results showed that maximizers make better decisions than satisficers.} \]
3. In the discussion section, your interpretation always needs to be tempered by the limitations of the study. Always exercise caution in your interpretation. Maintaining your skeptical mind-set is especially important when you are writing up your own research!

Right: The current study had several limitations, all of which may have contributed to the lower percentage of maximizers we found in relation to prior research. Foremost among these limitations are that the current study had a smaller sample size and was conducted as part of an in-class exercise in an introductory course on research methods; students served first as participants and then as investigators responsible for analyzing the data collected from their class and producing a laboratory report. Thus, the participants were fewer in number and recruited in a decidedly nonrandom manner. As such, any interpretation of the current results is constrained by the fact that the participants may not have constituted a representative sample. Other limitations...

The following statement would be wrong because it is too informal and does not at all explain the idea of how limitations of the study could specifically constrain any interpretation of the results.

Wrong: No study is perfect, and we did this as part of our class, and so I wouldn’t offer any interpretation of the results.

4. Conclude by placing your results, notwithstanding the limitations of the study within a broader theoretical context.

Right: The current results added to growing empirical evidence in support for distinguishing maximizers and satisfiers, with recent studies suggesting that these two decision-making strategies may in turn play an important role in emotional well-being and vocational achievement (Iyengar et al., 2006; Schwartz, 2004).

Conclusions

Research can be divided into approaches: experimental and nonexperimental. An experimental approach provides the strongest evidence for a cause-and-effect relationship between an independent variable and a dependent variable. By contrast, a nonexperimental approach is often described as correlational; it cannot establish causality because the independent variable(s) cannot be directly manipulated. In reality, causality is difficult to establish for any theory in psychology, as even highly controlled experiments cannot rule out all potential confounding factors. Evidence for causality should establish (a) temporal precedence, (b) covariation of cause and effect, and (c) elimination of alternative explanations. For both experimental and nonexperimental research, always consider the so-called third-variable problem before concluding that there is evidence of a correlation between a pair of measures. Likewise, variables are defined both conceptually and operationally in experimental and nonexperimental research.

Both inductive and deductive reasoning can figure prominently in theory formation and explanatory research. We have likened this process to a research circle in which deductive reasoning goes from theory to hypotheses to data, whereas inductive reasoning goes from data to empirical generalizations to theory. Ideas, as the so-called grist for the mill for research aimed toward building scientific theory, can come from
many sources. The most important of these is the psychological literature, which consists of studies that have met the rigors of peer review. Scientific journalism and popular science literature can be two other potential sources for ideas, but articles and reports appearing in these two venues are not subject to peer review. As such, these secondary sources can best serve as clues to lead you to the primary source, the first-hand empirical report published in a peer-reviewed journal.

Writing in psychology is a discipline-specific form of scientific reporting that is based on the APA Publication Style Manual (2009). Empirical evidence is the cornerstone of psychology and psychological writing. Opinions, anecdotes, and personal testimonies, however compelling, are not empirical evidence and therefore are “inadmissible” in psychological writing. In writing and reading research, go to primary sources. In both reading a primary source of an empirical article and writing an empirical report, pay close attention as to whether the abstract summarizes the study, the introduction defines key concepts, the method specifies operations and procedures, the results present descriptive and inferential statistics, and the discussion covers interpretation of the findings as well as limitations of the research.

Last, descriptive statistics are distinguished from inferential statistics. The goal of descriptive statistics is to summarize and present numerical information in a manner that is instructive and helpful. Measures of central tendency (e.g., mean) and variability (e.g., standard deviation) can be computed to provide objective statistics that are used to describe the distribution of values. Descriptive data can be graphed. For example, a bar chart graphs the frequency distribution of a categorical variable, and a histogram graphs the frequency distribution of a continuous, quantitative variable. However, and importantly, you can neither draw conclusions on the basis of descriptive statistics nor test a hypothesis or generalize results to the larger population. On the other hand, inferential statistics are a set of techniques that allow for testing of hypotheses about a population from data collected from a sample. Critically, inferential statistics can do what descriptive statistics cannot. Inferential statistics can provide a direct test of a research hypothesis. That is, inferential statistics provide the techniques and procedures to determine the probability that the results that you obtained in your analysis of the aggregated data can be generalized to the larger population from which your sample was drawn.

### Key Terms

- Alternative explanation
- Applied research
- Bar chart
- Basic research
- Central tendency
- Conceptual definition
- Control group
- Covariation of the cause and effect
- Deductive research
- Descriptive statistics
- Direction of association
- Double blind
- Ecological validity
- Effect size
- Empirical articles
- Empirical generalization
- Ethnography
- Experimental
- External validity
- Frequency distribution
- Generalization
- Histogram
- Inductive research
- Inferential statistics
- Journals
- Meta-analysis
- Naturalistic observation
- Nonexperimental
- Operational definition
- Placebo
- Popular science
- Primary source
- Program evaluation
- Proprietary
- PsycINFO
- PsycLIT
- Publication bias
- Qualitative research
- Random assignment
- Randomized clinical trial
- Research circle
- Review articles
- Robust
- Science journalism
- Secondary sources
- Social Sciences Citation Index (SSCI)
- Temporal precedence
- Third variables
- Treatment group
- Variability

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Research in the News


2. In the online *Time* January 16, 2009, article "How to Lift Your Mood? Try Smiling," John Cloud tells the story of how he was coaxed during his workouts by his personal trainer: "Relax your face." Cloud writes that he remained skeptical about his trainer’s advice until he read a January 2009 *Journal of Personality and Social Psychology* study by Matsumoto and Willingham (2009), which compared facial expressions in two groups of judo athletes—blind and sighted competitors from the 2004 Olympics in Athens. This study prompted Cloud to discover one of the oldest questions in the study of emotion as to whether we all learn facial expression through our culture or they are genetically coded for everyone. By the end of his enjoyable piece, Cloud concludes,

   "The emotional train does run in two directions between your brain, which may be screaming from the pain that your trainer is causing, and your face, which can—if you draw it into a relaxed expression—inform your brain that it shouldn’t be protesting so much. So next time you’re working out and grimacing push your facial muscles into submission. Look blank. You will find it’s easier to get through one more rep. (http://content.time.com/time/health/article/0,8599,1871687,00.html)"

What makes this piece an example of science journalism? How would you describe the reporting methods used in this article? How do the style, organization, and content of science journalism compare with the scientific method of peer-reviewed studies? Do you think Cloud’s conclusions are supported by the scientific literature?

Activity Questions

1. Researchers in psychology “play” with ideas that require conceptual and operational definitions, such topics as maximization, happiness, intelligence, anxiety, impulsivity, attention, and emotion. For each of these, provide conceptual and operational definitions.

2. Independent, dependent, and control variables also fall under the “must know” category. To understand them requires practice. Here are some study situations that demonstrate each of these three variables.

   a. You want to see if different instructional sets influence performance on a cognitive test. One instructional set presents the cognitive test as an ability-diagnostic measure of intelligence, and the other instructional set presents the cognitive test as an ability-nondiagnostic laboratory measure of problem solving unrelated to intelligence.

      Independent (what you change/manipulate) variable: instructional set.
Dependent (what you observe/measure) variable: scores on cognitive test.
Control (what you hold constant) variable: cognitive test, same test given under the two instructional sets

b. You want to see if facial expressions can influence perception. You decide to have subjects look at cartoons and rate them on a funniness scale either while holding a pen between their lips, which makes it impossible to contract either of the two smiling muscles, or while holding a pen clenched between their teeth, which has the opposite effect of making them smile.
Independent (what you change/manipulate) variable: facial expression induced by holding a pen either between lips or clenched between teeth
Dependent (what you observe/measure) variable: funniness scores/ratings
Control (what you hold constant) variable: cartoons, same whether viewed while holding a pen between lips or clenched between teeth; funniness scale

c. You have been hired to evaluate the effectiveness of two diets: South Beach versus Atkins. You want to make sure both dieting groups weigh about the same before starting either the South Beach or the Atkins diet. So you weigh everyone before the diet and at the completion of the diet 6 weeks later.
Independent (what you change/manipulate) variable: diet (South Beach vs. Atkins).
Dependent (what you observe/measure) variable: difference in weight before and after.
Control (what you hold constant) variable: pre-diet weight; length of time (6 weeks) on respective diets

d. You want to study the influence of Alzheimer’s disease on memory while controlling for age. What this means is that you will have two groups of people of about the same age; one group will be diagnosed with Alzheimer’s disease, and the other group will be your control group of healthy persons.
Independent (what you change/manipulate) variable: group (Alzheimer’s disease vs. control).
Dependent (what you observe/measure) variable: scores on memory test.
Control (what you hold constant) variable: age, memory test, same given to both groups.

3. Transform each of the following statements or problems into at least two testable hypotheses.
   a. Talking on cell phones while driving should be against the law.
   b. Listening to Mozart will make people smarter.
   c. Steroids increase home runs in baseball.
   d. Eating a vegetarian diet increases your grade-point average.
   e. Money can buy you happiness.

4. In virtually all experiments, there is a degree of deception as researchers need to avoid creating bias by providing too much information before subjects have completed a study. What do you think about the ethics of deception in psychological research?

5. High school yearbooks can be used to study faces. Consider the Kniffin and Wilson (2004) study, in which participants rated photographs of people they knew taken from their high school yearbooks. Then these same photographs were rated by another person of the same age and sex as the yearbook owner who did not know the people in the photographs. This would be a rather straightforward exercise to do in class, provided students have their high school yearbooks! Students rate the attractiveness of photographs of graduates they knew from their own yearbook, and then these same photographs are rated by another student of the same age and sex as the yearbook owner who does not know the people in the photographs. You can collect data and then combine them with ratings from other students who participated in the exercise. What are your independent and dependent variables? What is your hypothesis and why? What are your expected results and why?

6. Consider the following “thought experiment” taken from the psychologist Paula M. Niedenthal’s (2007) review published in Science, “Embodying Emotion”: A man goes into a bar to tell a new joke. Two people are already in the bar. One is smiling and one is frowning. Who is more likely to “get” the punch line and appreciate his joke? (p. 1002)

   You probably could easily guess correctly that the smiling person would get the joke. But describe how the research of Ekman and colleagues could be used as evidence for your answer.
Review Questions

1. Why is a naturalistic observational methodology considered to be a nonexperimental study? What are the strengths and limitations of nonexperimental studies?

2. Describe how Paul Ekman’s studies of facial expression of emotions addressed cross-cultural differences.

3. Compare and contrast deductive and inductive research strategies.

4. Identify and explain the three criteria for establishing cause and effect.

5. Describe how a researcher develops and uses conceptual and operational definitions.

6. Describe how there are the three kinds of evidence that are needed to establish causality. Why should a psychological researcher always be skeptical about interpreting evidence of causality?

7. How might a third variable serve to confound the interpretation of results? What should a researcher do when concerned about third variables?

8. Explain how it is that a theory cannot be directly tested. If this is so, how does a researcher go about evaluating a theory?

9. When obtained results achieve statistical significance, what does that mean precisely?

10. External validity and ecological validity are two important considerations in evaluating research. What do they mean? How are they related? How are they different?

11. What considerations should you keep in mind when using popular search engines, such as Google Scholar?

12. Science journalism and popular science represent two interesting sources for developing thoughts and ideas about research. How would you use these sources as leads in pursuing a research question?

13. How might confirmatory bias on the part of the researcher contaminate a literature review? What can be done to reduce confirmatory bias in literature reviews?

14. What is peer review, and why is it important?

15. How would you review each of the sections of an empirical article?

16. What is the purpose of a control group?

17. Explain how an obtained result could achieve statistical significance but be of a small effect size.

18. Explain the fundamental truism that you cannot infer causality on the basis of correlation.

19. Explain how a correlation coefficient contains two critical pieces of information about the relationship of two variables: (a) the strength of the relationship and (b) the direction of the relationship.

20. How does publication bias influence a literature review?