Psychology—broadly defined as the scientific study of people, the mind, and behavior—focuses attention on virtually endless questions about how we feel, think, behave, believe, and interact. We begin this chapter by focusing on questions about feelings of well-being—feelings that motivate much of our activity,
influence how we view the world, what we remember, and how we behave with others. Ask yourself the following question: Do you always shoot for the best, or are you okay with settling for “good enough”? When you are looking for professional work after receiving your college degree (congratulations!), will you shoot for the best possible outcome in terms of job satisfaction and salary or will you be happy with hitting a certain target—a certain income that’s good enough?

Barry Schwartz (2004) and colleagues set out to look at how happy recent college graduates are with the job choices they made. They found an interesting and surprising result, but before delving into the details of the study, let’s imagine that you are a participant in the Schwartz study. What we want to know first is how much you would agree or disagree with the following set of 13 statements. We will explain the ideas more fully, but first just please indicate the degree to which you agree with each statement by recording a number between 1 (disagree completely) and 7 (agree completely).

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 (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. ___
Schwartz and colleagues gave the “Maximization Scale”—this set of 13 statements—to thousands of people and found the highest score was 75. While the researchers did not use a sharp cutoff to distinguish maximizers from satisficers, they considered people whose average ratings are higher than 4 (the scale’s midpoint) to be maximizers and those whose average ratings are lower than the midpoint as satisficers (Schwartz, 2004). So if you scored above 52 (i.e., scale’s midpoint of 4 multiplied by the 13 items), you are thought to be a person who always has to perform an exhaustive check of all the available choices to make sure you pick the best. From finding a TV channel or picking a restaurant to searching for the “best” job, you generally try to exhaust all possibilities before making your final choice. On the other hand, if you have a score of 52 or less, you are a satisficer—you set standards for yourself and you will choose the first option that meets that standard.

Now let’s switch hats from research participant to research investigator a la Sheena Iyengar, Rachael Wells, and Barry Schwartz (2006). Who do you predict is more likely to be satisfied with their choices and who do you believe will make the “best” choice? Iyengar and company investigated this question by categorizing 548 graduating students in the fall of their senior year and then followed them during the next year as they searched for jobs. When interviewed again the following summer, maximizers had found jobs that paid 20% more on average than the satisficers’ jobs, but maximizers were less satisfied with the outcome of their job search and were more pessimistic, stressed, tired, worried, overwhelmed, and depressed. Maximizers felt worse even though they had done better than satisficers, the researcher reasoned, because considering so many choices led to unrealistic expectations that 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 they hadn’t applied for and to wish they had pursued even more jobs than they did.

The findings are somewhat surprising. On one hand, the maximizers’ careful search for the best job paid off. They found jobs that paid 20% more on average than the satisficers’ jobs. You might have expected this finding; after all, most advisors encourage recent college graduates searching for jobs to perform an extensive search of all opportunities and to carefully weigh all options before arriving at a final choice. This did pay off for the maximizers in higher salaries. The unexpected finding was that the maximizers derived less satisfaction from their choices than did the satisficers. They were “doing better but feeling worse” (i.e., the title of the article by Iyengar, Wells, & Schwartz, 2006). They were satisfied with their final job selection, perhaps in part because their extensive job searches made them more aware of other options and caused them to second-guess, leading them to feelings of regret and to ask themselves, “What if . . . ?” So as one headline summarizing the study (Jarrett, 2006) aptly put it: “Are you a grumpy maximizer or a happy satisficer?” (The British Psychological Society Research Digest, March 3, 2006).
Let us use the study by Schwartz and colleagues to learn how psychology acquires knowledge through the use of the scientific method. As you will learn throughout the book, the scientific method is the cornerstone of research. We will flesh out various key features of the scientific method throughout the book. But as a starting point, let’s think of the scientific method as the veritable rules of the game of research. These rules reflect procedures and techniques for conducting and evaluating psychological research. Together, these rules, procedures, and techniques form a unified conceptual framework—a formal way of thinking about a problem, idea, or question. Just as any game will have a set of rules, procedures, and techniques to govern play, so too does the scientific method lay out a foundation for how information is collected, measured, examined, and evaluated. In this sense, then, the scientific method serves as a playbook or toolbox for psychological research.

The origins of the scientific method, most scholars agree, may be traced to the school of philosophy known as empiricism, which holds that knowledge is gained through experience, observation, and experiment. In science, the term empirical is used to denote information gained objectively from observation or experimentation. This information, commonly referred to as data, is described as empirical because it can be measured and evaluated statistically. These data constitute empirical evidence against which all scientific knowledge is tested.

Empirical evidence differs from anecdotal evidence, which refers to impressions—opinions of just one person, usually, that are not translated into a quantifiable form. Investigative journalism may use such anecdotal evidence. Likewise, a very different methodology is used in legal reasoning and jurisprudence, one that emphasizes customs,precedence, and morality using techniques of cross-examination, persuasion, and rhetoric. A legal framework is thus very different, in both substance and procedures, from the scientific method.

The scientific method is crucial to research because it minimizes bias by providing the rules by which observations are collected and results are evaluated. Bias is a familiar term that often indicates unfair practices that wrongly discriminate against others. Within the framework of the scientific method, bias reflects a subtle process that comes in many different forms, all of which can be fatal to a research study. In fact, if you were marooned on an island and in order to be rescued you had to come up with the most important reason for the scientific method, its raison d’etre, or reason for being, you could do a lot worse than the following: The scientific method exists largely as a countervailing force to biases that operate at virtually all steps in the research process and that can distort and negate a study.

What Is a Scientific Question?

Many questions that might interest us may not, however, be researchable. That is, some questions may deal with topics for which the scientific method is moot.
These include questions of religion and faith that fall well beyond the realm of science and for which empiricism would be considered an anathema and maybe even an apostasy. Philosophers often distinguish two types of questions: those that they call “is” questions from those that they call “ought” questions. This philosophical distinction (known as is-ought) may help us understand what is meant by a scientific or “researchable” question. “Is” questions can be answered by facts or empirical data, and these answers are independent of social, cultural, political, and religious preference. These so-called “is” questions, many would argue, are the exclusive domain of scientific research. These are questions that can be best addressed through scientific research.

On the other hand are the “ought” questions, that call upon cultural values and ethical considerations, but cannot be answered solely on the basis of scientific evidence. Does God exist? Should capital punishment be overturned? Should same-sex marriage be legalized? Ought questions address the values inherent in laws and customs and are influenced by beliefs that can reflect ideology, politics and interpretation of rights. “These “ought” questions are influenced by beliefs that reflect ideology, politics, and, at least for same-sex marriage and capital punishment, constitutional law. Here science may help to contribute to the debate, but science in itself certainly cannot provide any direct, definitive answers to these questions. These questions we will leave to philosophers, theologians, and constitutional scholars.

The scientific method thus aims to answer scientific questions. Scientific questions and their answers are commonly framed in reference to a particular theory. In psychology, theory is defined as a coherent set of propositions that are used as principles to describe, understand, and explain psychological or behavioral phenomena. Theories often address questions of “how,” as in the case of Schwartz and colleagues, who studied how maximizing relates to feelings of well-being. Ideas for a study often spring from psychological theories. We in turn use the scientific method to assess the quality of any psychological theory.

In psychology, theory often influences all aspects of a study. Not only does it serve as the source of inspiration for the seminal idea of a study, its influence will continue through the final interpretation of the results (Kuhn, 1962). Indeed, we can see the influence of the Schwartz and colleagues theory of the paradoxical effect of choice on satisfaction and happiness on how they interpreted their findings.

From Theory to Testable Hypothesis

A theory generates testable hypotheses, which are evaluated empirically with the scientific method. A testable hypothesis is framed as a statement, often in the form of a prediction that is made prior to the actual collection of data. A testable hypothesis is therefore described as a priori, meaning that it exists before experimentation or observation. A priori hypotheses constitute a key feature of the scientific method. By formulating hypotheses before data collection and analysis, a scientist is less likely to be prone to error and bias by bending the theory to fit the numbers.
In direct contradistinction are hypotheses that are formulated after the data are collected and analyzed. These hypotheses, described as post hoc (in Latin, “after this”), pose serious problems for the scientific method. Post hoc hypotheses increase the likelihood of error and bias. The notion is the more you look the more likely it is you will find something—the more hypotheses you test post hoc, the more likely it is that one of these will by chance be wrongly accepted as true. Post hoc hypotheses are therefore held in disfavor and require statistical adjustments that essentially raise the ante, increasing the threshold for what would be accepted as a genuine or significant finding.

**Variables and Measurement**

A researcher will identify, often based on theory, key variables to investigate scientifically. A variable is simply defined as any characteristic that can take on different values or can vary across research participants. Variables can include age, gender, weight, height, education, attitude, income, and virtually any other attribute that can assume multiple values or can vary in people. For example, Schwartz and colleagues focus on three key variables—maximizer/satisficer, satisfaction, and salary. Each of these variables had a range of values that was recorded using objective measurements. The scientific method requires objective measurement of identifiable and specifiable variables. Schwartz and colleagues used an objective measurement to categorize subjects as either satisficers or maximizers. If something in psychology cannot be measured, then it cannot be investigated scientifically.

**Systematic Observation and Data Collection**

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 1872 book *The Expression of the Emotions in Man and Animals*, and again relying exclusively on observation, Darwin would make the case that all mammals regularly display emotion in their faces. Often in research, our observations are collected systematically and quantified by sampling a population. A population is defined as any entire collection of people, animals, plants, or things, all of which can be referred to as units, from which we may collect information. Because a population is too large to study in its entirety, a sample is generally selected for study. A sample is defined as a group of units selected from a larger group that is known as the population. Schwartz and colleagues selected a sample of 548 graduating students for their study. Thus, they had a sample size (notation for sample size is n) of 548 college graduating seniors who are referred to as research participants (n = 548).

How a researcher selects a sample from a larger population is critically important for the scientific method. A researcher tries to maximize what is referred to as generalizability—the extent to which findings that are derived from a sample can be applied to a wider population. Remember, a major reason for the scientific method is to combat bias, and a key source of potential bias can originate from how a sample is selected. For example, case studies can be seriously if not fatally
flawed by selecting only those cases that fit preconceived ideas. This sort of “cherry picking”—that is, deliberately picking only cases that support your view while ignoring those opposing your view—is an anathema to the scientific method. This can lead to a particular form of bias, sample bias, which means that some members of the population are less likely than others to be included in the study (Trochim, 2006). Such exclusion of certain members or subgroups of a population...
under study can produce misleading results (see Exhibit 1.1). We will discuss sampling at greater length in Chapter 5.

**Evaluating Evidence and Theory**

The scientific method thus requires the collection of observations, such as responses to questions, test scores, or ratings; these observations are categorized or quantified systematically, and numeric values are either assigned or computed. These number values are what constitute empirical evidence. In this regard, you can see that Schwartz and colleagues computed for each of their research participants a maximization score that could range from a low of 13 to a high of 91. Higher scores meant higher maximization. They later interviewed these research participants, used an objective rating scale to assess job satisfaction, and also recorded their yearly salary. They therefore had objective, quantitative measures of maximization, job satisfaction, and yearly salary.

The scientific method uses statistics to test relationships between and among objective, quantifiable measures that are derived from either experimentation or observation. Schwartz and colleagues tested statistically the relationship among their three measures. We will not at this point delve into the details of statistical testing. For now, two basic points are important to emphasize. Statistics are computed on the sample, which in this case consisted of 548 graduating college seniors. The sample statistics are assumed to provide estimates of the population, in this case graduating college seniors. All statistics are based on the logic of probability, and they all use the same criterion for evaluation. The question asked and answered by statistical tests may be stated as follows: In light of the data, what is the probability that the obtained results are due to chance? If the statistical analyses of the data show that the obtained results are highly unlikely due to chance, then the predicted relationship between, for example, high maximization and high salary but low job satisfaction is considered to be highly likely. If, on the other hand, the statistical analyses of the data show that the obtained results are likely due to chance, then there is no empirical evidence in support of the expected relationship of high maximization and high salary but low satisfaction.

The statistical evidence therefore provides a means to evaluate or test a theory. Schwartz and colleagues interpreted their empirical findings as support for the theory that maximizers may end up unhappy because they become debilitated by unrealistically high expectations when faced with an array of choices. From their findings, they reasoned that choice had a paradoxical effect on satisfaction—more choices, less satisfaction (see Exhibit 1.2).

**Reliability and Validity**

All sound research studies rely on the scientific method. However, as we will learn, different areas of psychology often pose and answer research scientific
questions differently. Psychologists investigate these questions from a hypothetical research “toolbox” consisting of a variety of methods and techniques, each with its own advantages and disadvantages. Two important standards are used to judge the scientific quality of these methods and techniques as well as the results that they produce. First is reliability, which simply means consistency. Not all data are created as equal, as wise psychologists have often noted. A reliable study is one that produces data that can be replicated, that is, repeated with the same results. Whenever you read about a result of a study, always find out if it has been replicated, and if it has, then you can have greater confidence in its reliability.

Even more important in evaluating research is validity, which is defined as the extent to which a study provides a true measure of what it is meant to investigate. A reliable study may not necessarily be valid. For example, studies may consistently classify a certain percentage of college graduates as maximizers, but these results might be explained by other personality traits that may be related to but presumably conceptually distinct from the maximizer/satisficer classification. Could we reasonably argue that maximizers are really just perfectionists? Likewise, other factors might be related to maximization/satisficer categorization, and these could seriously detract from the validity of the conclusions of the Schwartz study. As an example, let’s say you discover that the distinction varies with college major, financial need, or graduate school plans. How then can we conclude that the differences in salary and happiness can be solely attributable to differences in scores on the maximization/satisficer scale? Other aspects of how a study is designed and carried out can also influence the extent to which its conclusions are judged as unbiased, meaningful, and valid. How a study sample is selected from a population and how representative it is can influence validity.

We will learn that there are different types of validity, all of which, however, address the same question: “How true are our conclusions?” In evaluating validity, you will learn to look for what are known as confounds or confounding variables, which are unwanted sources of influence that can be viewed, much to the dismay of the researcher, as viable alternative explanations for the result of a study. “Those darn confounds” is a damning phrase that can make researchers cringe, as it cuts to the heart of validity of a study. In many studies, researchers use what is referred to as a control variable in order to measure an unwanted source of influence that could invalidate the conclusions of a study. The aim is to be able to rule out the effect of a control variable on the results of a study. So for the Schwartz study, a personality test to measure perfectionism could have served as a control variable. This could have allowed the researchers to show that perfectionism had no bearing on their findings. This, then, would rule out perfectionism as an explanation, thereby strengthening the validity of their conclusion that maximizers may end up unhappy because they become debilitated by unrealistically high expectations when faced with an array of choices.
In this book we will learn about a variety of research tools that psychologists use to investigate scientific questions. Each of these tools has its own advantages and disadvantages, and each will be judged by the extent to which it can reliably and validly address the research question posed by a study. Below, we will introduce some of the different types of methods commonly used in psychological research, as well as some of the different types of study design. Oftentimes, a research study will incorporate different techniques, combining, for example, survey measures with interviews and observational rating scales.

**True Experiments**

An experiment is a controlled investigation in which one or more variables are manipulated. Variables will differ in the degree to which they can be controlled or manipulated. We will learn that in a “true experiment,” the researcher controls who conducts the study, what is studied, and how the study is conducted. That is, a researcher designs an experiment in which a particular aspect of the study is systematically altered or manipulated. This is defined as the independent variable, an element of the study that you as a researcher systematically manipulate, change,
or select. The effects of the manipulation of the independent variable are examined and measured by the dependent variable. That is, the dependent variable is the observed effect, result, or outcome that is measured in response to a systematic change in the independent variable. Why the term true experiment? As we will learn in Chapter 6, the term true experiment is restricted to those independent variables, such as a placebo and an experimental drug, that can be randomly assigned. Random assignment helps to ensure that research participants are similar prior to the manipulation of the independent variable. Thus, the thinking is that any subsequent differences in the dependent variable can be attributed to manipulation of the independent variable rather than to confounding factors (Exhibit 1.4).

Exhibit 1.3 Table 1 Research Toolbox

<table>
<thead>
<tr>
<th>True experiments</th>
<th>Random assignment of participants to groups and manipulation of one or more independent variables.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quasiexperiments</td>
<td>Experiments in which random assignment is not possible to groups.</td>
</tr>
<tr>
<td>Descriptive research</td>
<td>Studies that focus on the distribution of variables, the quantitative association of variables; causation cannot be established.</td>
</tr>
<tr>
<td>Survey design</td>
<td>Research in which information is obtained from a sample of individuals through their responses to specific questions.</td>
</tr>
<tr>
<td>Performance-based measures</td>
<td>Studies of data collected from standardized tests.</td>
</tr>
<tr>
<td>Single-subject designs</td>
<td>Systematic investigation of one or a few cases.</td>
</tr>
<tr>
<td>Qualitative research</td>
<td>Qualitative methods, such as participant observation, intensive interviewing, and focus groups used to study and understand phenomena in terms of the meanings people attach to them.</td>
</tr>
</tbody>
</table>

Exhibit 1.4 Three Key Variables

Quasiexperiments

In real life, random assignment is not possible, so a true experiment is neither practical nor plausible for many scientific questions studied by psychologists. Enter quasi-experimental studies (quasi means “as if” in Latin) for investigations that aim to examine the effects of an independent variable that cannot be directly manipulated or randomly assigned on a dependent variable. Gender, race, age, ethnicity, socioeconomic status (SES), locale, diagnosis, personality traits, and personal history are just some examples of independent variables that cannot be directly manipulated by an experimenter. Rather, for these kinds of variables, an experimenter either selects participants who have a particular characteristic or studies participants who have been exposed to specified events, such as war or trauma, or might live in certain settings or situations, such as a neighborhood or a geographic region. Ideally, you will try to control for as many variables as possible so that the interpretation of the relationship between the independent and dependent variables is not unduly confounded by unwanted influences. However, in reality, this is seldom possible, so special statistical techniques may be used to remove the effects of potential confounds.

Descriptive Research

Researchers often aim to examine the relationship between two or more variables. For example, following Schwartz and colleagues, let’s imagine that you sought to investigate the relationship in a sample of recent college graduates among three variables: maximization/satisficer score, levels of happiness, and current salary. To do so, you would compute what is referred to as a correlation between a pair of variables. A correlation is a statistic that is computed by a specific formula; this statistic provides an index of how closely related two variables are. This statistic, known as the correlation coefficient (symbolized as \( r \)), can range from \( .00 \) to \( +1.00 \) and \( .00 \) to \( -1.00 \). If there is no relationship between two variables, that is, variation in one variable has nothing to do with variation in the other variable, then the correlation value will be \( .00 \) or close to \( .00 \). The closer a correlation between two variables is to \( 1.00 \), either \( +1.00 \) or \( -1.00 \), the stronger is the relationship between the two variables. The positive and negative signs of the correlation coefficient tell the direction of the relationship between the two variables. A positive correlation coefficient (a “plus” sign) means that there is a positive linear relationship—as scores on one variable increase, so do scores on the other variable. For example, as scores on IQ increase, so do grades. This correlation helps psychologists establish the validity of IQ. A negative correlation coefficient (indicated by a “minus” sign) means that there is a negative linear relationship: As scores on one variable increase, scores on the other variable decrease. For example, as IQ increases, accident rates decrease. This negative relationship might also be used as evidence of validity of IQ, suggesting that higher IQ is associated with healthy functioning, as indicated by fewer accidents.

Descriptive research thus entails looking at the way one set of measurements goes up or down in tandem with another set of measurements. The chief advantage of correlational research is that it allows for the quantitative comparison of variables that cannot be manipulated directly. However, correlation can only look at relations among variables at one point in time. And also as we will learn, the
naturalistic observation is a type of descriptive research used to collect behavioral data in natural environments as opposed to laboratory or other controlled settings. For example, naturalistic observation provides a means to study animal behavior in its natural habitat. Developmental psychologists also use naturalistic observation to investigate children interacting with caregivers. This research approach is not simply a collection of subjective impressions but rather the systematic study of well-defined, measurable observations that can be repeated by others. An important disadvantage of naturalistic observation is the lack of control of the countless variables that could influence behavior in the natural environment. However, careful observation is often important in the process of research, as it can help the researcher to pose a scientific question and to formulate a hypothesis.

Survey Design

A survey is typically comprised of a set of questions asking respondents about their activities, opinions, attitudes, or preferences. Using self-report measures, such as the maximization-satisficer scale, a survey provides a relatively inexpensive way to collect a lot of data quickly and to formulate and test a hypothesis. A survey is, however, limited by what people are capable of reporting accurately.

Performance-Based Measures

Standardized tests, such as the college-board examination, are perhaps the best example of performance-based measures. In psychology, performance-based measures constitute a well-known psychometric approach for investigating variables such as intelligence, personality traits, and aptitude (the psychometric approach is covered in detail in Chapter 4). With this approach, test performance is scored and compared to a statistical average derived from a normative or standardization sample taken from a wider population. For example, a well-known psychometric test of intelligence is the Wechsler Adult Intelligence Scale–Fourth Edition (WAIS-IV; Wechsler, 2008). This test provides a measure of a variety of cognitive abilities, such as vocabulary, mental arithmetic, spatial reasoning, and using blocks to construct designs, performance on all of which is summarized in the form of an intelligence quotient (IQ). IQ is computed by comparing a person’s test score to that of a normative group of peers of similar ages. The advantage of the psychometric approach rests largely on the extensive reliability and validity studies that are performed in the development and construction of an instrument, such as the WAIS-IV. An important disadvantage, however, is that psychometric measures are often criticized for being culturally biased in their construction and selection of test items and tasks. An additional important consideration is the extent to which the normative or standardization sample for a psychometric test is
truly representative of the diversity of the general population or an appropriate benchmark for an individual test taker of an ethnic or racial minority.

Small-N and Single-Subject Designs

Single-Subject Designs are used to test the effectiveness of a particular intervention on one person or a small set of very similar cases and to monitor client progress. In this design (also known as a single-case or small-N design), between one and nine research participants are the target of an intervention. The structure of this design makes it useful for research on interventions in behavior analysis and clinical practice (Saville, 2003; Yarnold, 1992). Specifically, clinicians in their practice must make assessments, establish goals and outcomes for an intervention, deliver the intervention, and then evaluate client progress in terms of the desired outcome(s). In parallel fashion, researchers (or clinician/researchers) using a single-subject design assess a client (or a few clients) using a systematic measurement procedure, they monitor client progress by making repeated measurements in terms of the desired outcomes, and they then evaluate the efficacy of the intervention. In this way, clinicians can improve their ability to monitor their effectiveness and also contribute to a body of research on a treatment. A major disadvantage of this research design is uncertainty about whether the findings from one case or a few cases are applicable to others.

Qualitative Research

In many instances, researchers may seek to study questions for which numerical or empirical answers may not provide the most complete answers, such as questions of values and meanings people attach to human behavior and beliefs. For example, how and why is it that people from Western cultures tend to value independence and individualism in contrast to the high value people of Eastern cultures give to interdependence and collectivism? An even deeper question might be to address the fundamental nature of such categories as individualism and collectivism. For these questions of how and why, researchers often use what are referred to as qualitative methods, such as participant observation, intensive interviewing, and focus groups. These techniques are intended to go beyond numbers in order to study and understand phenomena in terms of the meanings people attach to them, thereby preserving and capturing the complexities and diversities of human behavior. While often complemented by quantitative approaches summarized in Table 1, qualitative methods are especially well suited for exploring research questions as well as for helping to define preliminary questions that can then be studied quantitatively. We will learn more about qualitative methods or research in Chapter 2. Chapter 11 will also present qualitative research in much more detail.

CULTURE AND PSYCHOLOGICAL SCIENCE

The science of psychology does not occur in a vacuum. How we think about psychological problems, ask questions, design studies, and interpret results occur
within a larger societal context, which is referred to as culture. Culture may be best defined as the rich and intricate melding of shared meanings, communal practices and rituals, and collective discourses and beliefs about human life that prevails in a given group or society (Shweder & Sullivan, 1993). These common patterns of beliefs, symbols, feelings, and customs are acquired and transmitted socially, although how the mechanisms through which this occurs have yet to be established. Some researchers, for example, have introduced the term memes as the genetic DNA of culture, and like genes, memes are postulated to act as units through which group ways of life spread from one mind to another (e.g., Dawkins, 1976/1989; Pinker, 1997) According to this school of thought, culture is generated by information-processing mechanisms situated in human minds and sculpted by evolution (Barkow, Cosmides, & Tooby, 1992).

Cultural Research

Why is understanding and appreciating culture vital to research in psychology? Because culture generates profound psychological differences among people, and such diversity enriches human life (Wilson, Van Vugt, & O’Gorman, 2008). To understand human psychology more fully and to study it more deeply therefore requires research that takes into account cultural influences. How can this be done? In the preceding section, you learned about the different kinds of research designs, all of which involved collecting data from a sample of people. In many instances, studies using these designs will sample people from a single culture. As you have learned earlier in this chapter, this poses a significant limitation for a study, which we refer to as the problem of generalizability. When a researcher uses a culturally homogeneous sample, results cannot be generalized to a wider population of people. This is not necessarily fatal, but it certainly is something a researcher should think about in designing a study and interpreting results.

On the other hand, certain fields within psychology are devoted to the study of culture. For example, a researcher in the field of cultural psychology studies how culture shapes our thinking and how our thinking shapes culture (e.g., Nisbett, Peng, Choi, & Norenzayan, 2001). A related but distinct field of study is cross-cultural psychology. Here the primary object is to investigate the universality of psychological processes across different cultures rather than to study how local cultural practices might shape psychological processes. So whereas a cross-cultural researcher might examine whether certain personality traits such as extraversion and introversion are universal across a variety of cultures, a cultural psychologist might be interested how particular cultures shape how personality traits are expressed and displayed (McAdams & Pals, 2006).

SCIENCE VERSUS PSEUDOSCIENCE

In philosophical terms, the scientific method represents an epistemology, that is, a way of knowing that is exclusively reliant upon objective, empirical investigation. Its techniques must be transparent so that the methods, procedures, and data analyses of any
study can be easily reproduced. This transparency allows for other researchers to see if the same study can be repeated with the same finding. As we have learned in this chapter, when a result is replicated, we have greater confidence that the finding is reliable.

Science builds knowledge through the replication of studies and findings. The maximizing study clearly meets the requirements of transparency in methods and procedures so that other researchers can see if they can independently replicate these findings. Their methods and procedures are open to public scrutiny, as you can easily see by the availability of the 13-item test that Schwartz and colleagues used to categorize their research participants as either satisficers or maximizers. Transparency also allows for peer review, the process by which other independent reviewers (meaning no relationship with the researchers whose work is under review) evaluate the scientific merit of the work. These peer reviews essentially determine whether the work will be accepted for publication. Schwartz and his colleagues submitted their study to the peer-reviewed journal *Psychological Science* and, following careful scientific scrutiny from peer reviewers, the journal editor accepted the study for publication.

Reliable and valid knowledge is thus knowledge that has a high probability of being true because it has been systematically acquired and empirically tested; that is, it has been produced and evaluated by the scientific method. Now let us consider knowledge gained not through the scientific method but through other means, such as intuition, impression, gut reactions, or experience. We may be convinced that this knowledge is also true and valid. However, it is not based on empirical evidence generated by the scientific method. Instead, it might be based on authoritarian or expert evidence of what a person tells you to believe or it might be based on testimonial or anecdotal evidence offered by a person who believes the knowledge to be true because of personal subjective experience.

The crux of the problem arises when the methods of establishing evidence and the body of knowledge generated from these techniques are claimed to represent a legitimate scientific field of study. Consider the well-known case of astrology that uses horoscopes to predict personality and behavior; many people may swear by astrology and believe it to be scientific. However, astrology, along with extrasensory perception, alien-abduction reports, out-of-body experiences, the lunar lunacy effect, rebirthing therapy, and handwriting analysis are just some of examples of what is referred to as pseudoscience. In popular psychology, pseudoscientific beliefs are dubious but fascinating claims that are touted as “scientifically proven” and bolstered by fervent, public testimonials of believers who have experienced first hand or who have claimed to have witnessed the phenomenon.

**Recognizing Pseudoscience**

History tells us that with advancements over time, some fields of study come to be seen as pseudoscientific: Today’s pseudoscience could be yesterday’s science. Take for example, phrenology, a now defunct field of study that was once considered a science in the 19th century. The major, unified belief of phrenology held that bumps and fissures of the skull determined the character and personality of a person. Phrenologists believed that various psychological attributes, including
personality traits, intellectual faculties, and moral character, could all be assessed by running their fingertips and palms over the skulls of a patient to feel for enlargements or indentations (see Exhibit 1.5). Advances in neurology would

Exhibit 1.5 This porcelain head for sale in a New Orleans antique store shows the sections of the brain, as detailed by 19th-century phrenologists. They believed that each section was responsible for a particular human personality trait. If a section were enlarged or shrunken, the personality would be likewise abnormal. Doctors, particularly those doing entry examinations at American prisons, would examine the new inmate’s head for bumps or cavities to develop a criminal profile. For example, if the section of brain responsible for “acquisitiveness” was enlarged, the offender probably was a thief. Lombroso and his school combined phrenology with other models that included external physical appearance traits that could single out criminals from the general population.

Source: Photo taken by Cecil Greek.
relegate phrenology to the dustbin of pseudoscience. However, some of its assumptions have come to influence modern neuroscience and neuropsychology. Among these are the centrality of the brain as the organ of the mind and the localization of certain mental functions across particular brain regions.

Psychology professor Scott Lilienfeld of Emory University has identified “The 10 Commandments of Helping Students Distinguish Science from Pseudoscience in Psychology,” and he proposes these rules as a way for us to understand better what science is and what science isn’t. According to Lilienfeld (2005), just as we cannot grasp fully the concept of cold without understanding hot, we cannot grasp fully the concept of scientific thinking without an understanding of pseudoscientific beliefs—specifically those beliefs that at first blush appear scientific but are not. Among the warning signs of pseudoscience laid out by Lilienfeld (2005) are:

- A tendency to invoke ad hoc hypotheses, which can be thought of as “escape hatches” or loopholes, as a means of immunizing claims from falsification.
- An absence of self-correction and an accompanying intellectual stagnation.
- An emphasis on confirmation rather than refutation.
- A tendency to place the burden of proof on skeptics, not proponents, of claims.
- Excessive reliance on anecdotal and testimonial evidence to substantiate claims.
- Evasion of the scrutiny afforded by peer review.
- Absence of “connectivity” (Stanovich, 1997), that is, a failure to build on existing scientific knowledge.
- Use of impressive-sounding jargon whose primary purpose is to lend claims a facade of scientific respectability.
- An absence of boundary conditions (Hines, 2003), that is, a failure to specify the settings under which claims do not hold.

Now none of these warning signs alone is sufficient to render a discipline as pseudoscientific. But the more warning signs that are present, the more reason to suspect pseudoscientific machinations are at work.

**WHY PSEUDOSCIENCE?**

Why are we so susceptible to pseudoscience? Recall that theories help us to understand how a particular phenomenon works. In this case, we want to understand how, in theory, pseudoscience might work. To do so, we examine the scientific literature of human thinking and reasoning. What we find may very well surprise you, as this research shows that humans commonly reason with unseen and
persistent biases. As you will see, pseudoscience preys on these biases, which can only be combated by (you guessed it!), the scientific method. As Lilienfeld (2005) noted, the scientific method provides a “tool box” to prevent researchers from confirming their own biases.

Cognitive Illusions

Cognitive psychologists study how we think and make decisions. One of the most striking contributions cognitive psychologists have made over the past decades is the finding that laypersons and experts alike tend to make consistent, systematic, deeply ingrained, and often insidious mistakes of reasoning that reflect our poor grasp of logic and probability theory. So important is this discovery that its principal pioneer, originator, and founding figure, psychology professor Daniel Kahneman, won the 2002 Nobel Prize in Economic Sciences. The body of empirical evidence underlying this program of research comes from a rather simple but elegant study design in which cognitive psychologists devised a vast array of confusing questions that most people answer incorrectly because of their poor grasp of logic and probability theory. The correct answers are so counterintuitive that they elicit strong emotions of disbelief comparable to those produced by familiar optical illusions. For example, in the optical illusion in Exhibit 1.6, your visual system deceives you so that the figure in the background seems larger, although they are exactly the same size. In the same way, cognitive illusions occur when our thinking deceives us, and these occur.

Note: To most people, the one in the background seems larger, though in fact they are exactly the same size. But the depth cues in the picture (the receding tunnel) give the 2D image a 3D feel. Although both monsters create the same size image in our eyes, our brains take the depth cues into account, which results in a perception of the upper monster as farther away—making it seem larger.

because of curious blind spots, or mental tunnels in our minds (e.g., Piatelli-Palmarini, 1994).

The human mind, these studies tell us, is “probability blind,” meaning that it is naturally endowed to favor subjective impressions and personal anecdotes over cold, hard statistics. These **heuristic biases** for the subjective over the objective act as mental shortcuts that can distort logical reasoning. We all, expert and novice alike, use these heuristic biases regularly, naturally, and automatically in making a variety of decisions, such as marrying a partner, picking a stock, or diagnosing a disease (not even medical doctors are immune to heuristic biases). When faced with making decisions for which available information is incomplete or overly complex, we rely on simplifying heuristics, or efficient rules of thumb (e.g., Piatelli-Palmarini, 1994). Michael Shermer, prolific journalist and scholar, who specializes in the study of pseudoscience, perhaps says it best and with panache in his August 2008 *Scientific American* column “Skeptic,” explaining why subjective anecdotes often trump cold hard data, when he writes, “. . . we have evolved brains that pay attention to anecdotes because false positives (believing there is a connection between A and B when there is not) are usually harmless, whereas false negatives (believing there is no connection between A and B when there is) may take you out of the gene pool” (p. 42).

**Confirmatory Bias**

Confirmatory bias has been described as a ubiquitous phenomenon that comes in many guises (Nickerson, 1988). It is considered a primary source of errors in human reasoning, and researchers have argued that our natural and universal tendency for confirmatory bias is major reason why pseudoscience has persisted and flourished over time (Sternberg, 2007). As Sternberg wrote, “. . . people want to believe, and so they find ways to believe” (p. 292). **Confirmatory bias** is defined as a natural tendency of the human mind to actively seek out and assign more weight to any kind of evidence that favors existing beliefs, expectations, or a hypothesis in hand (Nickerson, 1998). Nickerson identified several scenarios in which confirmatory bias may contaminate scientific research. One common scenario occurs when a researcher restricts attention to a favored hypothesis, which is defined as either explanation of a phenomenon or a prediction of a theoretical relationship (e.g., income predicts happiness) that requires empirical testing. (We will elaborate more on the meaning of hypothesis in Chapter 2.) Others include preferential treatment of that which supports existing beliefs, looking only or primarily for positive cases, a form of “cherry-picking” we discussed earlier in relation to sample bias, and overweighting positive confirmatory instances (Nickerson, 1998). Thus, a common mistake, confirmatory bias reflects a kind of selective thinking and observation—choosing to look only at things that are in line with our preferences or beliefs. **Exhibit 1.7** depicts the difference between selective observation and a related error in reasoning, overgeneralization.

Philosophers of science have long viewed confirmatory bias as a major threat or danger to research. Enter the work of Sir Karl Popper (1959), whose central idea,
referred to as the doctrine of falsification, was that scientists should aim to falsify their theories rather than confirm them. In the Popper approach, a scientist ought to investigate a theory by producing tests that disconfirm it rather than confirm it. As Nobel Prize Winner Eric R. Kandel writes in his autobiography, *In Search of Memory* (2006), “. . . Being on the wrong side of an interpretation was unimportant, Popper argued. The greatest strength of the scientific method is its ability to disprove a hypothesis” (p. 96). This is because, as Popper argued, confirming evidence could be consistent with several different theoretical explanations. In fact, theories entail many assumptions, some of which are undoubtedly wrong. If, however, there is no way to disconfirm, then there is no way to eliminate false theories and their assumptions.

Thus, for Popper, disconfirmation is an all-or-nothing affair: A single result can either disconfirm the hypothesis or else it does not (Koslowski, 1996). Consider the famous Popper example of “black swans” in which he observed that only a single black swan is required to falsify the theory that all “swans are white” even though there are thousands of white swans in evidence. Thus, if hypotheses or theories can stand the test of disproof, then they earn scientific acceptance. Theories should therefore be open to disproof. Falsification fits with the self-correcting nature of science in which information accumulates with new advances and discoveries. In stark contrast, pseudosciences are neither

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**Exhibit 1.7** The Difference Between Selective Observation and Overgeneralization

Overgeneralization: “Those people are never satisfied.”

Selective Observation: “Those people are never satisfied.”

self-correcting nor cumulative but instead are stagnant and show little or no progress in accumulating knowledge (Exhibit 1.8).

### Uncommon Sense

We can see that our minds might very well be naturally endowed to confirm our existing beliefs. Our inclination for what we consider to be “common sense”—for what seems intuitively obvious—can run counter to understanding the physical world and the social world. As developmental psychologists have noted, even before the development of language, 1-year-old babies possess a rich understanding of the physical world and the social world, with the former referred to as a “naïve physics” and the latter as a “naïve psychology” (Bloom & Weisberg, 2007). This evolved adaptation gives children a head start for understanding and learning about objects and people. By the same token, however, it inevitably conflicts with scientific discoveries, sowing the seeds of resistance in children to learning and accepting certain scientific facts. Indeed, as Carey (2000) noted, the challenge in teaching science to children is “not what the student lacks, but what the student has, namely alternative conceptual frameworks for the phenomena covered by the theories we are trying to teach” (p. 14).

Bloom and Weisberg (2007) proposed that people come to “resist certain scientific findings because many of these findings are unnatural and unintuitive”
(p. 997). Even commonsense psychology poses a major obstacle for understanding science. As an example, Bloom and Weisberg point to the philosophy of dualism, which holds that the mind is a nonphysical substance that is fundamentally different from the physical brain. They noted that children naturally believe that certain aspects of psychology, such as morality, love, and play, are solely dependent upon the immaterial nature of the interior life of the soul. And these intuitions are often further solidified and transmitted by cultural authorities. On the other hand, as we have learned earlier in this chapter, dualism touches upon questions of meaning spirituality that are not necessarily suited to science and empiricism. And for many, including scientists, for these domains of human experience, only religion can provide deep insights. In fact, the prestigious scientific organization National Academy of Sciences (NAS) endorses the value of dualism and has made clear that science and religion are not at all at odds with each other. In a 2008 publication titled Science, Evolution and Creationism, the Committee on Revising Science and Creationism (2008) stated, “Many scientists have written eloquently about how their scientific studies have increased their awe and understanding of a creator. The study of science need not lessen or compromise faith” (p. 54). Thus, we can see that pseudoscience can be appealing on many fronts. It often preys on our heuristic biases, capitalizing on our evolved and developed resistance to the uncommon sense of science.

CONCLUSIONS

In this chapter, we likened the scientific method to a toolbox of procedures and techniques that allows a researcher to ask, study, and answer particular questions about psychology. In philosophical terms, these questions are referred to as “is” questions and defined as those that can be answered by facts or empirical data, with these answers independent of social, cultural, political, and religious context. On the other hand are “ought’ questions that fall outside the domain of the scientific method, meaning that their ultimate answers and final directives hinge upon a collective, usually democratic, understanding of decency, justice, and fairness.

Scientific questions are commonly framed in reference to a particular theory that in turn leads to a testable hypothesis that specifies key variables to be investigated. Objective measurement of these variables is critical, because if something in psychology cannot be measured, then it cannot be investigated scientifically. Observations can then be collected systematically and quantified by sampling a population. These observations, translated into number values, are what constitute empirical evidence. Statistics are computed to test hypothesized relationships between and among objective, quantifiable measures. Statistics allow the researcher to assess the likelihood that the obtained results are due to chance; a finding that is unlikely due to chance is typically interpreted as supportive of the hypothesis of the study. Reliability and validity are two important standards that are used to judge the scientific quality of any research study.
Within the toolbox are several different kinds of research methods and designs. These, we learned, include experimental design, quasiexperimental design, descriptive research, surveys, performance-based measures, small-N studies, and qualitative methods. Each approach has its advantages and disadvantages, which will be discussed throughout the book. The degree to which variables can be manipulated is an important feature in deciding on a research approach. In a true experimental design, the independent variable is under complete control or manipulation by the researcher, and its effects on the dependent variable can thus be directly tested. By contrast, a quasiexperimental design is used for independent variables that cannot be directly manipulated or randomly assigned. Descriptive research also allows for comparison of variables that cannot be manipulated directly. We also learned that how we think about psychological problems, ask questions, design studies, and interpret results occur within a larger societal context, which is referred to as culture.

Finally, we learned that the scientific method represents an epistemology, that is, a way of knowing that is exclusively reliant upon objective, empirical investigation. Its techniques must be transparent so that the methods, procedures, and data analyses of any study can be easily reproduced. Pseudoscience, on the other hand, relies not on empirical evidence but on anecdotal testimonial accounts. Pseudoscientific beliefs are dubious but fascinating claims that are touted as “scientifically proven” and bolstered by fervent, public testimonials of believers who have experienced first hand or who have claimed to have witnessed the phenomenon. We theorized that pseudoscience preys on our naturally evolved and universal tendency for confirmatory bias.

Chapter Highlights

- The scientific method is the conceptual framework we use to design, conduct, and evaluate theories and to test hypotheses.

- The scientific method is empirical, meaning that information is gained objectively from observation or experiment and represented as variables.

- A variable is defined as any characteristic or attribute that can take on more than one value or can vary across participants in a research study.

- The scientific method uses statistics to test relationships between and among objective, quantifiable measures of specified variables.

- All statistics are based on the logic of probability and they all use the same criterion for evaluation. The question asked and answered by statistical tests may be stated as follows: In light of the data, what is the probability that the obtained results are due to chance?
• There are a variety of research tools and research designs. These include experimental design, quasiexperimental design, descriptive research, surveys, performance-based measures, small-N studies, and qualitative methods. Reliability and validity are the main standards that psychologists use in evaluating each of these research techniques and procedures.

• Understanding and appreciating culture is vital to research in psychology. How we think about psychological problems, ask questions, design studies, and interpret results occur within a larger societal context, which is referred to as culture.

• The scientific method exists largely as a countervailing force to biases that operate at virtually all steps in the research process and that can distort and negate a study.

• The human mind is “probability blind,” meaning that it is naturally endowed to favor subjective impressions over cold, hard statistics. These heuristic biases for the subjective over the objective act as mental shortcuts that distort logical reasoning.

• Pseudoscience preys on heuristic biases, which can only be combated by the scientific method.

• Pseudoscience remains a powerful force that seems to satisfy a deep-rooted need etched into our collective consciousness to understand how the world works and how we fit into the grand cosmos.

**Key Terms**

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Examples abound of new pseudoscientific disciplines. Perhaps there is no better example than the best-selling tome *The Secret* by television producer Rhonda Byrne. It became a blockbuster, No. 1 on *The New York Times* best-seller list when it was featured not once but twice by television personality Oprah Winfrey’s popular show. What is so evidently alluring about *The Secret* is its central idea, known as the Law of Attraction, which states that wishing can make things come true, something very young children could resonate to in their beliefs about the Tooth Fairy and Santa Claus. Whether you want money, a new home, or even a regular parking space, just ask, believe you will get it, and you will get it, guaranteed! *The Secret*’s mantra is a simple and ancient idea: Ask. Believe. Receive. This is positive thinking with a guarantee, and of course, there are no guarantees in psychology. Explain how *The Secret* meets the seven warning signs of pseudoscience.

**Activity Questions**

1. As a cross-cultural psychologist, you have been hired to help researchers design studies that have greater generalizability. What would you recommend in terms of sampling? What kinds of measures might be most helpful? What kind of study design would you recommend?

2. The question of whether creation should be taught as a science has long been debated in the public arena and in the courts across the land. In *McLean v. Arkansas* (*McLean v. Arkansas Board of Education*, Decision January 5, 1982), Judge William Overton ruled that “creation science” was not scientific and should not be taught
in Arkansas public schools. Judge Overton cited the lack of falsifiability as one of the reasons he determined “creation science” to be not scientific and why it should not be taught in Arkansas public schools. In his conclusion, Judge Overton explained his reasoning as to why he used falsifiability as a criterion to determine the creation science was not a science. He wrote that a methodology cannot be described as scientific if it begins with a conclusion and does not change regardless of evidence to the contrary. Explain how and why you think Judge Overton came to use lack of falsifiability as a criterion for deciding against “creation science.” Explain how psychological research of heuristic biases might influence other legal rulings on “creation science.”

3. In a May 9, 2010, article in the Chronicle of Higher Education, titled “The New War Between Science and Religion,” Mano Singham writes about “the new war that pits those who argue that science and ‘moderate’ forms of religion are compatible worldviews against those who think they are not” [paragraph 1]. As you also learned in Chapter 1, the prestigious National Academy of Sciences endorses the position for the compatibility of science and religion. Weigh both the pros and cons of this debate. How might the philosophical distinction between questions of ought versus is be used to shed light on this debate?

4. Suppose you have been hired as a developmental psychologist to help design a curriculum to teach science and the scientific method to elementary school children. As a research psychologist, you know before the development of language, 1-year-old babies possess a rich understanding of the physical world and the social world, with the former referred to as a “naïve physics” and the latter as a “naïve psychology” (Bloom & Weisberg, 2007). Moreover, you also know that as psychologist Susan Carey (2000) noted, the challenge in teaching science to children is “not what the student lacks, but what the student has, namely alternative conceptual frameworks for the phenomena covered by the theories we are trying to teach” (p. 14). Organize a formal discussion, first addressing people’s commonsense intuitive understanding of psychology (“naïve psychology”) and why it comes so naturally to us. Address how it could contribute to scientific resistance for understanding the workings of the brain and mind.

5. Heuristic biases come in many forms. Consider the following example from “Where Mistakes of Reason Rule Our Minds” (Piatelli-Palmarini, 1994):

Steve is very shy and withdrawn, invariably helpful, but with little interest in people or the world of reality. A meek and tidy soul, he has a need for order and structure, and a passion for detail.

Which is more likely, that Steve is a librarian or farmer? Now, if you are like most people you will pick librarian. You will do so even though you have been provided background statistics that indicated that there are far more farmers than librarians. Your blind spots or cognitive illusions let the librarian stereotype override the fact that there are far more farmers than librarians. You neglect or ignore hard, cold statistical evidence about the higher base rate or incidence of farmers over librarians in favor of
impressionistic, subjective, intuitive, stereotypical information. Try with a group of naïve students and see how they respond.

**Review Questions**

1. What is a scientific question? Compare and contrast scientific questions and legal questions.

2. In the maximization study, how would you state the major hypothesis of the study? How did theory influence the formation of the hypothesis?

3. State the independent and dependent variables of the maximization study. How were they selected and measured?

4. What was the sample size of the maximization study? What implication does sample size have on statistical analysis? Would you consider this a random sample? Why or why not?

5. All statistics are based on the logic of probability. Explain how this works. How do statistics address question as to whether a study’s results are to be believed?

6. Describe the different kinds of studies that are part of the research toolbox.

7. What are confounds and how might they be controlled?

8. How can you tell the difference between pseudoscience and real science?

9. Why do you think pseudoscience is often so appealing? According to cognitive psychologists, how do our minds that make us susceptible to pseudoscience?

10. Explain how the scientific method tries to stamp out confirmatory bias.