Chapter 2
Research Methods: Vital Safeguards Against Error

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LECTURE GUIDE

I. THE BEAUTY AND NECESSITY OF GOOD RESEARCH DESIGN (Text p. 44)

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> Lecture Launchers
The Tragedy of Dr. Semmelweis and Childbed Fever

> Classroom Activities, Demonstrations, and Exercises
Estimating the Frequencies of Our Own and Others' Behaviors

A. *Why We Need Research Designs* (**Figure 2.1, text p. 43**)
1. "I can see that it works"—often our impressions are wrong.
   a. Without research designs, even intelligent, well-educated people can be fooled.
   b. Prefrontal lobotomy—example of what happens when we rely on our subjective impressions (**Figure 2.2, text p. 44**).
      i. Egaz Moniz won the Nobel prize for this procedure.
      ii. Clinical observations led to the rejection of the prefrontal lobotomy procedure.

B. *How We Can Be Fooled: Two Modes of Thinking*
1. The same psychological processes that serve us well in most situations also predispose us to errors in thinking.
   a. **Heuristics**—mental shortcuts or rules of thumb.
   b. Reduce the cognitive energy required to solve problems.
   c. But we oversimplify reality!
      i. Shortcuts help simplify reality and work most of the time, but can oversimplify complex information.
      ii. Research designs help avoid the oversimplifying reality.
      iii. Imagine yourself driving from Reno, Nevada, to San Diego, California—what compass direction would you take? (Hint: *you might think to say southwest—but you should actually drive south*east*!*) (**Figure 2.3, text p. 46**)

II. SCIENTIFIC METHODOLOGY: A TOOLBOX OF SKILLS (Text, p. 45)

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A. *There is no single scientific method; all methods enable us to test hypotheses derived from broader theories*
   1. Confirmed hypotheses only strengthen our confidence in a theory, they do not "prove" it.
   2. Advantages and disadvantage of research designs (**Table 2.1, text p. 48)**
B. *Naturalistic Observation: Studying Humans "In the Wild"*
   1. **Naturalistic observation:** watching behavior in real-world settings
   2. Robert Provine (1996, 2000) observed human laughter in natural settings; women laughed more than men, speakers laughed more than listeners, and most laughter was not in response to "funny" remarks.
   3. The major advantage of naturalistic observation is that studies are often high in **external validity**—the findings may be generalized to real-world settings.
   4. The major disadvantage of naturalistic observation is that studies tend to be low in **internal validity** and we are limited in the degree to which we can draw cause-and-effect conclusions.

C. *Case Study Designs: Getting to Know You*
   1. One of the simplest designs in the psychologist's investigative toolbox is the **case study**.
   2. Case studies can provide "**existence proofs**" that phenomena can occur and can enable us to generate hypotheses for controlled studies.
   3. Caution should be used when coming to conclusions based on case studies; the plural of "anecdote" is not "fact."

D. *Self-Report Measures and Surveys: Asking People about Themselves and Others*
   1. Random Selection: The Key to Generalizability
      a. **Random selection** is a survey approach in which every person in the population has an equal chance of being chosen to participate. This is essential for generalizing survey findings to a larger population.
         i. Random selection should not be confused with *random assignment*, one of the two ingredients in an experiment. Random selection deals with how we choose participants, random assignment deals with how we assign participants *after* they've been selected.
      b. The Hite Report (1987), a survey with surprising results about women and relationships, is an example of the misleading effect of nonrandom selection. Only 4.5 percent of those contacted responded to the Hite Report; a simultaneous Harris poll using random selection reported nearly opposite findings.
   2. Evaluating Measures
      a. **Reliability**—consistency of measurement
         i. *Test-retest reliability*—a measurement yielding similar scores within a group of people over time.
         ii. *Interrater reliability*—the extent to which different people who conduct an interview or make behavioral observations agree on characteristics.
      b. **Validity**—the extent to which a measure assesses what it claims to measure.
      c. Reliability and validity: The differences
         i. Reliability is necessary for validity, but it is not sufficient for validity.
   3. Advantages and Disadvantages of Self-Report Measures
      a. Self-report measures**:** questionnaires assessing a variety of characteristics
         i. Surveys: measure opinions, attitudes.
      b. Pros are that measures are easy to administer; direct (self) assessment of person's state.
      c. Cons are that accuracy is skewed for certain groups (narcissists); potential for dishonesty.
         i. **Response sets**—tendencies to distort answers to items appear more positive, for example, than they actually are.
   4. Rating Data: How Do They Rate
      a. Ratings of others are subject to halo effect and horns effect in which positive or negative ratings on one characteristic influence ratings of other characteristics

E. *Correlational Designs*
1. Identifying When a Design Is Correlational
    a. **Correlation design**—research design that examines the extent to which variables are associated.
2. Correlations: A Beginner's Guide
    a. Positive correlations indicate that as one variable increases, so does the other.
    b. Negative correlations indicate as one variable increases, the other decreases.
    c. Zero correlations indicate no relation between variables.
    d. Correlations range from –1.00 to +1.00; both of these correlation ratings indicate a perfect relationship; a correlation of 0 indicates no relationship between two variables; the strength of the association between two variables is indicated by the absolute value of the correlation; and the positive or negative sign indicates the direction of the association (**Figure 2.4, text p. 56**).
3. The Scatterplot
    a. A **scatterplot** is a grouping of points on a two-dimensional graph in which each dot represents a single person's data (**Figure 2.4, text p. 56**).
4. Illusory Correlation
    a. Correlations are **illusory** when we perceive an association between two things that does not exist, such as an association between the full moon and strange occurrences.
    b. We tend to pay too much attention to memorable events, while not attending to non-memorable events.
    c. We can minimize tendencies to make illusory correlations by forcing ourselves to keep track of disconfirming instances.
5. Correlation versus Causation: Jumping the Gun
    a. The most common mistake we make when interpreting correlational data is to draw causal conclusions from them.
    b. Correlational data does allow us to make predictions, but conclusions from this type of research are limited because we can't be sure why these predicted relationships exist.
    c. The news media frequently falls prey to the correlation vs. causation fallacy (**Figure 2.5, text p. 59**).

F. *Experimental Designs*

1. Experimental designs permit us to make cause-and-effect inferences.
2. Unlike correlational designs, researchers conducting experimental designs manipulate variables to see whether these manipulations produce differences in participants' behavior.
3. What Makes a Study an Experiment: Two Components
    a. An **experiment** is a research design characterized by random assignment of participants to conditions and manipulation of an independent variable.
        i. **Random Assignment**—experimenter randomly sorts participants into two groups.
            a. The **experimental group** receives the manipulation.
            b. The **control group** does not receive the manipulation.
        ii. Manipulation of an Independent Variable
            a. **Independent variable**—the treatment or intervention that the experimenter "manipulates" or varies.
            b. **Dependent variable**—variable that an experimenter measures to see whether the manipulation has an effect.
            c. When we define our independent and dependent variables for the purposes of a study, it is called an **operational definition**—a working definition of what it being measured.
4. Confounds: Sources of False Conclusions
    a. A **confounding variable** is any variable that differs between the experimental and control groups other than the independent variable.
        i. e.g., patients who received an antidepressant also received psychotherapy not received by the control group; "sessions of psychotherapy" is a confound.
5. Cause and Effect: Permission to Infer
    a. Experiments are distinct because they permit cause-and-effect inferences.

6. Pitfalls in Experimental Design
    a. The **Placebo Effect**—an improvement resulting from the mere expectation of improvement. Our expectations can become reality.
        i. Participants should be **blind** to the condition to which they have been assigned. If not, expectations will differ.
    b. The Nocebo Effect—Similar to the placebo effect, the nocebo effect results from the mere expectation of harm.
        i. More than two-thirds of students reported headaches when led to expect them after exposure to a nonexistent "electric current."
    c. The **Experimenter Expectancy Effect**—phenomena in which researcher's hypotheses lead them to unintentionally bias a study outcome.
        i. It is essential that experiments be conducted in a **double-blind** design in which neither researchers nor subjects know who is in the experimental or control group.
        ii. In a classic example of experimenter expectancy, Clever Hans the horse appeared to know mathematics; in fact, Clever Hans was detecting subtle cues coming from his questioners.
    d. **Demand Characteristics**—cues that participants pick up from a study that allow them to generate guesses regarding the researcher's hypotheses.
        i. To minimize the potential for demand characteristics, researchers can disguise the purpose of the study.

III. ETHICAL ISSUES IN RESEARCH DESIGN (Text p. 67)

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> Lecture Launchers

An Historical Perspective on Research Ethics

Is There Privacy in a Public Restroom?

A. *Tuskegee: A Shameful Moral Tale*
    1. From 1932 to 1972, the U.S. Public Health Service studied the course of untreated syphilis among poor African-American men in the South.
        a. Researchers never informed the men they had syphilis or that effective antibiotics were available.
        b. By the end of the study, 128 men had died as a result of syphilis, 40 wives were infected, 19 children had been born with syphilis.

B. *Ethical Guidelines for Human Research*
    1. Throughout history there have been a variety of ethically questionable studies that had the potential to inflict serious psychological harm.
    2. Every major American college/university has at least one *institutional review board (IRB)* that carefully reviews all research with an eye toward protecting participants against abuses.

3. **Informed Consent**—informing research participants of what is involved in a study before asking them to participate.
    a. Institutional Review Boards (IRBs) now require **informed consent** from participants.
    b. In Milgram's study of obedience (1963), deception was used to induce participants to deliver "shocks" to a learner.
    c. The American Psychological Association states that deception is justified only when it is necessary and the scientific knowledge outweighs the cost (**Table 2.3, text p. 69)**.
4. Debriefing: Educating Participants
    a. In *debriefing*, participants are informed about the purpose of the study.

C. *Ethical Issues in Animal Research*
1. Animal research, particularly invasive animal research, generates a great deal of anger and discomfort.
2. About 7–8 percent of published research in psychology relies on animals, usually rodents and birds.
3. Some opponents argue that the deaths of 20 million animals per year aren't worth the benefits.
4. Supporters argue that animal research has directly benefited humans, especially in the area of brain function and medication effectiveness.
5. Nevertheless, animal research has yielded important insights about brain and behavior. Animal researchers must weigh carefully the potential scientific gains of their work against the costs in death and suffering they produce.

IV. STATISTICS: THE LANGUAGE OF PSYCHOLOGICAL RESEARCH (Text, p. 70)

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> Lecture Launchers
Oscar the Deathcat: A Case of Illusory Correlation?

A. ***Statistics****—the application of mathematics to describing and analyzing data. They help us determine the value of a hypothesis.*

B. *Descriptive Statistics: What's What?*
1. **Descriptive statistics**—numerical characterizations that describe data. There are two types of descriptive statistics: central tendency and variability.
2. Central tendency: The 3 Ms
    a. There are three measures of **central tendency** (**Table 2.4, text p. 71**).
        i. the **mean**, or arithmetic average;
        ii. the **median**, or middle score;
        iii. and the **mode**, or most frequent score.
    b. If the data are normally distributed, the mean is the better measure of central tendency; if the data are skewed, the median or mode may be more representative (**Figure 2.6, text, p. 71**).

3. Variability (dispersion)
    a. Measures of **variability** describe how loosely or tightly bunched the scores are.
    b. The **range** is the difference between the highest and lowest score. (**Figure 2.7, text p. 72**).
        i. But it's key to note that data sets can display very different distribution of scores across the range.
    c. The **standard deviation** takes into account how far each data point is from the mean.

C. *Inferential Statistics: Testing Hypotheses*
1. **Inferential statistics**—these statistics allow us to determine whether we can generalize our sample findings to a larger population, or whether they just occurred by chance alone.
2. Statistical Significance
    a. A statistically significant finding is one that would occur by chance alone less than 5 percent of the time; if it would occur by chance that rarely, we conclude that the finding we observed in our sample is probably real.
    b. In psychology journals, a statistically significant finding is described using the phrase "$p < .05$".
3. Practical Significance
    a. A finding may be statistically significant, or unlikely to have occurred by chance, yet be so small that the findings do not translate into meaningful consequences in the real world.
    b. All other things being equal, larger sample sizes will increase the likelihood that a finding will be statistically significant, but will not have an effect on practical significance.

D. *How People Lie with Statistics*
1. If the distribution of data is skewed, reporting the mean as the measure of central tendency can give a false picture of the nature of the majority of the scores.
2. A truncated line graph in which the *y* axis starts at the lowest possible score, not 0, can create the illusion that groups of scores are very different from each other when real differences are tiny (**Figure 2.8, text p. 74**).

V. EVALUATING PSYCHOLOGICAL RESEARCH (Text p. 75)

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> Classroom Activities, Demonstrations, and Exercises
Give the Doctor Some Advice
What Do Journals Look Like?
Wonder Horse Dials 911 to Save Boy's Life

A. *Becoming a Peer Reviewer*
   1. In this process, fellow experts try to identify flaws that could undermine a study's findings and conclusions.
   2. Potential flaws include lack of random assignment to groups and lack of a true placebo control group in which participants receive an ineffective treatment.

B. *Most Reporters Aren't Scientists: Evaluating Psychology in the Media*
   1. Most reporters are not trained in psychology, and so fall prey to heuristics and biases that we are all susceptible to.
   2. We should consider the source, giving greater credence to reputable science magazines and less to tabloids or popular magazines.
      a. Internet sources associated with reputable organizations such as the APA and APS are more reliable than sites not affiliated with scientific organizations.
      b. Primary sources such as journal articles are more reliable than secondary sources such as newspapers and Web sites.
   3. We should be on the lookout for storytelling techniques, such as sharpening, in which the central gist of a study is exaggerated, and leveling, in which the less central details are downplayed.
   4. We should beware of pseudosymmetry, in which reporters present two sides to a controversy, when the evidence strongly favors one side. This gives the appearance of scientific controversy when none exists.

CHAPTER 2

Learning Objectives

On completion of this chapter, students should be able to

2.1a: identify two modes of thinking and their application to scientific reasoning (text p. 46); APA LO 2.4a (Describe research methods used by psychologists including their respective advantages and disadvantages); APA LO 1.5a (Relate examples of how a researcher's value system, sociocultural characteristics, and historical context influence the development of scientific inquiry on psychological questions)

2.2.a: describe the advantages and disadvantages of using naturalistic observation, case studies, self-report measures, and surveys (text p. 49); APA LO 2.4a (Describe research methods used by psychologists including their respective advantages and disadvantages)

2.2b: describe the role of correlational designs and distinguish correlation from causation (text p. 54); APA LO 2.2e (Interpret simple graphs and statistical findings)

2.2c: identify the components of an experiment, the potential pitfalls that can lead to faulty conclusions, and how psychologists control for these pitfalls (text p. 60); APA LO 2.4b (Discuss the value of experimental design (i.e., controlled comparisons) in justifying cause-effect relationships)

2.3a: explain the ethical obligations of researchers toward their research participants (text p. 67); APA LO 3.1a (Describe key regulations in the APA Ethics Code for protection of human or nonhuman research participants)

2.3b: describe both sides of the debate on the use of animals as research subjects (text p. 68); APA LO 3.1c (Discuss relevant ethical issues that reflect principles in the APA Code of Ethics)

2.4a: identify uses of various measures of central tendency and variability (text p. 70); APA LO 4.1f (Interpret quantitative data displayed in statistics, graphs, and tables, including statistical symbols in research reports)

2.4b: explain how inferential statistics can help us to determine whether we can generalize from our sample to the full population (text p. 72); APA LO 2.5d (Identify under what conditions research findings can be appropriately generalized)

2.4c: show how statistics can be misused for purposes of persuasion (text p. 72); APA LO 2.2d (Articulate criteria for identifying objective sources of psychology information)

2.5a: identify flaws in research designs and how to correct for them (text p. 75); APA LO 2.4a (Describe research methods used by psychologists including their respective advantages and disadvantages)

2.5b: identify skills for evaluating psychological claims in the popular media (text p. 76); APA LO 2.2b Describe what kinds of additional information beyond personal experience are acceptable in developing behavioral explanations (i.e., popular press reports vs. scientific findings).

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CHAPTER 2

Key Terms

Blind (text p. 63)
Case Study (text p. 48)
Central Tendency (text p. 71)
Control Group (text p. 61)
Correlational Design (text p. 54)
Demand Characteristics (text p. 66)
Dependent Variable (text p. 61)
Descriptive Statistics (text p. 71)
Double-Blind (text p. 65)
Existence Proof (text p. 49)
Experiment (text p. 60)
Experimenter Expectancy Effect (text p. 65)
Experimental Group (text p. 61)
External Validity (text p. 48)
Heuristic (text p. 46)
Illusory Correlation (text p. 57)
Independent Variable (text p. 61)
Inferential Statistics (text p. 73)
Informed Consent (text p. 68)
Internal Validity (text p. 48)
Mean (text p. 71)
Median (text p. 71)
Mode (text p. 71)
Naturalistic Observation (text p. 47)
Operational Definition (text p. 61)
Placebo Effect (text p. 63)
Prefrontal Lobotomy (text p. 44)
Random Assignment (text p. 61)
Random Selection (text p. 50)
Range (text p. 72)
Reliability (text p. 51)
Response Set (text p. 53)
Scatterplot (text p. 55)
Standard Deviation (text p. 72)
Statistics (text p. 70)
Validity (text p. 51)
Variability (text p. 72)

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▼LECTURE LAUNCHERS AND DISCUSSIONS TOPICS

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Lecture/Discussion: The Tragedy of Dr. Semmelweis and Childbed Fever

The case of Dr. Ignac Semmelweis and childbed fever complements the debacle surrounding the technique of facilitated communication and powerfully illustrates the tragedies that ensue when scientific information is ignored or rejected. It is an extraordinary story that is as much psychological as it is medical. In 1847, Semmelweis attempted to persuade his fellow physicians that they were contaminating women during childbirth with some substance acquired from the cadavers of women who had died from this illness. When his own students washed their hands in an antiseptic, the death toll plummeted, but his fellow physicians disbelieved this clear and objective evidence. Describe the case and ask students why the medical community was so reluctant to accept Semmelweiss's findings. A brief presentation on cognitive dissonance theory may be helpful. That is, after watching women perish from this gruesome infection, the physicians' knowledge that they had caused these deaths may have been too discrepant with their self-concepts as healers to resolve the dissonance. They disparaged Semmelweis and his evidence. The story may be found by searching for "Semmelweis" on the New York University School of Medicine site (http://medhum.med.nyu.edu).

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Lecture/Discussion: Case Studies of Vietnam War Experiences

An excellent example of how the case study works in psychological research is the work of Lambright (2003), who studied the responses of six Vietnamese volunteers (varying in age from 24 to 68) to the disruption in their daily lives, occupations, and the cultural adjustments brought about by the war in Vietnam. She conducted the interviews individually, in different locations throughout Vietnam during June and July of 2002. The six volunteers, from whom she obtained written consent, answered seven questions. While the standard seven questions might suggest that this face-to-face interview was a highly structured one, Lambright was in fact free to follow up any interesting answers with more questions as the need arose, making the interview an unstructured one. Here are two brief excerpts from those interviews, answers to the question "What about your culture explains its resilience during sustained disruption (such as war, famine, social and political crises)?"

(Nguyen Ban, 24) "A happy stable family takes care of each other…we all overcome together. We have a solid base to stand on… The Vietnamese are very flexible, adaptable to the situation. They are resilient; in the hard time they are unified and come together in a community to fight against the enemy…"

(Le Minh Viet, 68): Resilience, without the ability to adapt under circumstances, we wouldn't have survived the Chinese domination, the French, and all the wars over the centuries. Circumstances shape the attitudes, the emotions, and the behaviors. All of us are used to war situation and became acclimated so it minimizes trauma."

Notice that while both interviewees stress the adaptability of the Vietnamese, the younger Nguyen seems focused on how Vietnamese people might react in some future conflict—Nguyen did not live through wartime. The older Minh did experience the war, and talks more about how the past affects his culture now. This kind of detailed information is only possible in a case study style of research. Mere observation would not provide the answers to Lambright's questions.

Interview Questions:

1. What about your culture explains its resilience during sustained disruption (such as war, famine, social and political crises)?
2. What lessons have been learned as a result?
3. How have these lessons been integrated into the current society?
4. Can you share some examples of adjustment to the turmoil, examples known within your area of expertise or with which you are personally familiar?
5. Can you give examples of maladjustment known within your area of expertise or with which you are personally familiar?
6. In thinking about your answers, what do you see as being particular to the Vietnamese culture that explains your response to the above questions?
7. Is there anything else you would like to add to this interview?

Lambright, L.L. (2003) Paper presented at International Conference, Midwest Institute for International/Intercultural Education, Cleveland, Ohio, April.

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Lecture/Discussion: Correlations and Causal Relationships

There seems to be a general human tendency to attribute causality to correlated events. The layperson, like the psychologist, often imposes patterns of (apparently) lawful regularity on observed events. Given what is perceived as an "effect," we search for causes. Events are more likely to be singled out for attention and analysis when they are unusual, anomalous, and discontinuous with our prior experience. When such events are natural phenomena, they are typically relegated to the status of "cause" and then the search is directed toward their aftereffects.

One of the most persistent instances in which pseudo-correlations of behavior consequences are reported to flow from salient natural and human events is the "baby boom" syndrome. For example, the allegation of increased births nine months after a major power blackout in New York is well known. So too, is the baby boom in Israel nine months after their war with Egypt.

Invariably, when base rate data are used to compare the assumed “increase in births,” the effect vanishes. That is, when seasonal fluctuations in births are taken into account, there is no unusual effect left to relate to the nine-months-earlier unusual event. But that does not deter the correlation seekers. Three University of North Carolina sociologists attributed a 1955 drop in Southern birth rates to the Supreme Court’s 1954 school desegregation decision (Rindfuss, Reed, & St. John, 1978). They theorized that uncertain prospects for the future “demoralize” prospective parents (both whites and, to a lesser extent, blacks), causing them to postpone any children they might otherwise have conceived in the three- or four-month period immediately following the decision. The subsequent recovery in the birth rate is attributed to the realization that desegregation would in fact proceed slowly.

And on it goes. Less than a week after Chicago’s “Blizzard of ’79,” at least one newspaper columnist was speculating on the possibility of a baby boom in the coming autumn (Kup’s column, *Chicago Sun-Times*, January 17, 1979, p. 52).

Another example of the temptation to confuse correlation with a causal connection is in the area of extramarital sexual affairs. Biracree (1984) found that for men there was an almost perfect positive correlation between annual income and the percentage of men who had been unfaithful to their wives. This relationship was not true for married women. If this finding is valid, what are the possible explanations for these relationships? Is there any strong evidence to support any of these explanations, or are they, at the moment, speculations?

Biracree, T. (1984). *How you rate: Men* and *How you rate: Women*. New York: Dell.
Rindfuss, R. R., Reed, J. S., & St. John, C. A. (1978). A fertility reaction to a historical event: Southern white birthrates and the 1954 desegregation ruling. *Science, 201*, 178–180.

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Lecture/Discussion: Independent and Dependent Variables

In the cereal and fruit example, the cereal and the fruit are independent variables and the rash is the dependent variable. One useful way of thinking about and identifying independent and dependent variables is to remember that the basic hypothesis underlying any experiment is “X causes Y” (coloring a movie [X] changes the way people respond to it [Y]; a cereal [X] caused a rash [Y]; a fruit [X] caused a rash [Y]). To test such hypotheses, X is manipulated in order to determine its effect on Y. Thus, X is the independent variable and Y is the dependent variable. Advise students that, when trying to identify independent and dependent variables (as might happen in the context of an exam question), they should put the variables in the scenario into an “X causes Y” statement.

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Lecture/Discussion: The Placebo Effect

The power of suggestion is powerful indeed. Consider the example of the placebo effect. During the 1950s, surgeons routinely performed a simple operation to relieve chest pain suffered by patients with angina pectoris. An amazing number of the patients—nearly 90 percent—reported relief from pain. An experimental study divided angina patients into two groups and informed them that they were going to have an operation that had a very high success rate in relieving angina pain. The actual surgery was performed on only half the patients. What was done with the other half would no longer be allowed according to ethical medical standards. The surgeons took the remaining half of the patients, put them under anesthesia, made the surgical incision in their chests, and then simply sewed them up again. When the patients awakened in the recovery room, they were told that the operation had been performed (Cherry, 1981). The patients who had the sham surgery did even better than the patients who had undergone the actual operation! Their pain had been relieved simply by the power of suggestion. Remind students of the aspirin study and ask why the researcher included a placebo.

Cherry, L. (1981, September). Power of the empty pill. *Science Digest,* 116, 60–67.

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Lecture/Discussion: The Road from Hypothesis to Conclusion

How do we know that cigarette smoking is dangerous to your health?

Cigarette smoking became common in Europe after French and British soldiers picked up the habit from Turkish soldiers in the Crimean War of 1854 to 1856. The habit was adopted by a few Americans in the next 30 or 40 years. The tobacco was strong and they rolled their own. More American males began to smoke after the automatic cigarette-making machine was perfected in North Carolina in the 1880s. Very few women smoked, at least in public, until after World War I when U.S. tobacco companies began to target women with their advertising.

People must have suspected that cigarettes are dangerous to health long before any research was done. The slang term for cigarettes, “coffin nails,” was used during the first half of the century.

The conjecture became a hypothesis when doctors noticed that many people who died of lung cancer had been heavy smokers, and it was also suspected that nicotine affects the circulatory system. Early studies produced high negative correlations between cigarette smoking and age at death: the more people smoked, the younger they were when they died.

This correlational data resulted in the first warning labels on cigarettes in the 1960s: “Caution: The Surgeon General has determined that cigarette smoking may be hazardous to your health.” Notice that the warning reads “may be hazardous,” rather than “is hazardous.” The conservative warning is all that is justified by correlational data. A relationship between variables does not imply that the variables are causally related. The earlier death of smokers could be for reasons other than cigarette smoking. Perhaps smokers live more stressful lives, and both the smoking and their illness are the result of stress. Also, it is possible that smokers are not as careful of their health in other ways as nonsmokers; maybe they don’t exercise or have nutritious diets. Or

perhaps both the smoking and the mortality have a genetic basis.
To do a definitive experiment on the effects of smoking, one would need to get a sample of 100 or so young people who have never smoked and assign them randomly to a smoking group and nonsmoking group. The smokers would smoke at least one package of cigarettes a day for life, beginning at age 16 or 18, and the nonsmokers would not smoke at all. The dependent variable is age at death, and the successors of the original researchers could not analyze the data until all the subjects died. If the nonsmokers lived significantly longer, the researchers would be justified in concluding that cigarette smoking *is* hazardous to health.

An experiment like this has not been done, and probably never will be done. In the 1970s the label on cigarette packages was changed to read, "Cigarette smoking is dangerous to your health." The evidence that prompted this change came from several sources. One source was studies that tried to match smokers and nonsmokers on various alternative causes, such as stress, and thus to control for its effects on health. Another source of evidence came from animal studies. The conclusions that cigarettes are truly "coffin nails" is based on large amounts of data and a multitude of studies.

Many studies were required to get from a hypothesis to a firm conclusion in the establishment of a causal link between smoking and disease and death. The reason is that there are humane and ethical constraints that rule out certain types of research. Because humans are the primary focus in psychology, it is often difficult for us to get answers to important questions. As just one example of this, we would like to know if child abuse has permanent effects on personality, and if so, what these effects are. But we cannot assign infants at birth to be abused or not abused, so to study this question we must try to tease out these effects from the mass of environmental variables that affect the development of human personality.

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Lecture/Discussion: An Experimental Example

Can vitamins increase IQ?

Suppose you hear about a boy with an intellectual disability who did better schoolwork after being given a dose of a vitamin-mineral supplement, and you decide to conduct an experiment to see if intellectual functioning of children with intellectual disabilities can really be improved by such a diet supplement. You start with the hypothesis, "A vitamin-mineral supplement (independent variable) added to the diet of children with intellectual disabilities will improve their intellectual functioning (dependent variable)."

Your first task is to define your variables more precisely. What vitamins and minerals will you use, and at what strength? How many times a day and for how many months? You may decide to use an IQ test score as a numerical measure of your dependent variable; you may also decide that you will require a minimum increase in the number of points as acceptable evidence of improvement, because many chance factors can influence test scores.

You draw your subjects from a group of children who have all been tested and diagnosed as having an intellectual disability, and you randomly assign them to either the experimental group,

who will get the supplement, or the control group, who will be given a placebo (some inert substance) instead of the supplement.
There are several precautions you will need to take to avoid bias in your results. Besides controlling for similarity of your two groups at the start, you will want to be sure that the subjects in both groups are exposed to all the same conditions during the experiment except for the exposure to the independent variable, the nutritional supplement. Temperature, timing, instructions, conditions of testing, and other events during the time of the experiment should be as similar as possible for the two groups.

Your own desires to prove or disprove the idea that vitamins may increase school performance may be a possible source of bias. To reduce this bias, would you conduct a single-blind or double-blind experiment?

For a fixed period of time, say four months, the children in the experimental group receive the supplements in tablets at each meal. The control-group children also receive tablets, but they contain nothing of biological value (a placebo). Neither the children nor those working with them or testing them know which child is getting which kind of tablet. At the end of the four months, intelligence tests are given again to see if the groups now differ.

You may find that both groups have higher scores than originally, perhaps from all the extra attention they have been receiving or from some natural development over this period. So you use the control group's scores as a baseline and compare the experimental group's scores with that baseline.

If you find no difference, the study may end there, or you may try variations, perhaps a stronger supplement or a longer time period or subjects with milder intellectual disabilities.

If you do find a difference in your original study, you will evaluate the probability that your obtained difference could have occurred by chance alone, even without the independent variable. If it is unlikely that it is a chance finding, your confidence in the hypothesis is increased.

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Lecture /Discussion: A Historical Perspective on Research Ethics

When discussing the ethical treatment of human research participants, several "classic" studies, which would be ethically questionable by today's standards, serve as examples. For instance, many instructors discuss Stanley Milgram's studies of obedience, Philip Zimbardo's prison simulation, or Stanley Schachter's studies of autonomic arousal and attribution. Students often have mixed reactions to these examples. Some find them relatively innocuous, whereas others have strong reactions to the treatments participants were asked to endure. The fact that such studies took place within relatively recent times compounds the issue. Some students see these 1960s experiments as "long ago and of a different time," whereas others see them as examples of the "unethical treatment psychologists still foist on people to this day."

To provide a context for these types of issues, your students might be interested in hearing about older examples of ethically questionable research. For example, Carney Landis, a noted psychologist of the 1920s and 1930s, conducted a series of studies dealing with the experience and expression of emotion. In one set of studies he was particularly interested in capturing facial expressions of emotion, and used strong elicitors of emotion to produce them. For example, one situation involved dropping a lit firecracker underneath an unsuspecting subject's chair, whereas another involved showing participants pornographic (for their day) photographs and photos of horribly disfiguring skin diseases.

Although these manipulations may seem harsh, Landis used stronger ones as well. For example, participants were instructed in one situation to plunge their hand into a pail of shallow water that, unbeknownst to them, contained 3 live frogs. (This manipulation was presumably used to evoke disgust.) To quote Landis, however..."After the subject had reacted to the frogs the experimenter said, 'Yes, but you have not felt everything yet, feel around again.' While the subject was doing so he received a strong...shock from an induction coil, attached to the pail by concealed wiring."

And for the *coup de grâce*:

> "The table in front of the subject was covered with a cloth. A flat tray and a butcher's knife were placed on the cloth. A live white rat was given to the subject. He (sic) was instructed, 'Hold this rat with your left hand and then cut off its head with the knife.'...In five cases where the subjects could not be persuaded to follow directions the experimenter cut off the head while the subject looked on."

Mention is also made of a final experiment involving shock which "...varied from a just noticeable intensity to a strength which caused the subject to jump from the chair," as well as other studies. Landis' participants, in passing, included graduate students, a stenographer, a school teacher, and a thirteen-year-old boy with high blood pressure.

Although Landis has been singled out for examination here, there certainly is no lack of experiments from the 1920s through the 1960s work mentioned above that can provide examples of ethically dubious research. Discussing such studies, especially in light of current APA standards, should produce spirited discussion among your students.

Landis, C. (1924). Studies of emotional reactions II: General behavior and facial expression. *Comparative Psychology*, *4*, 447-509.

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Lecture/Discussion: Is There Privacy in a Public Restroom?

In an infamous study of the correlates and consequences of invasion of personal space, Middlemist and colleagues measured latency to urinate and urination duration among men in public restrooms. In a pilot study, men designated as "subjects" were covertly observed urinating in a public restroom. Results indicated that onset of urination correlated negatively (r =.315) with the distance between the subject and another male using a nearby urinal. When only 1 urinal separated the men, mean latency of the subjects to urinate was 7.9 seconds; when

3 or more urinals separated the men, the latency was 5.7 seconds. Subsequently, an experimental study was carried out. Using a bucket and mop as props, urinals in a college restroom were blocked. Subjects were forced either to urinate at a urinal adjacent to a confederate or at a urinal separated by an “out-of-order” urinal between the two men. In a third control condition, no confederate was present. The subjects were observed and timed covertly by means of a “periscope” hidden within and monitored from a stall. Results revealed mean latencies to onset of urination of 4.9, 6.2, and 8.4 seconds within the control, moderate, and close distance groups. No subjects were ever informed that they had participated in a study. Clearly then, there was no attempt to obtain informed consent and no debriefing provided. Students may want to consider what possible harm could have resulted from such a study. Did subjects have a reasonable expectation of privacy in such a public setting? Could such a study have been done without the deception of the “secret recording”? Could such a study be carried out today? A complete version of the article may be found online by placing the following terms in your search engine: “Middlemist 1976 study Journal of Personality and Social Psychology.”

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Lecture/Discussion: Oscar the Deathcat: A Case of Illusory Correlation?

Historically, a number of superstitions have been associated with cats. For a brief summary, see the website of the Committee for the Scientific Investigation of Claims of the Paranormal (http://www.csicop.org). Type “black cat” into the search box.

During the summer of 2007, the story of “Oscar the Deathcat” hit the Internet. The story originated in an article written for the *New England Journal of Medicine* (and also in *Slate Magazine*). It is possible that Oscar can predict the deaths of the elderly and infirm, but extraordinary claims such as this require extraordinary evidence. Students should consider one additional causal mechanism: That Oscar the Deathcat is another superstitious belief due to an illusory correlation. The issue of Oscar may be addressed with reference to the “Great Fourfold Table of Life” presented in the text. Note that although the article on Oscar was published in the *NEJM*, it was NOT a peer-reviewed article! Students may want to consider the degree to which the *Journal*’s prestige and the author’s professional status conferred credibility to the story of Oscar. The original *NEJM* and *Slate* articles links are listed here; a link to a video presentation on Oscar is listed in the Media Resources section.

Dosa, D. M. (2007). Perspective: A day in the life of Oscar the cat. *New England Journal of Medicine 357,* 328–329.
Engber, D. (2007). The cat who knew too much: A dose of sentimental claptrap from the New England Journal of Medicine. *Slate,* August 1.

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▼CLASSROOM ACTIVITIES, DEMONSTRATIONS, AND EXERCISES

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Activity: Estimating the Frequencies of Our Own and Others’ Behaviors

To demonstrate availability-related biases in estimating frequency, you can use this demonstration, which is an adaptation of a paradigm used in a study by Messick et al. (1985) titled “Why We Are Fairer Than Others.” Ask students to take out a piece of paper and say: “On this sheet of paper, please write as many things that you can think of that you do, or that other people do, that you would describe as *inconsiderate.* If you think that you do these things more often than others, begin the sentence with “I.” If you think that others do these things more often than you do, then start the sentence with “They.” You will be given 3 minutes for this task.”

After 3 minutes, ask them to turn the paper over and say: “On this side, please write down as many things that you can think of that you do, or that other people do, that you would describe as *considerate*. If you think that you do these things more often than others, begin the sentence with “I.” If you think that others do these things more often than you do, then start the sentence with “They.” You will be given 3 minutes for this task.”

Students should tend to associate others with inconsiderate behaviors and themselves with considerate behaviors, something Messick and colleagues call the “differential slope model.” Also, students may tend to use frequency modifier words such as *sometimes* with respect to their own inconsiderate behaviors, and *always* when referring to others’ inconsiderate behaviors. Discuss why others’ negative behaviors are more memorable and therefore more available. Conversely, students may consider why their own considerate behaviors are more memorable. They may also be asked to consider the implications of this difference in availability for over (and under) estimating good and bad behaviors.

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Activity: Experimental Design

The overarching goals of the following exercise are to demonstrate how psychology and the scientific method can be used to address issues that interest your students, to teach them how the concepts they are learning influence experimental design, and to impress on them an appreciation for the challenges faced by experimental psychologists. Lead your class through the process of designing an experiment. Start with a hypothesis generated through brainstorming by the class. Allowing your students to provide the hypothesis ensures that it will interest them and that they will stay engaged. Students may start with topics such as alien abduction, crop circles, and the Loch Ness monster. Welcome this, as it gives you a terrific opportunity to talk about alternative explanations, existence proofs, and the fact that some topics, such as the proof of the existence of God, remain firmly outside the boundaries of science. The scientific method is not a panacea; it is a highly structured method for testing measurable factors and relationships. After your class has agreed on an issue to test, lead them toward a consensus and a testable hypothesis about the issue. Once your class has clearly defined a hypothesis, lead them through a discussion of possible alternative explanations. Challenge their hypothesis and their beliefs. Are there other possible explanations that are simpler and more likely? What assumptions and possible biases underlie their hypothesis? How would the hypothesis (and their assumptions and biases) generated by your class be different than explanations put forward by people from different cultures and different times? You might want to mention that spirit possession was a widely held explanation for mental illness until relatively recently. After listing a number of possible alternative explanations, allow your class to suggest a very basic methodology for testing the hypothesis and eliminating the alternative explanations. You might want to give them a head start by suggesting the kind of data that they would need to collect to measure the variables of interest. Depending on the hypothesis chosen and the sophistication of your class, outlining a reasonable experiment may be a difficult process. If the class begins to show signs of overload, you can quickly switch gears and use the exercise to demonstrate the difficulty in designing and executing well-controlled experiments.

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Demonstration: Equating Groups on Multiple Variables Using Randomization

An interesting demonstration of randomization is described in an article by Enders, Laurenceau, and Stuetzle, titled “Teaching Random Assignment: A Classroom Demonstration Using a Deck of Playing Cards.” The article is published in *Teaching of Psychology*, (2006), volume 33, No. 4, pages 239–242. The authors describe a simple strategy in which students “randomly assign” cards to two groups. The two groups of card/subjects are then compared with respect to the frequency of specific characteristics such as the number of face cards, red cards, etc. This will help students see how random assignment helps equate groups on characteristics beyond those the experimenter has in mind. Two packs of cards may also be used.

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Activity: Identifying the Parts of an Experiment

To help students learn to identify the components of an experiment, **Handout Master 2.1** presents the abstract from a recent article from the *Journal of the American Medical Association* on an issue of some interest to many: Smoking cessation. The abstract is dense, but the independent and dependent variables are clear, along with the treatment and placebo. It is interesting to note that side effects are also reported within the placebo group. Students may suggest possible explanations for this “nocebo” effect.

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Activity: Can Science Answer This Question?

Students are asked to identify whether specific questions can be addressed using the methods of science. The student handout is included as **Handout Master 2.2.** Suggested answers and explanations are listed below.

1. No. The question as stated is vague and the terms are not defined. What does “bad” mean? (Good and bad are value judgments.) Who or what is “society”? Bad for whom? However, specific correlates and consequences of abortion can be studied.
2. Yes. The independent variable would be “before or after eating” and the dependent variable would be talkativeness, which could be operationally defined (e.g., as the length of replies to questions).
3. Yes, so long as the variables are operationally defined. The independent variable would be jogging versus not jogging (or perhaps the frequency or duration of jogging); the dependent variable would be some measure of mental attitude, such as scores on a psychological test.
4. Yes. This question requires only the computation of a correlation between doctors’ GPAs in medical school and their subsequent incomes. Such variables as “years in practice” would have to be controlled and a representative sample would have to be selected.
5. No, probably not; it would be a little like comparing apples and oranges. Physiological measures of emotional strength would not be useful because there is not always a relationship between physiological arousal and subjective experience, and because love tends to be a more enduring emotion than anger.
6. Yes. The independent variable would be “bottle-fed versus breast-fed.” The dependent variable would be alertness, which would have to be operationally defined in behavioral terms. If babies were randomly assigned to the two groups, the study would be an experiment. If the researcher used babies whose mothers had already made the decision about feeding method, the study would be correlational, and inferences about cause and effect could not be made.
7. No. “Moral” is a broad, vague term that means different things to different people. Moreover, many unanticipated economic, political, and social developments could affect the outcome. Even if “moral” could be defined adequately, and projections from current trends and conditions could be made, the results might turn out to be meaningless, because definitions of morality change over time. What is “moral” in the 1990s might not be moral in 2020, and vice versa.

8. No. The subjects would be very uncooperative!

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Assignment: Observational Research in the Dining Hall

Koschmann and Wesp (2001) provide several research activities for observational research, correlational research, and experimental research. One way to introduce students to research methods is to allow them to become more cognizant of their everyday surroundings and fellow classmates' behaviors. Koschmann and Wesp suggest that the college or university dining hall is an excellent "laboratory" to observe human behavior. Merely ask students to observe others during meals in the cafeteria, such as seat selection or food choices. You might encourage student research teams to decide which behaviors they wish to observe. Ask students to record their observations, maintain confidentiality, and "debrief" anyone who asked them what they were doing. During the next scheduled class, ask students to share their findings and to generate discussion about potential hypotheses that may provide a better understanding of the behaviors they observed.

Koschmann, N. & Wesp, R. (2001). Using a dining facility as an introductory psychology research laboratory. *Teaching of Psychology, 28*, 105–108.

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Assignment: Naturalistic Observation

Objective: To collect data on spatial relationships
Materials: None
Procedure: Assign students to small groups of four or five individuals. Ask each to collect data on personal space in two distinct social situations, perhaps the student union building or other public areas on campus and a situation such as a party, a bar, or another area where individuals are talking. Ask the students to estimate the distance that individuals stand apart when they talk in this public area, noting any differences between same sex and opposite sex individuals. Encourage students to be creative in their data collection; for example, they could approach the participants with a yardstick, or they could count the number of tiles on the floor. Students will come up with their own ideas on the best methods of data collection. When students bring their data to class, summarize each group's findings in terms of the mean distances individuals stand apart while talking and put the results on the overhead or chalkboard. Break out the data by sex and situation. Discuss any problems the students encountered with this type of data collection.

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Activity: Understanding Correlations

This exercise on correlations can be used as a classroom demonstration or as a take-home assignment following a lecture on the nature and uses of correlations. The student handout for this exercise is included as **Handout Master 2.3.** Suggested answers are provided below; however, there are other reasonable explanations.

1. *Positive*. Mutual influence. Similar life experiences.
2. *Negative*. Orphanage environment has an adverse effect on cognitive development. Intelligent children are more likely to be adopted.
3. *Positive*. Violent pornography stimulates violent behavior. Both the violent crime and the number of stores are related to the size of cities. Violent criminals are attracted to violent pornography.
4. *Negative*. Absent students miss pearls of wisdom from the mouth of the instructor. Students with jobs or other responsibilities find it difficult both to get to class and to find time to study.
5. *Positive*. The money appropriated to control crime was poorly spent. The city grew during the eight years, resulting in more crime and more tax revenues.
6. *Positive*. Both variables are related to socioeconomic factors; children from affluent homes have both intellectual and physical advantages over children from substandard home environments. Age is the third variable that accounts for scores on both variables; older children have bigger vocabularies and are also stronger and better coordinated.

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Activity: Correlational and Experimental Research

Many students have difficulty understanding the difference between correlational research and experimental research. It might be useful to walk the class through an example where both kinds of research are illustrated with the same variables. Two examples that could be used this way are the relationship between violent television viewing and aggression, and the relationship between similarity and liking. In both examples either variable could plausibly be caused by the other (or by some third factor); so the step up from correlational to experimental research, where causality can be determined, can be seen as useful. Spend some time discussing how psychologists must be ingenious to turn concepts such as “liking” into measurable variables (this will help students appreciate the scientific process). As examples, you can present actual studies that have been done in these two areas. Byrne (1971) discusses extensive research on the influence of similarity on attraction, and Liebert and Sprafkin (1988) discuss the effects of television on children.

Byrne, D. (1971). *The Attraction Paradigm.* New York: Academic Press.
Liebert, R., & Sprafkin, J. (1988). *The Early Window: Effects of Television on Children and Youth.* New York: Pergamon Press.

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Activity: Testing Random Assignment (Group activity)

Students are often distrustful of random assignment, thinking that the people with the best memory or the worst sense of smell will all end up in the same group and make the results of research undependable. This demonstration is designed to show that random assignment does produce equivalent groups.

Provide students with small cards and have them record their height in inches on the card. If the class is small, ask them to record the height of their best friend on a second card. Collect the cards and then randomly assign them to several groups of 20. Have students calculate means for the groups.

The means should be quite close, illustrating that random assignment has produced equivalent groups. You might also explain that random assignment is not infallible and can be a source of experimental error.

This activity can be extended by using groups of different sizes, such as 2, 5, 10, 20, and 50, to show that the probability of getting groups that are not equivalent decreases as group size increases.

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Activity: Small Samples

Objective: To discover if small samples can really be representative
Materials: A coin, copies of the chart in **Handout Master 2.4**
Procedure: Sometimes students have a hard time believing that 1,000 people or so can represent the entire population of the United States. This activity will help them see that small samples can be representative. Divide students into small groups and instruct them as follows:

Point out to students that, as *n* gets bigger, the more balanced the percentage of heads and tails becomes. However, they should notice too that *n*=20 isn't much better than *n*=15. And it took a lot longer to collect 5 samples of 20 coin tosses each. In other words, there wasn't much gain in representativeness for the extra cost in time and energy. So, small samples can be representative, and increasing the size of a sample doesn't always pay off when costs are balanced against benefits.

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Activity: Which Method Would You Use?

The following examples can be used to generate a class discussion on the research methods used by psychologists. Write the methods on the board: case histories, naturalistic observation, laboratory observation, surveys, tests, correlational studies, and experiments. Then, for each situation, ask students to decide which method is appropriate and briefly describe why.

1. Determining the favorite food of adolescents.
   Method: Survey
   Explanation: Adolescents constitute a large population and the information sought should be accessible through questionnaires or interviews. Care will be needed to construct a sample that is representative of the population under consideration.
2. Determining whether a person is introverted or extroverted.
   Method: Psychological test
   Explanation: The goal is to measure psychological qualities within an individual. Other methods (e.g., case history, naturalistic observation) might be employed, but they are more time-consuming and do not offer the degree of standardization, reliability, and validity found in a well-constructed test.
3. Determining if frustration causes aggression.
   Method: Experiment
   Explanation: Cause-and-effect information is being sought. In science this information is obtained through experimentation in which the proposed causal variable is manipulated under controlled conditions.
4. Determining if level of education is associated with crime.
   Method: Correlation
   Explanation: This technique is used to determine if and how strongly two variables are related. Establishing that a correlation exists, however, does not address the problem of why two things are related.
5. Determining how teenagers behave on their first date.
   Method: Naturalistic observation
   Explanation: A description of behavior as it occurs in a real-life situation is being sought. Making the observations without arousing suspicion in subjects could be problematic, and the investigator will need to be careful to prevent “guinea-pig” reaction.
6. Determining the behavior of subjects who are anxious about participating in research.
   Method: Laboratory observation
   Explanation: The goal here can be readily achieved within an environment artificially set up by the experimenter. The advantage of this approach is that the investigator has greater control over the situation being studied.
7. Determining why a housewife gave up a flourishing career.
   Method: Case history
   Explanation: Making this determination requires in-depth information about the way a variety of psychological factors, expectations, values, motives, past experiences, and so forth, blend together within the person. This kind of information is unique to the person and could not be assessed through standardized tests.

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Activity: Name That Research Method

In this exercise, students are asked to match brief descriptions of research with the name of the method being used. Copy **Handout Master 2.5** and distribute to students as a basis for this exercise.
Answers: 1-c, 2-a, 3-e, 4-f, 5-d, 6-b.

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Activity: Using Memory to Demonstrate Methodology

This demonstration introduces the concept of the experimental method; however, it is equally applicable to the material in the memory chapter. Students are given the question "Can we improve memory by using a mnemonic technique?" and are asked to design an experiment to test the hypothesis. The experiment is then conducted using procedures summarized below. Through this procedure, students are guided through a typical psychological experiment and are introduced to the concepts of independent variable, dependent variable, experimental and control groups, and control procedures.

Prepare a mnemonic technique and write it on small slips of paper to hand to some of the students (half of the class). Construct a list of common words to use in conjunction with the mnemonic. Here is one of many mnemonic techniques:

PRESIDENTIAL

Word List: Pet, Road, Eagle, Screen, Ink, Dog, Envelope, Number, Target, Income, Alley, Library

Begin a discussion of the experimental method by asking for definitions of a hypothesis. After discussing the students' definitions tell them that they are going to conduct an experiment in class and provide them with the question above as the hypothesis. After defining mnemonic techniques, inform the class that you have a mnemonic technique but need to know how to proceed from this point. Students are asked for input as to how to test the hypothesis. Usually someone proposes that the class be divided into two groups: one that receives the mnemonic and one that does not. Ask how the students should be assigned to each group. This leads us to a discussion of random assignment.

The experiment begins by passing out the slips of paper with the mnemonic to the "experimental" group. All students are then given the following instructions: "I am going to read a list of words; when I'm finished I want you to recall as many words as you can IN THE SAME ORDER AS THEY WERE READ." Tell the experimental group how to use the mnemonic: "The letters of the word correspond to the first letter of each word in the list, so you can use the word to help you remember the order of the words in the list."

Read the list of words, pausing about 4 seconds between words. Then tell the students to write down as many words as they can remember in the same sequence as they were read. Allow about three minutes of recall time, then ask the students to correct their own paper and tabulate the results on the board. This demonstration typically yields a large difference between the two groups. If desired, you can initiate a discussion of statistical inference and perhaps conduct some preliminary analyses. Discuss how the results pertain to the original hypothesis.

Adapted from Davis, S. F., & Palladino, J. J. (1994) *Interactions: A newsletter to accompany Psychology*, *1(Win)*, 1.

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Activity: Give the Doctor Some Advice

This exercise describes research on the effects of drinking and driving. However, this study is flawed and students are asked to suggest ways to correct the errors. Copy **Handout Master 2.6** and distribute to students as a basis for this exercise.

Suggested answers:
1. e
2. Possible confounding variables:
   - The vodka and the placebo should be mixed in equal amounts of orange juice.
   - Subjects should be chosen randomly and also assigned randomly to the different groups. (The same amount of alcohol affects males and females differently.)
   - The researcher should not select friends, colleagues, or his own students as the subjects for this research, or any research, because of possible experimenter expectancy and demand characteristics.
   - The subjects should participate at the same time of day since their last meal can determine how potent the effects of alcohol can be.
   - Informed consent should be obtained before the research, not after.

Given these many possible confounding variables, Dr. Moesteller should be more cautious in his conclusions.

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Activity: What Do Journals Look Like?

Scientific journals and peer review are essential to the field, but even after they are fully described, may seem remote and abstract to students (especially when they have just entered college). Bring relatively recent journal issues to the class, pass them around and ask students to examine the tables of contents for articles that address issues that seem personally interesting to them; ask them to read the titles out loud to the class. Journals from the Association for Psychological Science are excellent for this exercise because they address diverse issues in psychology. The exercise is useful for demonstrating that psychological journals present findings that are of wide relevance and interest.

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Activity: Wonder Horse Dials 911 to Save Boy's Life

Jane Halonen suggests a fun class exercise that tests students' understanding of experimental methodology principles. Once you have covered the basics of correlation, experimentation, and causal inference, challenge your students to apply these principles by examining the outrageous claims made in tabloid headlines, many of which imply a causal relationship (e.g., dreaming in black-and-white improves your sex life; garlic diet improves memory...but not breath; large gopher presence precedes volcano eruptions). For this exercise, bring in a variety of headlines from the *Star*, *National Enquirer*, *Weekly World News*, *Globe*, etc. that are psychology-related and causal-sounding (or ask students to bring in examples). Challenge students to design simple studies that will accurately test whether or not the relationship claimed in the headline is a valid one. Halonen reports that students enjoy the opportunity to "think like scientists" in response to humorous and outrageous claims and that this exercise helps stimulate them to scrutinize causal claims from all sources and to design experiments more carefully and creatively (and, if that isn't enough, they can practice their newfound skills in line at the grocery store)!

Halonen, J. S. (1986). *Teaching critical thinking in psychology*. Milwaukee: Alverno Productions.

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Activity: Softens Hands While You Do Dishes

A variation of the tabloid exercise suggested above encourages students to apply experimental principles to claims they are bombarded with on a daily basis—television and magazine advertising. For this exercise, bring in (or have your students bring in) samples of advertising and have students critique the product claims of success according to principles of experimental methodology. Ads can be critiqued on several grounds, including the problem of personal testimony as unreliable, the absence of a control or comparison group, the presence of extraneous variables, the presence of plausible alternative explanations, unclear or undefined variables, and a lack of supporting statistics. Jane Halonen reports that students become enthusiastic about the usually dreaded topic of experimental methodology when they realize it has the potential to make them smarter consumers.

Halonen, J. S. (1986). *Teaching critical thinking in psychology*. Milwaukee: Alverno Productions.

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▼WRITING ASSIGNMENTS

Writing Assignment: Observation and Inference

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Activity: Observation and Inference

Naturalistic observation is important as a research method as is critical thinking in psychology. Jane Halonen suggests an excellent exercise that incorporates both of these ideals. In this assignment, students are asked to test their critical thinking and observation skills by assuming the identity of detective Sherlock Holmes. The basic premise is that Sherlock Holmes has carefully examined one of the student's personal environments (e.g., home, work, car, health club) and is attempting to find and meet the student based on clues derived from his investigation. Students are asked to write a short paper that consists of the letter that Sherlock Holmes might write to Dr. Watson describing his pursuit in detail, including the reason for it and the specific elements from the environment that justify his leads. This exercise should be assigned after you have talked about naturalistic observation and inference, and Halonen suggests that students' read Webb and colleagues' (1981) excellent chapter on physical evidence in their *Nonreactive Measures in the Social Sciences*. According to Halonen, students react enthusiastically to this assignment, as they enjoy the opportunity to disclose information about themselves as well as to role-play the clever Holmes. Importantly, students' papers are typically thoughtful and reveal many instances of critical thinking, such as extensive observations, use of concepts from the Webb chapter (e.g., erosion, garbology), logical but purposefully inaccurate inferences to add humor, and attention to the ethical dilemma of exploring private environments.

Halonen, J. S. (1986). *Teaching critical thinking in psychology*. Milwaukee: Alverno Productions.
Webb, E. J., Campbell, D. T., Schwartz, R. D., Sechrest, L., & Grove, J. B. (1981). *Nonreactive measures in the social sciences,* 2nd ed. Boston: Houghton-Mifflin.

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▼HANDOUT MASTERS

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Handout Master 2.1

Identifying the Parts of an Experiment

Please read the following abstract (i.e., summary) of a recent article by Jorenby and colleagues that appeared in the *Journal of the American Medical Association* (July 2006). Identify the following:

1. Independent variable; describe the treatment in some detail.
2. Dependent variable; describe this outcome variable in detail.
3. Method of selecting participants.
4. Method of assigning participants to groups.
5. Hypothesis/Research question.
6. Outcome (i.e., results) of the study.

You may also want to consider the following question: Why would members of the control group also experience “side effects”?

Efficacy of varenicline, an alpha4beta2 nicotinic acetylcholine receptor partial agonist vs. placebo or sustained-release bupropion for smoking cessation: a randomized controlled trial.

CONTEXT: Varenicline, a partial agonist at the alpha4beta2 nicotinic acetylcholine receptor, has the potential to aid smoking cessation by relieving nicotine withdrawal symptoms and reducing the rewarding properties of nicotine.

OBJECTIVE: To determine the efficacy and safety of varenicline for smoking cessation compared with placebo or sustained-release bupropion (bupropion SR).

DESIGN, SETTING, AND PARTICIPANTS: A randomized, double-blind, placebo-controlled trial conducted between June 2003 and March 2005 at 14 research centers with a 12-week treatment period and follow-up of smoking status to week 52. Of 1,413 adult smokers who volunteered for the study, 1,027 were enrolled; 65% of randomized participants completed the study.

INTERVENTION: Varenicline titrated to 1 mg twice daily (n = 344) or bupropion SR titrated to 150 mg twice daily (n = 342) or placebo (n = 341) for 12 weeks, plus weekly brief smoking cessation counseling.

MAIN OUTCOME MEASURES: Continuous abstinence from smoking during the last 4 weeks of treatment (weeks 9–12; primary end point) and through the follow-up period (weeks 9–24 and 9–52).

RESULTS: During the last 4 weeks of treatment (weeks 9–12), 43.9% of participants in the varenicline group were continuously abstinent from smoking compared with 17.6% in the placebo group (odds ratio [OR], 3.85; 95% confidence interval [CI], 2.69–5.50; P<.001) and 29.8% in the bupropion SR group (OR, 1.90; 95% CI, 1.38–2.62; P<.001). For weeks 9 through 24, 29.7% of participants in the varenicline group were continuously abstinent compared with 13.2% in the placebo group (OR, 2.83; 95% CI, 1.91-4.19; P<.001) and 20.2% in the bupropion group (OR, 1.69; 95% CI, 1.19–2.42; P = .003). For weeks 9 through 52, 23% of participants in the varenicline group were continuously abstinent compared with 10.3% in the placebo group (OR, 2.66; 95% CI, 1.72–4.11; P<.001) and 14.6% in the bupropion SR group (OR, 1.77; 95% CI, 1.19–2.63; P = .004).

Treatment was discontinued due to adverse events by 10.5% of participants in the varenicline group, 12.6% in the bupropion SR group, and 7.3% in the placebo group. The most common adverse event with varenicline was nausea, which occurred in 101 participants (29.4%).

CONCLUSIONS: Varenicline is an efficacious, safe, and well-tolerated smoking cessation pharmacotherapy. Varenicline's short-term and long-term efficacy exceeded that of both placebo and bupropion.

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Handout Master 2.2

Can Science Answer This Question?

Psychology is an empirical science; that is, its knowledge is obtained through observation, experimentation, and measurement. Some questions cannot be answered empirically and are, therefore, outside the realm of science.

Decide whether scientific research can answer the questions below and respond “yes” or “no” to each question. Do not try to answer the question itself. Just say whether or not scientific research can, in principle, address the question. Briefly explain why each question is, or is not, a good candidate for scientific inquiry.

For the questions that can be studied scientifically, identify what the independent and dependent variables would be in the experiment.

1. Is abortion on demand bad for society?

2. Do people talk more after they have eaten than they do when they are hungry?

3. Does jogging lead to a positive mental attitude?

4. Are the incomes of doctors related to the grades they make in medical school?

5. Which emotion is stronger, love or anger?

6. Are breast-fed babies more alert than bottle-fed babies?

7. Will people be more moral in the year 2020 than they are now?

8. Are people who commit suicide sorry after they have done it?

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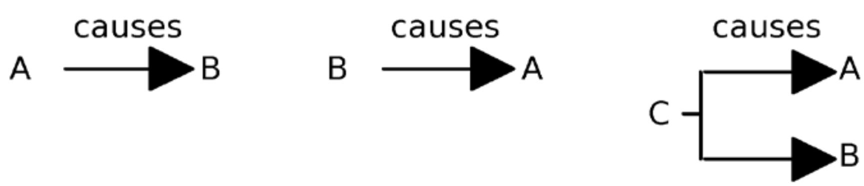
Handout Master 2.3

Critical Thinking Exercise: Understanding Correlations

Correlational studies show relationships between variables. If high scores on one variable predict high scores on the other variable, the correlation is *positive*. If high scores on one variable predict low scores on the other variable, the correlation is *negative*.

Showing that two variables are related does not justify claiming that a causal relationship exists. There may be a causal relationship, but other explanations usually exist. For example, the variables may be related because both have a causal relationship with a third variable.



For each of the correlational studies described below, decide whether the correlation is positive or negative and give two alternative explanations for each finding.

1. A study of married couples showed that the longer they had been married, the more similar their opinions on social and political issues were.
   Positive or negative?

   Explanation 1:

   Explanation 2:

2. An intelligence test was given to all the children in an orphanage. The results showed that the longer children had lived in the orphanage, the lower their IQ scores.
   Positive or negative?

   Explanation 1:

Explanation 2:

3. In a study of American cities, a relationship was found between the number of violent crimes and the number of stores selling violence-depicting pornography.

Positive or negative?

Explanation 1:

Explanation 2:

4. A college professor found that the more class absences students have, the lower their grade in the course tends to be.

Positive or negative?

Explanation 1:

Explanation 2:

5. A politician running against a candidate who had been in office for eight years pointed out that violent crime had increased steadily during those eight years even though the administration appropriated more and more money to fight crime.

Positive or negative?

Explanation 1:

Explanation 2:

6. It was found that elementary-school children who made high scores on a vocabulary test also tended to make high scores on a test of physical strength and muscular coordination.

Positive or negative?

Explanation 1:

Explanation 2:

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Handout Master 2.4

Small Samples

You probably know that when you flip a coin, the chance of getting a head or a tail is 50%. But this probability is based on an infinite number of coin tosses. But how well does tossing the coin twice represent the whole population of tosses, or the infinite number of tosses? If a sample of 2 tosses, or n=2 as a statistician would express it, doesn't represent the population, what about a sample of 5 or 10 or 15 or 20? To answer these questions, you have to take repeated samples of the same size. Toss a coin twice (n=2), and then write the number of heads and tails in the column labeled #1. Repeat the process four more times, recording your results the second time under #2, the third time under #3 and so on until you have a total of five samples, each of which consists of two coin tosses. When the n=2 row is completely filled in, calculate the overall percentage of heads and tails. Now use the same process to collect data on samples of n=5, n=10, n=15, and n=20.

Sample size	Toss #1		Toss #2		Toss #3		Toss #4		Toss #5		Overall %	
	H	T	H	T	H	T	H	T	H	T	H	T
n=2												
n=5												
n=10												
n=15												
n=20												

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Handout Master 2.5

Name That Research Method

Here are the major research methods used by psychologists. Match each with one of the following examples of research.

a. case history
b. naturalistic observation
c. laboratory observation
d. survey
e. psychological tests
f. experiment

1. Frank is a full professor who is interested in the factors that affect the performance of rats who are learning to find their way through a complex maze. Every afternoon he gives each of his 50 rats ten trials in the maze, counting the number of wrong turns each rat makes on its way through the maze.

2. Ben is counseling with Fennimore Jones in a small room in the neuropsychiatric hospital. Ben is a graduate student in clinical psychology and Fennimore is his client. Fennimore was admitted to the neuropsychiatric hospital when he came to the student health clinic complaining that he hears voices shouting obscenities at him, and confiding that he thinks he is going through a spontaneous sex change. After each session with Fennimore, Ben writes a report describing Fennimore's verbal and nonverbal behavior and his interpretations of the behavior.

3. Carl is a graduate student who plans to become a psychometrician. He, like Ben, is working at the neuropsychiatric hospital. His job is to administer a battery of tests to new patients. He will send the test results, along with his summary and interpretation of them, to the patient's clinical psychologist or psychiatrist.

4. Ada is testing the hypothesis that color preference can be influenced by associating a color with a pleasant experience, such as eating. This afternoon she is delivering a supply of red, yellow, blue, green, and white nursing bottles to the mothers of newborns who have consented to let their infants be subjects in her research.

5. Dee is an assistant professor who will teach introductory psychology for the first time next term. She has chosen some films to show to her class of more than 200 students, and is now preparing a questionnaire to administer to her students after each film. She thinks getting student reactions to the films will be helpful next time she teaches the class.

6. Ed is an undergraduate psychology major. For his senior thesis he is investigating the nature of the audience for pornography. This afternoon he is sitting in his car across the street from one of the pornographic bookstores in the area. He is taking notes on the sex, approximate age, and ethnicity of the patrons as they enter and leave the store.

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Handout Master 2.6

Give the Doctor Some Advice

Dr. Moesteller has long been interested in the effects of alcohol on human behavior. His latest experiment involved giving college students one of three kinds of drinks:

3 oz. of 100 proof vodka mixed with a standard size glass of orange juice,
2 oz. of 100 proof vodka mixed with a small glass of orange juice, or
3 oz. of a nonalcoholic but vodka-flavored substance mixed with a standard size glass of orange juice.

Dr. Moesteller recruited some of his subjects from the school's track team, which was easy because he is the assistant coach. He recruited the rest of his subjects from his introductory psychology class. Dr. Moesteller assigned the women on the track team to the 2 oz. vodka group, the men from his class to the 3 oz. vodka group, and the women from his class to the nonalcoholic group.

The women on the track team participated right after they finished practicing, and students from his class participated at various times during the day. After each group had a chance to drink the beverage, he had them sit in an automobile simulator where their task was to step on the brake every time they saw a red light.

Much to his surprise, the 2 oz. group showed slower reaction times to the red light than the 3 oz. group. The nonalcoholic group was the quickest to react. As soon as the experiment was over, he explained to the subjects the true purpose of the experiment and had them sign an informed consent form. From his analysis of the results, Dr. Moesteller concluded that drinking alcoholic beverages can slow reaction time for braking in college students who drive after drinking.

1. Based on his experiment, was Dr. Moesteller's conclusion correct?
   a. No, because he did not randomly select his subjects.
   b. No, because he knew some of his subjects better than others.
   c. Yes, because subjects in both experimental groups had slower reaction times than the control group.
   d. Yes, because his results agree with what we all know from our experience with those who drink and drive.
   e. No, because there were too many confounding variables in his experiment, including both a and b.

2. On the other side of this page, give Dr. Moesteller some advice on how he might improve his research on drinking.

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POWERPOINT SLIDES

PowerPoint Presentation (ADA Compliant) for *Psychology: From Inquiry to Understanding*, Fourth Edition (Download only) **(ISBN 10: 0134637674 and 13: 9780134637679).**

Image PowerPoint Presentation for *Psychology: From Inquiry to Understanding*, Fourth Edition (Download only) **(ISBN 10: 0134637623 and 13: 9780134637624).**

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Accessing Resources for Lilienfeld, *Psychology: From Inquiry to Understanding*

For a list of all student resources available with Lilienfeld, go to www.mypearsonstore.com, enter the text ISBN **(ISBN 10: 0134552512 and 13: 9780134552514)** and check out the “Everything That Goes with It” section under the book cover.

For access to the instructor supplements for Lilienfeld, *Psychology: From Inquiry to Understanding*, Fourth Edition, simply go to http://pearsonhighered.com/irc and follow the directions to register (or log in if you already have a Pearson user name and password).

Once you have registered and your status as an instructor is verified, you will be e-mailed a login name and password. Use your login name and password to access the catalogue. Click on the “online catalogue” link, click on “psychology” followed by “introductory psychology” and then the Lilienfeld, *Psychology: From Inquiry to Understanding*, Fourth Edition text. Under the description of each supplement is a link that allows you to download and save the supplement to your desktop.

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