The Science of Psychology

Brief Chapter Outline

I. The Four Major Research Perspectives
   A. Perspectives Emphasizing Internal Factors
   B. Perspectives Emphasizing External Factors

II. Research Methods Used by Psychologists
   A. Descriptive Methods
   B. Correlational Studies
   C. Experimental Research

III. How to Understand Research Results
   A. Descriptive Statistics
   B. Frequency Distributions

Detailed Chapter Outline

Psychology is the science of human behavior and mental processes, and psychologists attempt to understand all aspects of our observable behavior, such as speech and physical movement, and all aspects of our internal processes, such as thinking and remembering, which cannot be directly observed.

Introductory Class Activity: Course Overview
As an introductory activity for the first day of class, we have familiarized students with the course by asking them to indicate whether each of a series of 10 statements is true or false. Each statement corresponds to material covered in one of the textbook chapters. This activity works well using a student response system (“clickers”) because students can clearly see the typical lack of consensus on a “graph” screen after they submit their answers. If clickers are not available, you may also implement the activity by giving each student two index cards of different colors and asking them to hold up one color for True and another for False. We have provided the statements, answers, and page numbers corresponding to the answers at the end of this chapter of the Instructor’s Manual.

Scientific American Introductory Psychology Videos: The History of Psychology (9:30)
This video provides a great overview of the history of the field including major issues, “big questions,” and different perspectives. Narration is accompanied by photos of early researchers, interviews with prominent researchers, and memorable graphics to bring the text to life and put faces to names.
I. The Four Major Research Perspectives

All four perspectives are complementary; they fit together like the pieces of a jigsaw puzzle. No one perspective is more valid than any other, as each one provides information about behavior and mental processing.

A. Perspectives Emphasizing Internal Factors

1. In the biological perspective, physiological hardware (especially the brain and nervous system) is viewed as the major determinant of behavior and mental processing. From the biological perspective, the genetic and evolutionary bases of physiology are also important.

   For example, people become depressed for a variety of reasons. In the biological perspective, the focus is on the deficiency of activity of certain chemicals in the nervous system. To treat depression antidepressant drugs such as Prozac or Zoloft might be prescribed.

   Biological psychologists study the involvement of the various parts of the brain and nervous system on behavior and mental processing. For instance, although our eyes are in the front of our heads, vision is processed in the back of our heads.

2. The cognitive perspective emphasizes how mental processes, ranging from perception to higher-level processes such as problem solving and reasoning, operate and affect behavior.

   As an example, cognitive psychologists might study how people categorize information. More broadly, cognitive psychologists study issues related to memory and decision making such as retrieving previously learned information on an exam or solving a word problem.

   To take another example, many people report problems remembering other people’s names. Do they have bad memories, as they often claim, or have they not bothered to exert the mental energy required to encode other people’s names? Both explanations may have validity and would be of interest to a cognitive psychologist.

B. Perspectives Emphasizing External Factors

1. In the behavioral perspective, people behave as they do because of their history of conditioning by the environment. As discussed at length in Chapter 4 (Learning), there are two types of conditioning: classical conditioning and operant conditioning.

   a. Classical (or Pavlovian) conditioning can explain how people learn fear and other emotional responses, taste aversions, and certain other behaviors. In the most famous classical conditioning experiment, Pavlov demonstrated that he could get a dog to drool at the sound of a tone that had been repeatedly paired with food. When entering a department store, for example, people may catch the scent of a perfume or cologne and instantly be reminded of an old boyfriend or girlfriend with whom they came to associate the scent during a relationship.

   b. Operant conditioning involves the relationship between our behavior and its environmental consequences. For instance, if a student asks a question in class and the teacher says, “What a stupid question!” the student is unlikely to ask questions in the future to avoid a similar undesirable consequence. But if the teacher responds with, “That’s an interesting question,” the student may continue to ask questions in the future because of the desirable consequence of being implicitly acknowledged as smart.

2. The sociocultural perspective focuses on the impact of other people and culture on behavior and mental processing. The effects of other people on behavior and mental processing are the kinds of social factors that are examined by social psychologists.
A classic example of the influence of social factors (e.g., the presence of other people) on individuals’ behavior is the **bystander effect**, the finding that people are less likely to intervene when there are other people available to help than when they are the sole observers. In 1964, Kitty Genovese was brutally attacked and murdered while trying to enter her apartment building in New York City late one night. Some building residents heard her screams or saw the attack, but no one called the police until after the attacker had killed her and fled.

Subsequently, researchers devised laboratory experiments that examined how particular variables influence people’s decisions on whether to help one another. As discussed in Chapter 9 (Social Psychology), considerable evidence has been gathered to support the bystander effect.

To exemplify the complementary nature of the perspectives, you might point out the role of multiple perspectives in the development of language. For example, from the biological perspective there are specific brain areas involved in language acquisition. The cognitive perspective focuses on how children learn new words and organize concepts. The behavioral perspective emphasizes the importance of imitation and reinforcement as children expand their vocabulary. The sociocultural perspective has demonstrated that the cultural context of language is important for children learning about the social pragmatic functions of language.

After introducing the four perspectives, you may give students the opportunity to apply the different perspectives to a video about helping behavior.

*Worth Video Anthology for Introductory Psychology: Why do People Help? Explaining Behavior (5:25)*

This video illustrates how two male office workers risked their lives to save the life of a woman after the terrorist attack on the World Trade Center. The men carried the woman, who was unable to walk without a wheelchair, down 68 flights of stairs and out of the building very shortly before its collapse. The video may be used as a starting point for a discussion of how the major research perspectives explain why the men helped. What biological factors might be involved? What thought process underlies the men’s choice to risk their own lives? How might prior learning have contributed to their reaction? What social and cultural influences may have motivated them to help?

Students may falsely think they already know much of the information in this class and thus may not study it sufficiently. Be sure to warn students about **hindsight bias** (also known as the “I knew it all along” phenomenon), the tendency, after learning about an outcome, to be overconfident of one’s ability to have predicted it.

Almost any psychological research finding may seem like common sense after people learn about it. For instance, if people are asked if opposites attract most people agree that they do. However, if people are asked whether birds of a feather flock together, they may agree to that, too. Of course, both statements cannot be true, but only hindsight makes that obvious.
Prior to presenting information about the specific methods that psychologists use to describe and explain behavior, you can introduce students to key ethical principles that relate to psychological research. The video, “Ethics in Human Research: Violating One’s Privacy?” (7:00) is an excellent resource for this purpose. Prior to showing the video, you can ask students to access the American Psychological Association (APA) Web site at http://www.apa.org/ethics/code/index.aspx and familiarize themselves with the General Principles (Beneficence and Nonmaleficence, Fidelity and Responsibility, Integrity, Justice, and Respect for People’s Rights and Dignity) and sections of the Ethical Standards that are particularly applicable to the video. After viewing the video, students can discuss the extent to which the research is consistent with APA Principles and Standards.

The video itself focuses on an Icelandic research firm, deCODE, that has been granted access by the Icelandic parliament to the medical records of all citizens for the purpose of investigating genetic predispositions to illness. Although residents may be excluded if they submit a written request, the broad access appears ethically questionable from the perspective of the APA’s General Principles and Ethical Standards.

Because informed consent is an extremely important concern in psychological research, you can ask students to view the answers to some of the frequently asked questions about informed consent that are available on a U.S. Department of Health & Human Services Web site, http://www.ahrq.gov/funding/policies/informedconsent/icform1.html. These questions and answers should reinforce the importance of respecting the rights of persons when conducting psychological research.

II. Research Methods Used by Psychologists

The methods used by psychology researchers fall into three categories: descriptive methods, correlational studies, and experimental research. Experimental research is used most because it allows the researcher to explore cause-and-effect relationships. However, sometimes researchers can’t conduct experimental studies and must rely on other research methods.

A. Descriptive Methods

Observational techniques, case studies, and survey research are descriptive methods that are used to provide objective and detailed descriptions of behavior and mental processes. One potential problem with observational research is that it only allows the researcher to speculate about the cause-effect relationship. It is excellent for providing data to develop hypotheses about causal relationships.

1. Observational techniques. The researcher directly observes the behavior of interest. This can be a major problem if the observer influences or changes the behavior of those being observed.

   a. In naturalistic observation, the behavior being observed occurs in its natural setting, without the intervention of the researcher. Researchers use naturalistic observation when they are interested in how humans or other animals behave in their natural environments. For instance, two well-known observational studies were Dian Fossey’s study of mountain gorillas in Africa and Jane Goodall’s study of chimpanzees in Africa. Observational techniques are also used in settings such as schools, the workplace, and bars.
b. In **participant observation**, the observer must ostensibly be part of the group being observed. This type of research is similar to undercover police work. One famous example of participant observation was conducted by Rosenhan (1973). In this study, psychologists posing as patients with symptoms of a major mental disorder were admitted to psychiatric hospitals. Once admitted, these pseudo patients acted normally and asked to be released. Even though the psychiatric patients could tell the difference, hospital doctors could not tell the psychologists from the disordered patients and so the psychologists were not released until many days later.

2. **Case studies.** In case studies, a researcher studies an individual in depth over an extended period to attempt to learn as much as possible about the person or case. Case studies are often used in clinical settings to gather information that will help in the treatment of the patient. Results of case studies cannot be generalized to other populations.

   Case studies allow the researcher to develop hypotheses that can be tested using experimental research. For instance, the case of H. M., who had his hippocampus removed for medical reasons at a young age, was a case study. H. M. seemed to have normal memory for information learned before the surgery, but he did not seem able to form any new memories. This finding led to the hypothesis that the hippocampus plays an important role in the formation of new memories. The hypothesis about the role of the hippocampus was supported by subsequent experimental research. For a brief tribute to H. M. that provides a bit of historical background, you might ask students to read a news article published at the time of his death at age 82, http://www.nytimes.com/2008/12/05/us/05hm.html?_r=1

3. **Survey research.** Researchers use questionnaires and interviews to collect information about the behavior, beliefs, and attitudes of particular groups of people.

   It is critical to note that the wording, order, and structure of the survey questions may lead the participants to biased answers. Researchers must also be cautious of social desirability bias. If participants want to make a positive impression on the researchers, the participants might respond to some questions in a socially desirable manner that may or may not be truthful.

   Survey researchers must also make sure they are obtaining a representative **sample** of the **population** they are interested in studying. Samples that are representative of a population allow researchers to generalize their results to the entire population of interest. One unfortunate example of a sample that was not representative was a study of women and love. The sample was drawn mainly from women’s organizations and political groups and from women who requested and completed a survey following the researcher’s talk show appearances. Thus, the results (that women who had affairs were typically disenchanted with their relationships) were not representative of the total population of American women.

   In **random sampling**, each individual in the population has an equal opportunity of being in the sample. Random sampling is much like drawing names from a hat. Random sampling allows researchers to generalize their findings from the sample to the larger population.

**B. Correlational Studies**

In a correlational study, two variables are measured to determine whether they are related. A **variable** is any factor that can take on more than one value (e.g., height, age, GPA, extraversion level).

*Scientific American Introductory Psychology Videos: Correlation and Causation (10:00)*
This video differentiates causation from correlation to discuss various issues in research design. Examples of positive and negative correlations are given and the strength of relationships is described. Various experimental research designs are discussed as well as the limitations of experimentation due to ethical and other issues.

1. The **correlation coefficient** is a statistic that provides information about the type and the strength of the relationship between two variables. A correlation coefficient ranges in value from −1.0 to +1.0. A correlation coefficient consists of two elements. The first element, the sign of the coefficient (− or +), indicates the type of relationship, positive or negative.

   a. A **positive correlation** indicates a direct relationship between two variables, with low scores on one variable tending to be paired with low scores on the other variable, and high scores on one variable tending to be paired with high scores on the other variable. For instance, SAT scores and first-year college GPA tend to be positively correlated. A person’s height and weight also tend to be positively correlated.

   b. A **negative correlation** is an inverse relationship between two variables, with low scores on one variable tending to be paired with high scores on the other variable. For instance, there is a negative correlation between how much time a student watches TV and the student’s grades in school. Mountain elevation level and temperature are also negatively correlated.

      The second element of the correlation coefficient is its absolute value, which ranges from 0 to 1. Zero and absolute values near zero indicate no relationship. As the absolute value increases toward 1.0, the strength of the relationship increases.

      It is critical to note that the sign of the coefficient does not provide information about the strength of the relationship. Correlation coefficients are *not* measured on the number line upon which positive numbers are greater than negative numbers. For instance, a correlation of −0.60 is stronger than a correlation of + 0.40. If the correlation is + (or −) 1.0, there is perfect predictability.

2. A **scatterplot** is a depiction of correlational data. Scores on one variable are on the X-axis; scores on the second variable are on the Y-axis. Each data point in the scatterplot represents a person’s scores on each of the two variables (see Figure 1.1 in the text for an illustration).

      If the correlation between the two variables is close to +1.0, the data points run from the lower left corner to the upper right corner of the scatterplot. If the correlation between the two variables is close to −1.0, the data points run from the upper left corner to the lower right corner. If the correlation between the two variables is close to 0, the data points are randomly scattered.

*PsychInvestigator: Correlation and Statistics*

This interactive video demonstration summarizes the methods of research used in psychology. Following an approximately 13-minute video, students participate in a series of studies to better understand correlational relationships. Results provided by students are analyzed and there is a quiz to test comprehension of the materials presented.

3. The **third-variable problem** occurs when a third, unmeasured variable is responsible for the relationship observed between the two measured variables. Strong correlations provide excellent predictability, but they do not allow researchers to draw cause-and-effect conclusions about the relationships between the two variables.
For example, there is a negative correlation between self-esteem and depression. That is, as self-esteem increases, depression level tends to decrease. However, researchers cannot say that low self-esteem causes depression. First, it could be the reverse, that depression causes low self-esteem. Second, and more important, a correlation accounts for only two of the many influences on behavior and mental processes. It is possible that some third, unmeasured variable is responsible for the relationship between the two measured variables. For instance, there is a biological predisposition to both depression and low self-esteem; thus, the negative correlation may be the result of brain chemistry.

Another example of the third-variable problem is highlighted in a study on contraceptive use among Taiwanese women (Li, 1975). Li found that birth control use and the number of electrical appliances owned were correlated. However a third variable, level of education, was a better predictor of both socioeconomic status and being informed about birth control use.

To take another example, the length of time a man is married is negatively correlated with the amount of hair on his head. Does this mean that being married longer causes a man’s hair to fall out? (Some male students will be smiling and saying “yes” to this question.) Of course not. As a man ages, the length of time he is married naturally increases and the amount of hair on his head naturally decreases. Here, the third variable is age.

Class Activity: Correlation
When explaining correlation, the text includes an important discussion of the third-variable problem to illustrate one reason why we cannot infer causation from correlational analyses. To reinforce this crucial point, you can ask students to provide at least two possible explanations for various correlations. We have used examples such as the following:

- The longer couples were married, the more similar their opinions were on social issues.
- The longer children had lived in the orphanage, the lower their IQ scores were.
- The higher the grades students received in school, the more money they earned later in life.

Based on the information given, there is no single correct explanation—which is the point of the exercise. Students may develop their answers individually or in small groups. In either case, the class can discuss their answers as a group.

PsychSim 5 Tutorial: Correlation
This module is excellent for reviewing information covered in class and the text. At a very basic level, it presents what scatterplots are and how to read them, the difference between positive and negative correlations, and how to interpret correlation coefficients. The emphasis is on why people need a precise number to describe a scatterplot and how correlations are used to make predictions about the relationship between two variables, including the notion of the line of best fit. In addition, students can modify a small dataset and watch as changes to the dataset result in changes to the scatterplot and correlation coefficient. The module cautions against inferring causality from correlations.
C. Experimental Research

The key aspect of experimental research is that the researcher controls the experimental setting. This control allows the researcher to make cause-and-effect statements about the experimental results. First, the experimenter controls for the influence of possible third variables by making sure the variables are held constant across all the experimental groups and conditions. Second, the experimenter controls for any possible influence of the individual characteristics of the participants, such as intelligence, by using **random assignment**. Random assignment differs from random sampling. Random sampling is used in experiments and with other research methods already described to make generalized statements about a population. Participants in an experiment are randomly assigned to groups to equalize participant characteristics across the various groups.

1. Designing an experiment
   a. When designing an experiment, the researcher begins with a hypothesis about the cause-and-effect relationship between two variables. One of the variables is assumed to be the cause, and the other variable is the one to be affected. The **independent variable** is the hypothesized cause, and the experimenter manipulates it. The **dependent variable** is the hypothesized effect and is the one the experimenter measures.
   b. The simplest of experiments is one with two groups. For control purposes, participants are randomly assigned to one of the two groups. One of the groups is exposed to the independent variable, and the other group is not. The group exposed to the independent variable is called the **experimental group**, and the group not exposed to the independent variable is called the **control group**.

   For instance, if the hypothesis is that aerobic exercise reduces anxiety, then the independent variable to be manipulated is aerobic exercise, and the dependent variable is the anxiety level of the participants. The experimental group participates in an aerobic exercise program, and the control group does not. The experimenter must measure the anxiety levels for the groups at the beginning of the study before the independent variable is manipulated and then again after the manipulation. If the two groups are truly equivalent, the average anxiety level for each group at the start of the study should be the same. If aerobic exercise reduces anxiety, then this difference would be apparent in the second measurement at the end of the experiment.

   Note that the independent and dependent variables in an experiment must be operationally defined. An **operational definition** is a description of the operations or procedures used in the experiment to manipulate or measure a variable. In the example above, anxiety could be operationally defined based on participant scores on a specific anxiety scale.
   c. In addition to the experimental and control groups, a **placebo group** is often used to improve an experiment. A placebo group is a group of participants who believe they are receiving the same treatment as the experimental group, but are in fact not receiving that treatment. Instead, they receive a **placebo**, a sham intervention that has no active ingredients or no proven effects. The participants in a placebo group, for example, may be told they are getting an antianxiety drug, but they are really only receiving a sugar pill.
The **placebo effect** is improvement due to the expectation of improving. The reduction of anxiety in the experimental group participants may be partially or completely due to a placebo effect. To conclude that the reduction of anxiety in the experimental group was not due to a placebo effect, the reduction would have to be significantly greater than that observed in the placebo group. In real world settings, the placebo effect can be enhanced if a patient thinks the placebo is an expensive drug, or if the pill is given by someone in a lab coat, or even if it is injected rather than given in pill form. The complete experimental design for the aerobic exercise includes an experimental group, a placebo group, and a control group (Figure 1.2).

d. **Inferential statistical analyses** allow researchers to draw conclusions about the results of their study by determining the probability that their findings were due to chance. In the experiment described above, researchers were interested in whether manipulations to the amount of aerobic exercise (the independent variable) were the cause of changes in the dependent variable (anxiety). They would describe their results as “significant” if there was less than a 5 percent probability that the results were due to chance.

e. Another control measure is the **double-blind procedure**, in which neither the experimenters nor the participants know which participants are in the experimental and control groups. The double-blind procedure controls for experimenter and participant expectations. If experimenters know which condition the participants are in, they might unintentionally treat the participants differently and thereby have an impact on their behavior. If the participants know what condition they have been assigned to, their own biases might influence the outcome of the experiment.

f. Often researchers have many hypotheses and multiple independent and dependent variables. For example, in the above experiment, the researchers might be interested in the effect of diet on anxiety as well. They might also be interested in the effects of both diet and aerobic exercise on both anxiety and depression.

g. In order to compare the findings of many different studies related to a single experimental question, researchers might conduct a **meta-analysis**. A meta-analysis is a powerful statistical technique used to combine results from many different studies on one experimental question.

Table 1.3 summarizes all of the research techniques described in this section.

---

**Worth Video Anthology for Introductory Psychology: Experimental Design (7:24)**

This video provides a chance for students to review information related to experimental design by listening to a description of a two-group laboratory experiment. Concepts reviewed include independent and dependent variables and random assignment, with extensive commentary on the importance of manipulating one or more variables while holding all others constant. This module explicates the difficulties inherent in doing experimental research and the importance of attending to the details of experimental design.

**Worth Video Anthology for Introductory Psychology: Schachter’s Affiliation Experiment (7:05)**
This segment provides an opportunity to review experimental methodology. The video illustrates Schachter’s procedures in an experiment to learn how fear influences the desire to affiliate with others. Because of the experiment’s relative simplicity, it can be used to illustrate many of the concepts discussed in this part of the text, including random assignment, independent and dependent variables, and operational definitions. Potential shortcomings of Schachter’s experiment can also be discussed.

**PsychSim 5 Tutorial: What’s Wrong with This Study?**

This module provides a way to review the information presented in the text and in class on the three major research objectives. The module reviews the objectives, discussing the notions of samples and populations, the importance of random sampling, and the importance of sample size. Random assignment, experimental conditions, and the double-blind procedure are presented in a section on experimental research. Students are then encouraged to identify research pitfalls in four research studies. The studies are described, and students answer questions about what is wrong with each study and how such shortcomings can be improved. Explanations of the problems with the studies and how each could be improved are presented after each example. Having students work through these research studies is an ideal way to reinforce what can be difficult information for introductory psychology students.

**III. How to Understand Research Results**

Interpreting research results requires the use of two types of statistics: inferential statistics (described in the previous section) and descriptive statistics, which are statistics used to describe the data of a research study in a concise fashion (e.g., the correlation coefficient). Two types of descriptive statistics are measures of central tendency and measures of variability. A researcher also often examines a frequency distribution, which depicts the number of participants receiving each score for a variable in a table or graph.

**A. Descriptive Statistics**

1. A measure of central tendency is designed to summarize a set of data with one number. There are three measures of central tendency.
   a. The **mean** is the numerical average for a distribution of scores.
   b. The **median** is the score that is positioned in the middle of the distribution of scores when all the scores are listed from lowest to highest. If there is an odd number of scores, the median is the middle score. If there is an even number of scores, the median is the average of the two center scores.
   c. The **mode** is the most frequently occurring score in the distribution of scores. If two or more scores occur with equal frequency, all can be the mode.
   d. To demonstrate the measure of central tendency, you can use numbers provided in the text: 70, 80, 80, 85, and 85.
      (i). The mean is \((70 + 80 + 80 + 85 + 85)/5 = 80\).
      (ii). The median is the third score, 80.
      (iii) The modes are 80 and 85 because these two numbers are both the most frequently occurring scores.

   The mean is the most commonly used measure of central tendency. It is used to analyze data in many descriptive statistical tests. However, because the mean uses all scores in its computation, extremely high or extremely low scores can distort it. For instance, add the number 20 to the above set of five scores. Now the mean is 70. However, the median remains 80.

2. Two **measures of variability** are designed to provide an idea of the spread of the scores. Were the scores tightly clustered around the mean, or were they scattered?
a. The **range** is the difference between the highest and lowest scores in a distribution of scores. Like the mean, the range can be greatly distorted by extremely high or extremely low scores. In the example above, the range is 85 - 70, or 15.

b. The **standard deviation** is the average extent to which the scores vary from the mean of the distribution. A small standard deviation means that scores do not vary very much from the mean. A larger standard deviation means that scores tend to vary greatly from the mean. The standard deviation is especially relevant to the normal distribution, or bell curve, as will be seen in Chapter 6 in the discussion of intelligence and intelligence testing.

## B. Frequency Distributions

A frequency distribution organizes the data in a format that provides the frequency of each score.

1. **Normal distributions** have two important aspects as seen in Figure 1.3 in the textbook.
   a. The mean, the median, and the mode are all equal because the normal distribution is symmetric about its center.
   b. The percentage of scores falling within a certain number of standard deviations of the mean is set. About 68 percent of the scores fall within 1 standard deviation of the mean; about 95 percent fall within 2 standard deviations of the mean, and more than 99 percent fall within 3 standard deviations of the mean.

   It is these percentages that give the normal distribution its bell shape. Figure 1.4 in the text shows two normal distributions with the same mean but different standard deviations. The distribution with the smaller standard deviation (A) is taller because more scores are near the mean. The distribution with the larger standard deviation (B) is wider because scores tend to be more spread out around the mean.

   A **percentile rank** is the percentage of scores below a specific score in a distribution of scores. For instance, the percentile rank of a score that is 1 standard deviation above the mean is roughly 84 percent. Because a person cannot outscore himself or herself, a percentile rank of 100 percent does not exist. However, a person who has the lowest score in a distribution can have a percentile rank of 0 percent.

2. **Skewed distributions** are asymmetrical in shape (see Figure 1.5 in the text).
   a. A **right-skewed** (also called **positively skewed**) distribution is a frequency distribution in which there are some unusually high scores (Figure 1.5a), but most scores tend to be low.
   b. A **left-skewed** (also called **negatively skewed**) distribution is a frequency distribution in which there are some unusually low scores (Figure 1.5b), but most scores tend to be high.

Because unusually high or low scores distort a mean, distortion occurs for the means of all skewed distributions. The mean for a right-skewed distribution is distorted toward the tail created by the few high scores and so is greater than the median. For example, Figure 1.6 shows music downloads compared to the popularity of songs. Even though many more songs are available on Rhapsody, most downloaded music is available at Walmart as well. The mean for a left-skewed distribution is distorted toward the tail created by the few low scores and so is less than the median. For example, on an easy exam there may be many A and B grades with very few grades of an F.
To describe a skewed distribution, it is best to use the median because atypical scores in the distribution do not distort the median. For example, imagine that there are 10 guys sitting at a bar with a median annual income of $35,000. If Bill Gates walks in and sits down at the bar, the median remains $35,000 even though the average income of bar patrons has gone up dramatically. An excellent example of how using the mean can distort findings can be seen with economic growth in the early 2000s. Republicans touted economic growth based on mean increases in family income. However, the growth during that time was severely left-skewed with huge increases in income for the very wealthy and little change in income for lower, middle, and even upper-middle-class families.

Class Activity: Illustrating Statistical Concepts
This active learning exercise enhances the understanding of normal and skewed distributions. In response to instructor prompts, 10 to 20 student volunteers create distributions of varying shapes by standing at different points on an imagined number line ranging from 0 (absolutely do not like at all) to 10 (completely and totally like). The middle of the imagined line represents neutral. If multiple students have the same response, they stand single file in front of the same point. Connor (2003) reports that response to the prompt: “Position yourself on the number line according to how you feel about computers” results in a somewhat normal distribution. In contrast, she indicates that a prompt concerning “how you feel about chocolate” tends to create a negatively skewed distribution, whereas a prompt regarding “how you feel about watching football on television” typically leads to the creation of a bimodal distribution (particularly if the volunteers include similar numbers of men and women).

After each distribution is formed, Connor indicates that she stands at the estimated median point on the number line and asks all students to verbally describe the distribution, including its central tendency, variability, and the presence of outliers. Clearly, the exercise is best suited to classrooms with ample space for the student number line in the front or at the side of the room.


PsychSim 5 Tutorial: Descriptive Statistics
This module contains information on various descriptive statistics, from collecting raw scores to understanding distributions of scores around a midpoint. This module allows students to examine different types of distributions (both normal and skewed), work with measures of central tendency and variability, create a distribution of scores and calculate the descriptive statistics for that distribution, and manipulate raw scores to see the effects on the various descriptive statistics. Students have the chance to construct frequency histograms and polygons and see how these graphics form distributions of raw scores. Problems with each measure of central tendency are presented, and problems with the range of the measures of variability are discussed. By illustrating how two distributions of scores would look if they had the same mean but different standard deviations, the module presents both textual and graphic information about the standard deviation.
TRUE-FALSE STATEMENTS FOR INTRODUCTORY CLASS ACTIVITY:
COURSE OVERVIEW

Chapter 1 (The Science of Psychology)
If cities that have more stores selling pornography also have more crimes involving rape, you can correctly conclude that pornography causes people to commit rape.

Chapter 2 (Neuroscience)
During the stage of sleep in which most dreaming occurs, our body is essentially paralyzed.

Chapter 3 (Sensation and Perception)
For a person to perceive a light as twice as bright, the actual intensity of the light needs to be eight or nine times brighter.

Chapter 4 (Learning)
If a child who really likes candy is given a piece of candy when he cries in the supermarket, it increases the likelihood that the child will cry in the supermarket again.

Chapter 5 (Memory)
People’s personal memories for an event that they have seen can be distorted by media reports.

Chapter 6 (Thinking and Intelligence)
When a person tosses a fair coin, if it lands on heads eight times in a row, the ninth toss is almost certain to be tails.

Chapter 7 (Developmental Psychology)
Typical 3-month-old infants do not realize that a toy continues to exist if they cannot see it.

Chapter 8 (Personality Theories and Assessment)
Most contemporary psychologists think that repression of extremely unpleasant experiences occurs very often.

Chapter 9 (Social Psychology)
If you fall and hurt your ankle, you are more likely to receive help from bystanders if many people see you fall than if only one person sees you fall.

Chapter 10 (Abnormal Psychology)
Schizophrenia is virtually the same as multiple personality disorder.

Answers
1. False (Third-variable problem, pp. 13, 15)
2. True (REM sleep, p. 82)
3. True (Stevens’s power law, pp. 101–102)
4. True (Positive reinforcement, pp. 155–156)
5. True (False memory/source misattribution, pp. 218–219)
6. False (Gambler’s fallacy/representativeness heuristic, pp. 240–241)
7. True (Object permanence, p. 284)
8. False (Evaluation of psychoanalytic theory, p. 324)
9. False (Bystander effect, pp. 373–374)
10. False (Schizophrenia, p. 413)
OPERATIONAL DEFINITIONS

Defining terms

Whenever we have to investigate some aspect of behavior that is vague or may have multiple meanings, we may want to define such terms or concepts in ways that are precise, measurable, and concrete. Such definitions are called operational definitions. Below are some hypotheses that are being researched. Identify which terms in each hypothesis should be operationally defined, and then give an example of how each of these terms might be defined so that the hypotheses can be more clearly tested.

a. Memory improves with regular exercise.

b. Proper nutrition aids alertness in the classroom.

c. People who are talking on car phones do not drive safely.

d. Frustration causes aggression.

e. Lack of sleep impairs one’s judgment.

f. People in love perceive each other more positively than others perceive them.

g. Participating in team sports builds character.

h. Anxiety interferes with logical thinking.

i. Loving parents produce children who grow up to be honest adults.

j. Smoking on the part of mothers produces more hyperactive children.

k. Tall people are likely to be extroverts.

l. Religious people are friendlier than nonreligious people.

Source: http://mcckc.edu/pdf/CriticalThinking/Psych2i.pdf
Copyright © 1996, Andy Geoghegan, Critical Thinking Across the Curriculum Project, Longview Community College, Lee’s Summit, Missouri—U.S.A.