chapter
eight

SURVEY AND CORRELATIONAL RESEARCH DESIGNS

You have probably made or heard the popular comment "Is it just me, or [fill in the blank here]?" This question is really a survey that asks others to indicate their level of agreement with some viewpoint—for example, "Is it just me, or is it hot in here?" or "Is it just me, or was this exam difficult?" We largely ask such questions to gauge the opinions of others. Many examples likely occur every day, from completing a customer satisfaction survey to asking your friends what they plan to order at a restaurant to get a better idea of what you might want to order. Really, we could survey people to measure all sorts of constructs including love, attachment, personality, motivation, cognition, and many other constructs studied by behavioral scientists.

We can also identify how constructs such as love, attachment, personality, motivation, and cognition are related to other factors or behaviors such as the likelihood of depression, emotional well-being, and physical health. In everyday situations, you may notice relationships between temperature and aggression (e.g., the hotter it is outside, the more often you see people fighting at a sports stadium) or between class participation and grades (e.g., students with higher grades tend to also participate more in class). Hence, there is a natural tendency for us to engage the world under the assumption that behavior does not occur in isolation. Instead, behavior is related to or influenced by other factors in the environment.

It is therefore not uncommon at all for humans to observe the world by asking people to answer questions about themselves or by observing how human behavior is related to other factors such as health and well-being. The same is true in science. In this chapter, we describe how we can use the scientific method to evaluate or survey participant responses and identify relationships between factors.

SURVEY DESIGNS

Many research designs can be used to test the same hypotheses. This chapter is separated into two major sections; each section describes a nonexperimental research design: the survey and correlational designs. To introduce how each design can be used to test the same hypothesis, we will begin each major section by developing a new research design to test the same hypothesis.

Suppose we hypothesize that texting while driving is more prevalent among younger age groups, as has been tested in the published literature (Harrison, 2011; Ling, Bertel, & Sundsøy, 2012). We could use a survey research design by asking a sample of young college students who drive to indicate in a questionnaire how often they use text messaging while driving (per month). If the hypothesis is correct and we set up this study correctly, we should find that a high percentage of young drivers use text messaging while driving.

We will return to this hypothesis with a new way to answer it when we introduce correlational designs. We begin this chapter with an introduction to the research design that was illustrated here: the survey research design.

8.1 An Overview of Survey Designs

A nonexperimental research design used to describe an individual or a group by having participants complete a survey or questionnaire is called the **survey research design**. A **survey**, which is a common measurement tool in the behavioral sciences, is a series of questions or statements to which participants indicate responses. A survey can also be called a *questionnaire* or *self-report* because many surveys specifically include questions in which participants report about themselves—their attitudes, opinions, beliefs, activities, emotions, and so on.

> The **survey research design** is the use of a survey, administered either in written form or orally, to quantify, describe, or characterize an individual or a group.
>
> A **survey** is a series of questions or statements, called items, used in a questionnaire or an interview to measure the self-reports or responses of respondents.

A survey can be administered in printed form, or it can be distributed orally in an interview. While a survey can be used as a measurement tool in many research designs, the survey research design specifically refers to the use of surveys to quantify, describe, or characterize an individual or a group. In this chapter, we will introduce the types and writing of questions included in surveys, how to administer surveys, and some limitations associated with using surveys in the behavioral sciences.

8.2 Types of Survey Items

A survey consists of many questions or statements to which participants respond. A survey is sometimes called a *scale*, and the questions or statements in the survey are often called *items*. As an example of a scale with many items, the estimated daily intake scale for sugar (EDIS-S;

Privitera & Wallace, 2011) is identified as an 11-item scale, meaning that the scale or survey includes 11 items or statements to which participants respond on a 7-point scale from 1 (*completely disagree*) to 7 (*completely agree*). Notice that each item, listed in Table 8.1, is a statement about how much sugar participants consume in their diets.

Table 8.1 The Eleven Items for the EDIS-S

Item	Statement
1	I tend to eat cereals that have sugar in them.
2	I tend to put a lot of syrup on my pancakes or waffles.
3	I often eat candy to snack on when I am hungry.
4	I tend to crave foods that are high in sugar.
5	I tend to snack on healthier food options.
6	I tend to consume a low-sugar diet.
7	I often snack on sugary foods when I am hungry.
8	When I crave a snack, I typically seek out sweet-tasting foods.
9	I tend to eat foods that are most convenient, even if they contain a lot of sugar.
10	I like consuming sweet-tasting foods and drinks each day.
11	I tend to avoid consuming a high-sugar diet.

There are three types of questions or statements that can be included in a survey: open-ended items, partially open-ended items, and restricted items. Each type of item is described here.

Open-Ended Items

When researchers want participants to respond in their own words to a survey item, they include an **open-ended item** in the survey. An open-ended item is a question or statement that is left completely "open" for response. It allows participants to give any response they feel is appropriate with no limitations. For example, the following three items are open-ended questions that were asked in a focus group to study what educators and students think about using patients as teachers in medical education (Jha, Quinton, Bekker, & Roberts, 2009, pp. 455–456):

- What are your views on the role of patients teaching medical students?

- How do you think the role of patients as teachers in medical education will affect the doctor-patient relationship?

- One potential plan is to bring "expert patients" (patients who are experts in their long-term conditions) into the classroom to deliver teaching on their condition. What are your views of this?

> An **open-ended item** is a question or statement in a survey that allows the respondent to give any response in his or her own words, without restriction.

Open-ended items can also be given as a statement and not a question. For example, the researchers could have asked participants in the focus group to respond to the following survey item: "Describe an experience you had as a patient and whether you felt that experience was sufficient to deem you an 'expert' on your condition." In this example, the open-ended item is phrased as a statement and not a question; however, the response will still be open-ended.

Open-ended items are most often used with the qualitative research design because the responses in the survey are purely descriptive. Indeed, the Jha et al. (2009) focus group study was a qualitative research study. For all other research designs—those that are quantitative—the challenge is in coding the open-ended responses of participants. It is difficult to anticipate how participants will respond to an open-ended item, so the researcher must develop methods to code patterns or similarities in participant responses. Coding the responses to open-ended items, however, requires researchers to do both of the following:

> Open-ended questions allow participants to respond in their own words. These types of questions are most commonly used in qualitative research.

- Tediously anticipate and list all possible examples of potential responses in terms of how participants might write or express their responses.

- Use multiple raters and additional statistical analyses to make sure the coding is accurate.

For the reasons listed here, open-ended survey items are not often used in quantitative research, with partially open-ended or restricted items being favored among quantitative researchers.

Partially Open-Ended Items

Researchers can include items, called **partially open-ended items**, which give participants a few restricted answer options and then a last one that allows participants to respond in their own words in case the few restricted options do not fit with the answer they want to give. The open-ended option is typically stated as "other" with a blank space provided for the participant's open-ended response. For example, the Jha et al. (2009) focus group study also included the following partially open-ended item:

In what capacity do you (students or faculty or other) view the role of patients as teachers?

A. Teaching

B. Assessment

C. Curriculum development

D. Other _____ (p. 455)

In this item, participants either chose an option provided (teaching, assessment, or curriculum development), or provided their own open-ended response (other ___). For the researchers, it is easier to manage the participant responses, or data, when an open-ended item includes a few restricted options. To enter participant responses, researchers can code each answer option as a number. The last open-ended option could be coded further, or just analyzed without further coding. For example, we could report only the percent of participants choosing the last open-ended option, without analyzing the specific open-ended responses given. In this way, coding and analyzing partially open-ended items can be less tedious than for open-ended items.

A **partially open-ended item** is a question or statement in a survey that includes a few restricted answer options and then a last one that allows participants to respond in their own words in case the few restricted options do not fit with the answer they want to give.

Partially open-ended items include a few restricted options and one that allows participants to respond in their own words.

Restricted Items

The most commonly used survey item in quantitative research, called a **restricted item**, includes a restricted number of answer options. A restricted item does not give participants an option to respond in their own words; instead, the item is restricted to the finite number of options provided by the researcher. Restricted items are often given with a **Likert scale** for participants to respond. A Likert scale, named after Rensis Likert (Likert, 1932) who was the first to use such a scale, is a finite number of *points* for which a participant can respond to an item in a survey.

Two common applications of the Likert scale are to have participants use the scale to describe themselves or to indicate their level of agreement. For example, Schredl, Fricke-Oerkermann, Mitschke, Wiater, and Lehmkuhl (2009) used the following 3-point scale to record how children describe their dreams:

A **restricted item**, also called a **closed-ended item**, is a question or statement in a survey that includes a restricted number of answer options to which participants must respond.

A **Likert scale** is a numeric response scale used to indicate a participant's rating or level of agreement with a question or statement.

I have nightmares: (Circle one)

| 1	2	3
Never	Sometimes	Often

As an example of using a Likert scale to indicate a level of agreement, Haueter, Macan, and Winter (2003) used the following 5-point scale for an item included in the Newcomer Socialization Questionnaire:

I understand the tasks that make up my job. (Circle one)

1	2	3	4	5
Strongly disagree				Strongly agree

A response scale does not necessarily have to be numeric. For example, young children cannot count, let alone use numeric scales to describe themselves. In these cases, pictorial scales, such as the one shown in Figure 8.1 (Bradley & Lang, 1994; also shown in Figure 1.2), can be used. Capaldi and Privitera (2008) used this pictorial scale to measure how much children liked grapefruit juices. The researchers coded each picture using a numeric scale; however, the children used the facial expressions to describe how much they liked the grapefruit juices.

Figure 8.1 A Pictorial Rating Scale Used to Measure Emotion and Liking in Children
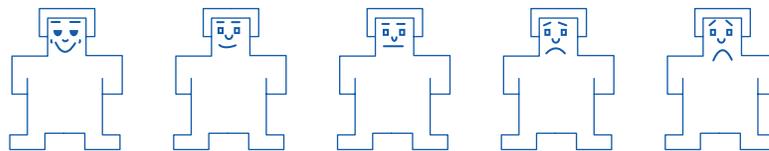
Adapted from Bradley & Lang, 1994.

The main advantage of using restricted items is that survey responses can be easily entered or coded for the purposes of statistical analysis. The main limitation of using restricted items is that the analysis is restricted to the finite number of options provided to participants. However, when the options available to participants are exhaustive of all options they could choose, this limitation is minimal.

LEARNING CHECK 1 ✓

1. State the type of survey item for each of the following items:
    A. How do you feel about the effectiveness of your professor's teaching style?
    B. On a scale from 1 (*very ineffective*) to 7 (*very effective*), how would you rate your professor?
    C. Is your professor's greatest strength his or her (a) timeliness to class, (b) knowledge of the material, (c) concern for students, or (d) other ___ (please explain)?

2. A _____ is a numeric response scale used to indicate a participant's rating or level of agreement with a question or statement.

Answers: 1. A. Open-ended item, B. Restricted item, C. Partially open-ended item; 2. Likert scale.

8.3 Rules for Writing Survey Items

Writing survey items is a thoughtful endeavor. The items that you write must be valid and reliable. In other words, the items must actually measure what you are trying to measure (valid), and the responses in the survey should be consistently observed across participants

and over time (reliable). In this section, we will describe the following nine rules used to write valid and reliable survey items:

1. Keep it simple.
2. Avoid double-barreled items.
3. Use neutral or unbiased language.
4. Minimize the use of negative wording.
5. Avoid the response set pitfall.
6. Use rating scales consistently.
7. Limit the points on a rating scale.
8. Label or anchor the rating scale points.
9. Minimize survey length.

Restricted items, which are most often used in quantitative research, include a restricted number of answer options for an item.

Keep It Simple

Everyone who takes a survey should be able to understand it. The best strategy is to use less than a high school–level vocabulary in writing the survey items. We use this strategy to make sure that participants' responses reflect their actual responses and are not given because they are confused about what the question is asking. For example, we could have participants rate how full they feel by asking, "How *satiated* do you feel?" However, some participants may not know that *satiated* means to satisfy an appetite, so it would be better to plainly ask, "How *full* do you feel?" In sum, keep the language simple.

Use simple words or language in a survey.

Avoid Double-Barreled Items

Ask only one question or give only one statement for each item. **Double-barreled items** are survey items that ask participants for one response to two different questions or statements. For example, to study relationship satisfaction we could ask participants to indicate their level of agreement with the following statement:

I enjoy the time we spend together and dislike the time we are apart.

1	2	3	4	5
Strongly disagree				Strongly agree

This item for relationship satisfaction is double-barreled. It is not necessarily true that people who enjoy the time they spend with their partner also dislike the time they are apart. Anytime a sentence uses a conjunction, such as *and*, it is likely that the item is double-barreled. The solution is to split the question into separate items. For example, we can change the double-barreled item into two separate items, each with a separate rating scale. We could write the first item as "I enjoy the time we spend together" and the second item as "I dislike the time we are apart" to allow participants to give a separate response to each individual item.

Double-barreled items are survey items that ask participants for one response to two different questions or statements.

Do not use double-barreled items in a survey.

Use appropriate and unbiased language in surveys.

Negative wording in a survey item can be confusing to respondents.

Use Neutral or Unbiased Language

Do not use language that is offensive or could potentially be considered offensive by a respondent. Offensive language is not only inappropriate, but can also lead people to respond in reaction to the language used. In other words, responses may be caused by the choice of wording in a survey item and not reflect the honest response of the participant. To avoid the use of potentially offensive language, the American Psychological Association (APA, 2009) provides guidelines for using appropriate language. Some suggestions include identifying persons 18 years and older as *women* and *men*, and to capitalize *Black* and *White* to identify racial and ethnic groups. More suggestions are provided in the publication manual (APA, 2009) and in Table 15.2 in Chapter 15.

Minimize the Use of Negative Wording

The use of negative wording can trick participants into misunderstanding a survey item. *Negative wording* is the use of words in a sentence or an item that negates or indicates the opposite of what was otherwise described. The rule is to avoid asking participants in a survey item what they would *not* do, which can require rephrasing a sentence or survey item. For example, the survey item "How much do you *not* like working?" can be rephrased to "How much do you *dislike* working?" It may seem like a small change, but it can effectively reduce confusion.

Avoid the Response Set Pitfall

When respondents notice an obvious pattern in the responses they provide, they will often use that same pattern to respond to future items in that survey. For example, suppose we ask participants to indicate their level of agreement with the following items on a 5-point scale to measure relationship satisfaction:

I enjoy the time I spend with my partner.

The time I spend with my partner makes me happy.

I look forward to the time I spend with my partner.

On the 5-point scale, suppose 1 indicates low satisfaction and 5 indicates high satisfaction. For each item, high satisfaction would be a rating of 5. If there were 20 questions like this, then participants would start to see a pattern, such as high ratings always indicate greater satisfaction. If they are generally satisfied in their relationship, they may begin marking 5 for each item without reading many of the items because they know what the scale represents. However, the ratings they give would reflect the fact that they saw a pattern, and not necessarily reflect their true ratings for each item. To avoid this problem, called a **response set**,

mix up the items in a survey so that ratings are not all on the same end of the scale for a given measure.

To illustrate how to avoid the response set pitfall, the following are four items from the EDIS-S (Privitera & Wallace, 2011), which is used to estimate how much sugar participants consume in their diet. Participants rate each item on a 7-point scale from 1 (*completely disagree*) to 7 (*completely agree*).

Do not include predictable response patterns in a survey.

I tend to eat cereals that have sugar in them.

I often eat candy to snack on when I am hungry.

I tend to crave foods that are high in sugar.

I tend to consume a low-sugar diet.

Notice that the last item is flipped—if participants eat a lot of sugar, then they would rate on the low end of the scale for this last listed item only. Because a few items in the EDIS-S are flipped like this, responses on this scale are unlikely to result from a response set. However, for the scale to make sense, higher overall ratings must indicate greater daily intake of sugar. The first three items are stated such that higher scores do indicate greater daily intake of sugar. Suppose, for example, a participant rates the first three items a 7. The participant's total score so far, then, is 7×3 items = 21.

The fourth item is a **reverse coded item**, meaning that we need to code responses for the item in reverse order. The participant rates his or her response on the 1 to 7 scale, but when we score it, we will reverse it to a 7 to 1 scale. Hence, a 1 is scored as a 7, a 2 as a 6, a 3 as a 5, a 4 remains a 4, a 5 is scored as a 3, a 6 as a 2, and a 7 as a 1. By doing so, a 7 for the reverse coded item again indicates the highest intake of sugar, and a 1 indicates the lowest intake of sugar—consistent with the scale for the other items in the survey. Returning to our example, suppose that our participant rates the fourth item a 2. We reverse code this item and score it as a 6, then calculate the total score, which is 21 (first three items) + 6 (fourth item) = 27 (total score). Because the fourth item was reverse coded, the survey can now be scored such that higher scores indicate greater daily intake of sugar, and also be written so as to avoid a response set pitfall.

Use Rating Scales Consistently

Another rule is to use only one rating scale at a time. In the simplest scenario, use only one scale if possible. The EDIS-S, for example, uses a level of agreement scale for all items in the survey from 1 (*completely disagree*) to 7 (*completely agree*). Having only one response scale makes it clear how respondents must respond to all items in a survey. If a

survey must use two or more different scales, then the items in the survey should be grouped from one type of scale to the next. Begin with all items for one scale (e.g., items with a scale rated from *very dissatisfied* to *very satisfied*); then give directions to clearly indicate a change in the scale for the next group of items (e.g., items with a scale rated from *not at all* to *all the time*). Consistent use of rating scales in a survey ensures that participants' responses reflect their true ratings for each item and not some confusion about the meaning of the scale used.

Be clear about the rating scale(s) used in surveys.

Limit the Points on a Rating Scale

To construct a response scale, keep the scale between 3 and 10 points (Komorita & Graham, 1965; Matell & Jacoby, 1971). Experts in *psychometrics*, a field involved in the construction of measurement scales, suggest that response scales should have a midpoint or intermediate response level. Having fewer than 3 points on a response scale violates this suggestion, and response scales with more than 10 points can be too confusing.

Bipolar scales are response scales that have points above (positive values) and below (negative values) a zero point.

There are two exceptions to the rule of limiting a rating scale to 3 to 10 points. One exception is that a 2-point scale is appropriate for dichotomous scales in which only two responses are possible. For example, dichotomous scales with true/false, yes/no, or agree/disagree as the response options are acceptable. A second exception is that **bipolar scales**, those that have points above and below a zero point, can be 3 to 10 points above and below the zero point. Hence, a bipolar scale, such as the one shown below with 11 points, can have up to 21 points, or 10 points above and 10 points below zero.

As a general rule, use 3 to 10 points on the rating scale for each item in a survey.

How do you feel about your ability to find a job that will make you happy?

| –5 | –4 | –3 | –2 | –1 | 0 | 1 | 2 | 3 | 4 | 5 |

Extremely pessimistic   No opinion   Extremely optimistic

Anchor or label the end points of a rating scale.

Label or Anchor the Rating Scale Points

To clearly indicate what a rating scale means we can use **anchors** or adjectives given at the end points of a rating scale. Anchors are often listed below the end points on a rating scale, such as those given for the bipolar scale for the previous rule. Notice also in the bipolar scale that the midpoint is labeled. Indeed, we can include anchors for the end points and label every other point on a scale if we choose.

Anchors are adjectives that are given to describe the end points of a rating scale to give the scale greater meaning.

Minimize Survey Length

A survey can be too long, although it is difficult to determine or define when a survey is "too long." The best advice is to write the survey to be as short and concise as possible, yet still able to convey or measure what it is intended to measure. Keep in mind that participants will fatigue or simply get tired of answering survey items. If this occurs, then a participant may start to "browse" survey items or even make up responses just to "get the survey over with." It is not to say that all participants will do this, but some will do this, and we want to avoid this problem of fatigue. The obvious solution is to make the survey as short as possible. A survey that is no longer than 10 to 15 minutes is typically preferred to one that takes an hour to complete.

The length to complete a survey tends to be more important than the number of items in the survey. For example, a survey with a few open-ended items may take 15 to 20 minutes to complete, whereas a survey that has 30 restricted items may take only a minute or two to complete. To minimize survey length, then, the key goal is to minimize how long (over time) it takes a participant to complete a survey, which does not always mean that the number of items in the survey must be small.

LEARNING CHECK 2 ✓

1. Which rule or rules for writing survey items does each of the following items violate?
   Note: Assume that each item is rated on a 5-point scale from 1 (*completely untrue)* to 5 (*completely true*):
   A. I am a likable person and enjoy the company of others.
   B. On a scale from 1 (*very unlikely*) to 13 (*very likely*), what are the chances you will win money in a casino?
   C. Reverse discrimination against *white* Americans is a big problem in America.
   D. *Misogynistic* men do *not* make good boyfriends.

2. True or false: How an item is worded can affect the reliability and validity of responses given for that item.

Answers: 1. A. Avoid double-barreled items, B. Limit the points on a rating scale, C. Use neutral or unbiased language, D. Keep it simple and minimize the use of negative wording; 2. True.

8.4 Administering Surveys

Once a survey is constructed, it is administered to participants who will respond to the survey. A survey can be written (in print or electronically) or spoken (such as in an interview). A written survey can be administered in person, by mail, or using the Internet. An interview survey can be administered face-to-face, by telephone, or in focus groups. Each method of administering a survey is described in this section.

Written Surveys

In-person surveys. A method that can effectively get participants to respond to a survey is to be physically present while participants complete the survey. The reason that more participants

are willing to complete a survey administered in person is that you, the researcher, can be there to explain the survey, observe participants take the survey, and answer any questions they may have while they complete the survey. This method is more time-consuming, however, because it requires the researcher to be present while each and every participant completes the survey.

Mail surveys. An alternative that can require less of the researcher's time is to submit surveys in the mail. However, mail surveys are associated with higher rates of potential respondents choosing not to complete and return them to the researcher. Mail surveys can also be costly in terms of both the time it takes to prepare the surveys (e.g., printing and addressing surveys) and the money spent to send them out to potential respondents (e.g., postage stamps and envelopes). The following are four strategies that can increase how many people complete and return a mail survey:

- Include a return envelope with the return postage already paid.
- Let potential respondents know in advance that the survey is being sent.
- Include a cover letter detailing the importance of completing the survey.
- Include a gift for the potential respondent to keep, such as a pen or gift card.

Internet surveys. A popular and cost-effective survey option is to administer surveys online. This option is inexpensive in that a survey can be administered to a large group of potential respondents with little more than a click of a button. Online surveys can be administered via links provided in an e-mail or using online survey construction sites, such as *SurveyMonkey.com* (see Dillman, 2000). The main concern for using online surveys is that the results of these surveys may be limited to individuals who have access to computers with online capabilities, and to individuals who know enough about using computers that they can complete and submit the survey correctly.

A written survey can be administered in person, by mail, or using the Internet.

Interview Surveys

Face-to-face interviews. A researcher could administer a survey orally to one participant at a time or to a small group. The advantage of a face-to-face interview is that the researcher can control how long it takes to complete the survey inasmuch as it is the researcher asking the questions. The drawback of face-to-face interviews is that they require the interviewer to be present for each survey and can be prone to **interviewer bias**, meaning that the interviewer's demeanor, words, or expressions in an interview may influence the responses of a participant. For this reason, face-to-face interviews, while used in quantitative research, tend to be more commonly applied in qualitative research for which interviewing is a primary method used to describe an individual or a group.

Interviewer bias is the tendency for the demeanor, words, or expressions of a researcher to influence the responses of a participant when the researcher and the participant are in direct contact.

Telephone interviews. An interview can also be administered via the telephone. Phone interviews can be interpersonal (e.g., the researcher asks the questions) or automated (e.g., computer-assisted technology asks the questions). One advantage of automated telephone interviews is that they can save

time and reduce the likelihood of interviewer bias. Another advantage is that telephone surveys can be administered at random by generating telephone numbers at random from within the area or region using **random digit dialing**. The key disadvantage of telephone interviews is that they often result in few people willingly agreeing to complete the survey. Also, the passage of new laws restricting telephone surveying has made this method of administering surveys less common in the behavioral sciences.

Focus-group interviews. Sometimes researchers use surveys that are aimed at getting people to share ideas or opinions on a certain topic or issue. A survey that is structured to get participants to interact is called a focus group, which is a small group of about three to eight people. Questions or survey items in a focus group are mostly open-ended, and the researcher plays more of a moderator role than an interviewer role. The goal of a focus group is to get participants talking to each other to get them to share their ideas and experiences on a predetermined topic. The conversations are typically recorded and then analyzed. While focus groups can reveal new directions and ideas for a given research topic, they are associated with the same problems mentioned for face-to-face interviews.

An interview survey can be administered face-to-face, by telephone, or in focus groups.

Each survey administration method described here can vary substantially on how effectively researchers obtain representative samples. Obtaining representative samples is important because surveys are often used for the purpose of learning about characteristics in a population of interest. For example, we sample a few potential voters to identify the candidate who is likely to obtain the most votes in the population, not just among those sampled. Therefore, it is important that the sample we select to complete a survey is representative of the population. Administering a survey in person or face-to-face can make it more likely that we can obtain a representative sample. Administering the survey by mail, telephone, or Internet, on the other hand, can limit the representativeness of our sample because often only a small proportion of those who receive the survey will respond and actually complete the survey. Issues related to this problem of response rate are discussed in Section 8.5.
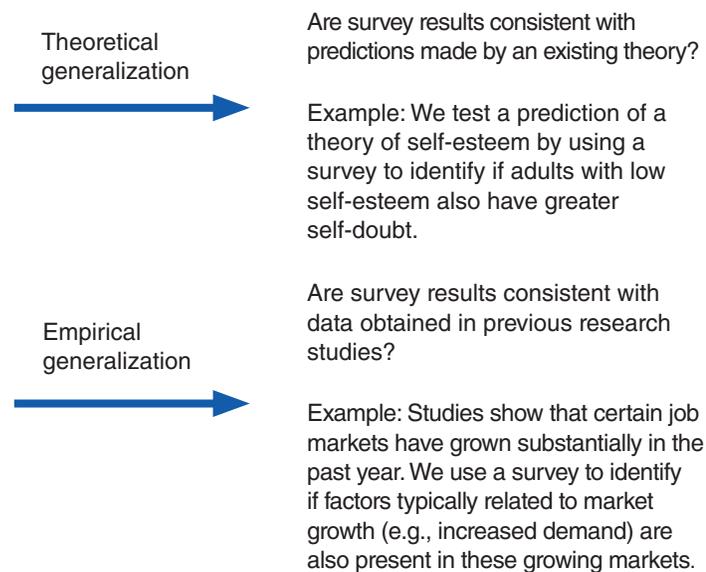
8.5 Surveys, Sampling, and Nonresponse Bias

When administering a survey, it is important to obtain a high survey **response rate**, which is the portion of participants who agree to complete a survey among all those who were asked to complete the survey. When the response rate is low, the concern is that any results from the survey will be limited to only those people who were actually willing to complete the survey. When the response rate is high, we can be more confident that the sample of those who completed the survey is representative of the larger population of interest.

Issues related to response rates center on the possibility of a *nonresponse bias* (see Chapter 5), which occurs when participants choose not to

complete a survey or choose not to respond to specific items in a survey. Although at least a 75% response rate should be obtained to minimize bias, the typical response rate to surveys in published peer-reviewed research is less than 50% (Baruch, 1999; Baruch & Holtom, 2008; Shih & Fan, 2008). The problem of low response rates is that people who respond to surveys are probably different from those who do not respond. Because we cannot collect data from people who fail to respond, it is difficult to know the exact characteristics of this group of nonresponders. For this reason, we cannot know for sure whether survey results of those who do respond are representative of the larger population of interest, which includes those who do not respond to surveys.

Figure 8.2 Two Types of Generalization for the Results in Survey Research

Theoretical generalization

Are survey results consistent with predictions made by an existing theory?

Example: We test a prediction of a theory of self-esteem by using a survey to identify if adults with low self-esteem also have greater self-doubt.

Empirical generalization

Are survey results consistent with data obtained in previous research studies?

Example: Studies show that certain job markets have grown substantially in the past year. We use a survey to identify if factors typically related to market growth (e.g., increased demand) are also present in these growing markets.

While the low response rates in published research can be problematic, there is good reason to publish the results from these journals. Although low response rates can limit the population validity (a subtype of external validity; see Chapter 6) of results from a survey, researchers are not always interested in generalizing results to a population. To establish some external validity, researchers often use survey results to instead generalize to a theory, called **theoretical generalization**, or generalize to other observations, called **empirical generalization**. Each type of generalization is illustrated in Figure 8.2 with an example given for each type. As long as survey results are rooted in existing theories and data, researchers "can afford to be lenient [to some extent] about sample quality in academic research" (Blair & Zinkhan, 2006, p. 6).

Theoretical generalization is the extent to which results in a survey or another research study are consistent with predictions made by an existing theory.

Empirical generalization is the extent to which results in a survey or another research study are consistent with data obtained in previous research studies.

8.6 Ethics in Focus: Handling and Administering Surveys

To show respect for persons, which is a key principle in the Belmont report and the APA (2010) code of conduct, the researcher has certain ethical responsibilities regarding how to handle and administer surveys in a research study. The following are four responsible and appropriate ways to handle and administer surveys:

- The survey itself should not be offensive or stressful to the respondents. The respondents should, under reasonable circumstances, be satisfied or comfortable with their survey experience such that they would not feel distress if asked to complete the survey again. If they would feel distress, then the survey may pose potential psychological risks to the respondents.

- Do not coerce respondents into answering questions or completing a survey. All respondents should be informed prior to completing the survey, typically in an informed consent form, that they can skip or choose not to answer any survey items, or the entire survey, without penalty or negative consequence.

- Do not harass respondents in any way for recruitment purposes. Because of high nonresponse rates, researchers often actively recruit potential respondents through e-mail or phone call reminders. The potential respondents must not view these recruitment efforts as harassing or intrusive.

- Protect the confidentiality or anonymity of respondents. Personally identifiable information of respondents should be protected at all times. If the researcher requires respondents to provide personally identifiable information, then such information should be safeguarded while in the possession of the researcher.

LEARNING CHECK 3 ✓

1. State three ways that a written survey can be administered. State three ways that an interview survey can be administered.

2. Is the typical response rate for survey research that is published in the behavioral sciences less than or greater than 50%?

3. True or false: A survey should not be offensive or stressful to the respondent.

Answers: 1. A written survey can be administered in person, by mail, and over the Internet. An interview survey can be administered face-to-face, by telephone, and in focus groups; 2. Less than; 3. True.

CORRELATIONAL DESIGNS

In the chapter opening, we stated the following hypothesis: Texting while driving is more prevalent among younger age groups. To answer the hypothesis we used a survey design to begin this chapter. However, we could use a correlational research design to test this hypothesis as well. To use the correlational design, for example, we could ask a sample of participants who drive to indicate in a questionnaire their age (in years) and how often they use text messaging while driving

(per month). If the hypothesis is correct and we set up this study correctly, then we should expect to find that increased texting is associated with younger drivers.

Notice that we used survey data (based on responses in a questionnaire) to record the data. Surveys are often used with a correlational research design. However, keep in mind that anytime we use data to determine if two or more factors are related/correlated, we are using the correlational design, even if we used a survey or questionnaire to record the data. In this final section, we introduce the research design that was illustrated here: the correlational research design.

8.7 The Structure of Correlational Designs

It is often difficult to determine that one factor causes changes in another factor. For example, in the texting-while-driving study used to introduce each major section in this chapter we cannot reasonably determine that being younger causes drivers to text more while driving because we cannot control for other possible factors that can cause a change in texting behavior. Other possible factors include how often people drive, how busy their daily lives are, how many friends they have, how good of a driver they think they are, or whether they believe texting while driving is dangerous. In these situations, when it is difficult to control for other possible factors that could be causing changes in behavior, we use the **correlational research design** to determine the extent to which two factors are related, not the extent to which one factor causes changes in another factor.

To set up a correlational research design, we make two or more measurements for each individual observed. For the purposes of introducing the correlational research design, we will introduce situations in which only two measurements are made. Each measurement is for a different variable that we believe is related. For example, colleges record the relationship between SAT scores and college GPA to determine admittance criteria. Higher SAT scores in high school are related to a higher freshman college GPA, which is why many colleges use SAT scores as part of their criteria for accepting students to enroll. The correlation establishes the extent to which two factors are related, such that values for one variable may predict changes in the values of a second variable.

A **correlational research design** is the measurement of two or more factors to determine or estimate the extent to which the values for the factors are related or change in an identifiable pattern.

The **correlation coefficient** is a statistic used to measure the strength and direction of the linear relationship, or correlation, between two factors. The value of r can range from −1.0 to +1.0.

A correlation can be established in any setting. The correlation between GPA and SAT scores, for example, can be measured in a classroom or academic setting. In a naturalistic setting, we could measure the correlation between customer satisfaction in a restaurant and timeliness to serve patrons. In a laboratory setting, we could expose participants to a fearful stimulus and record how fearful they rate the stimulus and their corresponding physiological stress response. Using existing data records, we could use legal documents to identify the correlation between duration of marriage (in years) and race, age, socioeconomic status, and any number of other demographic characteristics. In each example, we make two measurements for each individual (or document when using existing records), one measurement for each of the two variables being examined.

Once we measure two variables, we then compute a statistical measure called the **correlation coefficient** to identify the extent to which the values of the two variables or factors

are related or change in an identifiable pattern. The correlation coefficient ranges from –1.0 (the values for two factors change in opposite directions) to +1.0 (the values for two factors change in the same direction), and is used to identify a pattern in terms of the *direction* and *strength* of a relationship between two factors—each way of describing the relationship between two factors is introduced in this section.

> The correlational research design is used to identify the extent to which values for two or more factors are related.

In behavioral research, we mostly describe the linear (or straight-line) relationship between two factors. For this reason, we will limit this introduction to the direction and strength of a linear relationship between two factors.

8.8 Describing the Relationship Between Variables

The *direction* of a relationship between two factors is described as being positive or negative. The *strength* of a relationship between two factors is described by the value of the correlation coefficient, r; with values closer to $r = \pm 1.0$ indicating a stronger relationship between two factors. The direction and strength of correlation can be readily identified in a graph called a **scatterplot**. To construct a scatterplot, we plot each pair of values, called **data points**, along the *x*-axis and *y*-axis of a graph to see whether a pattern emerges.

> A **scatterplot**, also called a **scatter diagram** or **scattergram**, is a graphical display of discrete data points (*x*, *y*) used to summarize the relationship between two factors.
>
> **Data points** are the *x*- and *y*-coordinates for each plot in a scatterplot.
>
> The **regression line** is the best-fitting straight line to a set of data points. A best-fitting line is the line that minimizes the distance that all data points fall from it.

The extent to which two factors are related is determined by how far data points fall from a **regression line** when the data points are plotted in a graph. The regression line is the best-fitting or closest-fitting straight line to a set of data points. The best-fitting straight line is the one that minimizes the distance of all data points that fall from it. We will use the regression line to illustrate the direction and strength of the relationship between two factors using the correlational research design.

> Data points are fit to a regression line to determine the extent to which changes in one factor are related to changes in a second factor.
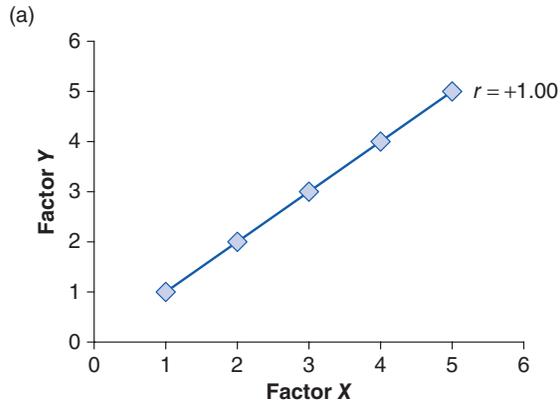
The Direction of a Relationship

In a scatterplot, a **positive correlation** means that as values of one factor increase, values of a second factor also increase; as values of one factor decrease, values of a second factor also decrease. If two factors have values that change in the same direction, we can graph the correlation using a straight line. Figure 8.3 shows that values on the *y*-axis increase as values on the *x*-axis increase.

Figure 8.3a shows a *perfect* positive correlation, which occurs when each data point falls exactly on a straight line, although this is rare. More commonly, as shown in Figure 8.3b, a positive correlation
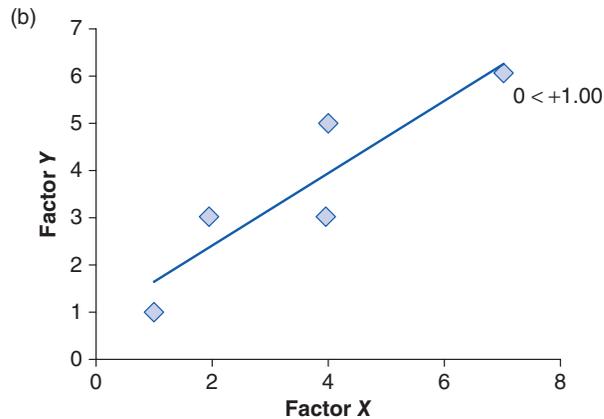
> A **positive correlation** is a positive value of *r* that indicates that the values of two factors change in the same direction: As the values of one factor increase, values of the second factor also increase; as the values of one factor decrease, values of the second factor also decrease.

Figure 8.3 A Perfect Positive (a) and a Positive (b) Linear Correlation

(a)

X	Y
1	1
2	2
3	3
4	4
5	5

$r = +1.00$

(b)

X	Y
1	1
2	3
4	3
4	5
7	6

$0 < +1.00$

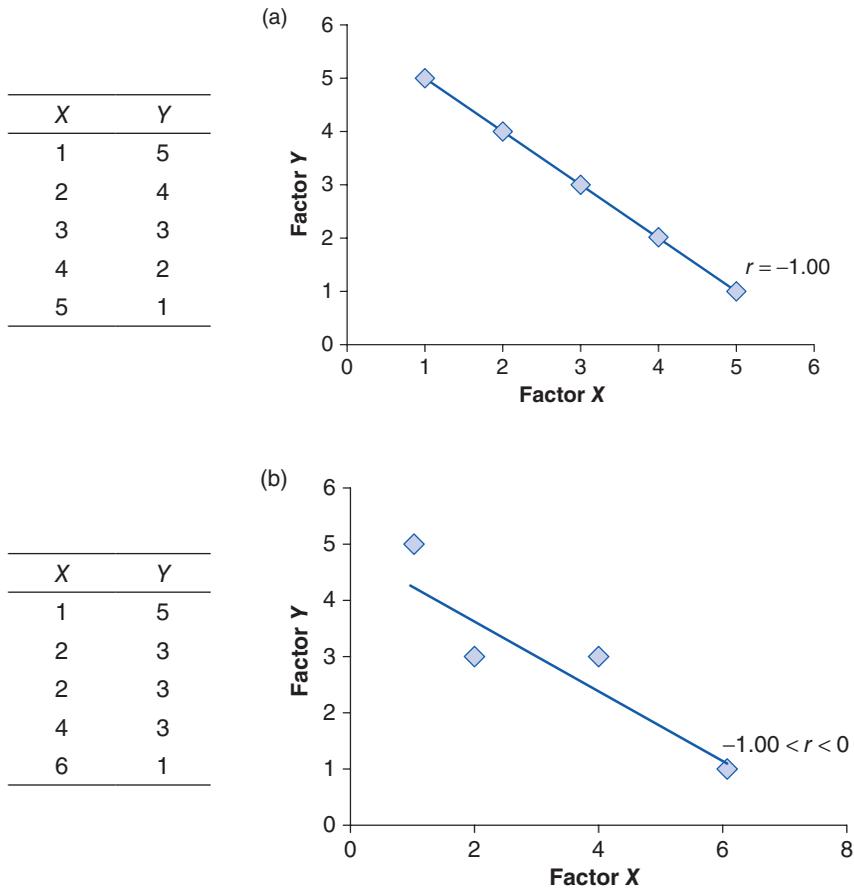Both the table and the scattergram show the same data for (a) and (b).

The sign of the correlation coefficient, r, indicates the direction of a relationship between two factors: + indicates that the values for two factors change in the same direction; − indicates that the values for two factors change in opposite directions.

is greater than 0 but less than 1.0, where the values of two factors change in the same direction, but not all data points fall exactly on the regression line.

A **negative correlation** means that as values of one factor increase, values of the second factor decrease. If two factors have values that change in the opposite direction, we can graph the correlation using a straight line. Figure 8.4 shows that values on the *y*-axis decrease as values on the *x*-axis increase.

Figure 8.4a shows a *perfect* negative correlation, which occurs when each data point falls exactly on a straight line, although this is also rare. More commonly, as shown in Figure 8.4b, a negative correlation is greater than –1.0 but less than 0, where the values of two factors change in the opposite direction, but not all data points fall exactly on the regression line.

Section III: Nonexperimental Research Designs

Figure 8.4   A Perfect Negative (a) and a Negative (b) Linear Correlation

(a)

X	Y
1	5
2	4
3	3
4	2
5	1

$r = -1.00$

(b)

X	Y
1	5
2	3
2	3
4	3
6	1

$-1.00 < r < 0$

Both the table and the scattergram show the same data for (a) and (b).

The Strength of a Relationship

A zero correlation ($r = 0$) means that there is no linear pattern or relationship between two factors. This outcome is rare because usually by mere chance at least some values of one factor, X, will show some pattern or relationship with values of a second factor, Y. The closer a correlation coefficient is to $r = 0$, the weaker the correlation and the less likely that two factors are related; the closer a correlation coefficient is to $r = \pm 1.0$, the stronger the correlation and the more likely that two factors are related.

The strength of a correlation reflects how consistently values for each factor change. When plotted in a graph, a stronger correlation means that the values for each factor change in a related pattern—the data points fall closer to a regression line, or the

A **negative correlation** is a negative value of r that indicates that the values of two factors change in different directions, meaning that as the values of one factor increase, values of the second factor decrease.

straight line that best fits a set of data points. Figure 8.5 shows two positive correlations between exercise (Factor *X*) and body image satisfaction (Factor *Y*), and Figure 8.6 shows two negative correlations between absences in class (Factor *X*) and quiz grades (Factor *Y*). In both figures, the closer a set of data points falls to the regression line, the stronger the correlation; hence, the closer a correlation coefficient is to $r = \pm 1.0$.

The Correlation Coefficient

The most commonly used formula for computing *r* is the **Pearson correlation coefficient,** which is used to determine the strength and direction of the relationship between two factors on an interval or a ratio scale of measurement.

Figure 8.5 The Consistency of Scores for a Positive Correlation
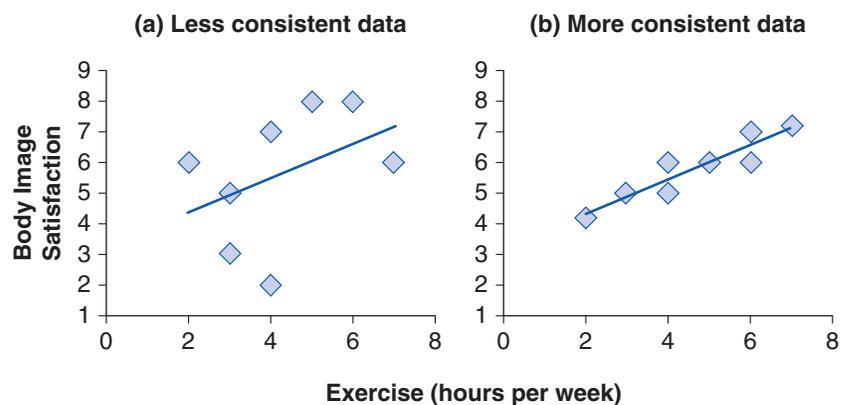
Both figures show approximately the same regression line, but the data points in (b) are more consistent because they fall closer to the regression line than in (a).

Figure 8.6 The Consistency of Scores for a Negative Correlation
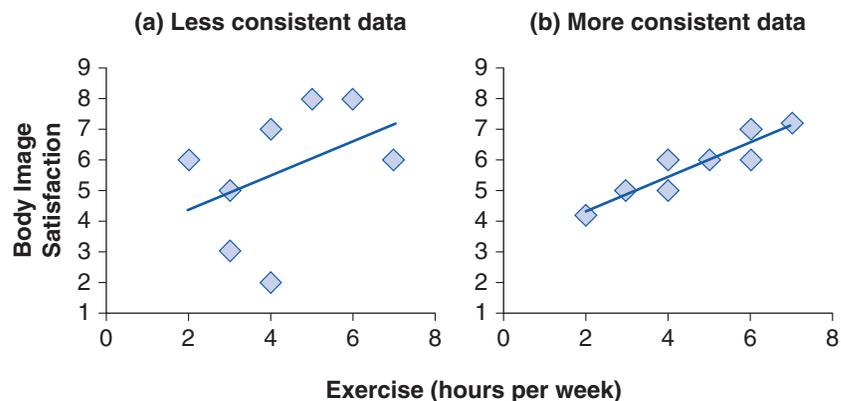
Both figures show approximately the same regression line, but the data points in (b) are more consistent because they fall closer to the regression line than in (a).

Alternative formulas for computing a correlation with many scales of measurement exist, as identified in Table 8.2; however, each of these alternative formulas was derived from the formula for the Pearson correlation coefficient, so only the Pearson formula will be described in this section. The formula for the Pearson correlation coefficient is a measure of the variance of data points from a regression line that is shared by the values of two factors (X and Y), divided by the total variance measured:

$$r = \frac{\text{variance shared by X and Y}}{\text{total variance measured}}$$

The correlation coefficient, r, measures the variance of X and the variance of Y, which constitutes the total variance that can be measured. The total variance is placed in the denominator of the formula for r. The variance in the numerator, called **covariance**, is the amount or proportion of the total variance that is shared by X and Y. The larger the covariance, the closer data points will fall to the regression line. When all data points for X and Y fall exactly on a regression line, the covariance equals the total variance, making the formula for r equal to +1.0 or –1.0, depending on the direction of the relationship between two factors. The farther that data points fall from the regression line, the smaller the covariance will be compared to the total variance in the denominator, resulting in a value of r closer to 0.

The **Pearson correlation coefficient** is used to measure the direction and strength of the linear relationship of two factors in which the data for both factors are on an interval or a ratio scale of measurement.

Covariance is the extent to which the values of two factors (X and Y) vary together. The closer data points fall to the regression line, the more the values of two factors vary together.

If we conceptualize covariance as circles, as illustrated in Figure 8.7, then the variance of each factor (X and Y) will be contained within each circle. The two circles, then, contain the total measured variance. The covariance of X and Y reflects the extent to which the total variance or the two circles overlap. In terms of computing r, the overlap or covariance is placed in the numerator; the total variance contained within each circle is placed in the denominator. The more the two circles overlap, the more the covariance (in the numerator) will equal the independent variances contained within each circle (in the denominator)—and the closer r will be to ±1.0.

Table 8.2	The Scales of Measurement for Factors Tested Using Correlation Coefficients
Correlation coefficient	**Scale of measurement for correlated variables**
Pearson	Both factors are interval or ratio data.
Spearman	Both factors are ranked or ordinal data.
Point-Biserial	One factor is dichotomous (nominal data), and a second factor is continuous (interval or ratio data).
Phi	Both factors are dichotomous (nominal data).

Figure 8.7 Covariance Between *X* and *Y*

Variance in *X* alone → *X*

Covariance between *X* and *Y* → *XY*

Variance in *Y* alone → *Y*
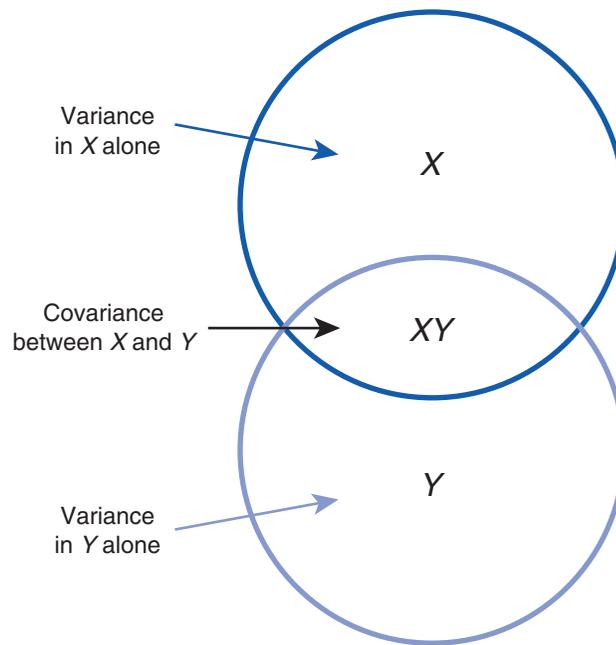
Each circle represents the variance of a factor. The variances of two factors covary inasmuch as the two circles overlap. The more overlap or shared variance of two factors, the more the two factors are related.

LEARNING CHECK 4 ✓

1. The value of the _____ provides an estimate of the strength and direction of the relationship between two factors.

2. A professor measures a negative correlation between time spent partying and grades. Interpret this result.

3. A researcher records a correlation of *r* = +.02.
   A. Identify the direction of this correlation.
   B. Identify the strength of this correlation.

4. How will the data points appear in a graph for two factors with values that change consistently?

Answers: 1. correlation coefficient (*r*); 2. As time spent partying increases, grades decrease; 3. A. The direction of the correlation is positive, B. The strength of the correlation is weak because .02 is close to 0; 4. The data points will fall close to the regression line.

8.9 Limitations in Interpretation

Fundamental limitations using the correlational method require that a significant correlation be interpreted with caution. Among the many considerations for interpreting a significant correlation, in this section we consider causality, outliers, and restriction of range.

Causality

Using a correlational design, we do not manipulate an independent variable, and we certainly make little effort to control for other possible factors that may also vary with the two variables we measured. For this reason, a significant correlation does not show that one factor causes changes in a second factor (i.e., causality). To illustrate, suppose we measure a significant negative correlation between the self-rated mood of participants and the amount of food they eat daily (in calories per day). We will look at four possible interpretations for this correlation.

> **Reverse causality** is a problem that arises when the direction of causality between two factors can be in either direction.
>
> Reverse causality occurs when the direction of causality for two factors, A and B, cannot be determined. Hence, changes in Factor A could cause changes in Factor B, or changes in Factor B could cause changes in Factor A.

1. Decreases in how people feel (mood) can cause an increase in the amount they eat (eating). This possibility cannot be ruled out.

2. Increases in the amount people eat (eating) can cause a decrease in how people feel (mood). So the direction of causality can be in the opposite direction. Hence, instead of changes in mood causing changes in eating, maybe changes in eating cause changes in mood. This possibility, called **reverse causality**, cannot be ruled out either.

3. The two factors could be systematic, meaning that they work together to cause a change. If two factors are systematic, then Conclusions 1 and 2 could both be correct. The worse people feel, the more they eat, and the more people eat, the worse they feel. This possibility, that each factor causes the other, cannot be ruled out either.

4. Changes in both factors may be caused by a third unanticipated **confound variable**. Perhaps biological factors, such as increased parasympathetic activity, make people feel worse and increase how much they want to eat. So, it is increased parasympathetic activity that could be causing changes in both mood and eating. This confound variable and any number of additional confound variables could be causing changes in mood and eating and cannot be ruled out either.

Figure 8.8 summarizes each possible explanation for an observed correlation between mood and eating. The correlational design cannot distinguish between these four possible explanations. Instead, a significant correlation shows that two factors are related. It does not provide an explanation for how or why they are related.

> A **confound** or **confound variable** is an unanticipated variable not accounted for in a research study that could be causing or associated with observed changes in one or more measured variables.

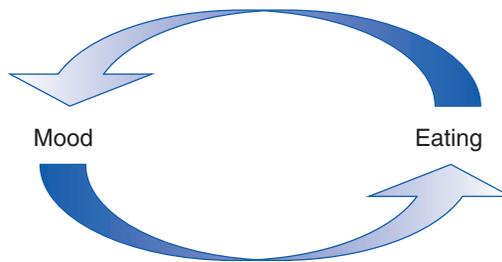**Figure 8.8**   Four Potential Explanations for a Significant Correlation

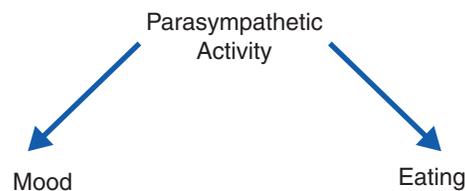**1.** Changes in mood cause changes in eating:

Mood ——————————————▶ Eating

2. Changes in eating cause changes in mood (reverse causality):

Mood ◀—————————————— Eating

3. The two variables work together (systematically) to cause an effect:

Mood   Eating

4. Changes in both factors are caused by a third confound variable:

Parasympathetic
Activity

Mood   Eating

Because factors are measured, but not manipulated using the correlational method, any one of these possibilities could explain a significant correlation.

Outliers

A significant correlation shows that two factors are related and not that one factor causes changes in a second factor.

Another limitation that can obscure the correlation or relationship between two factors is when an outlier is in the data. An **outlier** is a score that falls substantially above or below most other scores in a data set and can alter the direction and the strength of an observed correlation. Figure 8.9a shows data for the relationship between income and education without an outlier in the data. Figure 8.9b shows how an outlier, such as the income earned by a child movie star, changes the relationship between two factors. Notice in Figure 8.9 that the outlier changed both the direction and the strength of the correlation.

Figure 8.9 The Effects of an Outlier
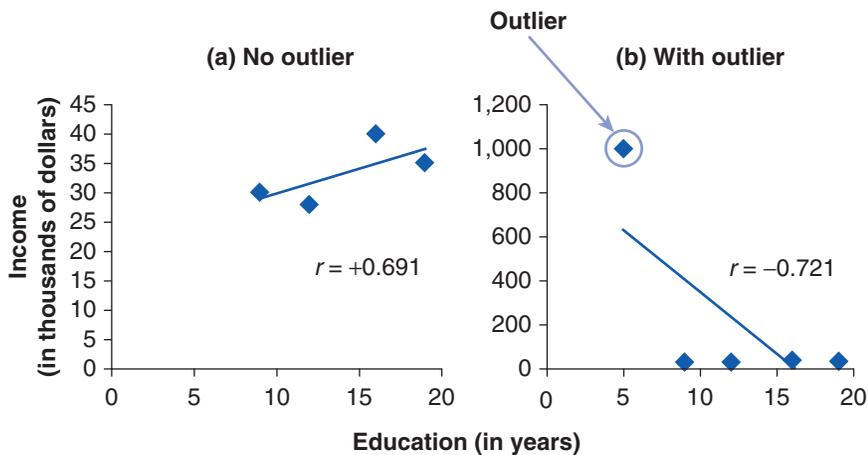
(a) displays a typical correlation between income and education, with more education being associated with higher income. (b) shows the same data with an additional outlier of a child movie star who earns $1 million. The inclusion of this outlier changed the direction and the strength of the correlation.

Restriction of Range

When interpreting a correlation, it is also important to avoid making conclusions about relationships that fall beyond the range of data measured. The **restriction of range** problem occurs when the range of data measured in a sample is restricted or smaller than the range of data in the general population.

Figure 8.10 shows how the range of data measured in a sample can lead to erroneous conclusions about the relationship between two factors in a given population. In the figure, a positive correlation for a hypothetical population (top graph) and the correlations in three possible samples we could select from this population (smaller graphs below) are shown. Notice that, depending on the range of data measured, we could identify a positive, a negative, or zero correlation from the same population, although the data in the population are actually positively correlated. To avoid the problem of restriction of range, the direction and the strength of a correlation should only be generalized to a population within the limited range of measurements observed in the sample.

> An **outlier** is a score that falls substantially above or below most other scores in a data set.

> **Restriction of range** is a problem that arises when the range of data for one or both correlated factors in a sample is limited or restricted, compared to the range of data in the population from which the sample was selected.

> Outliers can change the strength and the direction of a correlation or relationship between two factors.

Figure 8.10 The Effects of Restriction of Range
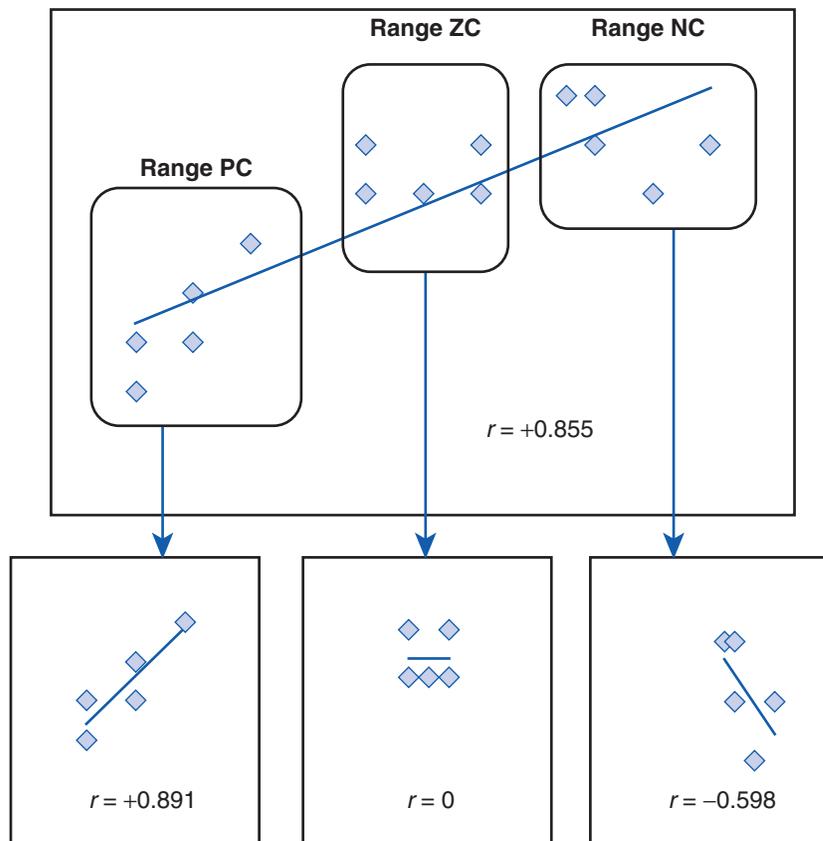
In this population, shown in the top graph, there is a positive correlation between two factors (r = +0.855). Also depicted are three possible samples we could select from this population. Range PC shows a positive correlation (r = +0.891), Range ZC shows a zero correlation (r = 0), and Range NC shows a negative correlation (r = −0.598)—all within the same population. Because different ranges of data within the same population can show very different patterns, correlations should never be interpreted beyond the range of data measured in a sample.

8.10   Correlation, Regression, and Prediction

Do not describe a correlation beyond the range of data observed in a sample to avoid the problem of restriction of range.

The correlation coefficient, r, is used to measure the extent to which two factors (X and Y) are related. The value of r indicates the direction and strength of a correlation. When r is negative, the values of two factors change in opposite directions; when r is positive, the values of two factors change in the same direction. The closer r is to ±1.0, the stronger the correlation, and the more closely two factors are related.

We can use the information provided by r to predict values of one factor, given known values of a second factor. Recall that the strength of a correlation

reflects how closely a set of data points fits to a regression line (the straight line that most closely fits a set of data points). We can use the value of r to compute the equation of a regression line and then use this equation to predict values of one factor, given known values of a second factor in a population. This procedure is called **linear regression**.

To use linear regression, we identity two types of variables: the predictor variable and the criterion variable. The **predictor variable** (X) is the variable with values that are known and can be used to predict values of the criterion variable; the predictor variable is plotted on the x-axis of a graph. The **criterion variable** (Y) is the variable with unknown values that we are trying to predict, given known values of the predictor variable; the criterion variable is plotted on the y-axis of a graph. If we know the equation of the regression line, we can predict values of the criterion variable, Y, so long as we know values of the predictor variable, X. To make use of this equation, we identify the following equation of a straight line:

$$Y = bX + a$$

In this equation, Y is a value we plot for the criterion variable, X is a value we plot for the predictor variable, b is the slope of a straight line, and a is the y-intercept (where the line crosses the y-axis). Given a set of data, researchers can find the values of a and b, then use the equation they found to predict outcomes of Y.

To illustrate the use of the regression line to predict outcomes, consider a study conducted by Chen, Dai, and Dong (2008). In this study, participants completed a revised version of the Aitken Procrastination Inventory (API), and their level of procrastination was recorded. The researchers found that the following regression equation could be used to predict procrastination (Y) based on known scores on the API (X):

$$\hat{Y} = 0.146X - 2.922$$

In this equation, $\hat{Y}$ is the predicted value of Y given known scores on the API, $a = 2.922$, and $b = 0.146$. Using this information, we could have a student complete the API, plug his or her API score into the equation for X, and solve for $\hat{Y}$ to find the procrastination level we predict for that student.

The advantage of using linear regression is that we can use the equation of the regression line to predict how people will behave or perform. A caution of using this procedure, however, is that smaller correlations, or those closer to $r = 0$, will produce inaccurate predictions using the equation of the regression line because the data points will fall far from it. Likewise, the stronger the correlation, or the closer to $r = \pm 1.0$, the more accurate the predictions made using the equation of the regression line because the data points will fall closer to it.

Linear regression, also called **regression**, is a statistical procedure used to determine the equation of a regression line to a set of data points and to determine the extent to which the regression equation can be used to predict values of one factor, given known values of a second factor in a population.

The **predictor variable (X)** is the variable with values that are known and can be used to predict values of another variable.

The **criterion variable (Y)** is the to-be-predicted variable with unknown values that can be predicted or estimated, given known values of the predictor variable.

The equation of the regression line can be used to predict outcomes of a criterion variable.

1. A correlational design does not demonstrate cause. Why?

2. True of false: An outlier can influence both the *direction* and the *strength* of an observed correlation.

3. _____ occurs when the range of data for one or both correlated factors in a sample is limited or restricted, compared to the range of data in the population from which the sample was selected.

4. What procedure is used to predict outcomes of one factor given known values of a second factor?

Answers: 1. Because we do not manipulate an independent variable, and we make little effort to control for other possible factors that may also vary with the two variables we measured; 2. True; 3. Restriction of range; 4. Linear regression.

8.11 SPSS in Focus: Correlation and Linear Regression

The correlational design will likely require the use of a correlation coefficient or linear regression to statistically analyze measured data. In this section, we will describe how to compute each type of statistic using SPSS.
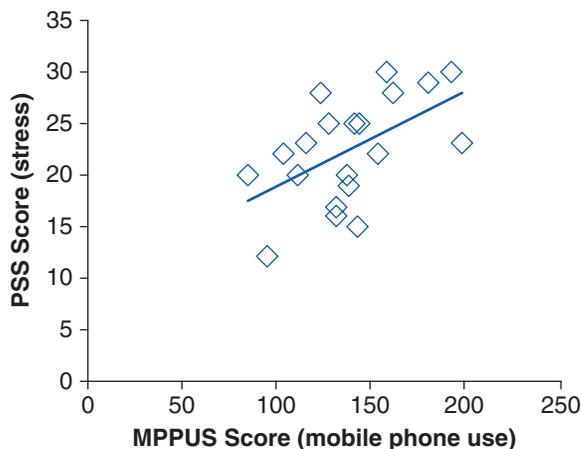
Pearson Correlation Coefficient

To compute a Pearson correlation coefficient using SPSS, suppose we test the hypothesis that greater mobile phone use is associated with increased stress, as has been tested in published research studies (see Reid et al., 2009; Thomée, Härenstam, & Hagberg, 2011). To measure mobile phone use, we can use the 27-item Mobile Phone Problem Use Scale (MPPUS; Bianchi & Phillips, 2005). To measure stress we can use the 10-item Perceived Stress Scale (PSS; S. Cohen & Williamson, 1988). Using these measures, we will enter the data shown in Figure 8.11 to compute a Pearson correlation coefficient using SPSS.

1. Click on the **Variable View** tab and enter *MPPUS* in the **Name column**; enter *PSS* in the Name column below it. Reduce the value to 0 in the **Decimals column** for both rows.

2. Click on the **Data View** tab. Enter the data for MPPUS in the first column; enter the data for PSS in the second column.

3. Go to the menu bar and click **Analyze**, then **Correlate**, then **Bivariate** to display a dialog box.

4. Using the arrows, move both variables into the **Variables** box.

5. Select **OK**, or select **Paste** and click the **Run** command.

The SPSS output table, shown in Table 8.3, is set up in a matrix with *MPPUS* and *PSS* listed in the rows and columns. Each cell in the matrix gives the direction and strength of the correlation ($r = .540$ for mobile phone use and stress; this value is shown with an asterisk for significant correlations), the significance ($p = .014$; how to interpret a p value is described in Chapters 10–12 and 14), and the sample size ($N = 20$). To make a decision: If a correlation is

MPPUS (Mobile Phone Use)	PSS (Perceived Stress)
142	25
115	23
127	25
122	28
137	20
103	22
85	20
198	23
95	12
131	16
158	30
142	15
140	25
111	20
137	19
153	22
132	17
192	30
160	28
180	29

The regression line is given in the scattergram. Both the table and the scattergram show the same data.

Table 8.3 SPSS Output Table for the Pearson Correlation Coefficient

Correlations

		MPPUS	PSS
MPPUS	Pearson Correlation	1	.540*
	Sig. (2-tailed)		.014
	N	20	20
PSS	Pearson Correlation	.540*	1
	Sig. (2-tailed)	.014	
	N	20	20

*. Correlation is significant at the 0.05 level (2-tailed).

significant, then the decision is that the correlation observed in the sample will also be observed in the larger population from which the sample was selected. We can report a correlation in a research journal using the guidelines provided in the *Publication Manual of the American Psychological Association* (APA, 2009). Using these guidelines, we state the value of *r*, the *p* value, and the sample size as shown:
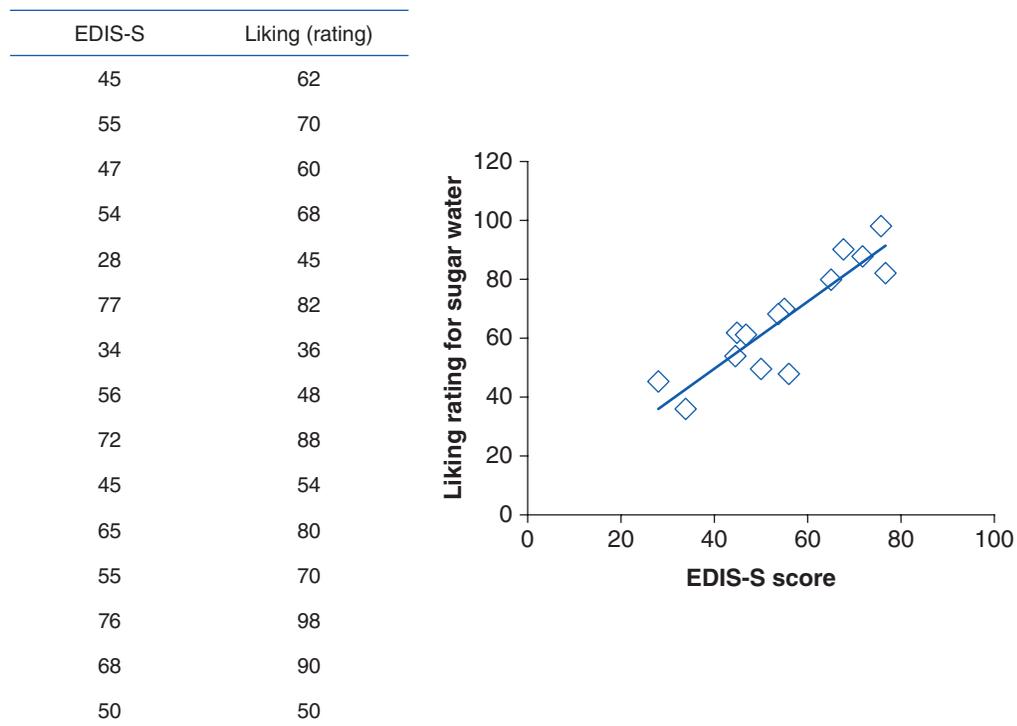
A Pearson correlation indicates that greater mobile phone use is associated with greater perceived stress, $r = .540$, $p = .014$, $N = 20$.

Linear Regression

For situations in which we want to know if values for one factor predict values for a second factor, we use linear regression. As an example, suppose we conduct a test similar to that computed by Privitera and Wallace (2011). In that study, the researchers tested if scores on the 11-item EDIS-S predicted how much people like the taste of sugar. To measure liking for sugar, participants drank sugar water and rated how much they liked the taste on a 100-millimeter line scale in which higher ratings indicated greater liking for the sugar water. Using data similar to those observed in the Privitera and Wallace (2011) study, we will enter the data shown in Figure 8.12 to compute linear regression using SPSS.

1. Click on the **Variable View** tab and enter *EDISS* in the **Name column**; enter *liking* in the Name column below it. Reduce the value to 0 in the **Decimals column** for both rows.

2. Click on the **Data View** tab. Enter the data for the EDIS-S in the first column; enter the data for liking in the second column.

Figure 8.12 A Table and Scattergram Showing the Relationship Between EDIS-S Scores and Liking for Sugar Water

EDIS-S	Liking (rating)
45	62
55	70
47	60
54	68
28	45
77	82
34	36
56	48
72	88
45	54
65	80
55	70
76	98
68	90
50	50

The regression line is given in the scattergram. Both the table and the scattergram show the same data.

3. Go to the menu bar and click **Analyze**, then **Regression**, then **Linear . . .** to display a dialog box.

4. Using the arrows, move the criterion variable, *liking*, in the **Dependent** box; move the predictor variable, *EDISS*, into the **Independent(s)** box.

5. Select **OK**, or select **Paste** and click the **Run** command.

The SPSS output table, shown in Table 8.4, displays three ways to analyze the data. The top table shows the proportion of variance, $R^2 = .797$, which is an estimate for how well EDIS-S scores predict ratings of liking for the sugar water. Values closer to 1.0 indicate better predictions. Results for the regression analysis are given in the middle table. Based on the results in that table, we conclude that EDIS-S scores (the predictor variable) do significantly predict a liking for sugar water (the criterion variable), as indicated by the p value in the **Sig.**

Table 8.4   SPSS Output for Linear Regression

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.893[a]	.797	.781	8.554

a. Predictors: (Constant), EDISS

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3729.789	1	3729.789	50.978	.000[b]
	Residual	951.145	13	73.165		
	Total	4680.933	14			

a. Dependent Variable: liking
b. Predictors: (Constant), EDISS

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.674	8.968		.521	.611
	EDISS	1.126	.158	.893	7.140	.000

a. Dependent Variable: liking

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column (how to interpret a p value is described further in Chapters 10–12 and 14). To make a decision: If a regression analysis is significant, then the decision is that the predictive relationship observed in the sample will also be observed in the larger population from which the sample was selected. To determine the direction of the relationship between EDIS-S scores and liking for the sugar water we look at the standardized beta coefficient given in the bottom table. In this example, the beta coefficient is positive, $\beta = +.893$, indicating that higher scores on the EDIS-S predict higher ratings for the sugar water.

Based on guidelines in the *Publication Manual of the American Psychological Association* (APA, 2009), we report the results of a regression analysis with one predictor variable by including the value of R^2 (top table), the value of β (bottom table), and the results of the regression analysis (middle table; reported as an F value) as shown:

A regression analysis showed that EDIS-S scores significantly predicted ratings of liking for sugar water, $\beta = +.893$, $F(1, 13) = 50.978$, $p < .001$ ($R^2 = .797$).

LO 1 Identify and construct open-ended, partially open-ended, and restricted survey items.

- An *open-ended item* is a question or statement in a survey that allows the respondent to give any response in his or her own words, without restriction. This type of question is most often used in qualitative research.

- A *partially open-ended item* is a question or statement in a survey that includes a few restricted answer options and then a last option that allows participants to respond in their own words in case the few restricted options do not fit with the answer they want to give.

- A *restricted item* is a question or statement in a survey that includes a restricted number of answer options to which participants must respond. This type of question is most often used in quantitative research.

LO 2 Identify nine rules for writing valid and reliable survey items.

- Nine rules for writing valid and reliable survey items are as follows:
  - Keep it simple.
  - Avoid double-barreled items.
  - Use neutral or unbiased language.
  - Minimize the use of negative wording.
  - Avoid the response set pitfall.
  - Use rating scales consistently.
  - Limit the points on a rating scale.
  - Label or anchor the rating scale points.
  - Minimize survey length.

LO 3 Describe methods of administering written surveys and interview surveys.

- A survey can be written (in print or electronically) or spoken (such as in an interview). A written survey can be administered in person, by mail, or using the Internet. An interview survey can be administered face-to-face, by telephone, or in focus groups. In-person and face-to-face surveys have the best response rates. Also, written surveys are preferred to interview surveys in quantitative research partly because interviews are prone to a possible interviewer bias.

LO 4 Explain how response rates to surveys can limit the interpretation of survey results.

- The problem of low response rates is that people who respond to surveys are probably different from those who do not respond. Because we cannot collect data from people who fail to respond, it is difficult to know the exact characteristics of this group of nonresponders. For this reason, we cannot know for sure whether survey results of those who do respond are representative of the larger population of interest, which includes those who do not respond to surveys.

LO 5 Identify how to appropriately handle and administer surveys.

- To appropriately handle and administer surveys, the survey itself should not be offensive or stressful to the respondent; do not coerce respondents into answering questions or completing a survey; do not harass respondents in any way for recruitment purposes; protect the confidentiality or anonymity of respondents.

LO 6 Identify and describe the direction and strength of a correlation.

- The **correlation coefficient**, r, is used to measure the extent to which two factors (X and Y) are related. The value of r indicates the direction and strength of a correlation. When r is negative, the values for two factors change in opposite directions; when r is positive, the values for two factors change in the same direction. The closer r is to ± 1.0, the stronger the correlation, and the more closely two factors are related.

- When plotted in a graph, the strength of a correlation is reflected by the distance that data points fall from the **regression line**. The closer that data points fall to a regression line, or the straight line that best fits a set of data points, the stronger the correlation or relationship between two factors.

LO 7 Explain how causality, outliers, and restriction of range can limit the interpretation of a correlation coefficient.

- Three considerations that must be made to accurately interpret a correlation coefficient are that (1) correlations do not demonstrate causality, (2) outliers can change the direction and the strength of a correlation, and (3) never generalize the direction and the strength of a correlation beyond the range of data measured in a sample (restriction of range).

LO 8 Explain how linear regression can be used to predict outcomes.

- We can use the information provided by r to predict values of one factor, given known values of a second factor using a procedure called **linear regression**. Specifically, we can use the value of r to compute the equation of a regression line and then use this equation to predict values of one factor, given known values of a second factor in a population. Using the following equation of the regression line, $Y = bX + a$, we can predict values of the criterion variable, Y, so long as we know values of the predictor variable, X.

LO 9 Compute the Pearson correlation coefficient and linear regression using SPSS.

- SPSS can be used to compute the Pearson correlation coefficient using the **Analyze, Correlate,** and **Bivariate** options in the menu bar. These actions will display a dialog box that allows you to identify the variables and to run the correlation (for more details, see Section 8.11).

- SPSS can be used to compute linear regression using the **Analyze, Regression,** and **Linear . . .** options in the menu bar. These actions will display a dialog box that allows you to identify the variables and to run the linear regression (for more details, see Section 8.11).

KEY TERMS

survey

survey research design

Likert scale

double-barreled
  questions

response set

bipolar scales

anchors

interviewer bias

response rate

correlational research design

correlation coefficient

scatter plot

scatter diagram

scatter gram

data points

linear regression

linear regression line

positive correlation

negative correlation

Pearson correlation coefficient

covariance

outlier

restriction of range

regression

predictor variable

criterion variable

open-ended item

partially open-ended item

restricted item

theoretical generalization

empirical generalization

confound variable

reverse causality

regression line

reverse coded item

closed-ended item

random digit dialing

REVIEW QUESTIONS

1. Distinguish between an open-ended and a partially open-ended question.

2. Identify the problem or flaw with each of the following survey items. Assume that each item is rated on a 5-point scale from 1 (*strongly disagree*) to 5 (*strongly agree*).

   A. I hate driving behind old people.

   B. I am happy when I am alone, and I do not like to be visited.

   C. I have difficulty engaging in convoluted situations.

   D. My friends are not willing to participate in activities that I am not willing to participate in.

3. State two problems with the following scale for a survey item:

   1   2   3   4   5   6   7   8   9   10   11

   Somewhat Flawed

4. What are three reasons that more participants are willing to complete a survey administered in person?

5. Which type of bias can occur when a survey is administered in an interview?

6. State four responsible and appropriate ways to handle and administer surveys.

7. A researcher reports that the farther college students are from their parents, the more often they communicate with their parents (either by phone or by e-mail). Is this an example of a positive or a negative correlation?

8. An instructor reports that as the number of student interruptions during class decreases, student scores on in-class quizzes increase. Is this an example of a positive or a negative correlation?

9. The following graphs display the data points for a linear correlation. Based on the information provided in these graphs, answer the following questions.
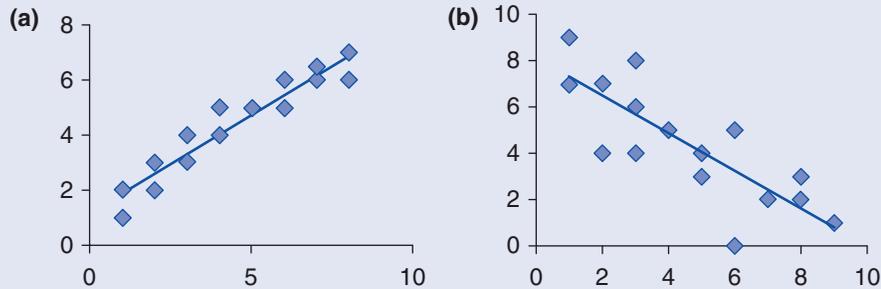
A. Which graph displays the negative correlation? Explain.

B. Which graph displays the stronger correlation? Explain.

10. A researcher finds that the softer the tone that a parent uses to speak to his or her child, the less often the child has outbursts.

A. Is this a positive or negative correlation?

B. Is reverse causality possible for this example? Explain.

11. True or false: Outliers can change the direction and strength of a correlation.

12. When does restriction of range limit the interpretation of a significant correlation?

13. The equation of a regression line can be used to _____ values of one factor, given known values of a second factor.

14. What is the relationship between the predictor variable and the criterion variable?

ACTIVITIES

1. Follow the eight rules for writing valid and reliable survey items to construct a short 6- to 10-item survey to measure a behavior that you are interested in. Then give the survey to at least five people, and summarize the responses given for each item in your survey.

2. Think of two factors that you predict will be related. Measure each factor in a sample of at least 10 people. Enter the data you collect into SPSS, and follow the instructions for computing a Pearson correlation coefficient, given in this chapter. Summarize the result in terms of the direction and the strength of the correlation between the two factors you measured.

Identify a problem

- Determine an area of interest.
- Review the literature.
- Identify new ideas in your area of interest.
- Develop a research hypothesis.

Develop a research plan

- Define the variables being tested.
- Identify participants or subjects and determine how to sample them.
- Select a research strategy and design.
- Evaluate ethics and obtain institutional approval to conduct research.

Generate more new ideas

- Results support your hypothesis—refine or expand on your ideas.
- Results do not support your hypothesis—reformulate a new idea or start over.

After reading this chapter, you should be able to:

1 Define and identify a quasi-experiment and a quasi-independent variable.
2 Identify and describe two one-group quasi-experimental research designs: the posttest-only and pretest-posttest designs.
3 Identify and describe two nonequivalent control group quasi-experimental research designs: the posttest-only and pretest-posttest designs.
4 Identify and describe three time series quasi-experimental research designs: basic, interrupted, and control designs.
5 Identify and describe three developmental quasi-experimental research designs: longitudinal, cross-sectional, and cohort-sequential designs.
6 Define the single-case experimental design.
7 Identify and describe three types of single-case research designs: the reversal, multiple-baseline, and changing-criterion designs.
8 Identify in a graph the stability and magnitude of a dependent measure, and explain how each is related to the internal validity of a single-case design.
9 Identify three ways that researchers can strengthen the external validity of a result using a single-case design.

Communicate the results

- Method of communication: oral, written, or in a poster.
- Style of communication: APA guidelines are provided to help prepare style and format.

Conduct the study

- Execute the research plan and measure or record the data.

Analyze and evaluate the data

- Analyze and evaluate the data as they relate to the research hypothesis.
- Summarize data and research results.