2

Generating Testable Ideas

Hearsay, gossip, scuttlebutts, and rumors are a common phenomenon. A friend tells you that someone else likes you, or a classmate tells you that she heard that class is canceled today. Yet how can you trust your friend or classmate? One way would be to confirm that your friend heard it from the person who likes you or your classmate heard it directly from the professor who canceled the class. In other words, the best information "comes straight from the horse's mouth." This idiomatic expression made popular in horse racing in the early 1900s is synonymous with reliability and observation.

The phrase is also synonymous with the reliability of one's sources. In horse racing, a person who was so close to a horse that he or she could see inside the horse's mouth must have been a trusted source. This phrase is also synonymous with observation. Throughout history, unscrupulous horse traders falsified equine health records and ages, in hopes of persuading potential buyers to overpay for horses. The only way to know the health and age of a horse for sure was to look inside the horse's mouth for the truth. A horse's health and age could be estimated quite accurately by looking at the number and condition of his or her teeth. Consequently, to appraise a horse's worth, one must make an observation "straight from the horse's mouth."

In the same way that horse traders relied on trustworthy sources and observations to make judgments of a horse's worth, scientists develop their ideas or hypotheses based on the reliability of their sources and on their observations of phenomena. In this chapter, we introduce the types of sources from which researchers generate ideas and the ways in which researchers can identify these sources based on whether the information reported in them "came straight from the horse's mouth."

2.1 Generating Interesting and Novel Ideas

It was the German-born American physicist Albert Einstein who once said, "I am neither especially clever nor especially gifted. I am only very, very curious." While it is more likely that Einstein was clever, gifted, and curious, his insight marks an important feature in science: Knowledge is only possible through inquiry. One characteristic of all good scientists is that they ask good questions. Einstein, for example, asked, "Are time and space the same thing?" His research was to answer this question, which led to his theory of relativity—a mathematical proof that the answer to his question is yes. For all of the complexities of the theory of relativity, imagine that this research was inspired by such a simple question.

A key objective of scientific research is to extend knowledge beyond what is already known. One way in which researchers can share or disseminate new knowledge to other scientists is to publish their work in a scientific journal, called a **peer-reviewed journal**. This way of sharing new knowledge is highly regarded in science. To publish a scientific work, it is important to be considerate of the aims and scope of a peer-reviewed scientific journal even as a work is being developed. Two criteria of importance to developing a work can be met by answering the following two important questions regarding an idea:

A **peer-reviewed journal** is a type of publication that specifically publishes scientific articles, reviews, or commentaries only after the work has been reviewed by peers or scientific experts who determine its scientific value or worth regarding publication. Only after acceptance from peer reviewers will a work be published.

- *Is my idea interesting?* An interesting idea can potentially benefit society, test a prediction, or develop areas of research where little is known. Peer-reviewed journals have a readership, and your idea must appeal to those who read that journal if you are to publish your ideas. In other words, journals prefer to publish papers that are going to be widely read and useful to their readers. The webpage for most peer-reviewed journals has an *aims and scope* section that you should read before deciding to submit your work to a particular journal. Not meeting the aims and scope of a journal can be grounds alone for rejection of a work.
- *Is my idea novel?* A novel idea is one that is original or new. You must be able to show how your idea adds to or builds upon the scientific literature. If you can demonstrate what we learn from your idea, then it is novel. It is valuable to replicate or repeat the results of other works; however, replication alone, without appreciable advancement of a fundamental new understanding or knowledge in an area, is often not sufficient to publish a work. Instead, the editors at peer-reviewed journals will prefer scientific reports of "original and significant" findings that extend, not simply repeat, scientific understanding or knowledge.

For any idea you have, the answer to both of these questions should be yes. Ultimately, it is your peers (i.e., other researchers in a field related to your idea) who will review your work before it can be published in a scientific journal. By answering yes to both questions, you should be able to effectively communicate the value of your idea to a scientific audience. Table 2.1 gives three examples of how the authors of a peer-reviewed article studying the use of iPads in elementary school classrooms communicated what made their ideas interesting and novel.

In this chapter, we specifically describe how scientists develop interesting and novel ideas—ideas that are based upon the review of reliable sources and can be tested; that is, we can make observations to confirm or disconfirm if the new idea is correct using the scientific method.

TABLE 2.1 ● Three Articles Concerning the Use of iPads in Elementary School Classrooms

Reference	Description	Is the idea interesting?	Is the idea novel?
Falloon (2015)	The researcher used observations, displayrecorded data, focus groups, and a survey to learn how features of the iPad affected students' collaboration.	Recent "research attention has turned towards mobile and touch screen technologies as offering new possibilities for supporting school learner collaboration" (p. 63).	This study "is profoundly different, and significantly extends earlier research. It is based on data collected over a period of almost 3 years in three different primary (elementary) school classrooms, where class and group sets of iPads were present 'fulltime', and used for the complete array of curriculum learning activities" (p. 63).
Milman, Carlson-Bancroft, and Boogart (2014)	Researchers examined how teachers differentiated instruction with the use of iPads.	As schools invest in new technologies, "interest continues to grow regarding the use of iPads in P–12 educational settings as mechanisms to increase student learning and achievement" (p. 119).	"There is a paucity of research on iPads in P–12 classroom Settings" (p. 120).
Carr (2012)	Researchers investigated the effect of the use of the iPad as a computing device on mathematics achievement.	An "investigation of the effects of iPads on fifth-grade mathematics achievement could not only fill a gap in the existing literature but also be used to inform elementary mathematics teachers" (p. 270).	"Scholarly research on the effects of iPad use on education has been limited in general and nonexistent for mathematics achievement" (p. 210).

The citation for where the authors of each article explicitly state what makes their research interesting and novel is given.

2.2 Converting Ideas to Hypotheses and Theories

In many ways, science may appear to be the search for new information. However, the information itself is of little value without organization. Imagine, for example, trying to find a book in a library that places books on shelves in a random order. The information is in the library; however, it will be difficult to find the information you seek. Moreover, we must do more than just catalog the information we obtain; we must also understand it. In other words, we identify the relevance or usefulness of information. Specifically, we identify the relevance of information by identifying how information can broaden our understanding of the phenomena we study.

The process of organizing information in science is similar to working on a puzzle. You begin with scattered pieces and guessing which pieces fit where. Once you have enough puzzle pieces in place, you can begin to organize other puzzle pieces based on what you know about the pieces in place. Some regions of the puzzle have a similar color and some have a similar design, and this organization can help you ultimately organize the remaining pieces until they all fit the puzzle. The pieces of the puzzle are like the observations we make. And the strategies we use to complete the puzzle are like the hypotheses and theories that researchers state.

A **hypothesis** is a specific, testable claim or prediction about what you expect to observe given a set of circumstances.

A **hypothesis**, also defined in Chapter 1, is a specific, testable claim or prediction about what you expect to observe given a set of circumstances. For example, researchers used a variety of analytical models to test the income inequality hypothesis, which predicts that income inequality has a negative effect on an individual's health (Kragten & Rözer, 2017). The hypothesis was a statement of prediction that specifically identified the outcome they expect to observe (a negative effect on health) given specified circumstances (income inequality). Using the puzzle analogy, each attempt to place puzzle pieces together is like an attempt to test a hypothesis. Sometimes we find evidence to support our hypothesis (the puzzle pieces fit) and sometimes we do not (the puzzle pieces do not fit). As we start to "put the pieces together," a theory can then develop.

A **theory** is a broad statement used to account for an existing body of knowledge and provide unique predictions to extend that body of knowledge. A theory is not necessarily correct; instead, it is a generally accepted explanation for evidence, as it is understood.

A **theory** is a broad statement used to account for or explain an existing body of knowledge and provide unique predictions to advance that body of knowledge. A theory essentially organizes evidence that has been rigorously tested and supported by scientific observations. If the findings of research studies point to a collective explanation for the observations made, then a theory develops. Returning to the puzzle analogy, imagine that we put together a puzzle without knowing what the image is that we are constructing. As we group pieces by colors and patterns, we will start to see an image appear in a similar way; as we gain evidence, we begin to "see" the nature of the phenomena we study. From that information, we can theorize what the puzzle image is. As we continue to fit pieces of the puzzle together, we can then modify and refine our theory for what is in the image, similar to how we modify and refine theories of natural or behavioral phenomena as we gather more evidence about these phenomena.

While not exhaustive, there are three key criteria to consider when developing a good hypothesis or theory that is regarded as scientific:

1. Testable/Falsifiable. A good theory or hypothesis must be stated in a way that makes it possible to reject it (i.e., it must be falsifiable). For example, we can state the theory that a belief in God leads to better health outcomes (Flannelly, 2017). This theory does lead to falsifiable predictions that researchers can readily test. However, we cannot state the theory that God exists because the existence of God cannot be falsified and therefore cannot be accepted as a good theory. That is not to say science says God does not exist; that is to say that such a claim cannot be tested using the scientific process.

2. Replicable/Precise. The mechanisms (i.e., presumed causes) and outcomes in a hypothesis or theory should be clearly defined and should be precise. For example, consider findings showing that obesity and depression are bidirectional, meaning that they tend to co-occur (Luppino et al., 2010). A theory explaining this finding should specify the mechanisms to explain this finding, such that the measures for these mechanisms can be observed. To explain findings that obesity and depression are bidirectional, for example, one theory proposes environmental mechanisms (Privitera, Misenheimer, & Doraiswamy, 2013), whereas another theory proposes neurobiological mechanisms (Nestler, 2012) to explain the bidirectionality. These theories are scientific inasmuch as the mechanisms (environment, neurobiology)

and the outcome (bidirectionality of obesity and depression) are specifically defined—such that other researchers could also readily observe, measure, and repeat/replicate the procedures used to test these theories. Environmental variables, for example, could be measured using existing data (e.g., number of fast-food restaurants in a region or over time) or by directly observing behavior (e.g., grocery shopping behavior); neurobiological variables could be measured using a variety of medical tools (e.g., a stethoscope to measure heart rate or a blood sample to measure cholesterol). The manner in which these variables are measured thus needs to be clearly defined and precise so that other researchers could readily set up similar measures and procedures to compare if they get similar results.

3. Parsimonious. **Parsimony** is a canon of science that simpler explanations should be preferred to more complex ones. For example, one poor theory popularized by television is the ancient alien theory, which posits that aliens have visited Earth in the past and influenced human civilizations. The theory is unnecessarily complex, among other flaws. A simpler explanation is simply that Man influenced human civilization. Evidence such as pyramid building and cultural norms such as burial practices can be explained without the need to appeal to ancient aliens visiting Earth and interacting with humans. Thus, one reason it is a poor theory for science is that simpler explanations can just as readily explain the evidence purported to support the theory itself.

Parsimony is a canon of science that states that, all else being equal, simpler explanations should be preferred to more complex ones.

The advantage of a theory is that it not only states unique predictions, but it can also explain an existing body of research. Figure 2.1 shows the general pattern of developing hypotheses and theories. Notice in the figure that a theory is just as open to testing as a hypothesis. Specifically, a theory is often tested in one of two ways:

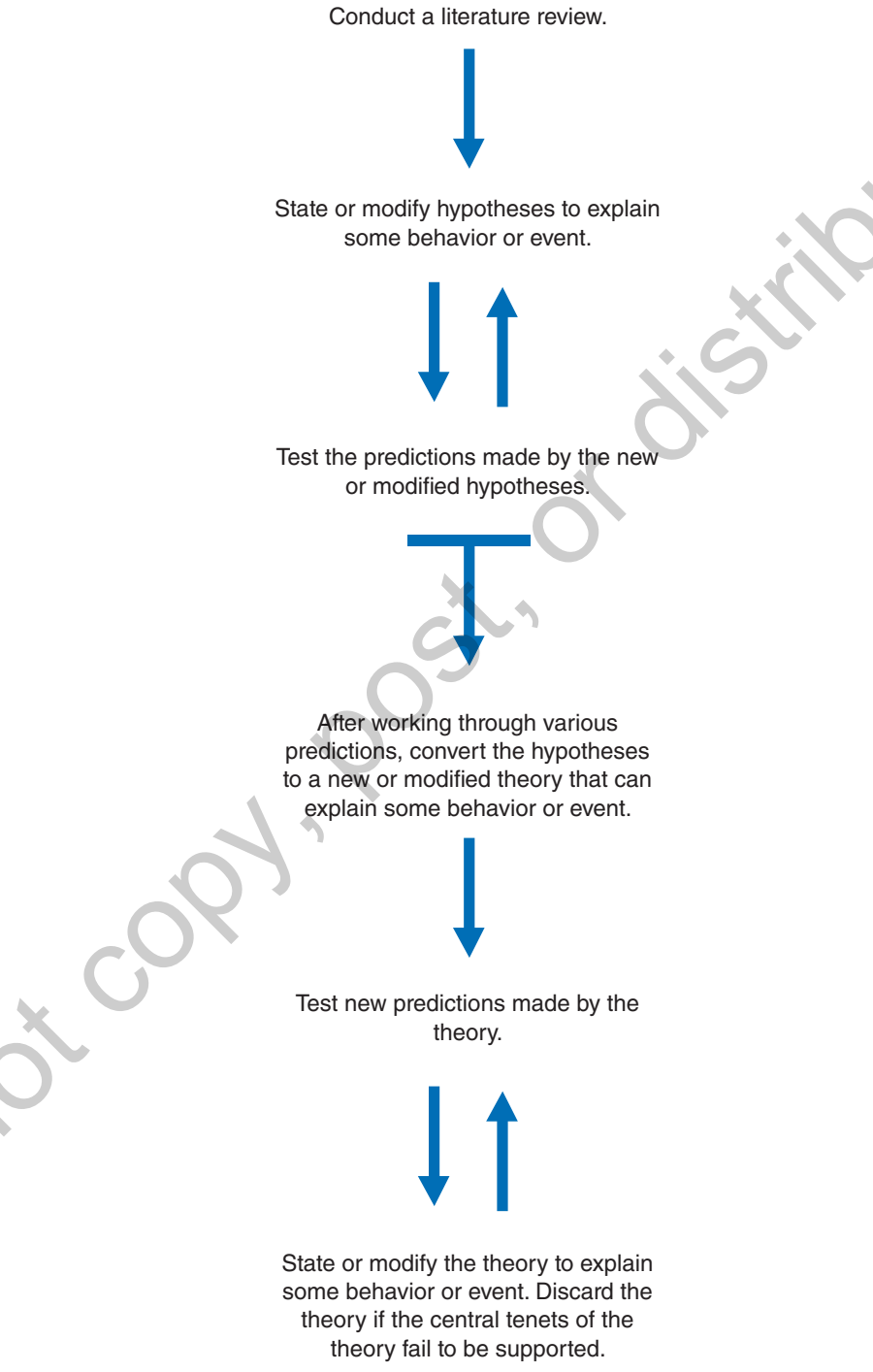
- **The predictions made by a theory can be tested**. For example, one theory related to branding states that the more familiar children are with a fast food toy or character, the more fast food they will consume (Emond et al., 2016). We can test a prediction of the theory to see if offering toys that are more familiar to children, in fact, results in increased food intake.
- **The limitations of a theory can be tested to either limit or extend the scope of predictions made by a theory**. For example, the theory related to branding (Emond et al., 2016) is stated for familiarity with toys offered with fast foods. One possible limitation of the theory is that the critical mechanism is limited to familiarity. We could test this possible limitation to see if features other than familiarity similarly influence intake. For example, we could offer a toy that is equally familiar to children but varies in other ways, such as by the size of the toy offered. These tests can identify limitations or constraints of the theory (if features other than toy familiarity fail to influence intake) or even extend or broaden the theory (if we find that features other than familiarity similarly increase intake among children).

An idea should be interesting (appeal to others) and novel (provide new information).

Researchers state hypotheses that, after being rigorously tested, can develop into a theory.

Hypotheses and theories allow researchers to organize a large body of research in a way that explains an understanding for evidence, as it is understood, and provides predictions to organize the expectations for what we should observe. From this platform we can state hypotheses to test our ideas, and we can also revise and develop our theories to better explain our observations—all with the hope of one day "completing the puzzle" of understanding human behavior.

FIGURE 2.1 ● A General Pattern of Developing Hypotheses and Theories to Explain Behaviors and Events



Learning Check 1 ✓

1. Explain why it is important for an idea to be interesting and novel.
2. Distinguish between a hypothesis and a theory.
3. State three key criteria to consider when developing a good hypothesis or theory that is regarded as scientific.

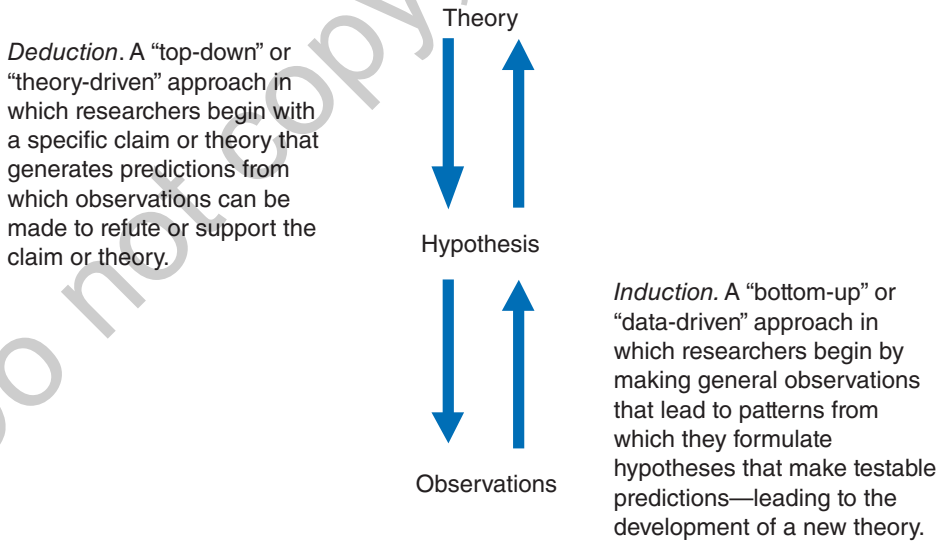
Answers:

1. An idea should be interesting because peer-reviewed journals have a readership and the idea must appeal to those who read that journal in order to be published. An idea should be novel because you must be able to show how your idea adds to or builds upon the scientific literature; 2. A hypothesis is a specific, testable claim or prediction about what you expect to observe given a set of circumstances, whereas a theory is a broad statement used to account for an existing body of knowledge and provide unique predictions to extend that body of knowledge; 3. Testable/falsifiable, replicable/precise, parsimonious.

2.3 Developing Your Idea: Deduction and Induction

The reasoning that scientists often use to develop their ideas is to begin with a theory or to begin with an observation, referred to as deductive and inductive reasoning, respectively. To some extent, many scientists use a combination of both types of reasoning to develop their ideas. Each type of reasoning is introduced here and illustrated in Figure 2.2.

FIGURE 2.2 ● A Comparison of Deductive and Inductive Reasoning



Deductive Reasoning

Deductive reasoning is a "top-down" type of reasoning in which a claim (a hypothesis or theory) is used to generate ideas or predictions and make observations.

Many scientific reports will explicitly state theories that have been developed to explain a body of knowledge. A useful theory is one that leads to logical predictions of what we should and should not observe if the theory is correct. The reasoning we use to develop ideas to test those predictions is called **deductive reasoning**. Using deductive reasoning, you begin with a hypothesis or theory, then use that claim to deduce what you believe should occur, or not occur, if the claim is correct. The prediction you deduce will be used to refute or support the claim. Hence, using deductive reasoning, you start with an idea (the hypothesis or theory) to generate your ideas (predictions made by the hypothesis or theory). Using deductive reasoning, the hypothesis or theory guides the ideas you generate and observations you make.

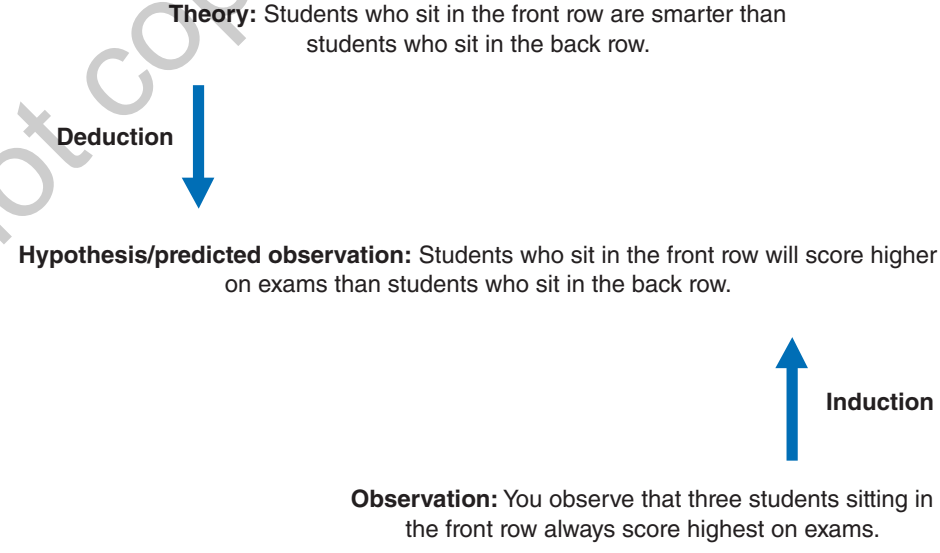
To illustrate deductive reasoning, imagine that, based on a literature review, you state the following theory, which you call the "front row theory": Students who sit in the front row are smarter than students who sit in the back row. From this starting point, you deduce predictions of what will be observed if your theory is correct. One prediction, for example, is that students who sit in the front row will score higher on an exam than students who sit in the back row. You can test this prediction by recording the grades of students and recording where they sat in class. In this way, your theory guides what you choose to observe. Figure 2.3 illustrates the "front row theory" example using deductive reasoning.

Inductive Reasoning

Inductive reasoning is a "bottom-up" type of reasoning in which a limited number of observations or measurements (i.e., data) are used to generate ideas and make observations.

Sometimes, you may find that your initial ideas are developed by your own data or observations. The type of reasoning you use to generate ideas from observations is called **inductive reasoning**. Using inductive reasoning, you make a casual observation (e.g., you see that students always attend a psychology class) or collect and measure data (e.g., you record total class attendance for 1 week). You then generate an idea to explain what

FIGURE 2.3 ● The Process of Deduction and Induction for the Same Problem



In this example, both types of reasoning led to the same hypothesis.

you observed or measured (e.g., students attend class because the professor gives quizzes each day). The idea you generate to explain the observation is your hypothesis. Hence, using inductive reasoning, you start with an observation to generate new ideas; you generalize beyond the limited observations you made. Using inductive reasoning, then, the data or observations guide the ideas you generate and observations you make.

To illustrate the distinction between deductive and inductive reasoning, we can revisit the "front row theory" example to show how inductive reasoning could lead to the same idea we developed using deductive reasoning. Suppose you observe that three students sitting in the front row always score highest on exams. From this starting point, you hypothesize that all students who sit in the front row will score higher on exams than those who sit in the back row. You record the grades of all students and record where they sat in class. Notice that we arrive at the same idea and the same study to test that idea using both types of reasoning. Figure 2.3 illustrates the "front row theory" example using inductive reasoning.

Inductive and deductive reasoning represent two ways in which researchers develop ideas for scientific testing.

Learning Check 2 ✓

1. Which of the following situations is an example of deductive reasoning, inductive reasoning, or both?
   - A. You observe two of your friends arguing. About 2 minutes into the argument, a comedy special airs on TV that makes both of them laugh. After that, they no longer argue. From this you conclude that humor can alleviate conflict.
   - B. While reading a professional paper you come across a theory stating that increased violence during children's television programming leads to an increase in violence among children. You resolve that if this is true, then it is also true that an increase in nonviolent children's television programming will lead to a decrease in violence among children.
   - C. You observe a friend praying while he is sick. Soon afterward he recovers. You conclude that spiritual faith has a positive impact on health. If this is true, you resolve, then people who express spiritual faith have a shorter duration of common illnesses than those who do not.

Answers: 1. A. Induction; B. Deduction; C. Both.

2.4 Performing a Literature Review

To develop an idea you must perform a **literature review**. The *literature* is the general body of published scientific knowledge. The *review* is the search you perform of this general body of knowledge. The literature is most often published in peer-reviewed journals and academic books. Other sources, such as newspapers, popular magazines, and Internet websites, are not part of the scientific literature because the information provided in these sources is not typically subjected to a peer review.

A **literature review** is a systematic search for and recording of information identified in the general body of published scientific knowledge.

A key objective of the literature review is to develop new ideas that can be converted into a hypothesis that is both interesting and novel. Research is not an isolated process; rather, it is one of collaboration and peer review. Therefore, reviewing the general body of knowledge in your topic area is important to determine what is known and to develop ideas

for what is yet to be discovered. In this section, we explain how to get started with your literature review to develop new ideas and select a research topic. We then explain how to use searchable databases and organize your search results.

Getting Started: Choosing a Research Topic

Inquiry begins with a question. What topics interest you? What questions do you want to ask about those topics? When choosing a research topic, be sure to select one that interests you. The research process can be tedious. Asking questions about topics that interest you can make this process fun. Certainly, topics involving food, sports, physical fitness, relationships, video game playing, drug addiction, politics, or even shopping interest you. A researcher is probably studying just about any topic or behavior you can think of. It will be difficult to stay committed to a research project if you are not interested in the topic you are studying.

Choose a research topic that interests you.

Getting Organized: Choosing Appropriate Sources

After you find an interesting research topic, you will review the literature about that topic. Keeping track of the types of sources you come across as you perform your review is important. A *source* is any published or printed article, chapter, or book from which information can be obtained. There can be thousands of sources for even a single research topic, and reviewing them all can be challenging. The following steps will help you organize the sources you come across and make a literature review more efficient:

- Begin with a search of review articles.
- Search only from peer-reviewed or other scientific sources.

A **secondary source** is any publication that refers to works, ideas, or observations that are not those of the author.

You can categorize sources as primary and secondary. A **secondary source** is any source in which an author describes research or ideas that are not necessarily his or her own. Secondary sources can include textbooks, newspaper and magazine articles, online sources, and review articles. *Review articles* provide a full summary of a research topic by an author who is regarded as an expert on that topic. It is good to begin with these types of articles for the following two reasons:

- Key sources pertaining to a topic of interest are described in a review article.
- Review articles are typically published in peer-reviewed journals.

Review articles include dozens of the most up-to-date findings in an area of research. To summarize the literature for a topic, an author will review many sources from other researchers in that topic area. Each source reviewed in the article that was not the actual work of the author is called a secondary source. In a review article, the author or authors provide a thorough review of sometimes hundreds of secondary sources. By reading review articles, you can quickly review a diverse number of sources that you can be confident are related to your topic of interest.

Each time you come across a secondary source that interests you, you can find the reference cited in that review article and read it for yourself. As you review secondary sources, be sure to record the full reference of each source that interests you. For most sources, you should write down the author, publication year, title, journal, issue, and page numbers. Or you can create an electronic file or spreadsheet with this information to keep your search organized. You can be more efficient by having this information ready when it comes time to find the secondary sources that interest you.

The original source of an idea or research is called a **primary source**. In an *empirical article*, in which the authors conduct a firsthand study, the introduction for these articles is a great place to find secondary sources. Empirical articles can often be readily identified because these include a detailed method and results section, in addition to a concluding discussion section. These additional sections are a primary source (or the original ideas/design of the authors). In your review, keep track of secondary sources so that you can find the primary source later. It is important to find and read a primary source from the original author of a work. You should not develop your ideas based on secondary sources because a secondary source is someone (e.g., the author of the review article) telling you what someone else (e.g., the original author of the work) observed. You need to check your sources. Find the primary source and read what the original author of that work did. You do this to check that what was reported in the review article was accurate and to be more confident in the ideas you develop from your review.

A **primary source** is any publication in which the works, ideas, or observations are those of the author.

Most of the primary and secondary sources you find in your review can be found using online databases. Many databases for searching only peer-reviewed and scientific works are available at colleges throughout the world. If you have access to these library databases, then this will make your search far easier and more efficient.

After you spend days or weeks reviewing a research topic, it is often all too easy to forget whether the information you have came from primary or secondary sources. One contributing factor to this problem is that you can find secondary sources in most articles you read, even in articles you list as being a primary source. Keeping track of primary and secondary sources as you review them can minimize this problem.

It can be more efficient to review secondary sources, and then primary sources, in a literature review.

MAKING SENSE—PRIMARY AND SECONDARY SOURCES

A common misconception is that a source is either primary or secondary. In fact, most journal articles, especially those published in peer-reviewed journals, are a mix of both. Review articles mostly consist of secondary sources. However, secondary sources can also be found in original research articles from primary sources. For any research, authors must explain how their research is novel, and to do so authors must show how their research study (primary source) builds upon the known body of research typically published by various different authors (secondary sources). For this reason, most articles published in peer-reviewed journals begin with an introduction, which is where authors will explain what is known (typically by reviewing secondary sources) and what is yet to be explained and so tested in their study (primary source).

Getting Searching: Using Online Databases

Online databases allow researchers to search for, save, and print thousands of primary and secondary sources in all topic areas in the behavioral sciences. Popular databases in the behavioral sciences, the contents of which are described in Table 2.2, include PsycINFO, PsycARTICLES, PubMed, ERIC, and JSTOR. Many of these databases offer peer-reviewed articles in **full text**, meaning that the full article is provided and can be downloaded and saved on your computer, usually as a PDF.

A **full-text article** is any article or text that is available in its full or complete published version.

A **full-text database** is any online database that makes full-text articles available for download electronically as a PDF or in another electronic format.

When searching for peer-reviewed articles it is important to recognize the types of articles you can find. Searching in the databases suggested here is the safest way to ensure that you are finding only peer-reviewed articles. However, if you are ever uncertain as to whether your source is peer reviewed—whether using the databases suggested here or other

TABLE 2.2 ● Descriptions for Five Widely Used Online Databases in the Behavioral Sciences

Database	Description
PsycINFO	An abstract database containing more than 2.7 million records updated weekly, from more than 49 countries and in 29 languages. Ninety-nine percent of journals covered are peer reviewed from areas in psychology and related disciplines (American Psychological Association [APA], 2018b).
PsycARTICLES	A full-text database containing more than 142,000 full-text articles in HTML or PDF updated weekly. Full-text articles cover 66 journals from 1894 to present in areas of psychology and related disciplines (APA, 2018a).
PubMed	A comprehensive bibliographic and full-text database that contains nearly 19 million records updated weekly in the biomedical and life sciences from 1949 to present (U.S. National Library of Medicine, n.d.).
ERIC	A bibliographic and full-text database that contains more than 1.2 million records, updated twice weekly for journal articles, books, conference and policy papers, technical reports, and other education-related materials (Educational Resource Information Center, n.d.).
JSTOR	A multidisciplinary database established in 1997, JSTOR covers disciplines in the arts and sciences, including 112 titles in psychology and related fields (ITHAKA, 2018).

databases such as Google Scholar—it is often beneficial to check that your source is indeed peer reviewed. You can do this by visiting the journal's website and viewing the *about this journal* or *aims and scope* sections. For inexperienced students, it can also be a good idea to check with your professor or another more experienced professional.

In the remainder of this section, we will describe the general process for navigating online databases using PsycINFO as an example. Note that the screenshots for this database can vary from those shown in Figures 2.4 and 2.5 depending on the type of computer system you use to search PsycINFO.

After logging on to a database, typically using access provided by a college or research institution, you will see several search options under the advanced search tab. To illustrate the use of PsycINFO, we will use this database to perform a literature review on the relationship between studying and student grades. Figure 2.4 shows the upper section of the screen for this search. To begin a search you need to select keywords for the database to search. For this example, the keyword "GPA" was entered in the top left cell, and the keyword "study habits" was entered in the cell below it. Be thoughtful when choosing keywords. It is unlikely that there is no research on your topic. It is more likely that you are not using appropriate terms to search for your topic. So before giving up your search, use a thesaurus or check if you are using the correct technical jargon for your topic. It is likely that articles for your topic will appear once you start using more appropriate terms.

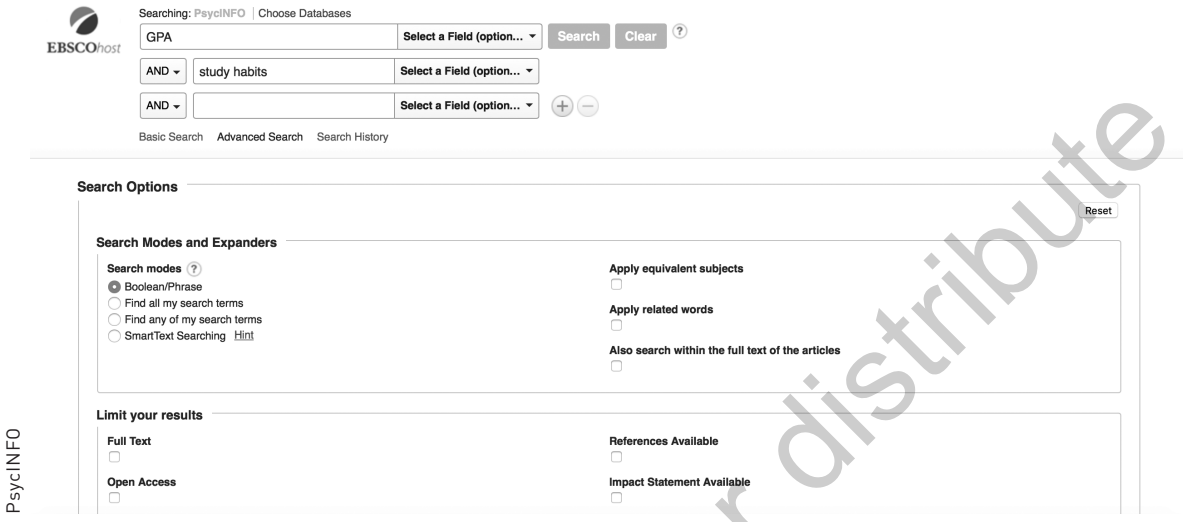
Online databases, such as PsycINFO, make research more accessible by allowing users to search thousands of articles in a single search.

In the keyword search, you have the option to search GPA *or* study habits if you enter these terms across the rows. As they are entered now, the database will search for GPA *and* study habits, which will narrow the search a bit. Note that the *and/or* options may not appear as dropdown menus in other database displays. You can also limit your search to find keywords anywhere in an article, by publication year, by author, and according to many other search options. At the bottom of the screen are additional search options. For this example, we will not limit our search, although you can do so. To perform the search using the keywords and criteria selected, click the "Search" option to the right.

An **abstract** is a brief written summary of the purpose, methods, and results of an article, a chapter, a book, or another published document. The length of an abstract can vary; however, abstracts are usually 250 words or less.

Clicking "Search" for the information entered in Figure 2.4 will display a list of sources related to the keywords you entered. Because the database is updated weekly, these results will change. Each article is listed with the title, year, author, journal, issue, and page information given. Many sources are full text, and all should include at least an **abstract** or brief overview of the article. In our search, one of the top article results was authored by McCabe and Lummis (2018). To select that article, click on the title. The information for the article

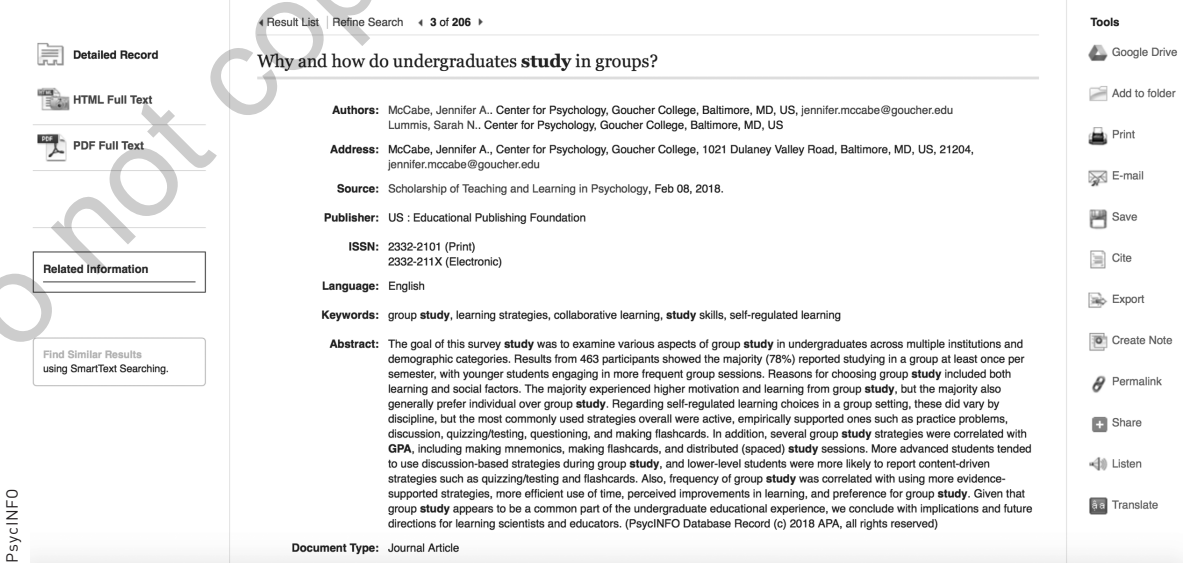
FIGURE 2.4 ● A Screenshot of the Upper Portion of an Initial Search View in PsycINFO



In our search we chose to search for the keywords "GPA" and "study habits."

is shown in Figure 2.5. If the full-text article is available, then download and save it. In our search, the left side of Figure 2.5 shows that a PDF is available in full text. If it is not, then saving the abstract and reference information will make it easier for you to find the full-text article later. If a source is not available electronically, then it can likely be found using the interlibrary loan process at your college or university library.

FIGURE 2.5 ● A Partial Screenshot of the Information Displayed in the Search Shown in Figure 2.4



These are the results of selecting the article authored by McCabe and Lummis (2018).

Section 2.6 expands on this general description of working with a database by describing some common practices for conducting an effective literature review. We turn first to a discussion in Section 2.5 for how to properly cite research that is used in your research study.

Learning Check 3 ✓

1. What is a literature review?
2. Distinguish between primary and secondary sources.
3. List five online databases used by behavioral scientists.

Answers:

1. A literature review is the systematic search for and recording of information discovered from the general body of published scientific knowledge. 2. A primary source is the works, ideas, or observations of the author, whereas a secondary source refers to works, ideas, or observations authored by other researchers; 3. PsycINFO, PsycARTICLES, PubMed, ERIC, and JSTOR.

2.5 ETHICS IN FOCUS

GIVING PROPER CREDIT

One important reason for organizing your sources when conducting a literature review is to avoid confusion when giving credit for sources cited in your research study. Ethical problems arise if you cite these sources incorrectly or without reference to the primary source. Four ways to avoid such ethical problems are the following:

- **Always double-check your sources for accuracy**. When referring to a secondary source, be sure to cite it properly and accurately so that your readers can find the source should they wish to pursue the subject you are writing about. Readers may become frustrated if they try to locate the source and cannot find it. Accuracy in citations is a concern for you and even among researchers who publish in peer-reviewed scientific journals—reference errors are evident in the published literature and can be readily avoided. An example of many common errors is given in Table 2.3 (Onwuegbuzie, Frels, & Slate, 2010).
- **Obtain the primary source of an article you cite.** One way to find the primary source is to check the references of secondary sources, particularly review articles. In that way, you can find the original work that should be given proper credit. After all, "citing the original article ensures that the person with priority for the discovery is provided proper credit. To cite a later source misallocates that credit" (Zigmond & Fischer, 2002, p. 231).
- **Avoid "abstracting."** Abstracting in this sense refers to instances in which an individual cites the full reference of some work after simply skimming through an abstract. This is poor practice because "citing references without scrutiny of the entire paper may lead to misrepresentation of the paper's actual findings" (Taylor, 2002, p. 167). When you cite a reference, be sure that you have read it in full to ensure that you properly represent the work.
- **Be aware of citation bias**. **Citation bias** occurs when an author or authors cite only evidence that supports their view and fail to cite conflicting evidence. For example, Ferguson (2010, 2015) identified such a problem in the video game violence literature. He noted that "a close look at the research on violence in video games reveals that findings are far less

consistent than have been reported by some sources" (Ferguson, 2010, p. 72) and in a later assessment concluded that "citation bias . . . continues to be [a] common problem for the field (Ferguson, 2015, p. 646). What he revealed was that many articles in the gaming literature only cited one side for or against the effects of violence in video games. Such bias should be avoided. Make sure you cite sources for all findings in your area of interest, and be aware of possible citation biases when reviewing the work of others.

In this section, we described four ethical concerns related to giving accurate and proper credit. The Office of Research Integrity offers a more exhaustive list of ethical considerations. To access the list, go to https://ori.hhs.gov and select "Case Summaries" in the "Research Misconduct" tab.

TABLE 2.3 ● Error Rates in Articles Published From 2003 to 2009 in *Research in the Schools*

Type of Error	Percentage of Articles With Error
Commas and authors	22.7
Direct quotes and page numbers	19.1
Citing multiple authors: first time	16.4
Citations in text	8.2
Not correctly citing a website	1.8
Alphabetizing citations and references	26.4
Misuse of punctuation with citation	8.2
Usage of & as opposed to the word *and* in citations	33.6

Source: Data adapted from those presented by Onwuegbuzie et al. (2010).

Learning Check 4 ✓

1. State the ethical pitfall that is described for each example given below:
   - A. A student reads an interesting abstract of an article. He tries to find the full article but is unable to locate it. He still cites the full article in his research paper.
   - B. A professor reads an interesting review article stating that other researchers have shown a link between diet and addiction. She later writes about this link and gives credit to the review article but not the original researchers who showed this link.
   - C. An author makes a claim that watching television reduces the attention span of a child and cites only those sources that support his view even though some evidence exists that refutes his view.
   - D. A researcher reads an article that includes a study that piques his interest. When he goes to find the reference cited he notices that the publication year is wrong.

Answers:

1. A. The student is guilty of abstracting; B. The professor has failed to obtain the primary source of an article cited; C. The work has a citation bias; D. The author of the article failed to double-check the sources for accuracy.

Citation bias is a misleading approach to citing sources that occurs when an author or authors cite only evidence that supports their view and fail to cite existing evidence that refutes their view.

2.6 The "3 Cs" of an Effective Literature Review

This section presents some additional strategies for conducting an effective literature review. You can remember them as the "3 Cs," or being comprehensive, critical, and clever.

Be Comprehensive

Most of the sources available using online databases are peer-reviewed research journals, which are considered very reliable sources. These journals specialize; that is, they tend to publish articles only in a particular area of research. If you find an article relevant to your research topic in one journal, then it is likely that there are additional articles on that topic in other issues of that journal. To search the journal's archive, enter the journal title in an online database keyword search and search by journal.

Searching multiple databases can also enhance your search. Each database, such as PsycINFO or PubMed, includes a different list of journals to search from. It is very possible that an online search performed in one database will produce different results than an online search in another database. Hence, searching multiple databases can increase the total number of possible results to review for your topic of interest.

Keep in mind that each journal article follows a particular format. While many follow an APA (2010)–style format, not all journals will do so. Regardless of the formatting style used, each article will include a title, followed by an abstract, an introduction, method, results, discussion, and references. Table 2.4 lists and describes each of these sections. Usually, reading select portions of an article is sufficient to determine whether it is relevant to your research topic. Examining each article in the following order will help you search most efficiently.

Title. In many cases, if the title of an article does not pique your interest, then neither will the article.

Abstract. The abstract summarizes, typically in fewer than 250 words, the purpose and results of some work. Reading the title and abstract takes about 1 minute and allows you to discard many of the articles that are not relevant to your research topic. Many online databases give you a minimum of the title and abstract of an article, making it easy to distinguish the articles you do need from those you do not.

Introduction and discussion. For the articles that you like, you can print and save the full text; if you are unable to access the article, see your librarian to learn how you can obtain a copy. Reading the introduction and discussion sections can allow you to determine if an article is truly relevant. If the article is relevant, then its list of secondary sources will identify other articles of possible interest.

Method and results. Once you have determined that an article is relevant to your research topic, carefully read through it. Be critical of the methods and results published in an article and make sure that both are consistent with the conclusions drawn in the article.

References. Once you have fully reviewed articles of interest, you can search through the references listed at the end of each article to double-check that you have exhausted all articles related to your research topic of interest.

TABLE 2.4 ● The Sections of Articles in Peer-Reviewed Journals

Section	Description
Title	A single sentence that captures the topic of a study
Abstract	A brief summary of the purpose and results of a study
Introduction	An overview of the research topic that explains how it is interesting and novel and identifies the hypotheses being tested
Method	A description of the materials, procedures, and participants or subjects in a study
Results	A summary of the statistical analyses that often includes figures and tables to summarize data
Discussion	The conclusion of the study that explains how the results of a study answered the hypotheses tested and sometimes offers ideas for future research
References	A listing for every source that was cited in the body of the article

Also, keep in mind that one study rarely is sufficient to answer a research question or prove a claim, so you should not base your entire literature review on a single article or viewpoint. Scientists hold many opposing views and often present data that contradict scientific evidence published earlier. To be comprehensive, you should identify some of these opposing viewpoints and the contradictory evidence in those studies. Doing so can actually help you develop your own ideas to generate stronger hypotheses and theories.

Be Critical

To be critical means that you ask questions, know your sources, and are objective as you conduct your literature review. Each aspect of being critical is described here.

Ask questions. As you read an article, ask yourself questions about the participants that the researchers used, the methods or procedures employed, and the conclusions drawn. The article itself will provide most of the answers. Also, many researchers identify potential limitations or drawbacks to their study in the discussion section. As you read through this section, think of ways you could address them. Asking questions will help you generate your own ideas, and those ideas could eventually become part of your hypothesis.

Know your sources. Know where your information comes from. Know whether the information you find comes from a secondary or a primary source and whether it is peer reviewed. Most journals disclose their review policies in each issue. Also, be cautious when using online sources because they are often not subjected to a peer review. You must check the credibility of online sources closely, as a few may be peer reviewed, such as articles from open access publishers (e.g., BioMed Central: https://www.biomedcentral.com).

Being comprehensive means performing an effective literature review in a minimum amount of time.

Being critical means that you ask challenging questions rooted in the scientific literature.

Remain objective. Be aware of your own biases. You may have some ideas before starting the literature review, which may affect what you decide to read and pay attention to during your search. If you keep an open mind, you may find sources that contradict your point of view. Knowing the opposing views may even help you generate some of your best ideas. After all, if you disagree with a point of view, then you should be able to explain why you disagree, which can often lead to new ideas or explanations.

Be Clever

Being clever means that you actively think of unique ways to advance the research you read about in your literature review; be innovative in your approach to advance scientific research. The following are five strategies you can use to be clever in your approach to generate new ideas for your research topic.

Identify flaws. There is some probability of an error in all published scientific data. Additionally, scientists are not infallible—on some occasions they can, without intention, misinterpret, mislead, or misrepresent the data they publish. Consequently, some of the research you come across can be wrong or inaccurate. Identify these inaccuracies and conduct a study without them.

Identify contradictions. You may come across two or more studies with contradictory hypotheses or data. If you read these articles closely, you can develop hypotheses of your own that make predictions that can lend support to one or both studies. Your work will help clarify possible confusion in the published work.

Identify anomalies. Look for conclusions, interpretations, or data presented in articles that are inconsistent. For example, researchers often disregard scores called *outliers* that do not fit with most of the data as anomalies or errors. Often, anomalies are not errors, and they can lead to new ideas that result in new directions of research.

Consider subtleties. You may find that subtle changes to a study can make a big difference in a research result. An important issue, particularly in laboratory research, is whether research studies generalize to situations beyond those observed. Making subtle changes, such as observing participants with different demographic characteristics, or measuring different variables, can have a significant impact on the results observed.

Think beyond the research. Physiologist Ivan Pavlov, who won the 1904 Nobel Prize in Physiology or Medicine, is just as well known for his work on classical conditioning, research that merged his Nobel Prize–winning work in physiology with psychology. Princeton University psychologist Daniel Kahneman won the 2002 Nobel Prize in Economic Sciences for his landmark research applying psychology to economic theory. Both of these scientists combined two previously unrelated areas of research and observed very new and interesting results. Perhaps you can use a similar strategy to generate new ideas of your own by merging two different research topics to resolve the same problem.

Being clever means that you are innovative in your approach to advance scientific research.

This brief list of strategies aims to help you see how knowing what to look for and how to generate new ideas can help you select a research topic. Your goal should be to generate your own new ideas, and the "3Cs" can help guide you in the right direction for achieving that goal.

Learning Check 5 ✓

1. List the order in which you should read sections of a research article as part of your literature review.
2. For each of the following examples, state the aspect of being critical that the student is ignoring.
   A. A student reads through an article and just accepts every argument in the article without question.
   B. A student cites an article as key evidence to justify her hypothesis, but she does not know whether the source is peer reviewed.
   C. A student gets upset at a relevant article that contradicts his point of view, so he decides to put it aside and not include it in his paper.
3. State five clever strategies for generating new ideas that can help you select a research topic.

Answers:

1. Title, abstract, introduction and discussion, method and results, and references; 2. A. The student neglected to ask questions; B. The student failed to know the sources; C. The student did not remain objective; 3. Identify flaws, identify contradictions, identify anomalies, consider subtleties, and think beyond the research.

2.7 Testing Your Idea: Confirmation and Disconfirmation

Any idea you develop must be testable—it must make specific predictions that can be observed under specified conditions. In this section, we consider two ways to test a theory or hypothesis: a confirmational strategy in which a researcher tests *anticipated* outcomes, and a disconfirmational strategy in which *unanticipated* outcomes are tested by a researcher.

Confirmational Strategy

A **confirmational strategy** is a method of testing a theory or hypothesis in which a positive result confirms the predictions made by that theory or hypothesis. A *positive result* confirms a hypothesis or theory and occurs when an effect or a difference is observed. A confirmational strategy is often used to test a new theory or hypothesis in terms of the predictions that it anticipates will occur if the theory or hypothesis is correct. Using an "if . . . then" logic statement, a confirmational strategy can be represented as follows:

A **confirmational strategy** is a method of testing a theory or hypothesis in which a positive result confirms the predictions made by that theory or hypothesis.

If A is true, then B is true.

B is true.

Therefore, A is true.

The problem with using this type of logic, referred to as *affirming the consequent*, is that it can be fallacious or not true, as the following example demonstrates:

If you are a scientist (A), then you are educated (B).

You are educated (B).

Therefore, you are a scientist (A).

The conclusion that you are a scientist is not always true. While scientists are certainly educated, not all educated people are scientists. Thus, the logic is not valid. This problem of logical fallacy means that using the confirmational strategy alone to test theories and hypotheses is not good practice. To balance this major limitation, researchers also use a disconfirmational strategy.

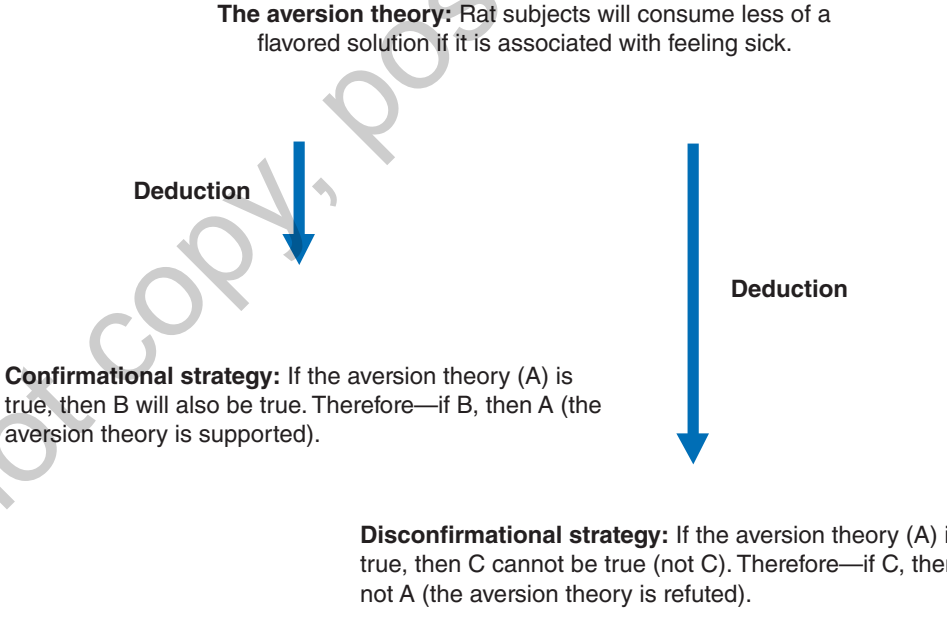
Disconfirmational Strategy

A **disconfirmational strategy** is a method of testing a theory or hypothesis in which a positive result disconfirms the predictions made by that theory or hypothesis.

Publication bias is the tendency for editors of peer-reviewed journals to preferentially accept articles that show positive results and reject those that show only negative results.

A **disconfirmational strategy** is a method of testing a theory or hypothesis in which you test an outcome that is not predicted by the theory or hypothesis you are testing. A *positive result* in this case disconfirms a hypothesis or theory. Using this strategy, for example, suppose we hypothesize that rat subjects will consume less of a flavored solution if it is associated with feeling sick, which is called an *aversion*. To test this theory, we first have rats consume two flavored solutions and record how much is consumed in a baseline phase. In a training phase, rats consume one flavored drink and are immediately injected with lithium chloride (LiCl), which makes rats feel sick. Rats consume a different flavored drink and are injected with a saline solution, which has no effect on the body. On a test day, subjects are given each flavored solution to drink. The amount consumed of each flavor after 30 minutes is measured and compared to the amount consumed of these solutions in baseline.

FIGURE 2.6 ● Using Confirmational and Disconfirmational Strategies to Test a Theory



In this example, the aversion theory anticipates B—a confirmational strategy is used to test this outcome. But the aversion theory does not anticipate C—a disconfirmational strategy is used to test this outcome.

In this example, we applied both a confirmational and a disconfirmational strategy. Our hypothesis predicts that on test day, rats will consume less of the flavored solution paired with an injection of LiCl because it made the rats feel sick. As illustrated in Figure 2.6, this test is a confirmational strategy: If A, then B. For our hypothesis to be correct, we also must observe that rats do not consume less of the flavored solution paired with an injection of saline because that solution did not cause sickness. As illustrated in Figure 2.6, this test is a disconfirmational strategy: If A, then not C. If we do observe C, then sickness is not likely causing reduced intake of a flavored solution.

A benefit of using the disconfirmational strategy is that we can refute a theory or hypothesis with a positive result. Alternatively, to refute a theory or hypothesis using a confirmational strategy, we would need to observe a *negative result*, meaning no effect or difference. As discussed in Section 2.8, because of problems related to statistical power (i.e., the likelihood of detecting an effect or a difference), negative results alone are rarely published in peer-reviewed journals. For this reason, a disconfirmational strategy is the best strategy for refuting a theory.

The publication bias is also called the **file drawer problem** because researchers have a tendency to file away studies that show negative results, knowing that most journals will likely reject them.

Positive results are more likely to be published in peer-reviewed journals than negative results.

Learning Check 6 ✓

1. A researcher proposes the following theory: The more often students miss class, the worse their class grade will be. The following two studies, A and B, tested this claim. State the type of strategy, confirmational or disconfirmational, used in each study.

   A. You select a sample of research methods students who have missed at least six classes during the semester. Half the students work full-time, and half do not work. You record the GPA of all students to see if there is a difference between groups. Because all students sampled in this study missed the same number of classes, the theory does not predict a difference between groups.

   B. You obtain school records from a random sample of college freshmen attending a small university. You record the semester GPA and the number of classes missed during the semester for each student sampled. If the theory is true, then it should also be true that the more classes students miss during the semester, the lower their semester GPA will be.

Answers:

1. A. Disconfirmational strategy; B. Confirmational strategy.

2.8 ETHICS IN FOCUS

PUBLICATION BIAS

Researchers conduct studies to observe an effect. An ***effect*** is any difference or significant outcome observed in a study. The failure to observe an effect in a study, particularly when the study is associated with low statistical power to detect the effect, means that few, if any, peer-reviewed journals will allow the study to be published (Hyman, 2017; Therrien & Cook, 2018). The response from reviewers for these journals is usually to tell the researchers to increase their statistical power and conduct the study again. For this reason, much of the peer-reviewed literature is biased in favor of studies showing positive results, a situation

(Continued)

(Continued)

described as the publication bias. The **publication bias** is the tendency for editors of peer-reviewed journals to preferentially accept articles that show positive results and reject those that show only negative results.

Because editors of peer-reviewed journals and the peer reviewers themselves often reject a manuscript on the basis of a failure to show positive results (Liesegang, Albert, & Schachat, 2008), researchers are often deterred from even trying to submit negative results for publication (Calnan, Smith, & Sterne, 2006; Olson et al., 2002). As a result, many researchers do not even try to publish negative findings, instead choosing to file them away, a situation described as the **file drawer problem**.

The publication bias means that the size of an effect could be overstated for many behavioral phenomena reported in the peer-reviewed literature. For example, suppose you read a few studies showing that a new behavioral therapy for depression significantly reduces symptoms of depression in patients. If a researcher tests the effectiveness of this same behavioral therapy and finds no effect, it is likely that no peer-reviewed journal will accept the manuscript, so you will never find it or read about it. It is therefore possible that the effectiveness of this therapy is overstated because studies failing to show an effect are not included in the published peer-reviewed literature. Howard, Lau, et al. (2009) stated that "scientific progress is made by trusting the bulk of current knowledge" (p. 117), and the publication bias compromises this trust. Keep in mind that while positive results reported in the peer-reviewed literature can certainly be trusted, also take caution in knowing that many negative results may not be included in your search.

Chapter Summary

LO 1 Explain what makes an idea interesting and novel.

- An interesting idea is any idea that appeals to the readership of **peer-reviewed journals**. A novel idea is one that is original or new.

LO 2 Distinguish between a hypothesis and a theory.

- A **hypothesis** is a specific, testable claim or prediction about what you expect to observe given a set of circumstances. A **theory** is a broader statement used to account for an existing body of knowledge and provide unique predictions to extend that body of knowledge.
- Three key criteria to consider when developing a good hypothesis or theory that is regarded as scientific are as follows: testable/falsifiable, replicable/precise, and parsimonious.

LO 3 Distinguish between induction and deduction.

- **Deductive reasoning** is a "top-down" type of reasoning in which a claim (hypothesis or theory) is used to generate ideas or predictions and make observations.
- **Inductive reasoning** is a "bottom-up" type of reasoning in which a limited number of observations or measurements (i.e., data) are used to generate ideas and make observations.

LO 4 Describe the process of conducting a literature review.

- Getting started: Find a research topic that interests you because it will make the scientific process more worthwhile.
- Getting organized: Review **secondary sources** to identify primary sources that are most relevant to

your research topic. Then follow up and read the **primary sources** to check what is reported in those sources.

- Getting searching: Use online databases, such as PsycINFO, PsycARTICLES, PubMed, ERIC, and JSTOR. Each online database allows you to use keyword searches to review thousands of articles and books.

LO 5 Identify four ethical concerns for giving proper credit.

- These concerns are as follows: incorrectly citing reference articles, failing to obtain or give proper credit to a primary source, citing a source after only reading the abstract for that source, and citation bias.
- **Citation bias** occurs when you cite only evidence that supports your view without also citing existing evidence that refutes your view.

LO 6 Describe the "3 Cs" of conducting an effective literature review.

- Be comprehensive. Journals specialize, so search a journal name if you know it contains articles that interest you. Read sections of research articles in the following order: title, abstract, introduction and discussion, method and results, and references. Also, be aware that one study rarely is sufficient to answer a research question or prove a hypothesis, so you should not base your entire literature review on a single article or viewpoint.
- Be critical. Ask questions as you read, know the types of sources you are using, and remain as objective as possible.
- Be clever. Some clever strategies are to identify flaws, identify contradictions, identify anomalies, consider subtleties, and think beyond the research.

LO 7 Distinguish between a confirmational and a disconfirmational strategy.

- A **confirmational strategy** is a method of testing a theory or hypothesis in which a positive result confirms the predictions made by that theory or hypothesis.
- A **disconfirmational strategy** is a method of testing a theory or hypothesis in which a positive result disconfirms the predictions made by that theory or hypothesis.

LO 8 Explain the issue of publication bias.

- **Publication bias** is the tendency for editors of peer-reviewed journals to preferentially accept articles that show positive results and reject those that show only negative results.
- The publication bias is also called the **file drawer problem** because researchers have a tendency to file away studies that show negative results, knowing that most journals will likely reject them. The publication bias means that the size of an effect could be overstated for many behavioral phenomena reported in the peer-reviewed literature.

Key Terms

peer-reviewed journal 28
hypothesis 30
theory 30
parsimony 31
deductive reasoning 34
inductive reasoning 34
literature review 35
secondary source 36
primary source 37
full-text article 37
full-text database 37
abstract 38
citation bias 40
confirmational strategy 45
disconfirmational strategy 46
publication bias 48
file drawer problem 48

Review Questions

1. Why is it important for a research idea to be novel?
2. McLean, Paxton, Wertheim, and Masters (2015) conducted a study concerning self-photo ("selfie") editing and body dissatisfaction among adolescent girls. In their article, the authors state the following:

> Social media engagement by adolescent girls is high. Despite its appeal, there are potential negative consequences for body dissatisfaction and disordered eating from social media use. This study aims to examine . . . the relationship between social media use, and social media activities related to taking "selfies" and sharing [and photoshopping these self-images], with overvaluation of shape and weight, body dissatisfaction, and dietary restraint. (p. 1132)

   A. Identify the portion of this excerpt that describes what makes this research interesting.
   B. Identify the portion of this excerpt that describes what makes this research novel.

3. Is a theory or a hypothesis described as a statement that has been rigorously tested and supported by scientific observations?
4. Which type of source, primary or secondary, should you use to begin your literature review search? Why?
5. Name five databases used to perform a literature review. What article information is typically provided for available articles in these databases?
6. Which scenario listed below is ethical, and which is not? (Hint: Refer to Section 2.4.) Explain your answer.
   A. A student attends a conference and reads an abstract on a poster that she finds interesting as a source for her own paper. The presenter of the poster tells her that the research described in the abstract has been published in *Psychological Science*. The student finds the full-text article, reads it, and cites it in her paper.
   B. A student conducts a literature review by searching articles in PsycINFO. In his search he finds three secondary sources that give many interesting primary sources. He is unable to find these primary sources; however, he still cites them in his own paper.
7. State the "3Cs" of an effective literature review.
8. What is the advantage of reading through the title and abstract of an article before reading further?
9. Which of the following terms best describes inductive or deductive reasoning?
   A. Top down
   B. Bottom up
10. The explanation below describes the reasoning you used to develop a theory. Identify the portion of the excerpt that (A) describes the use of inductive reasoning and (B) describes the use of deductive reasoning.

> You notice that among your college friends, those who are the most outgoing always seem to be dating. You conclude that being outgoing is necessary to get a date. Using this conclusion as your theory, you predict that more outgoing individuals are more likely to date.

11. Distinguish between a confirmational and a disconfirmational strategy.
12. Explain why using a confirmational strategy alone to test a theory or hypothesis is poor practice.
13. What is the concern regarding publication bias?

Activities

1. Choose a research topic that interests you and conduct a literature review as described in this chapter. In your search, find at least three articles that are relevant to your topic, and then do the following:
   A. Without restating the abstract, briefly describe the study in each article you chose. Indicate whether the article is a primary or a secondary source.
   B. What information in the title and abstract of each source made it obvious to you that the source was a good reference for your topic?
   C. Include the following reference information for each source: author or authors, publication year, title, journal name, volume, and page numbers.
2. The three hypotheses listed below have been tested in the published literature. You can use the citations to search for the full articles using PsycINFO. Choose one hypothesis and answer the questions that follow.

   Hypothesis 1: Access to mobile phone use while studying interferes with efforts for studying and doing homework (Q. Chen & Yan, 2016; David, Kim, Brickman, Ran, & Curtis, 2015).

   Hypothesis 2: Some athletes may practice "disordered restriction" [in terms of diet] as a way to enhance their performance (Karpinski & Milliner, 2016; Privitera & Dickinson, 2015).

   Hypothesis 3: Exposure to prosocial media—that is, media that foster caring in ways that benefit others—promotes prosocial outcomes (Coyne et al., 2018; Ng, 2016).

   A. Deduce one prediction that is generated from the hypothesis you chose. Devise a study to test this prediction using a confirmational strategy.
   B. Deduce one outcome that is not anticipated by the hypothesis you chose. Devise a study to test this unanticipated outcome using a disconfirmational strategy.
3. Over the course of the next week, observe the behavior and events you encounter. From your observations, use inductive reasoning to develop a research hypothesis and describe the behaviors or events that led to your hypothesis.

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.

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.

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.

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 research ethics.
2. Trace the history leading to the Nuremberg Code and state the 10 directives listed in the code.
3. Trace the history leading to the Belmont Report and state the three ethical principles listed in the report.
4. Identify the ethical concerns for three landmark studies in psychology: the Robbers Cave experiment, Milgram's obedience experiments, and the Stanford prison study.
5. Describe the role of the IRB in regulating ethical research with human participants.
6. Describe the standards in the APA code of conduct relating to human participant research.
7. Describe the role of an IACUC in regulating ethical research with animal subjects.
8. Describe the standards in the APA code of conduct relating to animal subject research.
9. Describe the standards in the APA code of conduct relating to scientific integrity.