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2 HYPOTHESIS DEVELOPMENT

Where Research Questions Come From

CONSIDER THE FOLLOWING QUESTIONS AS YOU READ CHAPTER 2

- How do researchers develop a research question?
- How do researchers conduct a literature review?
- What are some useful resources for a literature review?
- What will you find in a literature review?
- What are the different types of research articles, and how are they organized?
- How do we use a literature review to make hypotheses?
- What are the different types of hypotheses that a researcher can make?

LEARNING OBJECTIVES FOR CHAPTER 2

LO1: Generate appropriate research questions for a psychological study

LO2: Demonstrate how to conduct a literature review for a research question

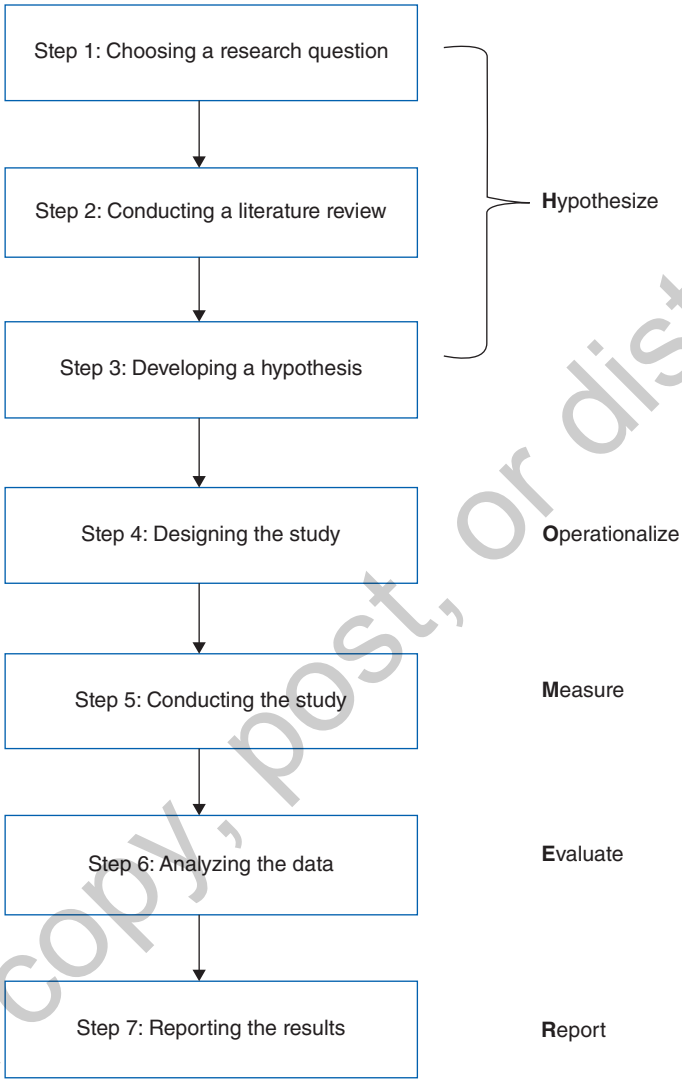
LO3: Locate relevant information in an empirical journal article

LO4: Explain the differences between a research question, a hypothesis, and a theory

Have you ever walked through your house with the intent to perform some task in another room, only to find that, once you get to the other room, you've completely forgotten why you went there to begin with? This has happened to me many times (more and more as I get older) and is a failure of what is known as *prospective memory*. Prospective memory is remembering to perform a task in the future, such as getting some acetaminophen tablets for your headache in the upstairs medicine cabinet. Failures can occur when we are distracted from the task by other thoughts or tasks as we do additional tasks before the correct time to perform the intended task (e.g., thinking about what you will have for dinner that night as you make your way to and up the stairs). As a memory researcher, I became interested in this phenomenon and have conducted experiments to investigate how long we can hold on to prospective memories (e.g., Conte & McBride, 2018; McBride & Flaherty, 2020; McBride et al., 2011). This story illustrates how everyday events such as these can spark psychological research questions (e.g., How long can we hold a prospective memory?).

In this chapter, we will begin to discuss the primary steps in the research process. Figure 2.1 presents the process as 7 steps to follow in conducting a research study. Steps 1–3 are all related and can be seen together as developing a **hypothesis**, which is a predicted answer to the research question. The next step is where we design the study and decide how we will define the behaviors we're interested in (operationalize). Then we conduct the study

FIGURE 2.1 ■ Steps in the Research Process: HOMER Acronym



and measure the behavior of interest. Once we have those measurements, we can analyze and evaluate the data, and then finally we report the results. Figure 2.1 shows these steps as Hypothesize (Steps 1–3), Operationalize, Measure, Evaluate, and Report (and possibly replicate and revise). Using the first letters of these steps, we have HOMER as an acronym we can use to remember the steps of the research process. Research (e.g., Lakin et al., 2007) has shown that frequent use of this acronym can help students remember the steps accurately (study tip!).

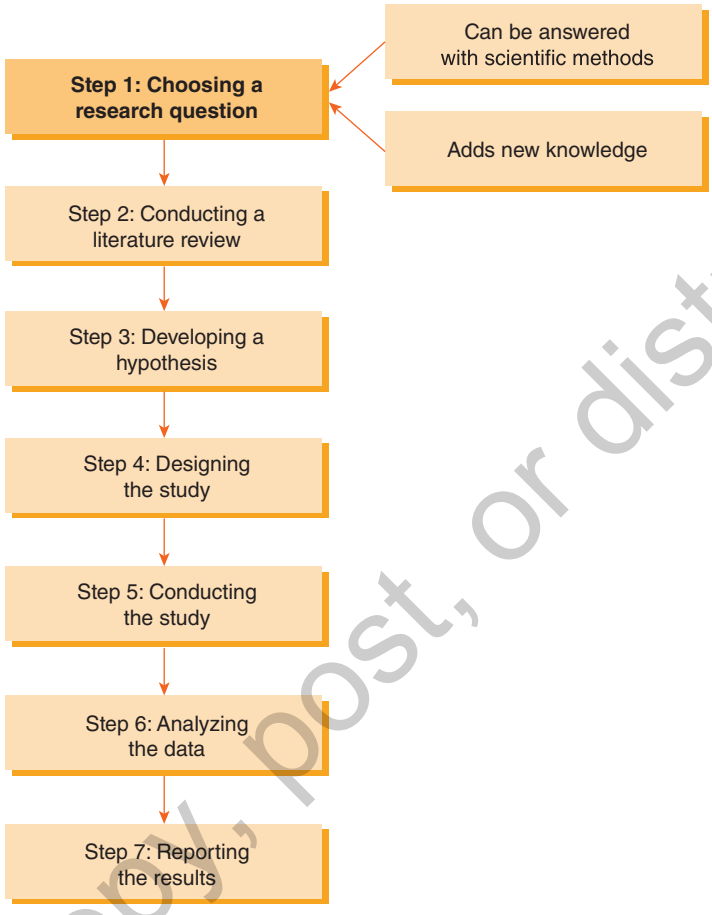
DEVELOPING A RESEARCH QUESTION

If we work through the HOMER acronym for our scientific method, developing our hypothesis is the first thing we need to do in conducting a research study. As you can see in Figure 2.1, we start to develop our hypothesis by choosing a research question. Answering a research question is the researcher's primary motivation for designing and conducting a study. Research questions come from many sources. Primarily, they come from what the researcher is interested in learning about. Let's try it: Think about what topics in psychology or a related field interest you the most. Can you think of questions about behavior that you would like to have answered? Have you ever asked yourself a "What if…" question about a behavior? That is often where research questions begin—from the questions a researcher is interested in. In the situation described at the start of the chapter, a research question was sparked by an everyday event (e.g., How long can we hold a prospective memory?). In other cases, research questions are developed to solve a real-world problem (e.g., Does the use of a cellular phone while driving contribute to traffic accidents?). Finally, an explanation of behavior that needs to be tested (a **theory**) can guide research questions (e.g., Does language develop implicitly through language exposure?).

Questions can be **descriptive research questions**, such as whether a specific behavior occurs (Are college students anxious?) and what the nature of the behavior is (How does anxiety manifest itself in college students' behaviors?). It can be **correlational** in asking whether behaviors occur together (Do college students who smoke also tend to be anxious?). Or questions can be **causal research questions**—about factors that cause behaviors to occur (What types of events cause college students to become anxious?). Many causal research questions are also designed to test a theory about the cause of a behavior (Is anxiety in college students caused by a lack of confidence in their abilities?) or to compare theories about behavior to see which explanation has more support (Does frequent low-stakes testing in a course reduce anxiety in students compared with infrequent high-stakes tests? Is anxiety in college students caused by a lack of confidence in their abilities or a lack of social support?). As described in Chapter 1, research questions can answer fundamental questions about behavior (What are the causes of anxiety among college students?) or questions about how to solve real-world problems (What kinds of student-oriented programs can a college or university initiate that will reduce anxiety in college students?). This is the difference between basic research questions and applied research questions. The type of question a researcher pursues is based on whether the researcher is interested in basic questions about a behavior or applications of the behavior to daily life. However, even though researcher interest is often a starting place for choosing a question to study, researchers must consider how appropriate their question is for both scientific methods and the specific field of study before moving on to designing a study.

One important issue in choosing a research question is whether the question can be answered with the scientific methods described in Chapter 1 (see Figure 2.2). Can observations of behavior provide an answer to the question? Some questions that would be difficult to test with scientific methods are "Does God exist?" and "Was Russia justified in invading

FIGURE 2.2 ■ Steps in the Research Process: Choosing a Research Question



Ukraine in 2022?" If specific observations of behavior can be made to help answer the question, then it might be an appropriate question for psychological research. Table 2.1 provides some examples of research questions that have been examined in different areas of behavioral research to give you some examples of questions that can be answered by observing behavior. In addition, Chapter 4 describes some specific ways to observe behaviors and how those observations help answer a research question.

We all develop research questions about everyday behavior: "Why did that person just scowl at me? Was it in response to something I did?" "Why did I score well on this exam but score poorly on my other exam when I studied equally hard for both of them?" "How can I get my dog to tell me she needs to go outside?" The human brain is designed to look for explanations for things that happen in the world. But not all research questions are causal

TABLE 2.1 ■ Examples of Research Questions in Different Areas of Psychology

Area of Psychological Research	Examples of Research Questions
Social psychology	How does an authority figure influence behavior? (Burger, 2009; Milgram, 1963)
	What types of faces are considered attractive? (Corneille et al., 2005)
Cognitive psychology	What types of memory decline as people age? (Lipman & Caplan, 1992; Ward et al., 2020)
	How does our knowledge of the world influence our perception? (Ban et al., 2004)
Industrial-organizational psychology	Does a work environment affect job stress? (Pal & Saksvik, 2008)
	How does perception of power in the workplace affect perceptions of sexual harassment? (DeSouza & Fansler, 2003)
Clinical psychology	What types of people benefit most from cognitive behavioral therapy? (Green et al., 2008)
	What are the causes of schizophrenia? (Compton et al., 2007)
Biological psychology	What are the effects of amphetamine on brain activity? (Heidenreich, 1993)
	What are the neurological causes of Parkinson's disease? (Olzmann, 2007)

the way these examples are. "How many other people are feeling as anxious as I am about the upcoming exam?" "How did the way I studied differ for the two exams on which I got different scores?" These questions simply ask about a description of behavior or how different behaviors are related instead of what causes the behavior. Any of these types of research questions are appropriate for a psychological study. The key is that the research question should be as specific as possible. A question like "Does listening to music help me study?" is not specific enough to directly study. We would need to first make the question more specific, such as "Will I get a lower exam score if I study while listening to rock music than studying in silence?" In this question, the concepts of interest are clearer: the background while studying (music and silence) and exam score. This is the type of research question you should try to come up with. Take a minute now to jot down some research questions you have about behavior and try to make them as specific as possible.

Another important consideration in choosing a research question is how much is already known about the question (see Figure 2.2). In other words, what has been learned from

previous studies about the question? To investigate what is known about a research question from previous studies, a thorough **literature review** should be conducted. A literature review involves searching research databases or other sources to find relevant research that has been done in an area of the field. By reading about what other researchers have done, the literature review helps a researcher to determine what is already known about a research question, determine what methods have been used to investigate the question, and find information that can help them make a prediction about what the answer to the research question will be. Conducting a literature review ensures that a new study will add to the knowledge in an area without duplicating what is already known. However, it can take many studies with the same research question before the answer to the research question is supported by enough evidence to allow for confidence in the answer. Thus, *replication of results* is an important part of the scientific process. Just because a study has already been done on a specific research question does not mean more studies are not needed to fully answer the question. This is the reason that, when you conduct a literature review, you are likely to find a number of studies that all look at the same or that address similar research questions. It is also the reason researchers typically measure behavior from many individuals; this is a topic we will discuss in Chapter 6 on sampling. In other words, a research question does not need to be wholly original to contribute to psychological science, but the study should contribute something new to the answers we already have (Figure 2.3).

FIGURE 2.3 ■ Literature Reviews: A Collection of What Is Already Known About a Topic

Source: Copyright by S. Harris, http://www.sciencecartoonsplus.com/scimags.html.

STOP AND THINK

2.1 For each of the research questions below, identify whether it is a descriptive, correlational, or causal question:
- How often do rewards change behavior in daily life?
- Does jet lag affect one's mood?
- Are people who exercise regularly less likely to suffer from dementia?

2.2 Explain why a researcher should conduct a literature review before conducting a study.

HOW TO CONDUCT A LITERATURE REVIEW

After deciding on the specific research question you want to study, the next step is to conduct a literature review to find out what is already known about your question. Your first instinct may be to just do a Google search on the topic, but that can lead to unreliable information from unchecked sources. How do you find reliable information about a research question? The answer is to use databases to search for peer-reviewed articles on the topic. **Peer review** is part of the publication process where an article has been read by other experts in the field and those experts have given feedback on the article before it was published. Researchers must address the feedback, often through revisions to the article, in order to have it accepted for publication. This process helps keep inaccurate information from being published, although it's not foolproof. Searching through databases can help you identify peer-reviewed articles relevant to your research question (see Photo 2.1). However, if you want to learn about the most recent studies in an area, databases are not always the best source because these databases typically list published works, and the publication process can take a year or more from the time an article is written to when it is published and cataloged in the database. Therefore, to conduct the most up-to-date literature review, it can be helpful to attend a psychological conference in an area where researchers typically present studies that have not yet been published. But, in this chapter, we'll focus on the main sources more easily available to you for conducting a literature review for your own study.

One thing to think about as you begin a literature review is which variables are of most interest to you for the topic you wish to study. A **variable** is something that can be different across individuals in a study (see Photo 2.2). It could be something you want to measure, such as anxiety, math skill, or feelings of belonging. Or it could be something you want to compare in a study, such as whether people are given time pressure for a task or not, whether people get a full night's sleep or not, or different types of medications that people take. In the research question example described earlier in the chapter, "Will I get a lower exam score if I study while listening to rock music than studying in silence?," the variables are the background while studying you want to compare (either music or silence) and exam score. Performance on the exam is the behavior you want to measure (using exam score as the measurement), and the background while studying is the causal variable you want to examine to see if it affects performance on the exam. Identifying the variables that are of interest to you (e.g., which type of medication—a

PHOTO 2.1 Conducting a literature review involves a search for peer-reviewed published studies that others have already done on a topic.

iStock.com/Bearinmind

PHOTO 2.2 Age can be a variable of interest that allows for comparisons on a specific behavior

iStock.com/fstop123

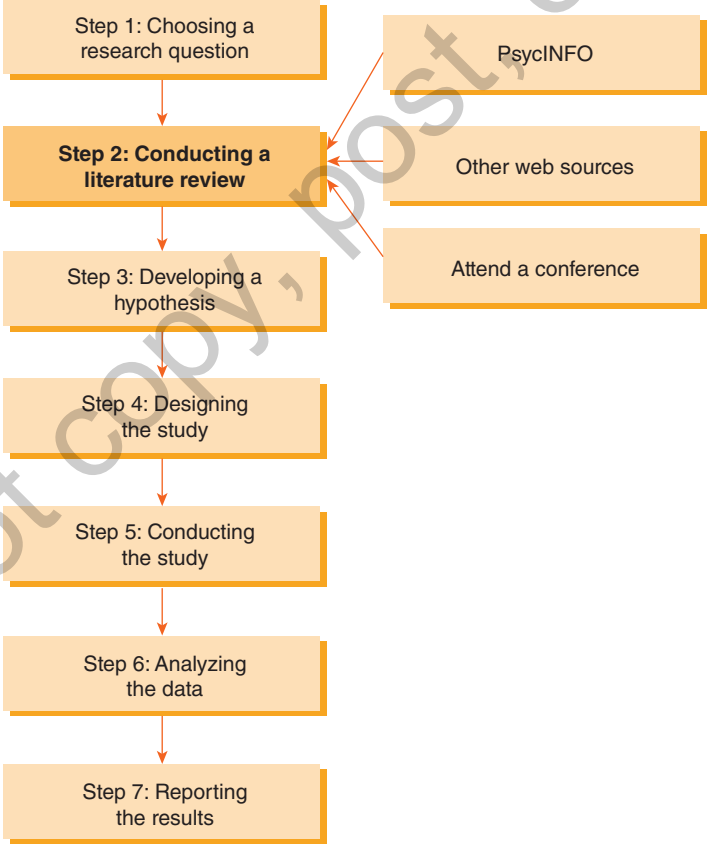
causal variable—best helps reduce anxiety—the behavior) is an important step to take before you begin your literature review if you already have a research question in mind. Identifying your variables first will help you focus your literature review better and will provide some key terms for starting your search. However, note that reading published studies can also help you

determine the specific research questions that are appropriate to study, so the literature review helps you refine your research questions as well. For the research questions you jotted down when you read the last section, try to identify the variables in each question.

PsycINFO

A very useful database for a literature review of psychological research is **PsycINFO** (see Figure 2.4). PsycINFO is a searchable database that contains records of articles, books, and book chapters written by researchers about research studies in an area of psychology. Although each version may have a different appearance, all versions of PsycINFO can be searched using many types of information, including words that appear in the citation information for the article (such as the title, authors, abstract, and topic words), author names, journal in which the article was published, year of publication, and so on. In other words, there are many ways to find articles and book chapters about a research question using PsycINFO. Searching by topic words (called keywords in PsycINFO) is a good way to start a search for a literature review. Note that PsycINFO is not the same as PsycTESTS.

FIGURE 2.4 ■ Steps in the Research Process: Conducting a Literature Review



PsycTESTS is a database of survey and questionnaire measures that have been developed for use in psychological research and applied settings. PsycINFO is typically available through a database service, such as EBSCO or Ovid, so those names may appear as you search for the PsycINFO portal that you have access to.

An example helps explain how this works. You can follow along by trying this out in PsycINFO if it is available at your college or university. If you have a different database available to you, such as PsycARTICLES, you may be able to follow this process, as most databases allow you to search in similar ways. See also http://www.apa.org/pubs/databases/training/search-guides.aspx for information on searching different databases.

Suppose that you are interested in conducting a literature search for the relationship between depression and bullying behaviors in children. A good place to start is a keyword search in PsycINFO. You can start by typing *depression* into the search window and indicate that you are conducting a keyword (KW) search. PsycINFO will execute a search of articles that have *depression* anywhere in the full reference of the article (e.g., title, abstract, topic words). If you try this, you should find that PsycINFO yields a large number of records that fit these keywords. (I found 134,116 sources when I last conducted this search using the keyword *depression*.) Depending on which keywords you choose, different sets of articles are found. Obviously, there are far too many for us to search through one by one, so we need to narrow the search further and include the bullying portion of our topic.

We can conduct a second keyword search for *bullying* using the same search procedure described above for *depression*. This search should find a large number of records as well but fewer records than the search for *depression*, as there have been fewer studies conducted on the topic of bullying. Finally, to narrow our search to the specific topic (we started with depression and bullying), we can combine our two searches. How you combine keywords in a search depends on your portal, but you should look for an "AND" option or a "Combine" function. If you combine your searches, you should find a more reasonable number of records to look at. (When I conducted this search in October 2022, I found 490 records, but you may find more if your search terms include more choices or if additional articles have been published on these topics since that time.) Note that you may also need to try variations of the keywords (e.g., *bully* or *bullied*) to find all the relevant articles on that topic, as different authors may use different variations of the keyword.

If we want to narrow down the number of sources further, we can limit the search based on year (if we want the most recent sources) or by type. PsycINFO will search all types of sources in the database, but not all the sources may be useful. For example, some sources may not be peer reviewed, such as theses and dissertations. To eliminate these sources, you can choose to search just in Academic Journals or limit your search to Peer-reviewed Sources. Furthermore, some sources listed in PsycINFO are in languages other than English. If you want to limit your search to sources in English, you can limit the search in the Language function. These options should be available in an Advanced Search window.

What will you get from the PsycINFO search? If you view the results of the search we conducted above, you will see a list of articles (probably the most recently published articles first) that indicates the names of the authors, the title of the article, the type of article (e.g., journal

article, book chapter, dissertation), and where (e.g., in which journal or book) and when (the year) the article was published. A good way to make a first judgment about whether or not a source is relevant to your search is to look through the titles of the sources listed. A good title will include information about the key variables examined in the study and can help you decide if you want to pay further attention to that source if you have a long list of sources to go through.

For each article you think might be relevant to your review, you can choose to view the *abstract* of the article. The abstract is a short paragraph that summarizes the content of the article; abstracts are discussed in detail later when the structure of journal articles is presented. You can then read through the abstracts of articles that might be relevant to your topic. You might also see a link to the article available online in PDF format or a link to search your library for the journal or book in which the article was published to assist you in locating any articles you find relevant to your literature review. Finally, the reference sections of the articles you find may also lead you to other relevant articles on your topic. Note that the entire article you find on a topic may not be relevant to your topic. It may be that their theoretical description of behavior is most relevant or that their research method is one you want to model in your study. Be sure to focus on the most relevant parts of the articles from your literature review when you summarize the background studies in developing the rationale for your study. Summarizing the entire article will not be appropriate in many cases. Your most relevant sources will be important in reporting your study once it is completed, and you will be tying these studies together as a way to motivate your study rather than simply summarizing them. (This topic will be covered in more depth in Chapter 8 on Reporting Research.)

Suppose that you find an article that is especially relevant to your topic and that you would like to know if the same author has published other articles relevant to your topic. You can find articles by a particular author by conducting an author search in PsycINFO. (You could also just click on the reference for the article and the author's name will appear as a link that will give you a list of all articles in the database by that author.) Simply type the author's last name, comma, and author's first name into the PsycINFO search window, and sources by any author that matches what you typed will appear. Note that sometimes the same author will be listed in a few different ways—with or without middle initial—or that more than one person will appear with that name. For example, if you type my name into the search window ("McBride, Dawn"), you will see articles I have published, but you will also see articles published by other authors with the same name. (I use my middle initial to distinguish my authorship.)

Let's consider another example of how to search PsycINFO for articles you might want in your literature review. The first step is to state your research question and to identify the variables in your question. Imagine that you are designing a research study in your class on how use of social media affects one's self-image. What are the variables in your research question? The causal variable is "use of social media," and the behavior variable is "one's self-image." What terms should we use in PsycINFO to find relevant articles? The first one is "social media," so we can type this one into the search box as a keyword. The other term is "self-image," so we can use the "AND" or "Combine" commands to search for articles that include both terms. This search comes up with only a few articles, and looking at the abstracts of these articles can help you decide if they are relevant to your study. But if only a couple of articles come up with these

terms, you can look at the references list from one of the relevant articles (look for the References link in the full source listing in PsycINFO) to see if any of the sources cited by those authors are also relevant to your study. You can even check if more-recent articles have cited the one you found (e.g., look for the "Times Cited in this Database" link if you're using EBSCO).

Other Databases

A newer database that is similar to PsycINFO is *SCOPUS*, which was created in 2004. Although it does not cover as many sources as PsycINFO, SCOPUS has a wider range of sources (e.g., conference materials) and includes many topics other than psychology and related sciences. It is as easy to use as PsycINFO, but, like PsycINFO, also requires a subscription. Its use is increasing in popularity and includes additional ways to search (such as by ORCID, a unique digit identifier for authors) and information about journal quality based on number of times articles in a journal have been cited in other sources.

In addition to PsycINFO and similar databases, there are search engines that can be accessed to obtain articles relevant to your topic. The first is a subengine of Google called *Google Scholar*. You can access Google Scholar at http://scholar.google.com/. Google Scholar searches the web for academic journals and books to find articles relevant to a defined topic or specific author. As with PsycINFO, you may not always find links to copies of the articles on Google Scholar, but with sites where authors post their work, such as Research Gate and PsyArxiv, becoming more popular, you may be able to find a copy of peer-reviewed articles in their pre-published format. Because Google Scholar will search for articles on many different topics, you are not limited to what is categorized in a particular database (e.g., you can find articles that are in both PsycINFO and SCOPUS in Google Scholar). In addition, if you are unsure of all the keywords that relate to a topic, Google Scholar can be a good place to start your search using less technical terms to find some sources. With search engines, though, you are also more likely to come across articles that have not been peer reviewed. Articles that have not been peer reviewed are typically less reliable sources of information, because they have not been evaluated by experts in the field who have verified the quality of the study.

Other search engines may yield information on a topic, but the veracity of that information may vary. Whereas PsycINFO and Google Scholar yield peer-reviewed articles on a topic, most search engines produce other types of information, such as popular press articles that may or may not report research findings accurately. Thus, a search of a database such as PsycINFO or Google Scholar is a necessary step in any literature review. Simply typing your topic into Google or Wikipedia will not provide an adequate search for a literature review. The sources that are represented in such searches are not reliable enough to use to design a study or to write a research report of a study. (More on writing research reports is presented in Chapter 8.) Wikipedia provides unverified information on a topic that is too general for use in a literature review, and a normal Google search of the web will not provide a thorough search of the articles on your topic, because many are not freely available on the web. You will also likely find sources that are not reliable with a Google search. In other words, Google web searches and Wikipedia searches are how *not* to do a literature review.

Finally, general field or topic area conferences can provide a way to get the most up-to-date information about research conducted on your research question (information that is often so new that it has not been published yet). If you are unable to attend such a conference yourself, you can often search the program of these conferences online to view titles, authors, and abstracts or research studies that will be or have been presented at the conference. As mentioned above, SCOPUS includes some of these materials. Some of the larger conferences that cover many areas of psychology are the American Psychological Association (APA) Convention (typically held in August each year) and the Association for Psychological Science Convention (typically held in May each year). In addition, there are many regional psychological association conferences for all areas of psychology (the Midwestern Psychological Association, the Southeastern Psychological Association, the Western Psychological Association, etc.). Many areas of psychology also hold annual conventions, and a quick web search will yield some of these meetings and sites.

Let's work through another example to help make the literature review process clearer. Suppose you've decided you want to answer the research question, "Does playing violent video games cause violent behavior?" This is a timely question that is often discussed in the media. How can you find out what the research says about this question? You'll want to search a database to look for published articles, but you need to know what to search for before you begin. So, let's identify the variables: the causal/comparison variable is about playing violent video games. A researcher could compare this situation with playing non-violent games. The other variable is violent behavior. From your question, that's what you want to measure. Those are the key terms we want to search for: "video games" and "violence." Everyone has access to Google Scholar, so let's begin the search there. If you type those terms into Google Scholar, you'll get about 568,000 results. You can't read through that many, so you'll want to refine your search. If you add in the word "cause" between "games" and "violence," that narrows it down to about 314,000 results, but that's still too many for you to read. How else can you narrow the search? If this is a new area for you, you might want to start with a review article, and a recent one at that, so perhaps your next step is to click on Review Articles under Type and Since 2022 or 2023 to search for the most recent reviews. That would bring the results down to about 500 articles. That's still a lot, but much more manageable to start looking through than the 378,000 you started with. The titles of the articles can help you decide if the article is relevant to your question. For example, if you only want to look at this question in children, you can look for titles about children. But this example also highlights the limitations of Google Scholar—its search narrowing features are limited. PsycINFO or SCOPUS can help you narrow your search even more by limiting other features of the articles, such as the participant population, the types of articles you want to include or exclude, and so on. In the next section, we'll consider how you can use the articles you find in these searches to continue your literature review by examining what is in these articles.

READING JOURNAL ARTICLES

As described above, a PsycINFO search (or a search with one of the other databases) provides you with a list of journal articles and/or book chapters that are relevant to your topic. How can these sources help you as you attempt to make a prediction about your research question? As

you read the articles, you may find important information for your literature review in different sections of the articles. Before you begin your literature review, becoming familiar with the structure of different types of articles and what type of information you can expect to get from the different sections in those articles can help you complete your literature review more easily. Thus, the next sections describe the structure of some of the different article types.

What Is a Journal Article?

An empirical journal article is written by a researcher (or multiple researchers in many cases) to describe a research study to others who might be interested in knowing what the researcher did; this could be someone like you if you are conducting a literature review on the researcher's topic. The researcher's article may describe a single study (e.g., one experiment), or it may describe multiple studies, all of which relate to the same research question. After the researcher has written the article, the researcher submits it to an academic journal to attempt to get it published. If the article is published in a psychology journal, it will be cataloged in PsycINFO, SCOPUS, or another database if the journal topic is primarily outside of psychology. The article is typically sent out to several reviewers who are experts on the general topic of the article (i.e., they are researchers who have done studies on the topic in the past). This is the process known as peer review. These reviewers make recommendations about revisions to the article to improve it and indicate whether or not they feel the journal should publish the article. The editor of the journal uses these reviews to decide if the article can be published in the journal and, if so, which revisions are most important. The author of the article then revises the article or may attempt to submit it to a different journal, if the editor has decided not to publish the article in that particular journal. If the revised article is submitted to the same journal, it may then be reviewed again, or it may be accepted by the editor for publication. The review process can be lengthy, sometimes taking many months or even a year, but it is important in verifying the quality of the study before it is published. Thus, articles that are not peer reviewed may describe studies of lower quality. If you conduct only a simple Google search of the web for your literature review, you may find only some of these unpublished articles. After the article is accepted for publication, it can then take a few more months before the article appears in the journal. Consequently, articles are rarely published very soon after they are written, which means that research is already a year or more old before it is published.

Empirical journal articles are considered primary sources for research information because they are written by the researchers who conducted the research and because details of the study are provided. Journal articles differ from popular magazine articles: Popular magazine articles often contain short summaries of the study written by an author other than the author of the primary source (i.e., these are secondary sources) and may not provide an accurate account of the study in all cases. Thus, popular magazine articles are considered to be secondary sources. An accurate and thorough literature review requires review of primary sources (i.e., journal articles).

Many areas of psychology have journals devoted to research on a particular topic, but there are also journals that publish research in all areas of behavior. Table 2.2 provides a list of some general psychology journals as well as some journals that specialize in a particular area. In most cases, you can figure out what types of studies are published in the journal from the title of the journal.

TABLE 2.2 ■ A List of Psychological Journals by Type of Article Published
General Psychology Journals—These journals publish studies from various areas of psychology.
Psychological Science
Journal of Experimental Psychology: General
Journal of Experimental Psychology: Applied
American Psychologist
Canadian Journal of Experimental Psychology
Experimental Psychology
Personality and Social Psychology Journals
Journal of Personality and Social Psychology
Journal of Experimental Social Psychology
Personality and Social Psychology Bulletin
Personality and Individual Differences
Journal of Research in Personality
Cognitive Psychology Journals
Journal of Experimental Psychology: Learning, Memory, and Cognition
Journal of Experimental Psychology: Human Perception and Performance
Cognition
Journal of Memory and Language
Memory & Cognition
Applied Cognitive Psychology
Developmental Psychology Journals
Journal of Experimental Child Psychology
Child Development
Psychology and Aging
Developmental Psychology
British Journal of Developmental Psychology

Biological Psychology Journals
Neuropsychology
Neuropsychologia
Applied Neuropsychology
Review and Theoretical Journals—These journals publish review articles and/or articles describing new or revised theories about behavior; some of these journals publish empirical studies as well.
Psychological Review
Psychological Bulletin
Psychonomic Bulletin & Review
Developmental Review
Best Practices in School Psychology
Behavioral and Brain Sciences

Structure of an Empirical Journal Article

Journal articles are organized into sections. Each section provides specific information about a study. This consistent structure helps readers easily find information they are looking for because each empirical article will follow this structure to a large degree. Each major section of a journal article is described in this section.

Abstract

As described earlier, an **abstract** is a short summary of the study that allows readers to decide if the article is relevant to their literature review without their reading the entire article. Abstracts of articles are catalogued in PsycINFO. They are typically fewer than 250 words long, and include a sentence or two summarizing each of the major sections of the article. (Strict APA style allows a maximum of 250 words in abstracts. See Chapter 8 for more information about APA style.) Thus, the abstract usually includes (a) the general topic of the study, (b) a brief description of the methodology, (c) the major results of the study, and (d) what was learned from the study.

Introduction

As the title implies, the **introduction** section of the article introduces the topic, research question, and other relevant information for the study. If an introduction is written well, it should contain the following information:

- Introduction to the general topic of the study (e.g., the bystander effect)
- General problem that the study addresses (e.g., factors that affect the bystander effect)
- Discussion of relevant background studies that informed the researchers about what is known about the problem and how these studies are related to the present study the researchers are describing in their article (e.g., studies that were found in a literature review of factors that affect the bystander effect and how they are relevant to the current research questions)
- Justification of the present study (i.e., what aspect of the research question the present study will answer that has not been determined from past studies)
- Brief description of how the current study addresses the relevant aspect of the research question, possibly including variables that are being studied and a short outline of the method of the study
- Predictions (i.e., hypotheses) that the researchers made about the outcome of the present study

The introduction should essentially make an argument about what the present study will contribute to knowledge in the selected area of psychology and why the researchers made their hypotheses. If you can identify the points of support for the authors' argument, then you probably have a reasonable understanding of the important information in the introduction. It also important to understand that an introduction is not simply a string of summaries of past studies on the topic. Instead, a well-written introduction will lead the reader through existing knowledge about a research question and why there is a need to further study the question. The goal of this section is to support the researchers' motivation for the study they conducted and to explain why they expected the results in their predictions. If the literature review portion of the introduction is written well, the reader should be able to figure out the authors' predictions before they are stated.

Method

The purpose of the **method** section is to provide enough information about how a study was conducted so that others can evaluate and (if they wish) reproduce the study to see if the results replicate. There are four subsections of the method: participants (also called *subjects* in non-APA-style journals or if animal subjects are used), design, materials, and procedure. The participants subsection describes who the participants in the study were (How many were there? Why was this number chosen? Were they college students? How many men and women participated? If they were animal subjects, what species were they?). How the participants for the study are obtained is also described (Did they volunteer from a participant pool? Were they recruited on a website? If they were animal subjects, were they bred by the researcher or obtained elsewhere?). The design subsection describes the design of the study (What were the variables studied? How were they measured/compared?). The materials subsection describes the various materials and apparatus that were used in the study (If there were stimuli shown to the participants, what were the stimuli? How were the stimuli developed? If a survey was used, what kinds of items did it include?). The procedure subsection provides

a chronological description of what the participants did in the study (What were their tasks? What instructions were they given? How many trials did the participants complete?). Sometimes authors will combine some of these subsections (e.g., design and materials) as the information in these sections can overlap. In very short empirical articles (e.g., short reports published in some academic journals), the subsections will be combined into one large method section.

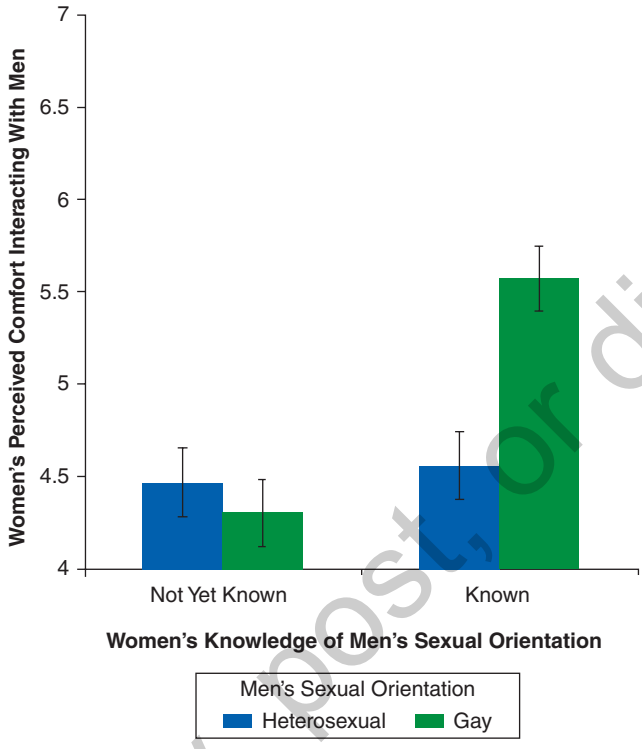
Results

The **results** section provides a summary of the data (often in tables or figures) and information about the statistical tests that were performed to analyze the data. The findings are described in the text with statistical values given as support for the findings described. The specific types of values given depend on the type of tests the researchers conducted. Thus, if the tests themselves are not familiar to you, focus on the description the authors provide of the findings. Were there group differences? Was there a relationship between the behaviors measured? Look back at what the authors expected to find to see if you can match their findings to their predictions. A well-written Results section won't require sophisticated knowledge of statistical techniques to understand the key findings. It should be written in plain language with the statistics supporting the statements of the findings, and not the other way around. Tables and figures are typically organized by the most important variables of interest, so consider the organization of tables and figures as you work on understanding the design of a study. The graph in Figure 2.5 shows an example of this organization from a study by Russell et al. (2018) that investigated women's comfort level while interacting with gay and heterosexual men. The behavior variable the researchers measured (which was the participants' rating of how comfortable they would be talking to a man described in a scenario) is shown on the y-axis, and one of the causal variables (which was whether the participant knew the sexual orientation of the man described in the scenario when they made their ratings) is shown on the x-axis. The bars are grouped according to the other causal variable (which was sexual orientation—gay or heterosexual—of the man described in the scenario). However, note how the y-axis is presented—it does not begin at the rating of 1, which was the lowest possible rating. Graphs can be created in such a way as to make differences look larger or smaller than they really are. In this case though, the statistical outcomes of the comparisons were highlighted in the original graph in the published article, making it clear which differences were real in the data.

Discussion

The last section of the article is the **discussion** section. The authors go back to their predictions and discuss their findings in reference to their predictions. If the findings support their predictions, the authors indicate what they learned about the research question and perhaps where researchers should go next in this area. If the findings do not support their predictions, they should describe some possible explanations for why they did not support the predictions. A discussion of the results in the context of previous findings is also included. Finally, a summary of what was learned from the study should be included in the discussion section, with possible limitations of these conclusions based on strengths and weaknesses of the study conducted. Researchers may also suggest a direction for future research in that area.

FIGURE 2.5 ■ Results from Russell et al.'s (2018) Study Showing That Women Were More Comfortable Interacting With Gay Men Than With Heterosexual Men When They Knew the Men's Sexual Orientation



Multiple Experiment/Study Articles

Many articles that are published include more than one study that addresses the same research question. In this case, the article includes one introduction that provides the background and motivation for all the studies. It may also include short introductions to each study/experiment to describe the motivation for each design separately. The article also includes a separate method and results section for each design. The results section for each study may include a short discussion section for that study, but a general discussion section concludes the article that then ties all the studies together.

Review Articles and Book Chapters

Most of the articles you come across in a literature review are empirical journal articles as described above. However, you may find a smaller set of articles that fit into the categories of review article or book chapter. The purpose of these articles is to organize and summarize research in a particular area of study to give readers a review of the research to date. Accordingly, these sorts of articles can be very useful in a literature review because they allow a researcher

to find a lot of information about a topic in a single article. These reviews also provide a list of references that can be helpful in searching for empirical articles about specific studies that may be important for developing a prediction for the researcher's study. There is a difference between review articles and book chapters in where they are published. Some psychological journals are devoted entirely to review articles. There are also journals that reserve a small portion of space for review articles (e.g., *Psychonomic Bulletin & Review*). Review articles go through the same rigorous peer-review process as that for empirical journal articles (described above). Book chapters are typically published in a book that is either entirely written by a set of authors (i.e., every chapter is written by the same authors) or in an edited book where editors compile chapters on a similar topic from multiple authors. The review process for book chapters is variable and may not be as rigorous as that for journal articles.

STOP AND THINK

2.3 What is the purpose of a journal article?
2.4 How can reading journal articles aid in a literature review?
2.5 In what way(s) can peer review affect the quality of a journal article?
2.6 Briefly describe the major sections of a journal article.

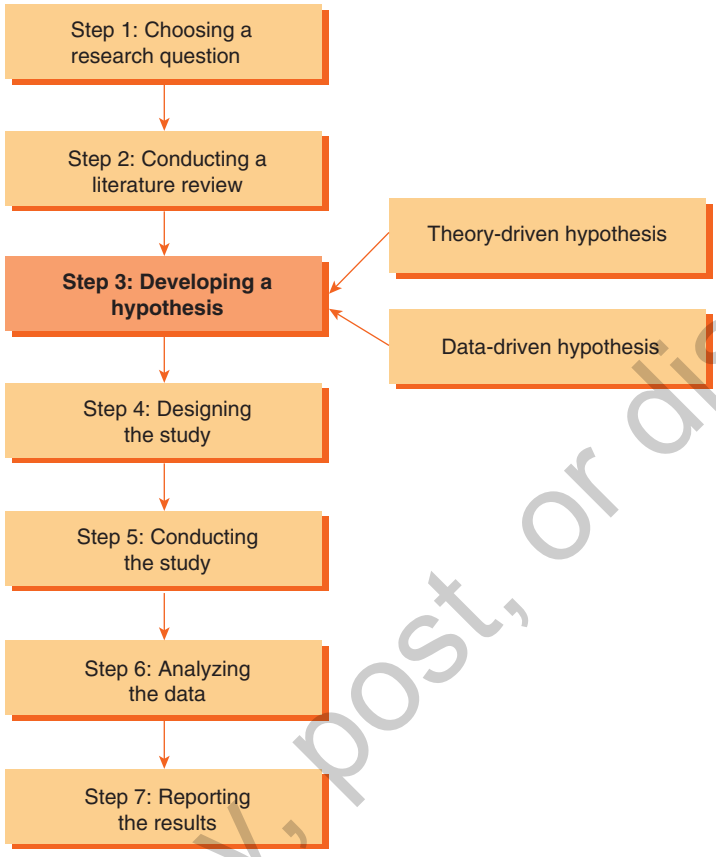
USING THE LITERATURE REVIEW TO MAKE HYPOTHESES AND OPERATIONALIZE VARIABLES

The primary goals of a literature review are (a) to determine what research has been done on a research question to avoid duplicating previous research and to refine your own research questions, and (b) to review previous findings and theories to allow a hypothesis to be made about the outcome of a study. A hypothesis is the prediction for the findings of the study. For example, a researcher might hypothesize that a relationship exists between two measures of behavior. For a different type of study, a researcher might predict that one group of participants will have average scores that are higher than the average scores of another group. There are two primary types of information that researchers use to make hypotheses for their study that can come from a literature review: theories and previous studies' results. These types of information result in **theory-driven hypotheses** and **data-driven hypotheses**, respectively. However, regardless of the types of hypotheses that are developed, hypotheses should be stated as specifically as possible in terms of how behaviors and/or conditions are related (Figure 2.6).

Theory-Driven Hypotheses

Theory-driven hypotheses are made from the predictions of a theory. These are typically made for studies designed to test a theory (i.e., to look for data that support or falsify a theory; see the Testability section in Chapter 1). For example, suppose a theory that anxiety causes insomnia has been proposed.

FIGURE 2.6 ■ Steps in the Research Process: Developing a Hypothesis



A researcher conducting a study to test this theory might then predict that, if two groups of participants are compared, one that is put in an anxiety-provoking situation and one that is put in a relaxing situation, the anxious group will report more problems sleeping than the relaxed group. In other words, the researcher might predict that the anxious group, on average, will report fewer hours of sleep than the relaxed group. This hypothesis would be consistent with the theory that anxiety causes insomnia and is therefore a theory-driven hypothesis. A theory-driven hypothesis involves **deductive reasoning** in that a researcher is taking a general statement about behavior (the theory) and making a specific prediction (the hypothesis) about the study from this general statement.

Another example of a theory-driven hypothesis can be seen in a recent study on face perception. Sofer et al. (2015, Experiment 1) tested a theory that the typicality of a face determines the social evaluation of a person. From this theory, the researchers hypothesized that more-typical faces would be judged as more trustworthy, because trustworthiness is an important part of social interaction. To test the hypothesis, they conducted a study where female students were presented with female faces created from composites of two faces: an attractive female face and a typical female face (see Photo 2.3). Are attractive faces viewed as less

PHOTO 2.3 Sofer et al. (2015) found that attractive faces are judged as less trustworthy because they are less typical.
iStock.com/Cecilie_Arcurs

trustworthy? Thus, the faces ranged from highly typical to highly attractive, depending on the amount of each of the two original faces present in the composite. Participants in the study were asked to judge both the attractiveness and the trustworthiness of each face. The results were consistent with the researchers' hypothesis: The more typical the face was, the higher the ratings of trustworthiness from the participants. The attractiveness ratings supported their prediction as well, as the less typical faces were judged as more attractive and less trustworthy than the more typical faces. Therefore, their study supported the hypothesis that typical faces are judged as more trustworthy, which provided support for the theory that the typicality of a face is important in social evaluations.

Now, consider how the process of a literature review can aid you in developing research questions and hypotheses for your studies. Suppose you are interested in the origin of math abilities and you are conducting a literature review on the development of mathematical concepts in children. You find that a researcher had suggested the theory that understanding of mathematical operations (e.g., addition, subtraction) is innate (i.e., something children are born with). Can you think of a way to make a theory-driven hypothesis for a study that tests this theory? Think about how the study would be conducted, and then use the theory to make a hypothesis about the outcome of the study. (An example of how this could be done is presented after the Test Yourself section at the end of this chapter.)

Data-Driven Hypotheses

Another way in which researchers can make hypotheses about a study is by examining the specific findings of previous studies found in their literature review and generalizing the findings to their study. Hypotheses made in this way are considered data-driven hypotheses because they are made based on data from previous studies. This type of hypothesis involves **inductive reasoning** because the researcher is taking a specific result from another study and using it to make a more general prediction for the research question of interest. For example, suppose researchers are interested in causes of insomnia. In their literature review, they come across a study that found that people who report high levels of anxiety also report getting less sleep per night. From this study's results, they may conclude that anxiety is related to insomnia and make the hypothesis for their study that a relationship will be found between level of anxiety and number of hours of sleep reported per night.

A study by Schnall et al. (2008) provides an example of a hypothesis based on data from previous studies. These researchers were interested in the connection between emotions and moral judgments. Previous studies had shown that, when participants were induced to feel disgust (e.g., exposed to a bad smell), they judged an action as more immoral than control participants who did not experience the disgusting situation. Schnall et al. hypothesized from these past results that, if feelings of cleanliness were induced, the opposite effect should occur: Participants should judge actions less harshly. They conducted two experiments to test this data-driven hypothesis. In both experiments, one group of participants was primed with the

PHOTO 2.4 Schnall et al. (2008) found that priming the concept of cleanliness led to less harsh judgments of moral situations, such as keeping money in a found wallet.

iStock.com/sasun bughdaryan

concept of cleanliness, while another group was not primed with this concept. Participants then judged the actions of others in a set of moral dilemmas (e.g., keeping money in a found wallet). Results indicated that participants who experienced the concept of cleanliness in the study rated the actions in the dilemmas less harshly than participants who were not primed with the concept. Thus, Schnall et al. supported their data-driven hypothesis with the results of their study.

One important thing to note about testing hypotheses and theories: We can never *prove* a hypothesis or theory is correct in a single research study. The best we can do is to support or not support the hypothesis/theory with the data we observe in our study. This is due to the limitations of the research process (e.g., we are testing a small sample, our statistical tests are based on the probabilities of outcomes). We will discuss these limitations throughout the text, but know that they are part of any scientific process. The goal is not to prove facts but rather to support predictions and explanations of the phenomena through the observations we make in our studies.

Operational Definitions

One additional thing a literature review can do is help a researcher determine how to measure or compare aspects of variables. In other words, reading published studies can help you decide how to measure behavior or how to change situations to compare conditions in a study. These decisions are part of the operationalize process introduced in Figure 2.1 (i.e., the O in HOMER). **Operational definitions** are a key part of Step 4 in the research process (see Figure 2.6). An operational definition is the specific behaviors a researcher chooses to observe in the participants to measure a concept (e.g., counting the number of times someone smiles to determine their current mood) or the different situations the researcher sets up to compare in the study (i.e., the conditions). Literature reviews can help a researcher determine the best operational definitions for their variables. For example, suppose you want to measure a personality characteristic, such as how open someone is to trying new things. Would you need to create your own questionnaire to ask people about these kinds of behaviors? The answer is no, because there are lots of studies that have measured this characteristic in the past, and those researchers have already done the work of creating a questionnaire and checking that it measures this characteristic accurately and consistently. Someone who wants to measure this characteristic just needs to conduct a literature review to find a good questionnaire to use in their study (and of course cite that study as the source for the questionnaire). The questionnaire found in the past studies becomes your operational definition for how open someone is to trying new things.

STOP AND THINK

2.7 Explain the difference between a theory-driven and a data-driven hypothesis.
2.8 How does a literature review help researchers make hypotheses about their study?
2.9 Describe the difference between a theory and a hypothesis.
2.10 What are two possible operational definitions that a researcher could use to measure anxiety?

THINKING ABOUT RESEARCH

A summary of a research study in psychology is given below. After you read the summary, answer the following questions:

1. What type of hypothesis (theory-driven or data-driven) did the authors make?
2. Can you state the authors' research question? From the description of the study, where did this research question seem to come from?
3. Do you think this study tests a causal research question or a descriptive research question? How do you know?
4. If you were to conduct a literature review for their research question on PsycINFO, how would you proceed? Describe the steps you would take.
5. Write an abstract for the study in your own words that adheres to APA guidelines.
6. If you were to read an APA-style article describing this study (which you can do by finding the reference below), in which section would you find information about the paragraphs the participants read during the study? In which section would the authors report what statistical test they conducted? In which section would they indicate if their hypothesis was supported?

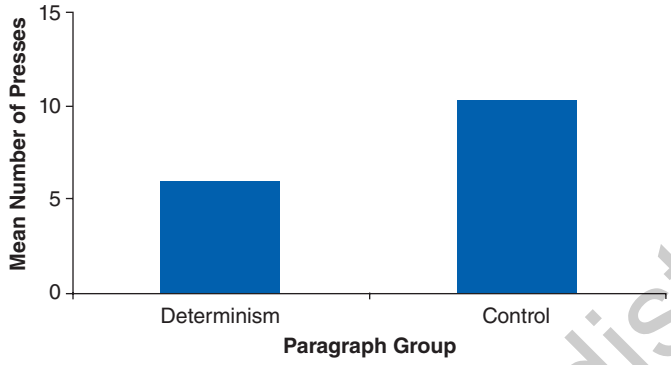
Research Study. Vohs, K. D., & Schooler, J. W. (2008). The value of believing in free will: Encouraging a belief in determinism increases cheating. *Psychological Science, 19*, 49–54.

Purpose of the Study. Vohs and Schooler (2008) were interested in the effects of a belief in determinism (i.e., believing that events in a person's life are not under their control) on moral behaviors. Their interest stemmed from recent findings from neuroscientists that our behaviors may be caused by factors out of our control (e.g., our genes, the functioning of our brain, our environments). They reported that a previous study (Mueller & Dweck, 1998) had found that children exert less effort in a task if they are told that their failure, in a difficult task they had previously completed, was due to their intelligence level rather than their level of effort. From this finding, Vohs and Schooler reasoned that a belief in determinism may negatively affect behavior. Thus, in their study they predicted that exposure to a deterministic argument would result in more cheating behaviors than if this belief was not promoted.

Method of the Study. Thirty college students participated in the study. Participants were randomly assigned to read one of two paragraphs taken from the same book. One of the paragraphs suggested that scientists believe that free will is an illusion. The other paragraph discussed consciousness and did not mention the topic of free will. All participants were then asked to complete a set of math problems, presented one at a time on a computer screen. Participants were asked to complete each problem. They were also told that the computer program had an error such that the answers to some of the problems may appear with the problem and that they should try to solve the problems on their own; they could make the answer disappear by pressing the space bar when the problem appeared. The researchers measured the number of times the participants pressed the space bar as a measure of cheating behavior (i.e., more presses means less cheating).

Results of the Study. The results indicated that the group that read the determinism paragraph pressed the space bar less often (about 5 times during the study) than the control group (about 10 times during the study) that read the consciousness paragraph. Figure 2.7 displays the mean space bar presses for each group.

FIGURE 2.7 ■ Mean Number of Space Bar Presses for Each Group



Source: Results from Vohs and Schooler's (2008) study.

Conclusions of the Study. From their results, Vohs and Schooler (2008) concluded that a belief in determinism (i.e., free will is an illusion) causes more immoral behavior (e.g., cheating) to be exhibited by individuals.

CHAPTER SUMMARY

Reconsider the questions from the beginning of the chapter:

- How do researchers develop a research question? Research questions come from many sources, including researchers' curiosity. However, research questions should be relevant to current knowledge in the field of study and answerable using scientific methods. A literature review helps researchers determine if their research question fulfills these criteria.
- How do researchers conduct a literature review? A literature review is a thorough review of research done in an area of study. Searchable databases, such as PsycINFO and SCOPUS, are useful for conducting a literature review. Conducting a Google web search or using Wikipedia is *not* a good way to conduct a literature review.
- What are some useful resources for a literature review? Searchable databases that provide researchers access to empirical and review journal articles include PsycINFO, Google Scholar, and SCOPUS.
- What will you find in a literature review? A thorough literature review produces journal articles that researchers can use to understand what types of research questions add to knowledge in a field of study, what methods researchers are currently using to answer those research questions, and the theories or past results in an area that help researchers develop hypotheses for their studies.

- What are the different types of research articles, and how are they organized? Research articles are either empirical, review, or theoretical. Empirical articles describe a study conducted by the authors of the article. Review articles summarize results and methods from a particular area of study. Theoretical articles discuss new or revised theories of behavior in an area of study.
- How do we use a literature review to make hypotheses? Researchers can use theories described in journal articles to develop hypotheses, or researchers can use past studies' results to develop a hypothesis about the outcome of their study.
- What are the different types of hypotheses that a researcher can make? A researcher can make theory-driven and data-driven hypotheses.

COMMON PITFALLS AND HOW TO AVOID THEM

Problem: Generating a research question that is too broad to directly study.

Solution: Try to be as specific as possible in stating research questions. Try to identify the variables in your question and think about how you would measure or compare the variables.

Problem: Using inappropriate search engines. Students often use common search engines such as Google and Yahoo, or refer to Wikipedia, to search for information about psychological research, which is unreliable and incomplete.

Solution: Use databases such as PsycINFO, Google Scholar, and SCOPUS to search for primary source journal articles about psychological research. Google Scholar can also help you search for scientific articles on the web.

Problem: Using inappropriate sources. Sometimes students include sources in literature reviews that are either not peer reviewed or are not the most relevant sources for the research question of interest.

Solution: Check the type of publication for sources (this information is provided by PsycINFO) to ensure that sources included in a literature review are the most appropriate for the research question. Evidence of peer review is something to look for in a published article.

Problem: Stating hypotheses too generally. Students often state hypotheses for studies too generally without addressing specific aspects of the study.

Solution: Attempt to state hypotheses as specifically as possible, including variables of the study when appropriate (see Chapter 4 for more information on variables).

Problem: Focusing on full-text articles. Oftentimes students will focus a literature review too heavily on articles with full text access online, and so miss important studies for their topic.

Solution: Be sure to conduct a thorough literature review, even if that means walking over to the library to pick up a hard copy of an article that does not have full text available online.

Problem: Reading only the abstract. Because the abstract contains a summary of the article, students sometimes believe that they can fully understand the article by reading just the abstract.

Solution: Abstracts are written to provide a short summary of the article and may not fully represent the method or results of a study. Thus, it is important to read through the entire article when conducting a literature review. In addition, you should never cite a source that you have not fully read.

APPLYING YOUR KNOWLEDGE

Shark attacks are often reported in the news, making it seem as though the chance of an attack is higher than it actually is.

- Suppose you wanted to determine how likely a shark attack actually is. State a research question for this type of study.
- What kinds of sources would be appropriate to help you answer your research question? Explain how you would go about finding these sources.

TEST YOURSELF

1. For the information listed below, indicate in which section(s) of a journal article it should be found.
   a. Average scores for different groups in a study
   b. Number of participants in the study
   c. Researchers' hypotheses
   d. Comparison of results of present study with results of previous studies
   e. Summary of the instructions given to the participants
2. Describe how theory-driven and data-driven hypotheses are made.
3. Explain why the research question below is not an appropriate research question for behavioral research:
   - Does every human being have a soul?
4. What is a *peer-reviewed journal article*, and how does it differ from an article you might find in a popular magazine?
5. What is a literature review, and why is it an important part of the research process?
6. For each research question below, identify the behavior variable and the causal variable:
   a. Do men and women differ in conscientiousness?
   b. Does waking up at the same time (i.e., setting an alarm) every day improve sleep quality?
   c. Does ostracism increase violent behavior?

d. Is eyewitness memory in children worse than in adults?
e. Does using crutches change the way you perceive the size of an opening?

7. Explain the differences between a database such as PsycINFO and a search engine such as Google.

8. A short summary of a journal article that appears at the beginning of the article and in databases such as PsycINFO is called a(n) _____.

9. Creating a theory-driven hypothesis involves _____ reasoning.

10. A research question that asks about a link between exercise and memory would be classified as a _____ research question.

11. What is the difference between an empirical journal article and a book chapter or review article?

12. For each of the questions below, indicate if it is a descriptive, correlational, or causal research question.
a. Do people with less-healthy eating habits sleep fewer hours per night than people with more-healthy eating habits?
b. Does priming a stereotype lead to inaccurate memories about a witnessed event?
c. Do college students typically study while consuming caffeinated beverages?
d. Do people who list reading as a hobby also tend to be introverted?
e. How often do college students report feeling anxiety?

13. Describe the four major sections of an empirical journal article.

Answers can be found in Appendix B.

Example of Theory-Driven Hypothesis for Innateness of Mathematical Operations (From the section "Theory-Driven Hypotheses"): To determine that something is innate, you would need to test infants who are very young and have not had enough experience with objects to develop an understanding of mathematical operations such as addition and subtraction. You could then test these infants in a study where you show them objects of a set number that they are habituated to (no longer show interest in), occlude the objects with a screen, and then either add an object or remove an object behind the screen so that the infant can see the object being added or subtracted. You then remove the screen and show them the objects, but show them an incorrect number of objects based on the operation. If the infants show interest (indicating something that was not expected by the infants) in what they are shown, this can be seen as evidence that the infants understand what they should have seen after the operation was performed. Thus, the theory-driven hypothesis for this study is that infants will look longer when the number of objects does not match the operation than when the number of objects does match the operation.

A study like this was performed by Wynn (1992), where her findings indicated that infants as young as 5 months looked longer when the number of objects did not match the operation than when the number of objects shown was correct based on the operation. Wynn argued that these results support the theory that understanding of addition and subtraction operations is innate.

KEY TERMS

abstract
causal research question
correlational research question
data-driven hypothesis
deductive reasoning
descriptive research question
discussion
hypothesis
inductive reasoning
introduction
literature review
method
operational definition
peer review
PsycINFO
results
theory
theory-driven hypothesis
variable