

# 2

## GENERATING TESTABLE IDEAS

### CHAPTER SUMMARY

#### 2.1 Generating Interesting and Novel Ideas

Once a research study is complete, researchers may try to publish the results in a scientific journal, called a **peer-reviewed journal**. To publish a work, you should consider the aims of scientific journals and two additional criteria or questions: First, is your idea interesting (to the readership of a journal)? Second, is your idea novel (i.e., does it add to an existing body of literature)? To publish your work, your answer should be yes to both questions.

#### 2.2 Converting Ideas to Hypotheses and Theories

In science, the information obtained is of little value without organization. One way in which scientists organize information is by stating hypotheses or theories about the information that is obtained.

A **hypothesis** is a specific, testable prediction or claim 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 to also provide unique predictions to extend that body of knowledge. The advantage of a theory is that it states unique predictions and can also be used to explain an existing body of research. A theory is often tested in one of two ways: Predictions made by a theory can be tested, or the limitations of a theory can be tested. 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. **Parsimony** is a canon of science that states that, all else being equal, simpler explanations should be preferred to more complex ones.

#### 2.3 Developing Your Idea: Deduction and Induction

Using **deductive reasoning**, you begin with a theory and deduce a prediction that must be true if the theory is correct—the prediction you deduce is your hypothesis, which will be tested to refute or support the theory. Using deductive reasoning, then, you start with a theory or idea to generate new ideas (e.g., predictions made by a theory). Hence, the theory guides the ideas you generate and the observations you make.

### CHAPTER LEARNING OBJECTIVES

1. Explain what makes an idea interesting and novel.
2. Distinguish between a hypothesis and a theory.
3. Distinguish between induction and deduction.
4. Describe the process of conducting a literature review.
5. Identify four ethical concerns for giving proper credit.
6. Describe the “3 Cs” of conducting an effective literature review.
7. Distinguish between a confirmational and a disconfirmational strategy.
8. Explain the issue of publication bias.

Using **inductive reasoning**, you make a casual observation or collect and measure data. You then generate an idea or hypothesis to explain what you observed or measured. The idea you generate to explain the observation is your hypothesis. Using inductive reasoning, then, you start with an observation to generate new ideas; that is, you generalize beyond the limited observations you made. Hence, the data or observations guide the ideas you generate and the observations you make.

## 2.4 Performing a Literature Review

To develop an idea, you 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. To get started with a literature review, first identify a research topic that interests you. To get organized, keep track of your sources and determine if each source is a **secondary source** (a source describing research or ideas that are not necessarily the author's own) or a **primary source** (a source from the original author of a work). To search the literature, use online databases that allow you to search for, save, and print thousands of primary and secondary sources in all topic areas in the behavioral sciences. Popular databases include PsycINFO, PsycARTICLES, PubMed, ERIC, and JSTOR.

## 2.5 Ethics in Focus: Giving Proper Credit

Four ways to avoid ethical problems are to (1) always double-check your sources for accuracy, (2) obtain the primary source of an article you cite, (3) avoid “abstracting,” and (4) be aware of **citation bias**. Citation bias is when an author or authors cite only evidence that supports their view and fail to cite conflicting evidence.

## 2.6 The “3 Cs” of an Effective Literature Review

The “3 Cs” of an effective literature review are to be comprehensive, critical, and clever. To be *comprehensive*, search for research articles by journal, search multiple databases, and search an article in the following order: title, abstract, introduction and discussion, methods and results, and references. To be *critical*, ask questions as you read an article, know your sources, and remain objective. To be *clever*, identify flaws or inaccuracies in an article, identify contradictions across many studies, identify anomalies within a study, consider subtle changes to a study that can be impactful, and think beyond the research.

## 2.7 Testing Your Idea: Confirmation and Disconfirmation

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* occurs when an effect or difference is observed. A confirmational strategy uses a logic statement called *affirming the consequent*, which can be false logic. For this reason, researchers also use a 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. Using this strategy, you test an outcome that is not predicted or anticipated by the theory or hypothesis being tested. One benefit of using the disconfirmational strategy is that researchers can refute a theory or hypothesis with a positive result.

## 2.8 Ethics in Focus: Publication Bias

**Publication bias** is the tendency for editors of peer-reviewed scientific journals to preferentially accept articles that show positive results and reject those that show only negative results. Because editors and peer reviewers often decide to reject a manuscript on the basis of its failure to show positive results, many researchers do not even try to publish negative findings and instead choose to file them away, which is called the **file drawer problem**. Although the 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 ORGANIZED BY LEARNING OBJECTIVE

#### 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 also 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, methods 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.

**TIPS AND CAUTIONS FOR STUDENTS****Deductive Versus Inductive Reasoning**

Here we will further distinguish deductive from inductive reasoning. Keep in mind that deductive reasoning works from more general to more specific—this is sometimes called a “top-down” approach. Using deductive reasoning, then, we might begin with a *theory* about our topic of interest, then narrow that down into more specific *hypotheses* that we can test and *observations*

we can make to address the hypotheses. Ultimately, this process of reasoning leads us to be able to test the hypotheses with specific data to *confirm* or *disconfirm* our original theories.

Inductive reasoning works in the opposite direction, from more specific observations to broader generalizations and theories—this is sometimes called a “bottom-up” approach. Using inductive reasoning, then, we begin with specific or general observations and measures. If patterns or regularities are detected, then we can formulate some tentative hypotheses that can be explored and can eventually lead to some general conclusions or theories.

### Confirmational Versus Disconfirmational Strategies

To simplify the distinction between a confirmational and a disconfirmational strategy for testing a hypothesis or theory, keep in mind the idea of observing a positive result. Using a confirmational strategy, we look for evidence to confirm predictions from a theory; if a positive (i.e., significant) result shows evidence to support a tested prediction, then we are using a confirmational strategy. However, using a disconfirmational strategy, we look for evidence to disconfirm predictions from a theory; if a positive (i.e., significant) result shows evidence to disconfirm a prediction not otherwise anticipated by a theory, then we are using a disconfirmational strategy.

To further illustrate this distinction, if a theory predicts  $Y$  but is contradicted by  $X$ , then we can use a confirmational strategy to test  $Y$ ; if results are significant (positive), then we can confirm that the theory predicts  $Y$ . We can also use a disconfirmational strategy to test  $X$ ; if results are significant (positive), then we can confirm that  $X$  is true, which provides evidence to contradict or disconfirm the theory.

### PRACTICE QUIZ

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1. Once a research study is complete, researchers may try to publish the results in a scientific journal called a:
  - a. Peer-reviewed journal
  - b. Nonreviewed journal
  - c. Partially reviewed journal
  - d. None of the above
2. An idea that is tested using the scientific method should be \_\_\_\_\_; in other words, it should provide new information.
  - a. Questionable
  - b. Convolutted
  - c. Novel
  - d. Marginal
3. Which of the following criteria of a good hypothesis or theory identifies that simpler explanations should be preferred to more complex ones?
  - a. Falsifiability
  - b. Parsimony
  - c. Precise
  - d. Replicable
4. Which of the following is true about a hypothesis?
  - a. It is a statement of prediction.
  - b. It is a testable claim.

- c. It is a statement, not a question.
  - d. All of the above
5. Deductive reasoning is a \_\_\_\_\_ approach, whereas inductive reasoning is a \_\_\_\_\_ approach.
- a. Top-down; bottom-up
  - b. Top-up; bottom-down
  - c. Bottom-up; top-down
  - d. Bottom-down; top-up
6. 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, your friends no longer argue. From this, you conclude that humor can alleviate conflict. This is an example of what type of reasoning?
- a. Deductive reasoning
  - b. Inductive reasoning
  - c. Statistical reasoning
  - d. Evaluative reasoning
7. In a literature review, the *literature* refers to:
- a. Fiction and nonfiction novels
  - b. Any works published on the Internet
  - c. The general body of published scientific knowledge
  - d. Personal diaries and notes
8. Which of the following is an example of a secondary source?
- a. An author's published ideas
  - b. A review article
  - c. A textbook
  - d. Both B and C
9. Any publication in which the works, ideas, or observations are those of the author is called:
- a. A primary source
  - b. A secondary source
  - c. Hearsay
  - d. All of the above
10. PsycINFO, PsycARTICLES, PubMed, ERIC, and JSTOR are examples of:
- a. Professional clubs
  - b. Electronic databases
  - c. Physical libraries
  - d. Famous authors
11. When searching for articles in a database, we type in \_\_\_\_\_ to find articles that are related to the topic or idea we want to search.
- a. Illustrations
  - b. Keywords
  - c. Images
  - d. Pictures

12. The length of an abstract can vary; however, abstracts are typically how long?
- 250 words or fewer
  - At least 500 words
  - Between two and three pages
  - One or two sentences at most
13. Which of the following is a way to avoid citing sources incorrectly?
- Always double-check your sources for accuracy
  - Obtain the primary source of an article you cite
  - Be aware of citation bias
  - All of the above
14. Each of the following is one of the “3 Cs” of an effective literature review, *except*:
- Be critical
  - Be clever
  - Be cooperative
  - Be comprehensive
15. Which of the following parts of an article should you read first to be comprehensive in your literature review?
- References
  - Discussion
  - Title and abstract
  - Results
16. Thinking beyond the research is part of which of the “3 Cs” of an effective literature review?
- Be clever
  - Be comprehensive
  - Be charismatic
  - Be convoluted
17. Which type of strategy uses the following logic statement?
- If A is true, then B is true.  
B is true.  
Therefore, A is true.
- Conformational strategy
  - Disconfirmational strategy
18. A disconfirmational strategy is a method of testing a theory or hypothesis in which:
- A negative result disconfirms the predictions made by that theory or hypothesis
  - A positive result disconfirms the predictions made by that theory or hypothesis
  - We use the type of logic referred to as *affirming the consequent*
  - Both B and C
19. A publication bias is the tendency for editors of peer-reviewed journals to preferentially accept articles that show \_\_\_\_\_ results and reject those that show only \_\_\_\_\_ results.
- Negative; positive
  - Positive; negative

- c. Significant; impactful
  - d. Impactful; significant
20. Another term for publication bias is:
- a. Citation bias
  - b. Literature advancement
  - c. Primary sourcing
  - d. File drawer problem

## CHAPTER EXERCISE

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### Matching

Match the following items.

- |  |                                       |
|--|---------------------------------------|
| ___ 1. One example of being clever                                     | A. Online databases                   |
| ___ 2. Top-down approach to reasoning                                  | B. Citation bias                      |
| ___ 3. Also called the file drawer problem                             | C. Title and abstract                 |
| ___ 4. Examples include PubMed and PsycINFO                            | D. Predictions and limitations        |
| ___ 5. Parts of a theory that are often tested                         | E. Secondary sources                  |
| ___ 6. Uses logic called <i>affirming the consequent</i>               | F. Confirmational strategy            |
| ___ 7. The parts of an article you should read first                   | G. Think beyond the research          |
| ___ 8. Citing only evidence that supports your viewpoint               | H. Testable, replicable, parsimonious |
| ___ 9. A review article includes many _____ on a selected topic        | I. Deductive                          |
| ___ 10. Key criteria to develop a good scientific hypothesis or theory | J. Publication bias                   |

### Questions

1. Identify the three key criteria to consider when developing a good hypothesis or theory that is regarded as scientific. Explain why each criterion is important.
2. What is abstracting? Why is it an ethical concern?
3. Explain why the confirmational strategy alone is a problematic strategy for testing a theory.