Unlike classics of art, music, and literature, a classic text such as *Evaluating Research in Communication Disorders* calls for continual revision and updating. But, despite the ever-present fear that any change may undermine a valuable resource that has “withstood the test of time,” it nonetheless remains that the value of any resource is inherently tied to its ability to address contemporary needs and concerns. One of the most prominent concerns today is the implementation of evidence-based practice. From the time Canadian physician David Sackett and his colleagues set forth the standard definition of evidence-based medicine in 1996, the “conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients” has been embraced increasingly by health care professionals, including those who practice audiology and speech-language pathology. That’s not to say that there had been no prior relationship between research and practice in our discipline. As stressed in the first chapter, our discipline and its professions took root in early research laboratories and their associated training programs. Furthermore, although the phrase “evidence-based practice” had not yet been popularized in 1980 when Ira Ventry and Nicholas Schiavetti coauthored the first edition of this book, they nonetheless sought to advance its basic tenet: to promote research literacy as a means to inform clinical decision making and thus improve practice.

There are many worthy texts that aim to educate the reader on how to do useful and competent research (several of which are cited in this text). However, from the outset, this work was conceptualized as “a guide for clinicians and students” in becoming better “consumers of the literature” in their discipline. With the current emphasis on evidence-based clinical decision making, the ability to critically evaluate research has never been as important as it is now. Without question, it has become an indispensable core competency for any practicing clinician. That’s not to say that this book is not also relevant for the nascent researcher. Clearly, the ability to conduct good and meaningful research depends on one’s ability to critically read, understand, and evaluate the research done by others. Indeed, it is our sincere hope that students reading this book will be inspired to pursue a career as a researcher or researcher-practitioner.

The seventh edition of *Evaluating Research in Communication Disorders* maintains the vision and purpose of the earlier editions, but completes a major reorganization of the material that was initiated with the previous revision. Much of the change has been informed by the author’s own experiences as a course instructor, as well as from generous feedback and insightful suggestions from others who have used this text. We also drew on our extensive experience as editors and article manuscript reviewers for several research
journals in communication sciences and disorders. We’ve been pleased that the majority of feedback has been quite positive and encouraging. Several comments from both students and instructors were particularly helpful about ways to improve the text to better match their needs within the confines of a single-semester course. For instance, many have requested more information about evidence-based practice so as to provide greater context for the evaluation of research articles. We’ve done this throughout the current edition and in ways that distinguish it from most other books on the subject. Very often, quantitative research studies (particularly randomized controlled trials) are seen as solely relevant to evidence-based decisions in clinical practice. However, the current conceptualization of evidence-based practice is one of integrating best research evidence with practitioner knowledge and skill, as well as the needs and preferences of the client to improve clinical outcome. As a book with a primary focus on reading, understanding, and evaluating our professional literature, we’ve stressed the different research designs and types of publications that can inform all components of evidence-based practice. This gives greater context to our discussions of qualitative research, narrative literature reviews, and research-based tutorials.

Another useful suggestion was to move the material on evaluating of treatment efficacy research from the previous edition’s final chapter to closer proximity of the discussion of research design. Now, following the chapter that describes the basic concepts in qualitative and quantitative research design, Chapter 5, Experimental Designs for Studying Treatment Efficacy, builds on that understanding with a focus on treatment outcome and efficacy studies. The present edition concludes with Chapter 10, Best Evidence and Clinical Decision Making, a new addition to this text that reinforces the principles of evidence-based practice, while providing a more useful context for our discussion of qualitative and quantitative systematic reviews, meta-analyses, and evidence-based clinical practice guidelines. In this way, Chapters 1 and 10, with their emphasis on evidence-based practice, serve as “bookends” to our coverage of scientific research and research literacy in communication sciences and disorders.

A common concern for both students and instructors has been the expansive chapter on research results. In this edition, we’ve taken a “divide and conquer” approach to this issue. The present Chapter 7, The Results Section of the Research Article: Findings, discusses the organization and description of both qualitative and quantitative results, whereas the new Chapter 8, The Results Section of the Research Article: Statistical Inference, focuses on just that—the statistical analysis of quantitative data to infer differences between experimental variables.

In a related vein, because most of the “study questions” in the previous edition required the reading of multiple articles, many readers found them a bit overwhelming and time consuming. For this edition, we’ve largely limited each of these items to a single article, calling them “Exercises in Critical Reading.” Each exercise directs the reader to the literature and, in as practical a manner as possible, highlights a key concept and/or skill that was addressed in that chapter. Our belief is that this text will serve little purpose if students neither hone their critical reading skills by perusing the literature in our field nor develop the skills necessary to support evidence-based practice. In constructing these exercises, we tried to include research articles that reflect the remarkable breadth of speech, language, swallowing, and hearing studies represented in our literature. As a supplement
to the readings in the text, lecture, and discussion, we’ve found it useful to assign the exercises to small groups of students who can then present their answers (and a brief overview of the article) to the remainder of the class. To facilitate this use, the previous eight chapter study questions have been expanded to twelve article-based exercises.

Lastly, of our own accord, the phrase “communicative disorders” has been changed to “communication disorders” in the title and throughout the text. A minor change, indeed, but one that recognizes that *communication sciences and disorders* has now been universally accepted—at least in the United States—as the name of the discipline within which speech and hearing professionals practice and produce basic and applied research.

Using the structure of a research article as a guide, the text takes the reader from the Introduction to the Conclusions, providing copious illustrative excerpts from the research literature along the way. After addressing the critical evaluation of each section of a research article, the text uses this information as the foundation for practical ways to employ evidence-based practice in routine clinical decision making. Despite extensive revision, the current edition has attempted to remain true to the spirit of the text as developed by coauthors Nicholas Schiavetti and Dale Evan Metz. If we’ve been successful in this effort, the seminal influence of Ira Ventry should also be in clear evidence.

**New to This Edition**

In revising the text, I’ve attempted to keep in mind the sorts of questions that students typically ask, as well as many common misconceptions. Wherever possible, description and context have been added in anticipation of such questions and misunderstanding. Specifically, the seventh edition of *Evaluating Research in Communication Disorders* features the following changes to ensure that the material is current and comprehensive, while meeting the needs of students, instructors, and practitioners:

- Reorganization of material to aid the development of evaluation skills, critical thinking ability, and reinforcement of key concepts
- New exercises in critical reading for each chapter to facilitate instruction, learning, and application
- Expansion of the text to ten chapters as a means to improve flow, reinforce concepts, and minimize variation in chapter length
- New material on:
  - The use of person-first language
  - Reflective practice and cultural competence
  - Framing “foreground” and “background” questions, as well as the role of qualitative research studies, literature overviews, and tutorials in supporting evidence-based practice
  - Retrieving electronic resources, including a discussion of URLs and the digital object identifier system
  - Expanded discussions of:
    - Research-practice relationships, implementing evidence-based practice, assessing levels of evidence, and using systematic reviews to inform clinical decision making
The critical evaluation of arguments used in a rationale for a study or in the discussion of results

- Qualitative and mixed-methods research designs, including a discussion of the types of data coding used in such designs
- Treatment outcome and efficacy studies, including more detailed discussion of the five-phase model of treatment outcome research
- Meta-analysis techniques, including a discussion of forest and funnel plots

New! Pearson eText Available

To enhance affordability and portability this exciting new edition is available as a Pearson eText. With the eText students can easily take and share notes, highlight, and search for key concepts. To learn more about the Pearson eText, go to www.pearsonhighered.com/etextbooks.

Acknowledgments

We gratefully acknowledge permission granted by the American Speech-Language-Hearing Association and by the authors to reprint selections from their journal articles. Special thanks to several anonymous reviewers whose critical appraisal of the previous edition has been very helpful for developing the current edition of Evaluating Research in Communication Disorders. Thanks also to Steve Dragin, editor extraordinaire, for his steadfast support and encouragement, as well as to production managers Annette Joseph at Pearson and Jeanine Furino at Cenveo for their efforts on our behalf. Also, as recognized in every previous edition, much of the success—if not the very existence of this work—is owed to the efforts of Ray O’Connell. Although gone, he remains, as ever, the guardian angel of this book.

In assuming the role of first author of this book, I am indebted to Cheryl Ridgway, my administrative assistant in the Department of Communication Sciences and Disorders at West Virginia University, without whom I would be unable to balance my responsibilities as chairperson with the time needed to prepare this revision. We would also like to acknowledge the reviewers for this edition: Judith Brasseur, California State University Chico; Anne Bothe Marcotte, University of Georgia; and Lisa A. Proctor, Missouri State University. And, finally, a warm thank-you to my wife, Jennifer Orlikoff, without whose thirty years of love and encouragement, I would be unable to balance my life at all.

Robert F. Orlikoff
Morgantown, West Virginia
The purpose of this book is to help practitioners and students in communication disorders become critical readers of the research literature in their discipline. A critic is “one who forms and expresses judgments of the merits, faults, value, or truth of a matter,” and the word critical is used, here and throughout, to mean “characterized by careful, exact evaluation and judgment” (“Critic/Critical,” 2000). A critical review of the research literature helps inform clinical decision making. Our basic premise is that sound clinical practice should be based, in large measure, on relevant basic and applied research rather than on pronouncements by authorities, intuition, or dogma. As Siegel (1993) has stated, “clinicians need to have enough familiarity with research to judge whether the claims are reasonable and to determine just how closely the proposed clinical procedures adhere to the research methods and the underlying theory” (p. 36). In short, critical readers are critical thinkers, and critical thinking is the foundation of effective professional practice.

Before considering the research literature in communication sciences and disorders, let’s consider first what, precisely, is meant by research. As described by Reynolds (1975):

As its root meaning (“to search again”) implies, most research either results in a rediscovery, and hence a confirmation, of already known facts and principles or represents another painstaking attempt to answer a formerly unanswered question in an objective and repeatable fashion. But research also means the search for and the discovery of formerly misunderstood or unconceived principles and facts. (p. 13)

In its broadest sense, research is an organized way to seek answers to questions (Houser & Bokovoy, 2006). As such, it should be immediately apparent that research is by no means the sole purview of the “laboratory scientist.” Clinicians continually ask—and strive to answer—questions about a number of core practical issues relating to, among other things, evaluation, diagnosis, prognosis, treatment, and case management. These professionals perform assessments for intervention and assessments of intervention, employing the principles of research to enhance their knowledge base and to perfect their clinical skills. They engage in empirical inquiry regarding the appropriateness and effectiveness of their treatment, make supported arguments that affect health care policy and service delivery, and, yes, they participate in “scientific research activities” to present and publish their findings so as to advance their discipline (Bloom, Fischer, & Orme, 2009; Golper, Wertz, & Brown, 2006; Konnerup & Schwartz, 2006; Lum, 2002; Meline & Paradiso,
Chapter 1

2003; Ramig, 2002). The “essential quality that differentiates a profession from other vocations,” Baumgartner and Hensley (2013, p. 5) remind us, “is the continuous pursuit and dissemination of new knowledge.”

Knowledge Acquisition

How does one acquire knowledge? On what basis does one accept new information as accurate or truthful? Such questions are the broad concern of epistemology, the study of the nature and foundation of knowledge. We’ve equated research with the acquisition of knowledge, but knowledge can be acquired in numerous ways. In a highly influential essay, the scientist and philosopher Charles Sanders Peirce (1877) outlined four general methods that people use in order to know something. According to Peirce, the pursuit of knowledge is driven by an inherent avoidance of doubt, largely because uncertainty interferes with our ability to “guide our desires and shape our actions.”

The method of tenacity was described by Peirce as perhaps the most common means of “fixing belief.” This method avoids “the irritation of doubt” by a steadfast adherence to the views we already hold. These views are typically those we find most agreeable and are retained, not by the pursuit of truth, but by preference, personal opinion, and habit. This “way of knowing” often requires people to shield themselves from competing or contradictory opinions or evidence. Peirce recalls an instance when a friend advised him to avoid reading a particular newspaper article because it might result in a change of opinion, warning him that, by shaking the confidence in held beliefs, he might reject what he already knows to be true. Although recognizing that it is a very popular means of establishing what people believe, the method of tenacity is derided by Peirce as one that, ultimately, “will be unable to hold its ground in practice.”

Peirce refers to a second way of knowing as the method of authority. Instead of focusing on the individual as does the method of tenacity, the method of authority focuses on a community. Within the method of authority, people accept knowledge from an individual or group of individuals who have been, in some way, designated as authoritative producers of knowledge. An example of the method of authority is the belief that the sun revolves around the earth because a historical institution, such as a government or religion, insists that it is true. Haines and Jones (1994) note that throughout history leaders in health care “have occasionally endorsed treatments that have subsequently been shown to be ineffective or even dangerous.” The method of authority is not necessarily unsound, depending on how the authority acquired its knowledge. In the United States, for example, citizens generally accept the authority of the U.S. Food and Drug Administration regarding prescription medicines and food safety—but much of its authority is based on sound scientific evidence. The method of authority may be unsound, however, if everyone merely accepts the word of authority without examining or questioning the qualifications of the source of its knowledge. Peirce acknowledges that the method of authority is more successful than the method of tenacity in “fixing belief,” but this, he feels, is more a consequence of reducing competing opinions than of the veracity or soundness of authoritative knowledge.

The third way of knowing is the method of intuition. It is also called the method of pure rationalism, the method of congruity, or as originally named by Peirce, the a priori
method. This method of knowing relies on the use of pure reason based on prior assumptions that are considered to be self-evident with little or no consideration given to the role of experience in the acquisition of knowledge. As the philosopher Bertrand Russell (1928) has noted: “The extent to which beliefs are based on evidence is very much less than believers suppose.” A serious limitation of intuition is that experience may show that a self-evident truth is not a valid assumption in a logical system and, if an a priori assumption is incorrect, the conclusion will be incorrect. For example, a conclusion drawn from basing a purely logical argument on the a priori assumption that the earth, not the sun, is the center of our solar system will be incorrect. With the exception of mathematics, pure rationalism is not used exclusively to develop scientific principles. Despite the limitations of pure rationalism, elements of rationalistic thinking are central to scientific inquiry in communication disorders and other disciplines. We discuss the relationship of rationalism and experience and their roles in scientific inquiry further in the following section.

The fourth method of knowing is the method of science. The word science is derived from the Latin word scire, which means “to know,” and the method of science is widely heralded as the most powerful and objective means available to gain new knowledge. Peirce heralds the scientific method because it bases belief on the “reality” of external evidence, separate from fashion and preference, as well as from personal or group conviction. Peirce also points out that, while there is no way to incorrectly apply the methods of tenacity, authority, or intuition (that is, they all function largely to endorse currently held beliefs), the method of science is very specific about its application. The method of science can, indeed, endorse currently held beliefs, but it can also call those beliefs into doubt. All scientific knowledge is derived from scientific research, which—in accord with Peirce’s view—Kerlinger and Lee (2000, p. 14) define as the “systematic, controlled, empirical, amoral, public, and critical investigation of natural phenomena.”

The words used in the preceding definition, italicized in the original, have conceptual importance, and they highlight many of the themes and concepts we introduce in this text. As such, let’s briefly examine these terms. The words systematic and controlled imply that scientific investigation is tightly disciplined and conducted in a manner that methodically rules out alternative explanations of a particular finding. Systematic control over events during the execution of a scientific investigation promotes confidence in the research findings. The word empirical implies that the beliefs must be subjected to outside independent tests; subjective beliefs must “be checked against objective reality.” The word amoral implies that knowledge obtained from scientific research does not have moral value. Research findings are not “good” or “bad.” Rather, research findings are considered in terms of their reliability and validity. Interpretation is tied to the data, not on preferences, biases, or what is popularly known as “spin.” Finally, the word public implies that scientific research is evaluated by other independent individuals of equal knowledge and training prior to being published in a professional journal. This process is called “peer review,” and we will have more to say about the peer review process later in this chapter.

Scientific research depends on a complex interplay of two distinct lines of inquiry, namely, empiricism and rationalism. Empiricism is a philosophical doctrine that knowledge is gained through experience and evidence. Empiricists generally rely on inductive reasoning; that is, they use evidence from particular cases to make inferences about general principles. To be accepted into the realm of knowledge, explanations of phenomena
must be based on evidence gained from observations of phenomena, and critical evaluation of the accuracy of observations is necessary before the observations can be accepted as evidence. This critical, self-correcting activity of empiricism is the core of scientific endeavor and a necessary requisite of sound research.

**Rationalism** is a philosophy that assumes knowledge must be gained through the exercise of logical thought. Rationalists generally rely on deductive reasoning; that is, the use of general principles to make inferences about specific cases. Rationalism is often referred to as a **schematic, formal, or analytic** endeavor because it deals with abstract models, and the logical criticism of propositions is necessary for the acceptance of explanations into the realm of knowledge.

Various schools of thought differ in the extent to which they rely on empirical and rational endeavors. In linguistics, for instance, Chomsky (1968) insisted that rational consideration rather than empirical inquiry is necessary for the development of a theory of language. In psychology, Skinner (1953) relied on empirical evidence for a functional analysis of behavior and eschewed the exclusively rational approach. Although these two examples illustrate the extreme ends of the continuum of rational and empirical thought, many positions regarding the integration of empirical evidence and rational inquiry exist along this continuum. Stevens (1968) suggested the term **schemapiric** for the “proper and judicious joining of the schematic with the empirical” and concluded that both are essential in scientific study.

### The Scientific Method

To understand the research enterprise (that is, common knowledge gathering) in communication disorders, it is necessary to understand the general scientific framework within which these research activities operate. Science is a search for knowledge concerning general truths or the operation of general laws, and it depends on the use of a systematic method for the development of such knowledge. This **scientific method** includes the recognition of a problem that can be studied objectively, the collection of data through observation or experiment and the drawing of conclusions based on an analysis of the data that have been gathered. According to Best and Kahn (2006), research “is a process of *testing* rather than *proving*, and it implies an objectivity that lets the data lead where they will.”

Scientific research may be directed toward the development of knowledge per se, in which case it is called **basic research**, or it may be undertaken to solve some problem of immediate consequence, in which case it is called **applied research**. In recent years, professionals in many disciplines have realized that basic research and applied research are not entirely separate or oppositional activities. Research that was conducted for the sake of basic knowledge may turn out to have an important application. Research conducted to solve an immediate problem may provide basic information concerning the nature of some phenomenon. Indeed, basic research provides the broad base of knowledge that provides the foundation for the development of practical solutions to recognized problems and needs. In the past, however, there have been instances of acrimonious opposition between people identified with the so-called basic and applied schools, and such opposition has resulted in communication failures that have hindered rather than advanced the
development of knowledge. Many now recognize the importance of both basic and applied research, as well as the need for clear communication between researchers with more basic orientations and those with more applied orientations.

Whether directed toward basic or applied knowledge, two major types of research may be identified: descriptive and experimental. **Descriptive research** examines group differences, developmental trends, or relationships among factors through the use of objective measurements, various kinds of tests, surveys, and/or naturalistic observations. **Experimental research** examines causation through observation of the consequent effects of manipulating certain events or characteristics under controlled conditions. These two types of research are different empirical approaches to the development of knowledge.

**Scientific Theory**

Statements formulated to explain phenomena are called theories (Best & Kahn, 2006). Unlike in everyday parlance, where a “theory” can mean little more than a conjecture or hunch, a **scientific theory** is established through empirical and rational inquiry. Empirical facts alone are meaningless unless they are linked through propositions that confer meaning on them (Rummel, 1967; Sidman, 1960). By coherently summarizing and organizing existing knowledge, theories establish a framework from which meaningful generalizations can be made. In Skinner’s (1972) words, a theory is “a formal representation of the data reduced to a minimal number of terms” used to succinctly identify and outline cause-and-effect relationships. One of the fundamental principles of the scientific method maintains that the best test of our understanding of cause–effect relationships lies in our ability to predict and/or control phenomena. According to science philosopher Karl Popper (1959), “Theories are nets to catch what we call ‘the world’: to rationalize, to explain, and to master it. We endeavour to make the mesh ever finer and finer” (p. 59). In this regard, theories represent not only the “ultimate aim of science” (Kerlinger & Lee, 2000) but the ultimate aim of clinical practice as well.

Another purpose of a scientific theory is to facilitate the modeling of phenomena or various processes. Some models may be **physical**, such as when a manipulable plastic representation of the vocal tract is used to study certain aspects of velopharyngeal function (e.g., Guyette & Carpenter, 1988) or when an animal or biological specimen is used as an analogue of human physiology or behavior. Alipour and Scherer (2000), for instance, used a human cadaver larynx to examine glottal airway dynamics, whereas Bauer, Turner, Caspary, Myers, and Brozoski (2008) studied chinchillas to relate tinnitus to different types of cochlear trauma. Rosenfield, Viswanth, and Helekar (2000) even proposed an animal model of stuttering using zebra finch songbirds! Other models may be **conceptual**, as is the case for psycholinguistic models of speech development (e.g., Baker, Croot, McLeod, & Paul, 2001) or **computational**, such as mathematical models of the vocal folds (e.g., Gunter, 2003) that can be used to construct computer simulations. Regardless of their construction, a model serves as simplified conceptualization that can be tested to see whether it is consistent with what is observed or fits empirical data. In this way, models are useful ways to test our understanding, generate insight, and gauge our ability to predict and control phenomena.
A prominent theory or group of theories gives rise to what another philosopher of science, Thomas Kuhn (1970), defined as a **scientific paradigm**. A paradigm is the collective way in which a community of researchers and clinicians identify the problems and the methods of investigation for their discipline. Both theory and paradigm construction depend on the dynamic nature of scientific inquiry. Theories depend on the philosophical doctrines of empiricism, defined earlier as the objective observation, measurement, and/or testing of the phenomena of interest, and **determinism**, the assumption that the universe is lawful. Continuing empirical and rational investigation is therefore necessary for theory verification or modification if observed facts are not adequately explained by the theory. Theories, then, either become more refined or are abandoned, to be replaced by more useful characterizations (Bordens & Abbott, 2011). Rather than being a solitary pursuit, research is a communal activity that builds on the work of others. On occasion, an unexpected discovery, an innovative hypothesis, the development of new technology, or a novel method of investigation may even result in a “paradigm shift” that provides a new framework for proposing research questions, obtaining information, and acquiring knowledge. A critical reader of research should recognize the theoretical organization of empirical evidence and the empirical confirmation of theories as two activities that coalesce to form the “schemapiric view” (Stevens, 1968).

Many factors contribute to the longevity, or lack thereof, of any particular theory. Bordens and Abbott (2011) have listed five essential factors that can figure centrally in the life of a theory. The first factor is **accountability**, the ability of a theory to “account for most of the existing data within its domain.” They explain that the amount of data accounted for is most and not all because some of the data germane to the theory may be unreliable. Second, theories must have **explanatory relevance**, meaning that the “explanation for a phenomenon provided by a theory must offer good grounds for believing that the phenomenon would occur under the specified conditions” of the theory. The third condition is that of **testability**, relating to a theory’s possibility of “failing some empirical test.” To be considered scientific, a theory must be verifiable and falsifiable. The ability to predict novel events or new phenomena is the fourth characteristic of a sound theory. That is, a theory should be able to predict phenomena “beyond those for which the theory was originally designed.” Finally, a good theory is **parsimonious**; that is, it should adopt the fewest and/or simplest set of assumptions in the interpretation of data. It is in this sense that many researchers refer to the principle of Occam’s razor: **Do not increase, beyond what is necessary, the complexity of an explanation.** If such frugality sounds rather austere and monkish, note that the principle is ascribed to William of Occam, a fourteenth-century Franciscan friar. For modern researchers and clinicians this principle establishes a valuable criterion for selecting from among competing theories that have equal explanatory power.

**The Conduct of Scientific Research**

Although most descriptions of scientific research suggest strict adherence to a clearly outlined series of logical steps, the reality is that the scientific method, while systematic, is not governed by a rigid set of prescribed actions that must be followed dogmatically during
Statement of the Problem. The researcher usually begins with the formulation of a general problem, a statement of purpose, a research question, or a hypothesis. In some cases, there may be a general statement followed by its breakdown into a number of specific subproblems or subpurposes. Whether researchers choose to present their topics with a statement of the problem, a purpose, a research question, or a hypothesis seems to be a matter of personal preference and, in fact, there is disagreement among researchers as to which of these linguistic vehicles is best for conveying the nature of the topic under investigation. We are not interested here in the polemics surrounding the choice of wording in presenting the topic to be investigated. We are more concerned that researchers provide a clear and concise statement of what is being investigated.

But the problem statement does more than simply specify what is being studied; it should also contain some indication of the meaningfulness or relevance of the topic under investigation by placing it in context. The real purpose of the statement is to specify why a problem is worth studying. This is generally accomplished by establishing a rationale for the study by presenting reasoned arguments supported by the published literature on the topic of investigation. This review may provide a historical background of the research to date and perhaps provide a summary or organization of the existing data so that the reader has an overview of what is known, what is not known, and what is equivocal concerning this general topic. Eventually, the review should culminate in a statement of the need for—and significance of—the particular study.

Method of Investigation. After stating the research problem and providing its rationale by placing it in perspective relative to the existing literature, the researcher outlines a strategy for investigating the problem. This is done by describing the method of investigation. Based on the research problem and the accompanying rationale, the researcher delineates the selection of who (or what) was the subject of investigation, the materials that were used to test, train, observe, or measure, and the specific procedure that was followed. Because the method is closely associated with how the research question is to be answered, if the statement of the problem is unclear, it will be difficult, if not impossible, to evaluate the appropriateness of the method of investigation. In short, the method of investigation addresses how the study is to be conducted and on whom.

Results of Investigation. Quite simply, the results of investigation addresses what, specifically, was yielded from the method of investigation previously described. The researcher objectively reports the results, often supplemented by tables and figures to summarize and organize the data. Tables and figures are usually easier to understand than a simple listing of all the individual or raw data. It is important for a researcher to
present a specific breakdown of the results as they relate to the specific subcomponents of the problem that had been outlined earlier.

**Conclusions.** After outlining the results, the researcher puts forward an interpretation, discussing the implications, and drawing conclusions from them that reflect on the original statement of the problem. The discussion may address the results in relation to previous research, theoretical implications, practical implications, and suggestions for further research. In many respects, the discussion and conclusions represent a recasting of the introduction and rationale in light of the new information provided by the current results. Thus, whereas the results of investigation details *what was found*, the discussion and conclusions that follow address the overarching question *So what?* Very often the discussion and conclusions raise a question of their own, *Now what?* to which the researcher may offer some suggestions. How conclusions are reached and the way in which they point the direction for future research highlights the way in which the scientific method works to build knowledge.

This simplified discussion of the manner in which the common steps in empirical research are reported in a journal article may give beginning readers the impression that research is a drab activity that follows a single lockstep pattern. It is difficult to understand the excitement and creativity inherent in the design and execution of an empirical study unless the student or practitioner experiences it directly. Many researchers do not faithfully follow the orderly steps just outlined in conducting their research; adjustments may be made to meet the needs of a researcher in a particular situation. Skinner (1959) captured some of the flavor of scientific creativity and excitement in his famous statement: “Here was a first principle not formally recognized by scientific methodologists: when you run onto something interesting, drop everything else and study it” (p. 363).

Rather than being constrained by a linear progression of steps, the flow of the research process is more appropriately viewed as a circular “springboard.” As diagrammed in Figure 1.1,

**FIGURE 1.1** A Simplified Depiction of the Research Process.
the conclusions reached address not only the original problem but lead to new lines of inquiry as well. However, as Skinner’s (1959) statement suggests, new research questions can be raised at any point in the research process, especially when devising and implementing the method of investigation. Various unforeseen factors that prevent the clear interpretation of results or the ability to derive trustworthy conclusions can also prompt new lines of investigation. Although finding the unexpected is often regarded as the true joy of the research process, there is a great deal of satisfaction in being able to clarify a potentially valuable research question. As Bloom, Fischer, and Orme (2009) have noted, “if we can clearly identify what our problem is, we have taken a major step toward its solution” (p. 57). In empirical research, we test by observing and observe by testing. Experienced investigators recognize that—rather than relying on introspection or even a thorough review of the literature—the most useful questions are often revealed through active participation in empirical research.

The common steps just outlined, then, are meant to illustrate the major components of the scientific method as reflected in the structure of most journal articles that report empirical research and should not be construed as an inviolate set of rules for defining the scientific method. The best way for students of communication disorders to appreciate these steps is to read journal articles that report empirical research. Sustained experience in the reading of empirical research will enable the student to eventually assimilate the concept or process of moving from the formulation of a problem that can be attacked empirically to the drawing of conclusions based on empirical evidence.

Research in Communication Sciences and Disorders

It is extremely difficult to paint a complete picture of the research enterprise in communication disorders. No one has done it, and we will not do it here. The data that would form the basis of such a picture are simply not available. A few generalizations should help, however, in understanding the broad scope of research activities that, either directly or indirectly, advance our understanding of communication disorders.

Although relatively few communication disorders specialists are involved in full-time research (American Speech-Language-Hearing Association [ASHA], 2011a), the research enterprise in the discipline is much broader than would appear from surveys of the ASHA membership. One obvious reason is that not everyone involved in communication disorders research is necessarily a member of ASHA. Another is that many people who conduct research do so in conjunction with other professional activities. Perhaps the best example of such a person is the academician whose primary responsibility is teaching. Such an individual is often involved in his or her own research or supervises doctoral dissertations or master’s theses. The same person publishes the results of his or her research not only to advance knowledge but also to advance his or her own standing in the academic community because “publish or perish” is still commonplace in university life. But it is also readily apparent when attending professional meetings or perusing professional journals that a large percentage of research is conducted by clinicians working in a wide variety of clinical settings.

Also note that much of the research appearing in the periodical literature is done by people working outside audiology and speech–language pathology. Many disciplines contribute to the scientific underpinnings of communication disorders, including the physical
or natural sciences (such as physics and the specializations of engineering, acoustics, and technology), the biological or life sciences (such as biology and the specializations of genetics, anatomy, physiology, neurology, and biochemistry), the social or behavioral sciences (primarily psychology, sociology, anthropology, and communication), and the health sciences (particularly medicine, physical therapy, and occupational therapy). Important contributions are also made by linguistics, special education, and the humanities, especially music and the performance arts. The number of published articles that relate directly or tangentially to the interests of professionals in communication disorders attest to the numbers and different interests and backgrounds of individuals involved in the research enterprise. Both the areas studied and the settings in which studies are conducted are almost as numerous as the researchers themselves—all working to provide the knowledge and tools that audiologists and speech–language pathologists can use to attack and solve clinical problems in communication disorders.

The breadth of research in communication disorders poses a substantial challenge for the practitioner and student because virtually all types of research strategies are represented in our literature. In addition to providing a comprehensive research base in the clinical education of students, the greater challenge is ensuring an ample supply of skilled researchers trained within the discipline of communication sciences and disorders. As emphasized in a 1994 technical report prepared by the Research and Scientific Affairs Committee of ASHA:

The professions of speech–language pathology and audiology cannot rely primarily on researchers from other disciplines to create knowledge that will have direct relevance to clinical practice. The major part of this responsibility must be assumed by researchers trained in the discipline. Without a consistent flow of new research relevant to the professions, speech–language pathology and audiology will stagnate. If we fail to provide an expanding knowledge base, the inevitable outcome will be loss of autonomy for the professions, leaving us with a technical, rather than professional, image among other health care providers. In large measure, it is the capacity to create its own knowledge base and clinical methods that distinguish autonomous human service professions from technical occupations. (p. 2)

Evidence-based Practice

When clinicians engage in evidence-based practice (EBP), they “recognize the needs, abilities, values, preferences, and interests of individuals and families to whom they provide clinical services and integrate those factors along with best current research evidence and their clinical expertise in making clinical decisions” (ASHA, 2005). Bernstein Ratner (2006, pp. 257–258) characterizes the most effective clinicians as “data seekers, data integrators, and critical evaluators of the application of new knowledge to clinical cases,” who recognize that “even if something appears to work, new information may assist the therapeutic process to work better.” In our opinion, a more appropriate term for EBP would be evidence-informed practice. What most agree upon, however, is that EBP depends most critically upon our ability as professionals to adopt a “questioning attitude toward practice” by “cultivating a spirit of inquiry” (Melnyk & Fineout-Overholt, 2011). At its heart, EBP is an approach to clinical problem solving (Rosenburg & David, 1995).
Although intuitively attractive, if not self-evident, Dollaghan (2004) suggests that EBP represents “a radical re-thinking of what we ‘know’ about clinical decision-making in communication disorders and new criteria for deciding when we know it” (p. 392). But scientific evidence “is only helpful to professionals and their clients if health service providers seek it out, understand it, and apply it” (Bernstein Ratner, 2006, p. 265). EBP, according to Johnson (2006), signals “an opportunity for growth and development for those willing to assume a critical, questioning attitude and to invest time and energy in learning new skills to enhance clinical decision making and, perhaps ultimately, client outcomes” (p. 22). It is not the intent of EBP to disregard the important role that clinical experience and patient perspectives are known to play in practice, but rather to consider them “against a background of the highest quality scientific evidence that can be found” (Dollaghan, 2004, pp. 392–393). As illustrated in Figure 1.2, EBP does not attempt to remove the practitioner from determining the method of diagnosis, treatment, or management (Haynes, Devereaux, & Guyatt, 2002), but to provide a framework from which to judge the available evidence and effectively use that information to make informed decisions within the practitioner’s own clinical environment, otherwise known as the context of care.

Ruscello (1993) notes that professions that are “well grounded in research” are those that are best poised to “meet the challenges of the future.” Thus, improving the services audiologists and speech–language pathologists provide to individuals with communication disorders will require not only a discipline with a robust research base,

![Evidence-Based Practice in Communication Disorders](image-url)
but practitioners who are “active consumers of this research.” To do so, according to Fineout-Overholt and Stillwell (2011), clinicians must learn to incorporate “good information-seeking habits into a daily routine.” In short, the ability to address the challenges of future practice, a clinician needs to know not only if an approach is likely to be effective, but how and why. Such understanding is, as Meline and Paradiso (2003) describe it, “the ultimate goal for science.” They note further that although it is common for clinicians to “rely on observable changes without knowing the mechanisms of change,” when “the observable changes rely on the scientific method for verification (not casual observation), they are credible evidence for practice” (p. 274).

Being highly contextual and specific to a given client or clinical practice, EBP is not meant to be used by any authority, institution, or organization to prescribe, endorse, or otherwise “micromanage” individual clinical decisions. Rather, the implementation of EBP is best viewed as a systematic process, one that cannot be dictated or standardized in any handbook or manual (Bernstein Ratner, 2011; Justice, 2008). It is a critically important process, one that is tied to our professional accountability for ensuring the use of “best practices” (Apel & Self, 2003) as well as the recognition that the assessment, intervention, and management of communication disorders is ever changing and necessitates a customized approach. Although the art and science of clinical practice involves uncertainties and probabilities, EBP works toward improving outcomes by promoting informed and defensible choices, discouraging those that grow out of professional tradition or authority, or solely out of the tenacity or intuition of the clinician. In short, accountable clinicians strive to demonstrate that the treatment they employ is not only “viable,” but “preferable” to others in meeting their clients’ needs. Along with considering the available intervention options, clinicians need to assess their probable effectiveness in the types of “real-world conditions” clients are likely to find themselves (Wong & Hickson, 2012).

Describing medical practice, Freeman and Sweeny (2001) noted that, whereas some physicians report that “evidence had clarified practice, focused clinical effort, and sometimes radically altered practice,” many others find themselves “shaping the square peg of the evidence to fit the round hole of the patient’s life.” It is now understood that the best evidence-informed practice requires the clinician to custom-fit evidence-based decisions to the individual who, more often than not, has a unique and “messy” personal and medical history. Not only might a client present a unique cluster of symptoms, but he or she will also possess customs, beliefs, and perspectives toward health care that are culturally determined (Hwa-Froelich & Vigil, 2004; Lum, 2011). As professionals, clinicians who wish to ensure the effectiveness of their intervention “must be prepared to provide services that are responsive to this diversity” (ASHA, 2004). Recognizing that participation in the activities of daily living “is influenced by environmental factors that include aspects of culture, language, race, and ethnicity,” ASHA (2011b) has emphasized that clinicians “need to understand and appreciate the influence of these factors if they are to provide appropriate evidence-based assessments and interventions.” This cultural competence, according to an ASHA (2011c) position statement, involves understanding the unique combination of cultural variables that the professional and patient/client bring to interactions. These variables include, for example, age, ability, ethnicity, experience, gender, gender identity, linguistic background, national origin, race, religion, sexual orientation, and socioeconomic status.
The statement concludes that “culturally competent professionals must have knowledge, understanding of, and appreciation for cultural and linguistic factors that may influence service delivery from the perspective of the patient/client and his or her family as well as their own.”

**Framing a Clinical Question**

Because of the breadth of the literature and the complexity of the clinical environment, the search for scientific evidence will be of little assistance to the clinician who is unclear about the clinical question in need of consideration. After all, it is not the literature that prompts a practical clinical decision, but rather the specific needs of the client. Accordingly, Schlosser and Raghavendra (2004) have proposed a seven-step EBP process to assist clinicians in applying the research literature to guide and advance their practice:

1. Asking a well-built question
2. Selecting evidence sources
3. Implementing a search strategy
4. Appraising and synthesizing the evidence
5. Applying the evidence
6. Evaluating the application of evidence
7. Disseminating the findings

Schlosser, Koul, and Costello (2007, p. 226) argue that it is this “first step of asking well-built questions” that is of primary importance in EBP, “because everything else hinges upon it.” Posing a focused and answerable question allows the clinician to narrow the search for evidence and to perform a better assessment of the feasibility and relevance of findings. For these reasons, we turn to our discussion of EBP to the matter of formulating useful clinical questions.

Clinicians make use of the literature to inform the decisions they make regarding assessment, treatment, management, and advocacy. Clearly constructing a clinical question is necessary to guide the search for relevant research evidence. That is, without a clear question there can be no clear answers. Researchers also frame questions, but they tend to ask research questions about entire groups or classes of individuals. Clinicians, however, typically ask questions that concern, first and foremost, the individual client in need of services (Jerger, 2008). Hargrove, Griffer, and Lund (2008) offer several examples of the types of questions a practitioner might pose when trying to determine the viability of using such treatment options as Vitalstim, SpeechEasy, group therapy, or specific exercises for their clients.

However, to be most useful as a guide to practice, clinical questions need to be as narrow in focus as possible. It would be helpful, for instance, to specify for whom an intervention is intended and under what particular circumstances. For example, would an intervention be more effective or more efficient than other available options for a prelingually deaf seven-year-old girl with a cochlear implant. Or, would a particular technique provide important information when assessing the voice of professional singers with vocal-fold nodules. In most cases, the clinician’s ability to search for and identify valuable evidence is enhanced when the clinical question is specific about patient
Chapter 1

characteristics, the nature of the impairment or disability, the type of intervention, or
the behavior or capability he or she wishes to target. Clinical questions are necessarily
variable and diverse, addressing issues of prevention, screening, assessment, treatment,
management, and service delivery—among many others. They are also dependent on
the unique case histories and life circumstances that largely define the clinical envi-
ronment. For all of these factors, clinicians need to not only ask a clinical question, but to
contextually frame it in such a way that it is customized for a particular clinical decision.
According to Schön (1987),

the problems of real-world practice do not present themselves to practitioners as well-formed
structures. Indeed, they tend not to present themselves as problems at all but as messy, inde-
terminate situations….When a practitioner sets a problem, he chooses and names the things
he will notice….Through complementary acts of naming and framing, the practitioner selects
things for attention and organizes them, guided by an appreciation of the situation that gives it
coherence and sets a direction for action. (p. 4)

A common technique for framing clinical questions is to use a formalized rubric or
template. Originally developed to facilitate the framing of questions in evidence-based
medicine, the PICO template is now widely used by many health care professionals
(Dollaghan, 2007; Falzon, Davidson, & Bruns, 2010; Richardson, Wilson, Nishikawa, &
Hayward, 1995; Wong & Hickson, 2011). PICO is an acronym that represents the key ele-
ments within its framework: “P” is the patient (or, alternatively, the population of interest
or the identified problem), “I” is the intervention being considered, “C” is the comparison
with available alternatives, and “O” stands for specific clinical outcomes (Table 1.1). As
indicated in Figure 1.3, the PICO template may be used to construct many types of focused
clinically relevant questions. Be aware, however, that answerable and searchable clinical

<table>
<thead>
<tr>
<th>Component</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Patient/client, Population, Problem</td>
</tr>
<tr>
<td>I</td>
<td>Intervention, Issue, Therapeutic strategy/approach, risk factor/behavior</td>
</tr>
<tr>
<td>C</td>
<td>Comparison/alternative, Alternative therapeutic strategy/approach,</td>
</tr>
<tr>
<td></td>
<td>placebo; no intervention; alternative assessment tool/technique; no risk factor/behavior</td>
</tr>
<tr>
<td>O</td>
<td>Outcome, Short-term goal; long-term goal; function; normalcy; ability,</td>
</tr>
<tr>
<td></td>
<td>mastery, accuracy, or skill; cost effectiveness; satisfaction; quality of life;</td>
</tr>
<tr>
<td></td>
<td>sociability; employability; accuracy of assessment/diagnosis; rate of recurrence/relapse; accuracy of prediction/prognosis</td>
</tr>
</tbody>
</table>
Evidence-based Practice in Communication Disorders

“Does group, as compared with individual, language intervention result in greater expressive language growth for preschool children with delays in language production?” In this case, P = preschool children with delays in language production, I = group language intervention, C = individual language intervention, and O = expressive language growth. (p. 23)

Dollaghan (2007, p. 10) provides another example of a PICO-constructed question: “In adults who sustained severe traumatic brain injury (TBI) at least 1 year previously (P), does a program of cognitive strategy instruction (I) lead to significantly better job performance ratings (O) than no intervention (C)?”

There has been criticism that the PICO format is not sufficient for framing all clinical questions (e.g., Huang, Lin, & Demner-Fushman, 2006). In response, Schlosser and his colleagues (2006, 2007) have proposed an expanded PESICO template. In addition to the traditional PICO, in the PESICO rubric “E” stands for communication environments (or “setting-related issues”) and “S” stands for the relevant stakeholders, such as parents and family members, friends, and employers, whose perspectives and attitudes “may directly or indirectly influence the decision.” Others have modified the original PICO template by appending an optional “T” for time frame (Fineout-Overholt, & Stillwell, 2011; Haynes, Sackett, Guyatt, & Tugwell, 2006). Clinicians often ask questions that address how quickly change can be effected, especially with respect to short-term goals or ultimate clinical outcomes. Thus, PICOT can serve as an important template when searching for evidence not only about the effectiveness of intervention, but about its efficiency as well. That is, when comparing equally effective treatments, one method may achieve an outcome sooner than other alternatives. This is likely to be an important consideration in EBP.
Still another rubric, developed specifically for evidence-based library and information professionals (Booth, 2006; Booth & Brice, 2004), may prove helpful for framing some types of clinical questions in audiology and speech–language pathology. In the SPICE template, “S” stands for the setting in which the intervention will occur, “P” represents the perspective of the person or population affected by the intervention, “I” is the intervention, “C” is the comparison with available alternatives, and “E” represents the evaluation or measured effect. Whichever system or framework is used to formulate focused and answerable questions, doing so is a requisite skill for arriving at the most relevant and practical evidence-based decisions. It is a skill that requires a great deal of practice by the student and routine implementation by the professional.

Audiologists and speech–language pathologists need to seek evidence that what they do is effective. The value of credible evidence is weighed by its ability to validate current treatment approaches and to guide the development of improved and alternative approaches (Houser & Bokovoy, 2006). “One of the chief reasons it is critical to be able to test a treatment claim,” according to Finn, Bothe, and Bramlett (2005), is because it is only through contradictory or disconfirming evidence that a scientific discipline is able to correct mistakes, misconceptions, or inaccuracies. This process, when combined with a receptive attitude to new ideas and a willingness to change, lies at the heart of a scientific approach to knowledge (Sagan, 1995). The goal of science is not to prove that something is correct but to determine what is true. (p. 174)

In general, treatment effectiveness may be established when, in routine application, an intervention results in a “clinically significant improvement in a client’s communication skills” (Bain & Dollaghan, 1991). However, to determine improvement, there needs to be a procedure for tracking positive clinical outcomes. But “outcomes” can be assessed in a number of ways depending on what aspect of treatment benefit the practitioner chooses to evaluate (Bagatto, Moodie, Seewald, Bartlett, & Scollie, 2011; Ching, 2012; Hansen, Mior, & Mootz, 2000; Humes & Krull, 2012; Olswang, 1993). Frattali (2013, p. 9) describes outcomes as a “multidimensional concept” defined by “all consumers of care” comprising “clinicians, teachers, employers, administrators, payers, and the clients/families themselves.” Discussed in more detail in Chapter 5, outcomes can be used in several potentially useful ways. For instance, assessed outcomes following a course of treatment can be contrasted with the long-term therapy goals or objectives (Laplante-Lévesque, Hickson, & Worrall, 2012). But outcomes might address issues of clinical administration, cost-effectiveness, vocation, sociability, or overall quality of life (e.g., ASHA, 2013; Golper & Frattali, 2013).

Reflective Practice

Good outcomes may be attributed as much or more to the skill of the clinician as to the treatment itself (e.g., Enderby & John, 1999; Kent, 2006). Indeed, Bernstein Ratner (2006) points out that it would be rare to find a clinician who adheres strictly to a small set of well-specified treatment approaches; I cannot recall fielding too many calls over the years that asked me to recommend a practitioner of a treatment rather than a “good therapist.” Another problem in linking outcomes specifically to
As unique as are the clinical cases themselves, it is evident that each practitioner brings his or her own body of knowledge, clinical skills, experiences, and preferences to the clinical environment. These factors are central to not only the clinician’s ability to appraise and evaluate the application of the evidence, but to assessing the appropriateness of a clinical decision and the effectiveness of an intervention as provided.

Schön (1983) has promoted the concept of **reflective practice**, which refers to the critical evaluation of the clinician’s own practice to assess outcome, what may have affected the outcome, whether the intervention was appropriate, and how intervention and outcome may affect future clinical questions and decisions. By using critical introspection to examine the possible reasons for an outcome, a clinician may be able to identify important gaps in his or her knowledge and expertise. This internal “debriefing process” also promotes better use of EBP to improve service delivery by leading toward more effective and efficient clinical alternatives (Boudreau, Liben, & Fuks, 2012; Schön, 1987). Reflection may be an important component in “practice-based learning” that, in many cases, may require a “reframing” of clinical questions and a retrospective (an informed, after-the-fact) search for evidence. As described by De Vera Barredo (2005):

Evidence-based practice and reflective practice are essential to the professional development of an individual and the advancement of any profession. The former provides a sound research based foundation for clinical practice and professional growth while the latter allows the practitioner to continually assess and reassess practice for the purpose of personal improvement. (p. 3)

According to Schön (1983, p. 69), “when someone reflects-in-action, he becomes a researcher in the practice context,” relying no longer on received wisdom or answers to questions posed by others. Such practice-based evidence informs Schlosser and Raghavendra’s (2004) final step in the EBP process, disseminating findings. When practitioners and stakeholders share EBP experiences and outcomes at clinical and professional conferences or in journals and newsletters, they may benefit other practitioners, improve EBP, and advance the profession.

### Research–Practice Relationships

With the rise of EBP as the guiding principle of service delivery in audiology and speech–language pathology, there has been a welcome reassessment of the presumed dichotomy between the “researcher” and the “practitioner”; between professionals who are “scientific” and those who are “clinical.” One prevailing misconception is that researchers tend to be antisocial types who work in an isolated sterile laboratory to explore problems that have little or no relevance to humanity, much less to the practicing clinician. In reality, most researchers are highly concerned about people, particularly those with communication disorders, and it is this concern that inspires their research. Indeed, a large number of today’s researchers have strong clinical backgrounds and extensive clinical experience. Several leading researchers have played important professional roles in communication disorders separate from their research activities. Even for those researchers who do not participate in
a clinical practice and whose work has no immediate application, their underlying motivation is often to answer questions that may have considerable relevance to clinical practice in the future. As Houser and Bokovoy (2006) have observed:

Research used to be something that was done in a laboratory; a researcher or scientist never touched a patient. Now research is an integral part of practice. Research is everywhere: in the news, on the internet, as the highlight of every clinical or management conference, and quoted by your patients. (p. 3)

As we have said, a major aim of this text is to assist clinicians and students to arrive at reasoned decisions about the adequacy of the research reported in our journals and to make independent judgments about the relevance of that research to their clinical activities. It is important for all professionals not only to become critical consumers of research literature, but also to see clinical practice itself as an applied experimental science. Yet many have noted a longstanding disconnect between research and clinical practice (e.g., Apel, 2011; Jerger, 1963; Logemann, 2000; Ringel, 1972; Ruscello, 1993; Siegel & Spradlin, 1985; Wambaugh & Bain, 2002). The essence of this disconnect appears to be based on the pervasive notion that research does little to inform clinical routine and a benighted model that segregates producers of research from consumers of research in communication disorders. Frankly, for too long have communication disorders and the communication sciences been viewed as separate disciplines. It has been well recognized that the speech, language, and hearing sciences are often seen by both students and clinicians as a rite of passage, if not a downright barrier, to entering the professions of audiology and speech–language pathology. In truth, audiology and speech–language pathology might more correctly be considered applied speech, language, and hearing sciences. By the same token, the speech, language, and hearing sciences might more correctly be labeled basic audiology and speech–language pathology.

It is not a matter of researchers and clinicians vying to “own” the literature in their discipline; rather both need to take responsibility for it. Friel-Patti (1994), for instance, describes a “commitment to theory” shared by researchers and clinicians. She notes that, just as “experienced and successful clinicians understand the importance of research findings for building a sound rationale for intervention,” in many cases researchers are compelled “to test hypotheses arising from [clinical] observations that do not accord well with current theory.” Often, according to Friel-Patti,

the individuals themselves and their presenting complex of symptoms or their response to an intervention technique compel us to reconsider current theory and reexamine intervention practices in order to generate better theories and methods. Thus, clinicians and researchers alike have reasons to seek improved theoretical models and more effective intervention practices. (p. 30)

Thus, researchers, clinicians, and researcher–practitioners share a “questioning approach” to practice that motivates the continuing search for answers based on the scientific method of investigation (Finn, 2011).

In addition to our goal of helping students and clinicians develop the critical skills required for reading research, we hope this text serves as a foundation to bridge the perceived gap between “clinician” and “researcher.” It is also our fervent hope that this
Evidence-based Practice in Communication Disorders

book serves as an entrée for those students who plan a career in research or for practitioners who are interested in conducting research within a clinic or school setting. It must be emphasized, however, that this is not a book on how to do research; it is a book on how to read research. It will become apparent, however, that intelligent evaluation of research has much in common with the intelligent conduct of research.

It is generally accepted that advances in diagnostic and treatment protocols for a particular disorder are derived from scholarly research (Katz, 2003). A simplified example from the field of medicine illustrates this point. Scholarly research to map the human genome has shed light on previously unexplained causes of certain disorders. Many forms of cancer, manic-depressive illness, obesity, and other abnormal conditions are now known to be, at least partially, genetically based (Gerber, 2001; Robin, 2008; Shprintzen, 1997). Such research leads to potential advances in diagnostic procedures like the identification of individuals with a predisposition to a particular disorder and advances in treatment procedures like gene replacement therapy. In this scenario, research leads to advances in practice in a rather straightforward fashion. However, the research–practice relationship in communication disorders may take several forms (Raghavendra, 2010). Ingram (1998) proposed three distinct relationships, or lines of communication, that may exist between research and practice: (1) research-driven communication, (2) practice-driven communication, and (3) shared-interest communication.

Research-Driven Relationships. Research-driven communication centers on the reporting of research findings and the manner in which they are implemented in practice. In 1897, after training with Edward Wheeler Scripture at Yale University in the first laboratory in the United States devoted to the study of speech behaviors, Carl Emil Seashore began developing the country’s first research and training program in speech and hearing at the University of Iowa. To do so, Seashore brought together professionals from the disciplines of psychology, linguistics, elocution, music, medicine, biology, and child development (Moeller, 1976). According to Wendell Johnson (1955), a former student, it was Seashore’s firm belief that the education of effective speech and hearing professionals relied critically on “dependable” knowledge and treatment options, which are only possible through scientific research. As Johnson wrote, “there must be productive laboratories before there can be worthwhile classrooms and there must be worthwhile classrooms before there can be effective clinics.” He noted that the speech pathology and audiology program at the University Iowa began, not with a clinic, but by “designing a laboratory” and educating strong researchers.

Communication driven by research is essential to the development of a discipline and a clinical profession. In the preface to his research-driven text, Speech Pathology, another of Seashore’s students, Lee Edward Travis (1931), acknowledges this, writing that:

As I see it, the new books dealing with disorders of speech are too elementary and too narrow. Serious students find too little of . . . theoretical, clinical, or scientific interest in them. They have not kept pace with research in the biological sciences and often have devitalized the field by adherence to old problems and theories and in some instances by adherence to obsolete data. This condition is to be expected as long as speech pathology is in its growing pains. (p. vii)

Although communication sciences and disorders may still be experiencing a few of those growing pains, a multitude of books, opportunities to attend wide-ranging
professional conferences, printed and online journals, and various Internet resources are now available. These can be seen as repositories of knowledge, and those in practice may then select from them that which they deem most useful. However, breakdowns in this line of communication occur when researchers fail to describe the nature and conduct of their studies clearly and concisely and to present the significance of their work in terms that practitioners can directly appreciate. Researchers, even those based primarily in the laboratory, are often asked to speculate on the specific applications of their research findings when, in fact, the clinician may be in the best position to do so. Research-driven lines of communication also fail when clinicians are unable to judge the quality and integrity of the information source and the limitations in research methods and analysis that allow valid and reliable adaptations of findings to their clinical practice.

**Practice-Driven Relationships.** Practice-driven communication concerns the manner in which clinicians express their interests to researchers regarding their information needs and the input they provide to promote research (Ingram, 1998). This can range from suggestions prompted by unexpected clinical observations to highly developed clinician-initiated research proposals. Often the aim of practice-driven research is to assist professionals in making better and more informed clinical decisions (Brown, 2006; Raghavendra, 2010). The value of practice-driven research lies in the clinician’s unique position to identify pertinent areas of research that would not be apparent as readily to researchers who may be based primarily in a laboratory.

Although not all research findings may impact directly and immediately on the clinical enterprise, many research topics and paradigms show great promise for both the researcher and the clinician. For example, Siegel (1993) argued that research on treatment effectiveness “makes a natural bridge between the requirements of careful research and the needs of clinical practice” (p. 37). Similarly, Olswang (1993) suggested that research on clinical efficacy (effectiveness) can address both applied clinical questions and questions of a more theoretical nature, noting:

For those of us driven by both clinical practice and theory, we have found our playground. Efficacy research allows us to function within our split interests—addressing practice and the needs of the individual while investigating theory and the underlying mechanisms of communication. What we need is further research with this two-pronged approach, advancing our clinical and theoretical knowledge. Our profession and discipline indeed depend on both. (p. 126)

Potentially hundreds of legitimate research questions fall under the general rubric of treatment efficacy research. For example, carefully controlled group studies could investigate the relative efficacy of two or more intervention paradigms designed to improve dysarthric speech, time-series designs could be employed to investigate the immediate and long-term effectiveness of fluency-enhancing protocols, and case studies could be used to investigate clinical strategies for increasing language output in children who are language delayed. An area rich with research potential, treatment efficacy research is discussed in detail in Chapter 5.

**Shared-Interest Relationships.** Shared-interest communication is based on the reasonable assumption that a continuum of interests exists between researchers and practitioners and that the most effective communication will occur when interests overlap. ASHA’s
Special Interest Divisions are meant to mutually benefit research efforts and clinical practice by providing a vehicle to encourage researcher–clinician interactions and to assist the growing number of professionals who may be best described as researcher-practitioners or clinician-investigators (Silverman, 1998; Tabor & Hambrecht, 1997).

Although researchers may work alone, conducting scientific investigations is not necessarily a solitary pursuit. Researchers often collaborate with statisticians, laboratory technicians, students, colleagues, and many other professionals in related disciplines. Just as clinical practice is improved through multidisciplinary participation, such collaborative efforts enhance the conduct of meaningful research as well (Moodie, Kothari, Bagatto, Seewald, Miller, & Scollie, 2011; Raghavendra, 2010). This is true even for researchers who are also engaged in their own clinical practice. Perhaps this form of researcher–clinician relationship is best thought of as a true research partnership.

A 1994 ASHA technical report specified the following regarding the role of research and the importance of shared-interest relationships in communication sciences and disorders:

As science-based professions, speech–language pathology and audiology require an expanding knowledge base from which new diagnostic and therapeutic methods can derive. Obviously, the professions cannot rely on serendipity to reveal more effective clinical procedures; neither will clinical experience alone suffice. Rather, the creation of new clinical methods should result from the combined efforts of different groups engaged in a variety of activities, from researchers conducting very basic experimentation concerning fundamental processes and mechanisms in communication to practitioners delivering clinical services to clients with communication disorders. Especially critical to the development of new clinical methods are researchers who bridge the gap between basic research and clinical practice. A fundamental task of these researchers is to apply newly discovered basic knowledge and emerging technology to issues of clinical practice. Researchers trained in the discipline of communication sciences and disorders are especially well suited to this role, due both to their knowledge of clinical issues and to their experience conducting systematic research. (p. 2)

Moodie and her colleagues (2011) are very persuasive in their argument for “active collaboration” between researchers and research users in all parts of the research process, including designing the research questions, shared decision-making regarding methodology, data collection and tools development involvement, interpretation of the findings, and dissemination and implementation of the research results” (pp. 11–12). The professions of audiology and speech–language pathology are constantly changing, growing, and developing. To ensure that the growth of the knowledge base is truly substantive, it must rest, we believe, on a scientific and research basis, a basis that must be understood and incorporated into clinical practice. Haynes and Johnson (2009) provide excellent discussions regarding the role research plays helping meet the challenges of practice.

The Editorial Process in the Publication of a Research Article

A common myth is that if an article appears in print, it must be worthwhile, valuable, and a significant contribution to the literature and to our knowledge. Alas, this is simply not the case. Inadequate research is reported, trivial problems are investigated, and articles vary tremendously in quality and value (Greenhalgh, 1997). There is good research and there is
poor research, both of which may be published. Perhaps a brief description of the publication process will help you understand how an article gets published and how the quality of research can vary from one article to the next.

The breadth of the discipline of communication sciences and disorders is reflected in the number of journals devoted to publishing original research articles that address hearing, speech, voice, language, swallowing, and other topics of key interest to audiologists and speech–language pathologists. Appendix B lists many of the common English-language journals in communication disorders along with a brief description of content and focus. Despite the variety of topics and formats used, as well as the fact that the specific editorial process differs from journal to journal, commonalities in the review process cut across most of these archival publications. As an example, let’s use an applied research article submitted for publication to the *American Journal of Speech-Language Pathology* (*AJSLP*), one of the journals published by ASHA. This journal is directed to professionals who provide services to individuals with communication disorders. Manuscripts that deal with the nature, assessment, prevention, and treatment of communication disorders are invited. Note that the *Journal of Speech, Language, and Hearing Research* (*JSLHR*), also published by ASHA, solicits articles “concerned with theoretical issues and research in the communication sciences.” Manuscripts submitted to *AJSLP* are considered on the basis of clinical significance, conformity to standards of evidence, and clarity of writing. The journal welcomes philosophical, conceptual, or synthesizing essays, as well as reports of clinical investigations. The details are contained in the Instructions for Authors (see http://ajslp.asha.org) that defines, in a general way, the scope and emphasis of the journal, thus helping potential contributors to decide whether *AJSLP* or, perhaps, *JSLHR* is the appropriate journal for their manuscript.

The editorial staff of *AJSLP* consists of an editor and several associate editors in areas such as fluency and fluency disorders, neurogenic communication disorders, dysphagia, voice disorders, and communication disorders in early childhood. In addition, there are more than 100 editorial consultants, all of whom are knowledgeable in one or more areas of communication disorders. Overall editorial policy is established by the editor and must be consistent with the general guidelines set by the ASHA Publications Board.

On receipt of a manuscript, a decision is made into whose purview the manuscript falls. An associate editor is then assigned to oversee the review process and to serve as a reviewer. Next, the manuscript is forwarded by the associate editor to two editorial consultants who, after careful evaluation of the manuscript, recommend one of four alternatives: (1) accept for publication as is, (2) accept contingent on the author agreeing to make certain revisions recommended by the reviewers, (3) defer decision pending major revisions and another review by two different editorial consultants, and (4) reject outright. No matter which alternative is recommended, the final decision to accept or reject lies with the editor. If a decision to reject is reached, the evaluations by the reviewers are forwarded to the author, usually with an extensive explanation of why the submission is not publishable, even with substantial revision by the authors. The editorial consultants are not identified to the author and the editorial consultants do not know the name of the author or the author’s institutional affiliation. That is, manuscripts are subjected to a “blind” review in which reviewers are ostensibly unaware of the identity of the author.
Although every effort is made to arrive at a publication decision quickly, the review process can be time consuming, especially if extensive revision is requested. The revisions may require considerable work on the part of the author, data may have to be reanalyzed or displayed differently, tables and figures may have to be added or deleted, and portions of the manuscript may have to be rewritten. Obviously, the more revisions required, the less likely is a manuscript to be accepted, particularly if a journal has a backlog of manuscripts already accepted for publication. All of this necessitates considerable correspondence between the author and the editor and, perhaps, even another review by two more editorial consultants. It is for these reasons that considerable time may elapse between the date the manuscript is received and the date it is finally accepted.

How, then, do inadequate or marginal manuscripts end up being published? Despite the care that is taken to select knowledgeable and informed editorial consultants, not all editorial consultants have the same level of expertise, have comparable research or evaluative skills, are equally familiar with a given area, use the same standards in evaluating a manuscript, and give the same amount of time and energy to the evaluation process. One of our journals, the *Journal of Fluency Disorders*, periodically surveys the consulting editors regarding their interests and expertise in an attempt to provide competent and balanced manuscript reviews. Another, the *Journal of Voice*, provides an annual performance report that, among other things, lists each reviewer’s “turn-around time” to facilitate more punctual manuscript reviews. Most every journal provides reviewers with a copy of the correspondence between the editor and the author. This provides the opportunity to read the other reviewer’s critique of the manuscript and to see how both sets of comments and suggestions have served to inform the editor’s recommendations to the author.

The research sophistication found among members of a profession or discipline can have a pronounced effect on the character and quality of its journals. Equally important, however, is the great care of the journal staff to ensure a high degree of excellence in what is called the peer-review process. Despite everyone’s devotion to quality, journal articles indeed differ in excellence, and educated readers of research have the responsibility of being able to identify those differences. The objective of the critical evaluation is to discern the good from the poor. A stance of healthy skepticism is good both for the reader and, in the long run, for the researcher and the profession.

**The Challenge of Cyberspace**

Over the last few decades, as technology has supplanted industry, information has become a commodity. The Internet, in particular, has transformed the way we disseminate information and ask questions. As of 2010, for instance, all ASHA research journals ceased print publication and began publishing exclusively online. Subscribers now have access to not only the most current issues, but to a complete digital archive that, for ASHA journals, dates back to 1936. Students and professionals never before have had greater or quicker availability to all manner of facts, observations, analyses, and opinions. In fact, so much information is obtained now via digital technology that many libraries refer to their reference staff as CyberLibrarians or cybrarians (“Cybrarian,” 2006). The proliferation of information
资源的使用对学生、研究人员和实践者来说非常有益，但充足的选择也带来了一些严重挑战。认识到这一点，早在万维网出现之前，美国图书馆协会（1989）就推广了信息素养的概念，即“认识到何时需要信息，并且有能力定位、评估和有效使用它。”

这种数字取向对知识获取的后果是，许多人，特别是学生，现在将研究等同于将“关键词”或“搜索词”输入搜索引擎，如Google、Yahoo!和Bing。响应这类查询的通常是大量的杂乱无章的网站列表，这些网站提供了包括图像、音频、视频文件、幻灯片演示文稿、博客、商业产品和各种“事实分析”在内的多种媒体。在《纽约时报》的一篇著名专栏文章中，专栏作家托马斯·弗里德曼（2002）评论说，虽然互联网代表了一种快速教育大量人群的手段，但它仍然是一种“未经处理、未经过滤的信息电子通道”，有迅速传播无知和错误信息的潜力。

因此，挑战不在于信息太多，而在于专业责任判断信息的正当性、有效性和可靠性。超越“感觉运气好”，最好的方式是检查知识的获取方式。这需要对问题的背景、研究方法、实验结果、对结果的解读和结论进行批判性阅读。与大多数研究期刊不同，互联网上发布的大多数内容都没有经过同行评审，而且许多内容未经验证或支持科学研究。互联网的巨大价值不在于其发布的信息，而在于其提供可检索数据库的能力，允许用户找到与主题相关的期刊文章（Robinson, Cole, & Kellum, 1996）。此外，任何网络图书馆员都能证明，数据库通常提供数字下载整篇期刊文章的链接，包括尚未以印刷形式出现的。数据库搜索用于文献检索的实施是一项非常重要的技能，而且它仍然是许多人难以掌握的（Guo, Bain, & Willer, 2008）。科克斯（2005）和丹尼斯和阿伯特（2006）提供了大量的指导，我们鼓励你参考这些资源。

**Uniform Resource Locators**

电子期刊出版和在线环境近年来已经大大扩展。因为电子信息的传播已经成为一个突出的问题，它可能有助于回顾一些获取电子资源的关键因素。一个**统一资源标识符（URL）**是“网络地址”，用于在互联网上映射数字信息（图1.4）。由字母、数字和其他符号组成的字符串，URL允许计算机检索特定资源，如网页或数字文件，从服务器中检索，已知为“主机”。URL以应用协议开始，表示计算机和主机之间的通信。URLs最常见的是以“http”开头，这表示“超文本传输协议”，由冒号和两个斜杠分隔协议和主机。URLs通常以“http”开头，这表示“超文本传输协议”，由冒号和两个斜杠分隔协议和主机。
subsequent web address. The term hypertext refers not only to the text displayed on a user’s computer screen, but also to displayed spreadsheets, figures, graphics, video, and sound. It also refers to hyperlinks that allow users to access additional hypertext via a mouse click or, increasingly, by touching the computer screen.

Following the protocol, the next component of the URL is the host name or address (also known as the domain name) that may or may not include “www” for the “World Wide Web.” For example, www.sciencedirect.com is a host site operated by the publisher Elsevier that provides access to its journal articles in electronic form. Another site, www.cpcjournal.org, is maintained by the American Cleft Palate–Craniofacial Association to provide its subscribers with online access to its Cleft Palate–Craniofacial Journal, just as lshss.asha.org is maintained by ASHA to host access to its journal Language, Speech, and Hearing Services in Schools. Note that domain names include an extension that may provide important information about the host. For commercial sites, the extension “.com” is often used, whereas nonprofit organizations use a “.org” extension. Other common extensions are “.edu” and “.gov” for educational institutions and government agencies, respectively. More recent extensions include “.info” for sites that seek to provide information and related resources and “.tv” for sites that feature multimedia content. The domain extension may also represent a country code, such as “.ca” for a site based in Canada, “.de” for a site in Germany, “.uk” for a site within the United Kingdom, or “.cn” for one based in China.

A URL may end with a forward slash after the domain name, which is often the case with a host’s “home page.” When searching for a resource, such as an electronic document, however, the document file name will follow, often with a “path” from the host home page to that resource. The path to a document varies quite a bit in length and form. Be aware that a tilde (~) in the URL path is often used to identify a personal home page. In such cases, the personal home page is likely to be the source, rather than the host.

An electronic document may take many forms, including hypertext, images, graphics, audio, video, and files generated by word processing, spreadsheet, and presentation programs. Accordingly, the format of the resource is often—but not necessarily—identified by its own extension. Among the multitude of file extensions are “.htm” or “.html” (for HyperText Markup Language, HTML), “.doc” or “.docx” (for Microsoft Word documents), “.pdf” (for Portable Document Format, PDF), and “.wav” or “.mp3” (among the many audio file formats). At present, most electronic journal articles are available in PDF and HTML format.
Although the Internet provides access to online articles published in reputable scholarly journals, it likewise offers easy access to a great deal of incorrect, misleading, and questionable information. Baumgartner and Hensley (2013, p. 63) pose the following questions for evaluating the credibility of information found on the Internet:

- **What is the source of the information?** Determine whether the domain name (host organization) and/or personal home page is appropriate for the type of information provided. Also, judge the source’s purpose for providing the information. Is there bias? Is there a product or service for sale?
- **Who is the author?** Determine the specific authorship of the electronic document to judge whether that individual (or group of individuals) is knowledgeable and appropriate for the information provided. Is the author’s intent to inform or persuade?
- **Is the information current?** Determine when the electronic document was written, when it was posted to the website, and if it has been updated since then.
- **Are references provided?** Determine if the electronic document includes some documentation of its sources of information. Is the electronic document unsubstantiated opinion or is verifiable evidence provided? In lieu of references, are there active links to other credible websites?

In addition to the above considerations, a major problem with electronic resources is that, unlike printed books and journal articles, they can be modified over time. But more importantly, host sites can change domain names or disappear entirely, as can the paths that lead to the desired resources. Typically, an “HTTP 404” or “File or Directory Not Found” error message occurs when a user attempts to follow a “broken” or “dead” hyperlink. This does not mean that an electronic journal article, for instance, no longer exists, but rather that it cannot be located based on the URL entered. The nature of the Internet is such that links to and the locations of resources cannot be considered permanent.

**The Digital Object Identifier System**

In addition to the fluidity of web addresses, the file name of a resource is arbitrary and changeable. For example, an electronic article may be named according to author, date of publication, journal volume, journal pages, topic, title, or an inscrutable series of numbers, letters, and/or symbols. Fortunately, a system has been developed to address the arbitrariness of naming electronic resources and the impermanence of their locations on the web. This system employs what is known as a **digital object identifier (DOI)**, which is composed of a string of characters that uniquely and permanently identify an electronic document. In fact, **digital objects** include not only documents in digital form (such as journal articles), but other types of digital entities, including image, audio, or video files. The DOI system focuses on the digital object itself rather than the web address where it is located. The unequivocal identification of an electronic publication by assigning a unique DOI greatly facilitates the search for that resource regardless of where it is housed on the Internet. DOIs are used by electronic **databases**, such as **PubMed** (http://www.ncbi.nlm.nih.gov/pubmed), the Education Resources Information Center (**ERIC**, http://www.eric.ed.gov/) and **PsycINFO** (http://www.apa.org/pubs/databases/psycinfo/) that act like an
electronic filing system that allows users to search for and retrieve digital objects, including journal articles, technical reports, and conference proceedings. DOIs are also used by “registration agencies,” such as CrossRef, which facilitate the linking of online resources across publishers.

As shown in Figure 1.5, DOIs include a digital identifier composed of a numerical prefix and a suffix separated by a forward slash. All DOI prefixes begin with “10.” to represent the DOI registry (www.doi.org), followed by a sequence of four or five digits that are unique to the organization or publisher that has registered the DOI. For instance, a prefix of “10.1044” identifies ASHA as the DOI registrant, a prefix of “10.3766” identifies the registrant as the American Academy of Audiology, and a prefix of “10.1159” identifies the registrant as Informa Healthcare, publishers of many journals, including the *International Journal of Audiology* and *Logopedics Phoniatrics Vocology*.

The DOI suffix is a sequence of printable characters that is unique to the electronic document. The suffix can be of any length and is assigned by the publisher of a journal article at the time it becomes available electronically. The object suffix, like a file name, may simply consist of a string of digits or include some identifying information, including journal name, year of publication, or author. Regardless of how the suffix is constructed, it remains uniquely and perpetually tied to its digital object. Furthermore, even in the event that the ownership of the digital object changes, the DOI—both prefix and suffix—does not change from that which was first assigned.

**Primary, Secondary, and Tertiary Information Sources**

In general, whether digital or in print form, information can be derived from what are considered primary, secondary, or tertiary sources depending on their purpose and the extent to which they depend on outside interpretation or abridgment. **Primary sources** are usually the first appearance of research results in the literature, providing a formal presentation of the information in its original form. For instance, Hua, Johansson, Jönsson, and Magnusson (2012) conducted a research study and found that adults with a unilateral cochlear implant and a substantial hearing loss in the opposite ear performed better on speech threshold and recognition tests when a contralateral hearing aid was used in conjunction with the implant. Their article, “Cochlear implant combined with a linear frequency transposing hearing aid,” serves as a primary source for this and the other research findings they report.
By contrast, secondary sources describe, explain, or interpret the information contained in primary sources. They may generalize, synthesize, or otherwise recast the original information to provide a broad overview or support a perspective on a particular topic in communication disorders. Most textbooks and book chapters represent secondary sources of information, as do the many review articles and tutorials found in professional journals.

For example, Neils-Strunjas, Groves-Wright, Mashima, and Harnish (2006) provide an overview of several primary sources of information on dysgraphia in Alzheimer’s disease. After placing them in a historical context, the authors, with the aid of hindsight, discuss the clinical and research significance of the various studies. As with many such critical narrative reviews, even though the overview offers secondary access to the research results, it remains the primary source for the conclusions and recommendations offered by Neils-Strunjas and her coauthors.

In another example, Cacace and McFarland (1998) wrote an article that addressed the lack of empirical evidence supporting central auditory processing disorders (CAPD) as a specific auditory dysfunction. They contended that the evaluation of CAPD in school-aged children was based on an assumption that an auditory-specific deficit underlies many learning problems and language disabilities. From their extensive review of the then current research literature on the topic, Cacace and McFarland (1998) concluded there was insufficient evidence to support the unimodal auditory-specific deficit assumption and suggested that multimodal perceptual testing be used to help clarify the true underlying nature of CAPD.

Usually much more comprehensive than the literature review found in the introduction to a typical research article, reviews provide a historical perspective of trends in the development of thought about a particular topic and demonstrate how these trends may have shaped research approaches to these topics. Such literature reviews are important in synthesizing research developments to date, organizing our thinking regarding how past research has contributed to our present knowledge, and suggesting new avenues for exploration. They are valuable also in theory construction and in placing data into theoretical perspective.

Comprehensive reviews of the research literature also illuminate what Boring (1950) has referred to as the zeitgeist (German: “time spirit”) or the prevailing outlook characteristic of a particular period or generation. The zeitgeist influences research trends along particular lines and may proscribe other directions, but it may also shift to generate new research trends. An example of a potential zeitgeist change is an article published by Hixon and Weismer (1995) in which they reexamined published data from the “Edinburgh study” (Draper, Ladefoged, & Whitteridge, 1959), widely considered a classic in the literature on speech breathing. Acknowledging that “the Edinburgh study has had a forceful, pervasive, and lasting impact on the speech sciences and is considered by many to be the definitive account of speech breathing function,” Hixon and Weismer (1995) nonetheless outlined several measurement and interpretive flaws that suggest the conclusions are of dubious validity. Rather than a lamentation, their analysis showcases the scientific method in action. Indeed, they concluded that “There is still much to be learned about speech breathing and its role in human communication. Our hope for this article is that it will
stimulate thinking and serve a useful tutorial purpose for those who will follow” (p. 58). In a sense, Hixon and Weismer’s critique serves as a strong impetus to conduct new and productive research in speech breathing processes.

Lastly, there are publications that represent tertiary sources of information. A tertiary source typically provides information collated from various sources to present a broad and rudimentary overview of a topic. For example, brochures, encyclopedia or Wikipedia entries, and some elementary texts may be considered tertiary sources of information. A distillation of knowledge derived from both primary and secondary sources, tertiary sources largely reformat and condense material so as to be easily accessible to readers with limited background on the topic. Tertiary sources can serve a very important function in the dissemination of knowledge. For instance, they can help educate the public, influence policy makers, prepare students in preprofessional study, and, of course, inform clients and their families about the nature and treatment of communication disorders. For most professionals, however, the information provided is simply too far removed from the source material to allow an adequate critical assessment of how the information was obtained or interpreted by the researchers who conducted the study. Nonetheless, it is important to keep in mind that the appropriateness of an information source depends critically on the nature of the question being asked. There are several kinds of evidence and different types of claims for which evidence is provided. As Pring (2004) notes: “Evidence that water boils at 100 degrees Centigrade at sea level would be very different from the evidence to indicate that a rock face is 100 million years old or that Caesar really did cross the Rubicon.”

**Background and Foreground Questions**

Although the primary aim of this text is to lead the clinician through the process of research evaluation, a fundamental prerequisite to an intelligent critique is the fund of substantive knowledge possessed by the research consumer. To illustrate, let’s take a primary source of information, such as a research article on stuttering. Let’s further consider the introductory section devoted to outlining the research question and the significance of the study. How can one evaluate the author’s rationale without some knowledge of the literature on stuttering? Have important citations been omitted because they are inconsistent with the author’s purpose? Can the reader understand the theoretical framework within which the author is operating? Has the author misinterpreted or misunderstood previous research? The only way the reader can answer these questions is to have a strong background in the subject of stuttering. The identical problem exists for the editorial consultant; that is why journals have large rosters of reviewers. The information explosion in communication disorders has made it almost impossible for one person to be truly knowledgeable in all substantive areas.

Skill in critically assessing research articles naturally improves as the knowledge base of the reader expands. Practicing these skills by reading the research literature fosters more complete and efficient knowledge acquisition. It tests our understanding by placing our knowledge in perspective. Evaluating research articles often calls our assumptions into question and reveals gaps in our knowledge. Critical reading, like EBP in general,
requires the integration of external evidence, internal reason, and a practical sense of purpose and application. This is admittedly a demanding task but one that will allow us to arrive at more informed decisions with a fuller appreciation of the implications and consequences.

The types of clinically framed questions that we’ve been discussing, whether constructed using a PICO(T), PESICO, or SPICE template, involve the targeted search for knowledge that can be applied to the immediate concerns of a specific patient or population within a clinical practice. Sometimes referred to as foreground questions, the answers typically require primary sources of information, but secondary sources (such as systematic reviews of a topic) may also prove helpful. Providing the evidentiary basis for specific clinical decisions, foreground information is meant for “just-in-time” application to a clinical case or caseload. Using terminology borrowed from manufacturing, it can be said that when a clinician poses a foreground question, there is a demand to “pull” information to help address a current clinical need. Booth (2006) has accordingly called for the formulation of “clear and present questions” when seeking highly focused foreground answers.

Although foreground questions represent the structure that supports EBP, not all clinical questions have immediate and specific application. So-called background questions are those that inquire about general clinical or professional information. Often answered using secondary and tertiary information sources, background questions typically address such issues as the nature of a disorder, its cause, common symptoms, and treatment options. Because these types of questions ask for general knowledge, textbooks and narrative review articles often serve as the most valuable background resources for answers. Seeking a broader response than more client-specific foreground questions, background questions address the “who, what, when, where, why, and how” of clinical practice. Examples of such questions would be “Who benefits from group therapy?” “What causes Bell’s palsy?” “How do you assess chronic tinnitus?” and “What are the treatment options for apraxia of speech?” As diagrammed in Figure 1.6, beginning clinicians tend to ask far more background than foreground questions. With experience, an expanding knowledge base, and greater skill in EBP, more expert clinicians shift toward a greater percentage of targeted foreground questions to inform their practice.

**FIGURE 1.6** The Relative Proportion of Background and Foreground Questions Posed by Clinicians with Different Levels of Experience and Expertise.
Representing the knowledge base for clinical practice, background information can be considered appropriate for “just-in-case” application to practice. With background questions, there is a “push” of information to the clinician to be organized and stored for later clinical use, if and when needed. All clinicians may expand their inventory of background information by critically reviewing published tutorials on specific clinical techniques, narratives that describe new theories or concepts, and even research articles on topics of interest if not of immediate clinical utility (e.g., Baker, Croot, McLeod, & Paul, 2001; Neils-Strunjas, Groves-Wright, Mashima, & Harnish, 2006; Robin, 2008). Recognizing the importance of such engagement with the literature, many certification and licensing agencies now mandate a “continuing education” requirement for practitioners.

If foreground questions establish the structure of EBP, background questions provide the supporting foundation for EBP. That is, background knowledge is crucial for the construction of useful and answerable foreground questions. Furthermore, as EBP calls for an integration of practitioner knowledge and skill, clinical outcomes depend on the use of background questions and the literature that supports their answer. We are well aware that this is not a book on stuttering, aphasia, autism, voice disorders, cleft palate, or audimetry; therefore, we’ve made the assumption that practitioners and students will approach a journal article with some background on the topic dealt with in the article. Although we attempt to provide a framework for evaluation, that framework must rest on a substantive knowledge-based foundation.
Chapter 1

Exercises in Critical Reading

1. Read the following article:


What strategies do Nail-Chiwetalu and Bernstein Ratner suggest for improving information literacy skills? What are the “parallels” between information literacy and implementing evidence-based practice?

2. Read the following research article:


What do Tabor and Hambrecht consider the role of the clinician–investigator? What problems and benefits do they associate with assuming this role?

3. Read the following article:


Summarize Dennis and Abbott’s suggestions for implementing an effective strategy for searching the research literature. How do they recommend using electronic databases for information retrieval?

4. Read the following article:


Describe Apel’s argument that clinical practice is “scientific.” What does he suggest is the role of “external verification and validation” in clinical practice? What might he consider some of the real and perceived differences among “scientists,” “researchers,” and “clinicians”?

5. Read the following article:


According to Blischak and Cheek, how does active participation in a class research project help develop skill in critically evaluating research? Why do they consider the replication of previous results an important research activity?
6. Read the following article:

How does Finn define “critical thinking”? Describe his view on why it is relevant for the process of evidence-based practice. What are some of the common thinking errors he discusses with respect to making decisions based on the method of intuition rather than the scientific method?

7. Read the following review article:

Describe how Ruscello uses his review of literature to assess the evidence for implementing nonspeech oral motor treatments for children with developmental speech sound disorders? In what ways does this review point toward new basic and applied research questions regarding theory and practice?

8. Read the following article:

What does Bernstein Ratner propose that clinicians do to balance certainty and uncertainty in their clinical practice? Why does she place importance on recognizing “what we do not know” in treatment decisions? What distinction does she make between information and knowledge?

9. Read the following article:

What concerns does Kent raise regarding the role of researchers and research in the discipline of communication disorders and the practice of audiology and speech–language pathology? In what ways does he feel that theory is insufficiently emphasized in the evaluation of scientific evidence? Why does he emphasize the importance of clinical experience and skill in identifying assessments and interventions?

10. Read the following research article:
What did Zipoli and Kennedy find regarding speech–language pathologists’ attitudes toward research and EBP? What potential limitations and perceived barriers did they identify? Do you agree with the two strategies they propose that clinical fellows use to promote more “positive attitudes toward research and to further develop some of the prerequisite skills needed for EBP”?

11. Read the following article:


How do Shune and Moon address the “viability” of treating dysphagia with neuromuscular electrical stimulation despite current controversies regarding research evidence? In particular, what issues do they raise with respect to clinical decisions to not use a particular technique?

12. Read the following article:


Describe the PESICO template that Schlosser and O’Neil-Pirozzi promote for developing “well-built” clinical questions. Why do they suggest that how the clinical problem is formulated “affects all subsequent steps of the EBP process”? Construct your own example of a PESICO-structured question.