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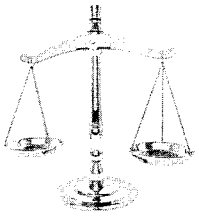
Introduction to Research



CHAPTER OUTLINE

Introduction
Importance of Research in Communication Disorders
Historical Evolution of Research in Communication Disorders
Sources of Knowledge
Types of Research
  Descriptive Research
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LEARNING OBJECTIVES

Upon completion of this chapter the reader will be able to:

- Discuss the importance of research to clinical practice
- Describe the historical evolution of research in the professions
- Briefly describe the sources of knowledge used in the professions
- Describe descriptive research including strengths and weaknesses
- Describe exploratory research including strengths and weaknesses
- Describe experimental research including strengths and weaknesses
- Describe survey research including strengths and weaknesses.

Introduction

The vitality and endurance of a profession are dependent on the quantity and quality of its ongoing research programs. The curricula of speech-language pathology and audiology programs traditionally have reserved the study of research methods and responsibilities for advanced graduate training. By that time, students may have developed an attitude of apprehension about research. Sometimes, these attitudes develop into sheer terror. Some academic advisors in programs having a thesis option rather than a requirement have difficulty persuading entering graduate students to consider pursuing a thesis project. By the time the students become informed and confident about doing research, they are so far along in their graduate programs that doing a thesis would delay graduation.

The purpose of this text is to remove the mystery surrounding research by teaching basic principles and providing practice in gathering and summarizing data. It is hoped that this information will be conveyed to students early in their training in an effort to increase the number of research projects conducted by speech-language pathology and audiology students. Once students have developed research skills under the direction of productive faculty, they are more likely to continue the practice as they move into varied professional settings.

Importance of Research in Communication Disorders

There are a number of reasons for doing research in communication sciences and disorders. Short-term or survival objectives for doing research include doing projects to complete one's education or to improve one's job security in an academic setting where tenure and promotion depend on research productivity.

More important reasons for doing research include contributing to the professional pool of knowledge about treatment of clients presenting a variety of communication disorders and maintaining quality clinical services while realizing a sense of professionalism by active involvement in learning through discovery. For the person who enjoys receiving professional recognition along with opportunity to be creative, satisfy curiosities, and engages in problem solving with a team of colleagues having similar interests, research provides numerous secondary rewards (Pannbacker & Middleton, 1991–1992).

A profession's image is readily enhanced by the integration of research along with the provision of clinical services. This has become more important with an increased emphasis on the use of *evidence-based practice*. Such practice increases professionalism, accountability to clients and other professionals, and the social relevance of the health services delivered in an economy with increased costs and decreased resources. *Clinical research* may readily integrate into the assessment, planning, intervention, and evaluation phases of clinical management (Portney & Watkins, 2009). Findley and DeLisa (1990) stress the importance of integrating clinical and research activities for the following reasons. The best clinicians and strongest research are providing clinical services and conducting research. Furthermore, staff training and awareness about new procedures and technology followed by improved client care are direct results. Both lead to the establishment of a rewarding, stimulating

professional environment that contributes to improved staff recruitment and retention.

There is also an ethical reason for accepting the challenge of doing research. The speech-language pathologist or audiologist is frequently asked by clients or their relatives, "Does this treatment really work?" or "Is this hearing aid going to make a difference?" These questions are very difficult to answer ethically and truthfully without controlled research to substantiate an affirmative response. Ferketic (1993) stated, "We can't ignore the challenge to promote efficacy research. There are many questions to be answered. We all have something to offer and we need to work together to answer the questions. It's an opportunity to strengthen our professional credibility and viability" (p. 12). Collaboration between researchers and clinicians has been identified as a priority by the American Speech-Language-Hearing Foundation (ASHF) (http://www.ashfoundation.org) and the National Institute on Deafness and Other Communication Disorders (http://www.nidcd.nih.gov). According to Rao (2011), there is a resource for SLPs and AUDs about assessing and treating specific communication disorders (http://www.asha.org/members/ebp/compendium).

Distinguishing two terms at this point is important. In research, *efficacy* is the benefit of an intervention plan as compared to a control or standard program. This type of research lets us examine theory and draw generalizations to large populations. *Effectiveness* in research is defined as the benefits and use of the procedure under "real world" conditions. Effectiveness involves the expectation that when researchers apply treatments, they do so without being able to control all circumstances (Portney & Watkins, 2000). Understanding the distinction and also the relationship between these two terms helps researchers ask answerable questions that meet the rigor of scientific methods and produce usable results.

Historical Evolution of Research in Communication Disorders

During the academic year, 1968 to 1969, Dr. Elaine Pagel Paden began to write a history of the American Speech-Language- Hearing Association (ASHA). In 1970, Paden authored a book which covered the years from 1925 to 1958. This is a summary of the early efforts by the membership to compile completed projects and continue research in speech disorders.

A small group interested in speech disorders met, beginning in 1919, at the annual meeting of the National Association of Teachers of Speech (NATS) and continuing until 1925. Lee Edward Travis reported a study in which he described the effects on phonatory pitch of stutterers and nonstutterers following the firing of a blank pistol at close range without warning. The teachers of public address (public speaking) in attendance were outraged at such inhumane treatment of subjects under investigation. Following this incident, it was decided that a separate organization for individuals interested in researching speech disorders should be established.

In December of 1925, the American Academy of Speech Correction was organized by 11 individuals, 5 men and 6 women. Conducting research about speech disorders was one of the three

minimal requirements for membership. From the very beginning, the group emphasized the importance of a working, productive organization. The projects initially assigned to the membership were all research in nature. They included establishing the classifications and terminology for the field, summarizing thesis projects in progress, developing bibliographies on topics in speech correction, and investigating topics including stuttering, foreign accent problems, and phonetic description of "careless speech."

Realizing the need for a vehicle for publishing studies in speech correction, the group initially mimeographed 28 studies and made them available for $3.00 each. Having made money on the project, the group continued the practice. The *Journal of Speech Disorders* was established in 1935. The University of Illinois library has in its collection the early issues of this journal.

In the first issue of the new journal, published in 1936, three articles appeared covering the topics of foreign dialect, cleft palate, and stuttering. Also a bibliography covering speech, voice, and hearing disorders was included. Gradually, the journal became less devoted to news items and increasingly dedicated to quality scholarly content. The camaraderie and friendships established among the young energetic contributors with similar professional interests remained.

Eventually the *Journal of Speech Disorders* was renamed the *Journal of Speech and Hearing Disorders*. The majority of articles that appeared in the journal for the first 20 years covered topics on stuttering followed by articles on general topics and therapy and "audiometry." Also, between 1936 and 1949, the articles were more clinically oriented. In 1950, the journal's focus shifted to articles with a research orientation until 1957 when the reverse trend began.

With the explosion of submitted research, the *Journal of Speech and Hearing Research* (JSHR) began publication in 1958. This journal adopted a research orientation whereas the *Journal of Speech and Hearing Disorders* (JSHD) published research with clinical application. Because individuals working in school settings were interested in clinical applications and felt that neither journal served their needs, another ASHA journal, *Language, Speech, and Hearing Services in Schools* (LSHSS), began publication in 1970.

In an effort to increase the relevance of the ASHA journal program to all members, in 1990, the *Journal of Speech and Hearing Disorders* was divided into two separate publications and its title was discontinued. Two new journals were initiated. The *American Journal of Audiology: A Journal of Clinical Practice* and the *American Journal of Speech-Language Pathology: A Journal of Clinical Practice* were first published in the fall of 1991. With these changes, both audiologists and speech-language pathologists have subject-specific periodicals in which to publish clinical and experimental research. Supporting research by the ASHA will continue to evolve as the needs of the professions change. In 2004, ASHA took action to develop the Advisory Committee on Evidence-Based Practice (ACEBP). This committee has been charged to address several issues relative to EBP in communication disorders. According to Mullen (2005), ASHA has also established the National Center for Evidence-Based Practice in Communication Disorders (N-CEP). Mullen (2005) stated that ASHA "members will be introduced to the basic principles of

a number of different research strategies. There is also a lack of agreement about these categories as well as overlap among the various types of research so that specific research projects may fit more than one classification (Schiavetti, Metz, & Orlikoff, 2011). Portney and Watkins (2009) view research on a continuum and describe the major categories: descriptive, exploratory, and experimental. Figure 1–1 shows how these types of research may be viewed along a continuum and that some share properties with all three categories (e.g., survey research) whereas others are specific to a particular category (e.g., randomized controlled trials).

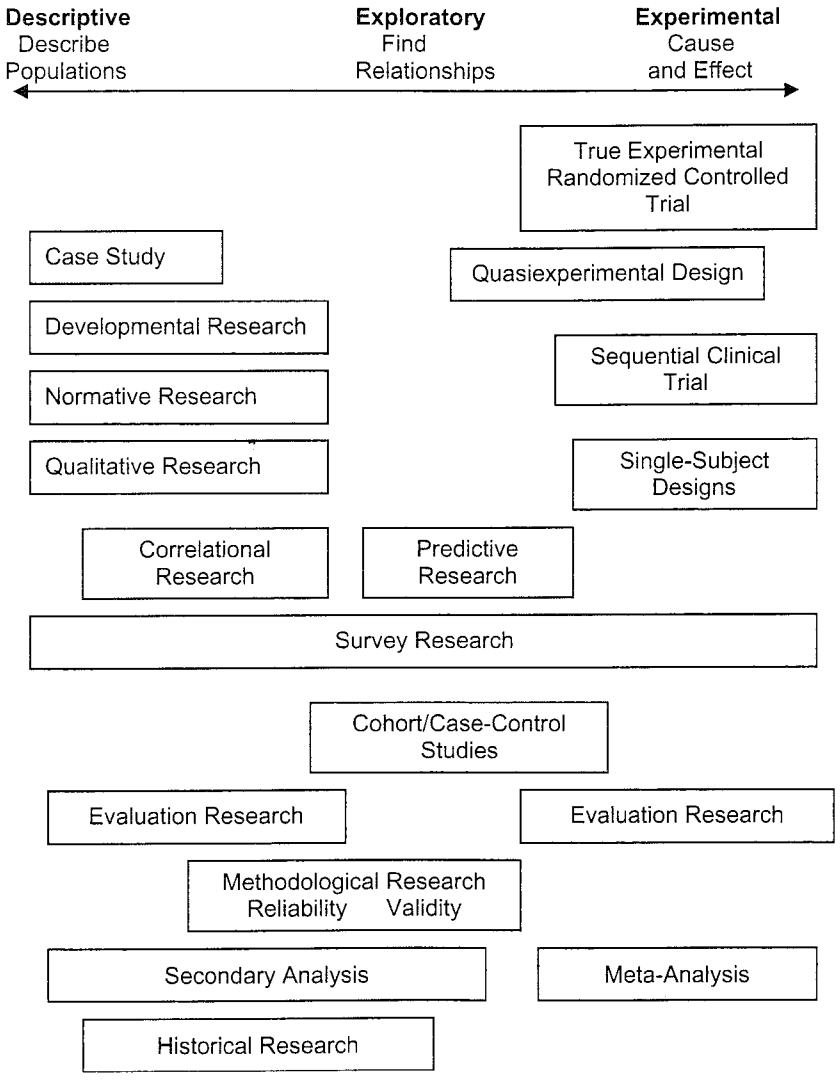

Figure 1–1. A continuum of research. Adapted with permission from *Foundations of Clinical Research* (2nd ed.), by L. G. Portney and M. P. Watkins, 2000, p. 13, Upper Saddle River, NJ: Pearson Education. Copyright 2000 Pearson Education, Inc.

EBP and provided with the necessary support tools to assist them with integrating quality evidence into their practice" (p. 1). Duchan (2006) has developed a website that documents the history of speech-language pathology during the 19th and 20th centuries. The historical review contains numerous references and efforts of various fields on the evolution of research in speech-language pathology. These fields include phonetic studies, brain studies, technology, testing, and child study.

The American Academy of Audiology (AAA) was founded in January 1988 when a group of audiology leaders met. The purpose of the study group was to establish an independent freestanding national organization run by and for audiologists. The AAA published the first edition of the *Journal of the American Academy of Audiology* (JAAA) in 1990 (http://www.audiology.org).

Sources of Knowledge

Information used by clinicians and other types of researchers can come from a variety of sources. As consumers of research, we may accept some findings based on tradition, authority, trial and error, and logical reasoning (deductive and inductive). For a summary of these sources, one should consult Portney and Watkins (2009). Each of these sources of knowledge may be limited by a lack of empirical research principles, an unsystematic use of variables, lack of control for critical variables, or stifling of new knowledge and thought.

Research is conducted to answer questions, and it is an increasingly important component in speech-language pathology and audiology because both basic and clinical questions remain unanswered. In an effort to determine cause-and-effect relationships, researchers conscientiously apply scientific methodology to carefully control variables. Kerlinger (1973) defined the *scientific approach* as a systematic, empirical, controlled, and critical examination of hypothetical propositions about the association among natural phenomena. Portney and Watkins (2000) assert that the element of control is "the most important characteristic that sets the scientific method apart from the other sources of knowledge" (p. 11). It is important for any researcher to attempt to control factors that are directly related to the variables in question.

Lieske (1986) described the systematic study of a problem or question as a cyclical process beginning with an unanswered question followed by a clear statement of the problem, development of appropriate hypotheses, data collection, and finally interpretation of the information gathered in an effort to accept or reject hypotheses.

Portney and Watkins (2009) caution researchers that the scientific method may have limitations when applied to human behavior. Because humans are unique and capacities vary widely, there will always be some uncertainty regarding the interpretation and generalization of data. It is almost impossible to control for all variables in clinical research. This does not mean that clinicians should allow for less control, but rather that they should recognize that other variables may be happening that could influence results.

Types of Research

Classification of research into specific categories is not easy because there are

1993). Such papers are often written at the request of a journal editor who wants to present a summary from the viewpoint of a recognized scholar (Shearer, 1982).

Shearer (1982) pointed out that "nearly every example of published research contains a miniature library study as part of the introductory section that refers to related research. More extensive reviews of the literature commonly comprise the second chapter of theses and dissertations" (p. 17).

The following characteristics of historical research were identified by Isaac and Michael (1987):

1. Historical research depends on data observed by others rather than the investigator.
2. Historical research must be rigorous, systematic, and exhaustive. Much "research" claiming to be historical is an undisciplined collection of inappropriate, unreliable, or biased information.
3. Historical research depends on two kinds of data: primary sources where the author was a direct observer of the recorded event, and secondary sources where the author reports the observation of others and is one or more times removed from the original event.
4. Two basic forms of criticism weight the value of the data: external criticism, which asks, "Is the document or relic authentic?" and internal criticism, which asks, "If authentic, are the data accurate and relevant?" This critical evaluation of the data is what makes true historical research so vigorous—in many ways more demanding than experimental methods (p. 45).

Case Study Research

Case study research is an intensive study of the background, current status, or environmental interactions of an individual, group, institution, or community (Isaac & Michael, 1987). Most case studies are descriptive studies that examine relationships among different variables or trends over time (Maxwell & Satake, 2006; Polit & Beck, 2010.)

The primary strength of case study research is that it may be the only method available for studying some phenomena when few subjects are available or when financial restrictions preclude the use of other types of study (Schiavetti, Metz, & Orlikoff, 2002). In some instances, case studies should be considered pilot studies because they need to be combined with appropriate follow-up studies using larger numbers of subjects having the same phenomena and focusing on specific hypotheses (Isaac & Michael, 1987). Table 1–1 presents several case studies that been done in communication disorders.

On the other hand, case studies also have weaknesses. Because of their narrow focus on a few subjects, case studies are limited in their generalizability. Also case studies are vulnerable to subjective bias. This may happen because the subjects were selected because of dramatic or atypical attributes.

Secondary Analysis

Secondary analysis involves research that uses previously gathered data (Polit & Beck, 2010). It may involve examining unanalyzed variables, testing unexplored relationships, focusing on a specific subsample, or changing the unit of analysis.

Descriptive Research

Descriptive research is designed to systemically describe situations or events as they naturally occur, in other words, the status of phenomena of interest as they currently exist (Polit & Beck, 2010). It is a type of research in which the distributions of selected dependent variables is observed and recorded (Hegde, 2003). Descriptive research is used to study group differences, developmental trends, and relationships among variables (Schiavetti, Metz, & Orlikoff, 2011). Sometimes this type of research is called normative or developmental research (Hegde, 2003). Developmental research that focuses on changes over time may be cross-sectional, longitudinal, or semilongitudinal (Maxwell & Satake, 2006; Portney & Watkins, 2009; Schiavetti, Metz, & Orlikoff, 2011; Shearer, 1982). Not all research is developmental in the maturational sense; it may be designed, for example, to study the course of progress for a pathology.

Cross-Sectional Research

Cross-sectional research involves selecting subjects from various age groups and observing differences between the behavior and characteristics of the group. This approach has several advantages: (1) it is less costly and less time consuming than longitudinal research and (2) it is relatively immune to subject attrition. The greatest disadvantage is the possibility that results could be attributable to biased selection of the cross-sectional groups. A variety of terms are used to describe cross-sectional research: disease, frequency, survey, and prevalence study (Rosenfeld, 1991).

Longitudinal Research

Many consider longitudinal research stronger than cross-sectional research because the same group of subjects is followed over time. This approach has the disadvantages of being expensive, time consuming, and vulnerable to subject attrition. Because of these problems, only a small number of subjects can be studied. Synonyms for longitudinal research include cohort study, follow-up study, incidence study, and perspective study (Rosenfeld, 1991).

Semilongitudinal Research

The semilongitudinal approach is a compromise designed to maximize the strengths and minimize the weaknesses of the cross-sectional and longitudinal approaches. This involves dividing the total age span to be studied into several overlapping age spans, selecting subjects whose ages are at the lower edge of each new age span, and following them until they reach the upper age of the span (Schiavetti, Metz,& Orlikoff, 2011; Shearer, 1982).

Historical Research

Historical research, sometimes referred to as archival or library research, is a type of research aimed at establishing facts and relationship about past events (Bordens & Abbott, 1988; Portney & Watkins, 2000). It may summarize a specific topic, sometimes in a type of review article entitled "State of the Art" or "Tutorial." Tutorial papers have been published about a variety of topics in communication disorders: facilitated communication (Duchan, 1993); and hearing loss, speech, and hearing aids (Van Tassell,

Table 1–1. Examples of Case Studies in Communication Disorders

Author(s)	Topic
Apel & Masterson (2001)	Effects of an intensive group intervention focusing on spelling and oral reading.
Bauch, Olsen, Lynn, Radin, & Dale (1999)	Hearing sensitivity and acoustic reflexes following a nail gun accident
Friel-Patti, DesBarres, & Thibodeau (2001)	Outcome of the Fast ForWord program with children presenting language-learning disabilities
Guitar, Schaefer, Donahue-Kilburg, & Bond (1992)	Change in parent speech variables and in child's stuttering
Kent, Sufit, Rosenbek, Kent, Weismer, Martin, et al. (1991)	Speech intelligibility, pulmonary function, and voice functions for a woman with amyotrophic lateral sclerosis (ALS).
McGann & Paslawski (1991)	Communication devices with two patients with locked-in syndrome (LIS)
Ray (2002)	Phonological disorder of 5-year-old bilingual child
Williams (2000)	Different models of intervention for 10 children with moderate-to-profound phonological impairments
Wilson, Onslow, & Lincoln (2004)	Use of Lindcombe Program for Early Stuttering with 5 children using low-tech telehealth
Windsor, Doyle, & Siegel (1994)	Study of a woman with autism from age 10 to acquisition of spoken language to age 26.

Because secondary analysis uses existing data, it has the advantage of reducing time and cost. It has the disadvantage of little or no control over data collection (Hearst & Hulley, 1988). There is also the possibility the data are inaccurate.

Evaluation Research

Evaluation research involves collection and analysis of information related to the effects of a program, policy, or procedure (Hegde, 2003; Polit & Beck, 2010). Four types of evaluation research have been described in the literature: process or implementation evaluation, outcome and impact evaluation, cost-benefit analysis, and comprehensive evaluation. This type of research can be used to ensure compliance with quality assurance policies and third-party payors such as Medicare and Medicaid.

Process or implementation evaluation is designed to answer questions about the function of a program or policy (Polit & Beck, 2010). Typically, this type of research involves intensive examination of a program and often involves collection of both qualitative and quantities data gathered through interviews

with clients and staff, observation of the program in operation, and analysis of records related to the program.

A process or implementation evaluation may focus on improving a new or ongoing program. Such an evaluation is sometimes referred to as a formative evaluation. In other instances, the evaluation may be designed primarily so that the program can be replicated by others (Polit & Hungler, 1999).

Outcome and impact evaluation is concerned with the effectiveness of a program. In other words, the purpose is to determine whether a program should be discontinued, replaced, modified, continued, or replicated. The evaluation may be referred to as a summative evaluation. An outcomes evaluation is fairly descriptive but does not utilize a vigorous experimental design (Polit & Beck, 2010). Such an evaluation documents the extent to which the goals of the program are achieved, the extent to which the goals of the program are achieved, and the extent to which positive outcomes result.

Impact evaluation is designed to identify the impact(s) of an intervention, in other words, the impact(s) that can be attributed to the intervention rather than to other factors. Polit and Hungler (1999) believe that impact evaluation usually involves "an experimental or quasi-experimental design, because the aim of such evaluations is to attribute a casual influence to the specific intervention" (p. 200). Hegde (1994) agrees to an extent because he feels that "in some ways, an impact evaluation resembles experimental research. However, in practice, appropriate experimental methods are not used in impact evaluation" (p. 101).

Evaluations that determine whether the benefits of the program outweigh the cost are referred to as cost-benefit analyses. Such analyses are often done in conjunction with impact evaluations (Polit & Beck 2010).

Evaluation research combines process and outcome-impact evaluations which were previously described. Hegde (2003) believes that comprehensive evaluation is the only truly useful type of evaluation research because the usefulness of process or impact evaluation is limited. A comprehensive model of evaluation, which includes multiple types of evaluation, was described by Isaac and Michael (1987) and is presented in Figure 1–2. The greatest problem with evaluation research is that it can be threatening to individuals. Even though the focus of evaluation research is on a program, procedure, or policy, people develop and implement the entity. Some people think they or their work are being evaluated. It can also be difficult to determine goals of the program (Polit & Beck, 2010). Often, the objectives of a program are multiple and diffuse.

Exploratory Research

An exploratory researcher examines how one event or events relate to other factors. Correlational research is used to determine possible relationships among factors (Portney & Watkins, 2009). Examples of correlational research include studying the role of home literacy practices and children's language and emergent literacy skills (Roberts, Jurgens, & Burchinal, 2005), frequency processing in listeners with hearing impairment (Healy, Kannabiran, & Bacon, 2005); and frequency discrimination and literacy skills for children with mild to moderate sensorineural hearing loss (Halliday & Bishop, 2005).

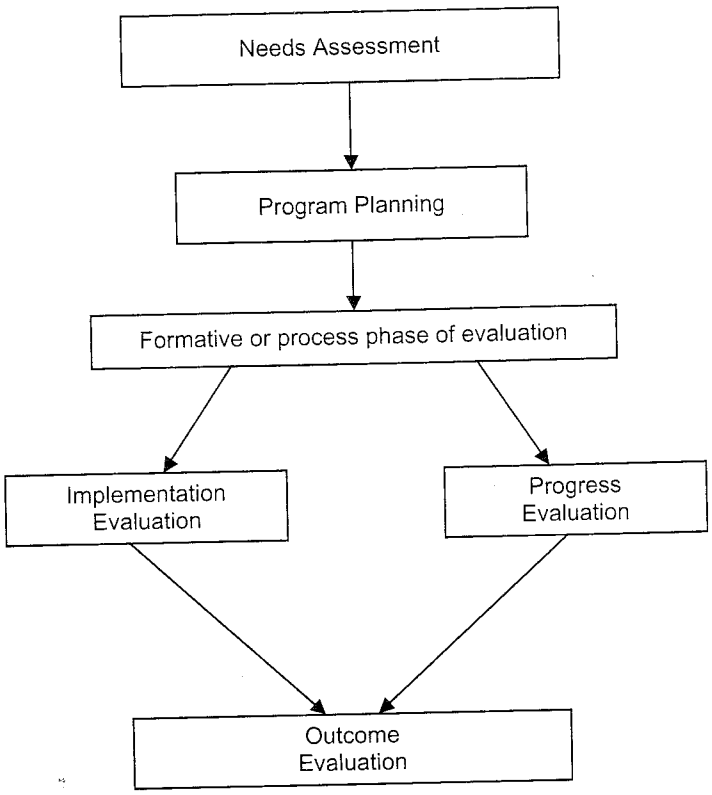

Figure 1–2. Comprehensive model of evaluation from needs assessment to outcome evaluation. From *Handbook in Research and Evaluation* (3rd ed.), by S. Issac and W. B. Michael, 1995, p 11, San Diego, CA: Edits Publishing. Copyright 1995 Edits Publishers. Reproduced with permission.

Correlational Research

Portney & Watkins (2000) state "predictive research studies are designed to predict a behavior or response based on the observed relationship between that behavior and other variables" (p. 278). For example, predictive studies can be used to study the scores achieved on standardized tests (e.g., Graduate Record Examination) and performance in a graduate program. Predictive research is being used more often in outcomes for making clinical decisions. For example, Daniels, McAdam, Brailey, and Foundas (1997) studied whether risk factors detected in the clinical examination approximated the videofluoroscopic swallow study in the identification of dysphagia severity. They studied six clinical features: dysphonia, dysarthria, abnormal volitional cough, abnormal gag reflex, cough after an oropharyngeal evaluation, and a clinical swallowing examination.

Case-Control Studies

Case-control studies are done when individuals are selected whether they have a particular disorder or not. Cases have the disorder or disease being studied and controls are chosen because they do not

have the disorder or disease (Portney & Watkins, 2009). The researcher may utilize a variety of techniques including interviews, questionnaires, or chart review to determine why an individual may or may not have a disorder/disease based on exposure factors. A study by Tallal, Hirsch, Realpe-Bonilla, Miller, Brzustowicz, Bartlett, et al. (2001) conducted a case-control study in which the current language related ability of all biological, primary relatives (mother, father, siblings) or probands with specific language impairment and compared them to matched controls.

Portney and Watkins (2000) suggest that "one advantage of case-control design is that samples are relatively easy to gather. Therefore, case-control studies are useful for studying disorders that are relatively rare, because they start by finding cases in a systematic manner" (p. 325). Case-control studies are typically done for diseases or disorders that have a long latency period.

Cohort Studies

A cohort study is where the "researcher selects a group of subjects who do not yet have the outcome of interest and follows them to see if they develop the disorder" (Portney & Watkins, 2000, p. 328). Cohort studies allow the researcher to follow the temporal sequence of factors that may have impacted the development of a disorder. Grievink, Peters, van Bon, and Schilder (1993) examined the relationship between early otitis media with effusion (OME) and later language ability in a group of children systematically documented with bilateral OME. The children in this study received tympanometry every 3 months, between the ages of 2 and 4, and at age 7, three groups participated in language-testing.

Cohort studies can be either prospective or retrospective. If a researcher determines that subjects have already been exposed to risk factors, then the study would be retrospective. If the researcher contacts the subjects before they develop the disorder, but after exposure to risk factors, then it would be prospective (Portney & Watkins, 2000).

Experimental Research

In experimental research, the independent variable is controlled to measure its effect on the dependent variables (Shearer, 1982). In other words, experimental research is used to examine possible cause-and-effect relationships by exposing one or more experimental groups to one or more conditions and comparing the results to one or more control groups (Isaac & Michael, 1987). This type of research has also been referred to as the cause-and-effect method, the pretest-posttest control group design, and the laboratory method (Leedy, 1989). The distinguishing feature of experimental research is the experiment and control of the main variables; other types of research do not involve an experiment (Hegde, 2003; Shearer, 1982). Experimental research is considered by many to be the best or most powerful research design, but it is not the only acceptable type of research (Hegde, 2003; Ottenbacher, 1990; Portney & Watkins, 2009). Shearer (1982) points out that the most appropriate type "of research is the one that best fits the problem and the situations available" (p. 10).

The three characteristics of experimental research described by Polit and Hungler (1999) were: (1) "manipulation —the experimenter does something to at least some of the subjects in the

study; (2) control—the experimenter introduces one or more control over the experimental situation, including the use of a control group and (3) randomization—the experimenter assigns subjects to a control or experimental group on a random basis" (p. 152).

Isaac and Michael (1987) have outlined the steps in experimental research (Table 1–2). This outline is useful in understanding experimental research and knowing the procedures that a researcher might utilize.

Hegde (2003) stated, "the strengths of experimental research are the strengths of science itself" (p. 170). It is the most appropriate method for testing hypotheses of cause-and-effect relationships between variables. Experimental research offers greater corroboration than any other type of research in that if the independent variable is manipulated in a certain way, then certain consequences in the dependent variable may be expected to ensue.

Experimental research has several weaknesses. First, there are many situations in which experimental research cannot be conducted because of ethical or practical considerations (Polit & Beck,

Table 1–2. Seven Steps in Experimental Research

1. Survey the literature relating to the problem.
2. Identify and define the problem.
3. Formulate a problem hypothesis, deducing the consequences and defining basic terms and variables.
4. Construct an experimental plan.
   a. Identify all nonexperimental variables that might contaminate the experiment, and determine how to control them.
   b. Select a research design.
   c. Select a sample of subjects to represent a given population, assign subjects to groups, and assign experimental treatment to groups.
   d. Select or construct and validate instruments to measure the outcome of the experiment.
   e. Outline procedures for collecting the data, and possible conduct a pilot or "trial run" test to perfect the instruments or design.
   f. State the statistical or null hypothesis.
5. Conduct the experiments.
6. Reduce the raw data in a manner that will produce the best appraisal of the effect which is presumed to exist.
7. Apply an appropriate test of significance to determine the confidence one can place on the results of the study.

Source: From *Understanding Educational Research* (Rev. ed.), by D. B. Van Dalen and W. J. Meyer, 1966, New York, NY: McGraw-Hill. Copyright 1966 by McGraw-Hill. Reproduced with permission of The McGraw-Hill Companies.

2010; Portney & Watkins, 2009). Another problem with experimental research is the Hawthorne effect. This refers to the effect on the dependent variable caused by changes in subjects' behavior because they know they are participating in a study (Huck, Cormier, & Bounds, 1974; Portney & Watkins, 2000). Despite problems inherent in research, Hegde (2003) believes none of the "weaknesses of experimental research seem to be valid" (p. 169).

Randomized Controlled Trial

The basic structure of an experiment involves the pretest-posttest design (Portney & Watkins, 2009). Some researchers (Portney & Watkins, 2009) regard the "gold standard" for clinical research to include the randomized controlled trial (RCT). This involves the experimental group receiving the variable of interest and the control group not receiving any form of treatment. Measuring the differences between the two groups, with all other factors being equal or constant, are due to the impact of the experimental variable. In RCT, the assignment of subjects to groups is randomized. An example for the use of RCT by speech-language pathologists includes Roy,Weinrich, Gray, Tanner, Stemple, and Sapienza (2003) who studied three treatments for teachers with voice disorders. Cohen, Hodson, O'Hare, Boyle, Durrani, McCartney, et al. (2005) used RCT when studying 77 children between the ages 6 to 10 and the effects of computer-based intervention through acoustically modified speech (i.e., Fast ForWord; Scientific Learning Corporation, 1998). Portney and Watkins (2009) assert that this design is strong in internal validity and selection bias can be controlled through random assignment of subjects.

Quasiexperimental

Variations of "true" experimental research are considered quasiexperimental because they have the same degree of experimental control or inferential confidence (Ottenbacher, 1990). This type of research is sometimes referred to as pseudoexperimental or pre-experimental (Huck, Cormier, & Bounds (1974). Quasi-experimental research, like experimental research, involves manipulation of an independent variable but does not have a comparison group or randomization (Polit & Beck, 2010). The two characteristics of quasiexperimental research identified by Isaac & Michael (1987) are: "(1) quasiexperimental typically involves applied setting where it is not possible to control all the relevant variables but only some of them; and (2) the distinction between true and quasiexperimental research is tenuous, particularly where human subjects are involved" (p. 54).

Sequential Clinical Trials

The use of sequential clinical trials (SCTs) addresses two concerns often seen with experimental designs. First, SCT does not require a fixed sample size before the study can begin. Subjects can be added to the study as they become available or develop a disease. Second, SCT allows for the analysis of data to occur when the subject has completed the trial. Other forms of experimental research require the collection of the data from the entire sample before data analysis begins (Portney & Watkins, 2009). The use of SCTs has application to the field of speech-language pathology and audiology because it allows for the comparison of a "new" treatment to an "old" treatment. This may address the ethical concerns of true

Table 1–3. Comparison of Personal Interviews and Questionnaires

Advantages of Personal Interviews	Advantages of Questionnaires
Clarity: Clarify questions; avoid problems of illiteracy.	Economy: Self-administration reduces staff time.
Complexity: Obtain more complex answers and observations about respondent's appearance and behavior.	Standardization: Written instruction reduces biases from difference in administration or from interactions with interviewer.
Completeness: Minimize omission and inappropriate responses.	Anonymity: Privacy encourages candid, honest answers to sensitive questions.
Control: Order sequence of questions.	

Sources: From "Planning the Measurements in a Questionnaire," by S. R. Cummings, W. Strull, M. C., Nevitt, and S. B. Hulley. In S. P. Hulley and S. R. Cummings (Eds.), *Designing Clinical Research*, 1988, p. 43, Baltimore, MD: Williams & Wilkins, with permission. Copyright 1988 Williams and Wilkins. Reprinted with permission.

monkey.com), Facebook (http://www.facebook.com), direct E-mail, "snail" mail, and telephone. The most important component of any survey, regardless of how it is distributed, is the response rate. High response rates are important for at least three reasons: (1) they increase sample size and statistical power, (2) they tend to produce a more representative sample, and (3) they reduce wasted time and materials (Dodd, Bosell, & Litwin, 1988). A response rate of 50% is considered adequate, a response rate of at least 60% is considered good, and a response rate of 70% or more is very good (Babbie, 1973). Shewan (1986) suggests pretesting questionnaires so that potential problems can be identified prior to disseminating them. Answers to the following questions are requested:

1. How long did it take you to complete the questionnaire?
2. Did you understand the instructions? What, if anything, was unclear?
3. Did you ever feel forced to make a choice that didn't fit your particular situation? If so, on which question(s) and why?
4. Were the questions reasonable and appropriate? How, in your judgment, could the questions be improved?

A cover letter should accompany all questionnaires (electronic or paper) briefly explaining the purpose of the survey, conveying researcher's thanks and appreciation for the reply, that the survey has been approved by the appropriate committee or advisor, and offering to provide a summary of the results. Contact information for the researcher should be listed such as telephone number, E-mail, and fax number. A self-addressed envelope should be enclosed for paper questionnaires. There are several resources for conducting surveys (Dillman, 1978; Groves, 1989; Portney & Watkins, 2009).

Surveys have been used to study a variety of topics in speech-language

pathology and audiology. Garcia, Chambers, and Molander (2005) surveyed the practice patterns of speech-language pathologists in their use of thickened liquids. Zipoli and Kennedy (2005) utilized a questionnaire to examine attitudes of 240 speech-language pathologists toward and use of research and evidence-based practice. Hoffman, Yorkston, Shumway-Cook, Ciol, Dudgeon, and Chan (2005) utilized the results from a Medicare Current Beneficiary Survey to determine how many respondents over 65 years of age were categorized by level of communication disability.

The use of surveys makes it possible to obtain a great deal of information from a large population (Kerlinger, 1973). They are also economical because of the amount and quality of information they yield. Surveys, however, have a number of weaknesses. First, survey research tends to be relatively superficial; in other words, it does not usually penetrate much below the surface (Kerlinger, 1973; Portney & Watkins, 2000). Second, survey research does not permit causeandeffect conclusions because of a lack of experimental manipulations (Hegde, 2003; Portney & Watkins, 2000). A third weakness is that surveys tend to be demanding of time and other resources and tend to focus on "soft" (i.e., opinions) dependent variables (Hegde, 2003).

Summary

This chapter has provided an introduction to the research process, historical overview of how it evolved during the early years of the professions, reviewing various sources of knowledge when making clinical decisions, and an overview of the scientific method and various types of research. It is important for all readers to understand that this chapter is not complete and exhaustive of all aspects related to research. In subsequent chapters, more information is discussed in greater detail. Although many research projects ask very important and viable questions, it is important to remember: The best research project is one that is done and properly disseminated. Subsequent chapters are designed to guide students through this process so that they can complete a research project that adheres to standards and answers important questions for the professions of speech-language pathology and audiology.

DISCUSSION QUESTIONS

1. What might be personal, professional, and ethical reasons to conduct research?
2. Differentiate between efficacy and effectiveness. What is used in speech-language pathology and audiology?
3. How did research evolve in the speech-language pathology and audiology professions?
4. What are some sources of knowledge? What might be some problems with these sources?

5. Describe the scientific method. Why is the issue of experimental control difficult for some studies in clinical practice?
6. What are three major types of research? How can these be viewed along a continuum?
7. What is developmental research?
8. Compare cross-sectional, longitudinal, and semilongitudinal research.
9. What are some problems with doing historical research? How might these problems be controlled or resolved?
10. Under what circumstances do researchers tend to use case studies?
11. What are some types of evaluation research? Why might this research be difficult to conduct?
12. Give some examples of exploratory research in speech-language pathology and audiology?
13. What has ASHA done to collect more data using EBP?
14. Compare case-control and cohort studies.
15. What is the distinguishing aspect of experimental research according to Portney and Watkins (2000)?
16. What is considered the "gold standard" for experimental research? Why?
17. Why might sequential clinical trials be valuable to a researcher involved in clinical practice for speech-language pathology or audiology?
18. What are some advantages and weaknesses of meta-analysis?
19. Surveys can be in various formats. Describe the pros and cons of each format.
20. What is considered an "adequate," "good," and "very good" response rate to a survey?
21. Describe why a questionnaire should be tested with some subjects prior to dissemination.
22. What are some weaknesses associated with surveys?

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