

THE PEARSON COMMUNICATION SCIENCES AND DISORDERS SERIES



INTRODUCTION TO COMMUNICATION DISORDERS



A Lifespan
Evidence-Based
Perspective

SIXTH EDITION

ROBERT E. OWENS, JR.
KIMBERLY A. FARINELLA

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Introduction to Communication Disorders

A LIFESPAN EVIDENCE-BASED PERSPECTIVE

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To Our Many Friends with Communication Disorders

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Introducing a new edition is always exciting and exhausting. We have taken great pains to reach a balance that we hope will please our various readers, from professors to students. We hope that those of you who are familiar with the previous editions will agree with us that this edition is a worthy introduction to the field of speech pathology and audiology and one that contributes meaningfully to the education of speech-language pathologists and audiologists.

Within each chapter, we have attempted to describe a specific type of disorder and related assessment and intervention methods. In addition, we have included lifespan issues and evidence-based practice to provide the reader with added insights. Each type of disorder is illustrated by personal stories of individuals with that disorder. Further knowledge can be gained through the suggested readings provided at the conclusion of each chapter.

NEW TO THIS EDITION

This sixth edition of *Introduction to Communication Disorders* has many new features that strengthen the existing material in the previous edition. These include the following:

- Chapters have been reorganized and rewritten to help conceptualize the information differently so as to conform more to current clinical and educational categories. Several chapters have been reworked entirely, specifically Chapters 5, 8, 9, and 11.
- As always, the material in each chapter has been updated to reflect the current state of clinical research. Special attention has been paid to the growing body of evidence-based research and literature. A quick perusal of the references will verify the addition of hundreds of new professional articles.
- As in the past, we have worked to improve readability throughout the book and to provide the right mix of information for those getting their first taste of this field. Several professors and students have commented favorably on our attempt in previous editions to speak directly to the reader, and we have continued and expanded this practice.
- We have continued to provide evidence-based practices in concise, easy-to-read boxes within each chapter. This demonstrates our commitment to this practice begun in the previous edition. As with all the rest of the text, these boxes have been updated to reflect our best knowledge to date.
- Users of previous editions may be pleased to find that we have attempted in the Augmentative and Alternative Communication (AAC) chapter to shift the focus. In the past, this chapter has been primarily one that explains AAC rather than approaching the topic from the disorder orientation found in the other chapters. Some explanation is inherent in the topic, but it has been softened in the current edition.

- Each chapter has been reorganized so that chapter Learning Objectives are reflected in the organization of the chapter.
- In our ever-changing field, terminology is constantly in flux. We have updated each chapter to use the most up-to-date terms.
- Anatomy figures are now in color, and new medical photographs were added to Chapter 9.
- Thought Questions have been updated to generate critical thinking on a variety of concepts and techniques.

We hope that you'll agree with us that this is a more user-friendly and informative text than the previous editions. Please feel free to contact us with suggestions for further strengthening our work.

ACKNOWLEDGMENTS

Robert Owens

I am most deeply indebted to my co-author Kim Farinella, Ph.D., who is a dedicated professional and a tireless worker. Despite being a new mom and a fulltime faculty member, she has put in a herculean effort on this new edition. I am truly blessed to have had such an indefatigable co-author through this sometimes very trying task of producing a new edition. I can never acknowledge her contribution enough, but—from the bottom of my heart—thanks, Kim.

I would like to thank the faculty of the Department of Communication Sciences and Disorders and the entire faculty and administration at the College of St. Rose in Albany, New York. What a wonderful place to work and to call home. The college places a premium on scholarship, student education, professionalism, and a friendly and supportive workplace environment, and recognizes the importance of our field. I am indebted to all for making my new academic home welcoming and comfortable. I am especially thankful to President Carolyn Stefanco, School of Education Dean Margaret McLane, my chair Jim Feeney, and my colleagues in my department, fellow faculty members Dave DeBonis, Dierdre Muldoon, Jack Pickering, Anne Rowley, and Julia Unger, and fellow clinical faculty members Director of Clinical Education Jackie Klein, Robin Anderson, Elizabeth Baird, Nina Benway, Marisa Bryant, Sarah Coons, Jessica Evans, Colleen Fluman, Elaine Galbraith, Julie Hart, Barbara Hoffman, Melissa Spring, and Lynn Stephens. You have all made me feel welcomed and valued.

I would be remiss if I did not acknowledge the continuing love and support I receive from my best buddy Addie Haas. She was with us in the first and second editions and continues to be a source of inspiration.

Finally, my most personal thanks and love goes to my spouse and partner, who supported and encouraged me and truly makes my life fulfilling and happy. I'm looking forward to our life together.

Kimberly Farinella

I want to thank Dr. Bob Owens for continuing to include me as a co-author on this textbook. It is an honor to work alongside one of my favorite former professors and mentors. His course was my first introduction to the field of speech-language pathology over 20 years ago. I continue to be inspired by this great man, and hope to have the same positive influence on my students.

I want to thank my former student, Niki Knight, for recruiting her dad, Steven R. Knight, CRNA APRN to take medical photographs for us for over a year, which he provided for use in the current edition of this textbook. I am forever grateful for the amount of time and effort that Mr. Knight devoted to helping us make this edition more clinically useful.

I would also like to thank my dear friend, Margo Zelenski, and the Mayo Clinic in Scottsdale, Arizona for contributing the swallowing videos to us for use in this edition. I'm also grateful to the clients and their families who were willing to share their audio and video samples with us so that students can learn from them.

I want to thank the Pearson editorial management team, specifically, Julie Peters, Carolyn Schweitzer, Shiela Quisel, and Faraz Sharique Ali, who worked closely with us to make this edition stellar. Thank you also to Jon Theiss for editing the audio and video samples.

Finally, I want to thank my husband, Tom, for his love and support of me and our family, and his willingness to be a full-time daddy so that I could work and complete this project. It has been quite an experience and I'm enjoying every minute.

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Introduction to Communication Disorders

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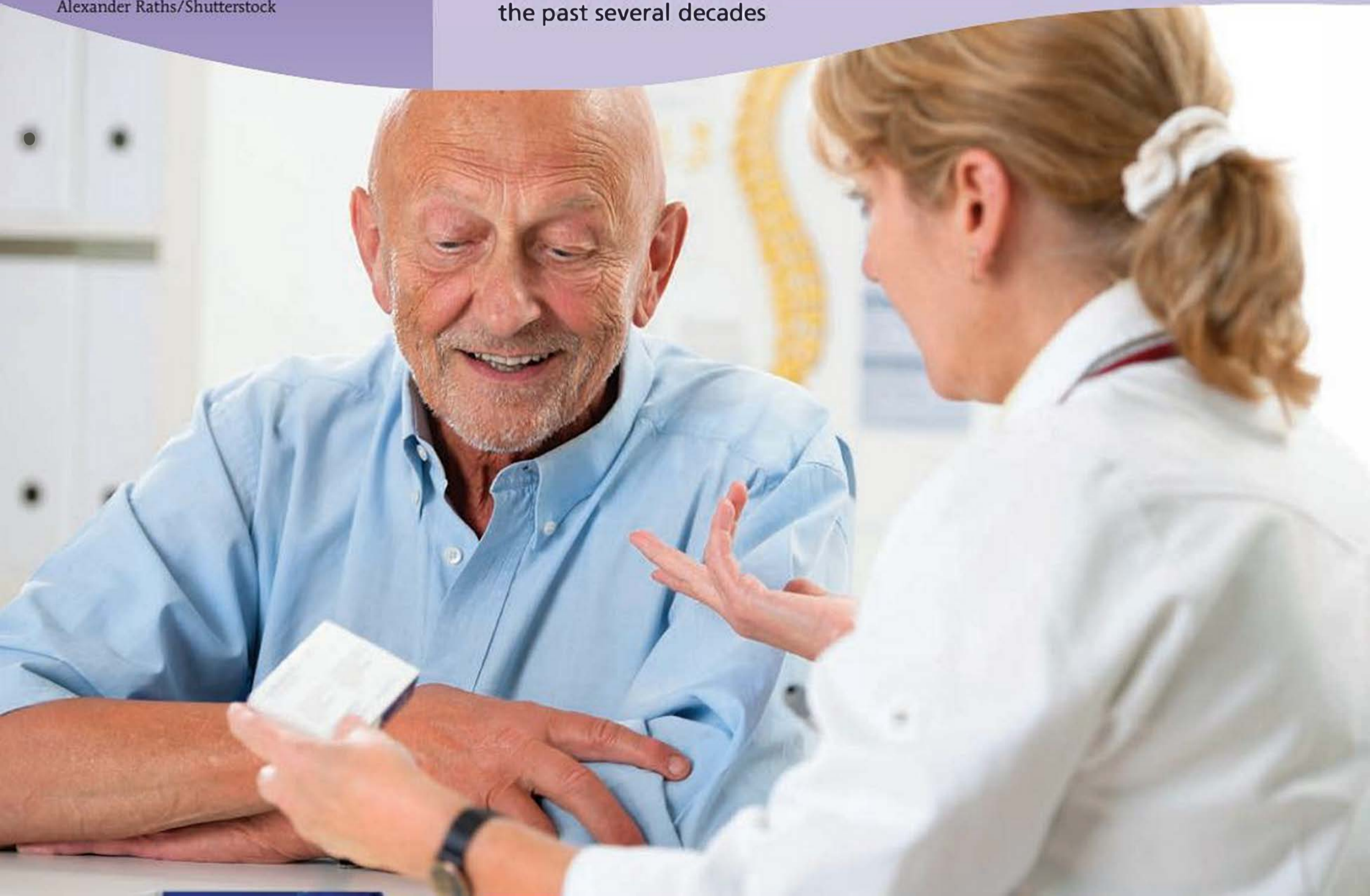
The Field, the Professionals, and the Clients

LEARNING OUTCOMES

When you have finished this chapter, you should be able to:

- Describe communication disorders
- Discuss the roles of audiologists, speech-language pathologists, and speech, language, and hearing scientists
- Explain how intervention services change through the lifespan
- Describe how evidence-based practice (EBP) influences clinical decisions
- Outline the history of changing attitudes toward individuals with communication disabilities over the centuries and legislation over the past several decades

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Can you imagine life without communication? No talking, no listening, no interacting with others? Communication is part of what makes us human. Even minor or temporary problems with communication, such as temporary laryngitis, are often frustrating. Imagine problems with eating and swallowing. We've all experienced the temporary inconvenience of trying to eat with a sore throat. What would life be like if these problems were more lasting?

Valery has loved baseball for as long as she can remember. She got it from her dad, a devoted Yankees fan. She loves to watch it and talk about it, but most of all she loves playing it. Unfortunately, she now believes because of her head injury in an auto accident that she'll never be able to even express how much she misses it. Even so, today may be momentous. Her speech-language pathologist (SLP), Pam, plans to introduce Valery to an assistive technology device that has a speech generator. Who knows what we'll hear from Valery next?

Valery is just one of millions of people who face daily communication challenges. We hope through this text to explore these challenges to communication, as well as to feeding and swallowing.

In this first chapter, we'll introduce this topic and the professionals who work with individuals who have communication and feeding and swallowing challenges. These highly trained professionals are called audiologists, speech-language pathologists, or speech/language scientists. We'll explore their roles and explain the need for evidence-based practice (EBP) and why it's important to intervention. EBP is one of the bases of this text. In addition, this first chapter provides a historical perspective and outlines the laws that mandate appropriate care for those in need. Finally, along the way, we'll explore why people choose these careers.

In the remainder of the text, we'll begin with some background material so we have a similar understanding of what comes next. We take a **holistic** approach to diagnosis and treatment of people with communicative impairments and examine the sometimes perplexing contrast between "typical" and "impaired." There are separate chapters that discuss speech characteristics such as voice, fluency, and phonology. We also provide chapters that are organized on the basis of etiology, such as neurogenic and craniofacial disorders. Within each chapter, we examine the interconnectedness of age, time of onset, social and cultural factors, and cause of the presenting disorder, and we describe evidence-based assessment and treatment practices. We recognize that it's common for an individual who demonstrates difficulties with one aspect of communication to be affected in other areas as well.

Why does someone decide to become a speech-language pathologist (SLP) or audiologist? It is mostly because of the satisfaction this person receives from helping others to live a fuller life. Many—maybe even you—first became interested through a personal or family encounter with a communication disorder or through work or volunteer experience with individuals having communication disorders. SLPs and audiologists may also have chosen their careers because they want to be useful to society, to contribute to the general good.

COMMUNICATION DISORDERS

We've mentioned communication disorders, but we haven't been very specific. It's always good to agree on our topic in any type of communication, so let's begin here.

A **communication disorder** impairs the ability to both receive and send, and also process and comprehend concepts or verbal, nonverbal, and graphic information. A communication disorder may affect hearing, language, and/or speech processes; may range from mild to profound severity; and may be developmental or acquired. One or a combination of communication disorders may be presented by an individual, and may result in a primary disability or may be secondary to other disabilities.

That's a lot. In short, a communication disorder may affect any and all aspects of communication, even gesturing. A communication disorder may affect hearing, language (the code we use to communicate), and/or speech (our primary mode or manner of communication). This is reflected in the American Speech-Language-Hearing Association's (ASHA) name. (The Appendix describes ASHA's professional role in more detail.) Although they work primarily with people having communication disorders, SLPs are not limited to just speech and language. As mentioned, SLPs are involved in feeding and swallowing disorders and non-speech (called *nonverbal*) forms of communication

A **speech disorder** may be evident in the atypical production of speech sounds, interruption in the flow of speaking, or abnormal production and/or absences of voice quality, including pitch, loudness, resonance, and/or duration. For example, when you had laryngitis your voice was temporarily affected. A **language disorder**, in contrast, is an impairment in comprehension and/or use of spoken, written, and/or other symbol systems, such as English. Finally, a **hearing disorder** is a result of impaired sensitivity of the auditory or hearing system. No doubt you've heard individuals referred to as deaf or hard of hearing. In addition, auditory impairment may include **central auditory processing disorders**, or deficits in the processing of information from audible signals.

It's appropriate to note here that communication disorders do not include communication differences, such as dialectal differences or speaking another language. If you've been to a country where you don't speak the language well, you know that this definitely can impede communication. While these differences may lead to communication difficulties, they are differences, not disorders, and cannot be treated by SLPs as if they are.

Another communication variation is **augmentative/alternative communication** systems. Far from being communication impairments, these systems, whether signing or the use of digital methods, are attempts often taught by SLPs to compensate and facilitate, on a temporary or permanent basis, for impaired or disabled communication disorders.

Finally, we would be remiss if we didn't at least note that an SLP's responsibility also extends to feeding and swallowing disorders. These vary from the preterm infant with a weak sucking response to the adult patient recovering from a stroke and slowly regaining the motor control needed to chew and swallow easily.

As you can see, communication and feeding and swallowing disorders cover a wide range of problems with varying severities and are related to several other disorders. Our purpose in preparing this text is to help you understand and appreciate the many varied disorders that are the charge of the SLP and audiologist.

Maybe a few pages ago you had some vague recollection of an SLP in your elementary school who mostly worked with children correcting their production of difficult speech sounds. That's part of disordered communication, but it's only a small part, as you are about to find out.

Opportunities for SLPs and audiologists include serving individuals of all ages from infancy through the aged with varied disorders, from mild to profound, in a wide assortment of settings.

THE PROFESSIONALS AND THEIR ROLES

Today, professionals who serve individuals with communication disorders come from several disciplines. They often refer clients to one another or work together in teams to provide optimal care. Specialists in communication disorders are employed in early intervention programs, preschools, schools, colleges and universities, hospitals, independent clinics, nursing care facilities, research laboratories, and home-based programs. Many are in private practice. Although it is still in its infancy, **telepractice**—provision of language assessment and intervention via the Internet—is slowly expanding, especially in underserved geographical areas (Waite et al., 2010).

Audiologists

Audiologists are specialists who measure hearing ability and identify, assess, manage, and prevent disorders of hearing and balance. They use a variety of technologies to measure and appraise hearing in people from infancy through old age. Although they work in educational settings to improve communication and programming for people with hearing disabilities, audiologists also contribute to the prevention of hearing loss by recommending and fitting protective devices and by consulting with government and industry on the detrimental effects and management of environmental noise. In addition, audiologists evaluate and assist individuals with **auditory processing disorders (APD)**, sometimes called central auditory processing disorders. They also select, fit, and dispense hearing aids and other amplification devices and provide guidance in their care and use (DeBonis & Moncrieff, 2008). Licensed audiologists are independent professionals who practice without a prescription from any other health care provider (ASHA, 2001b). Box 1.1 contains an audiologist's comments on some of the challenges and rewards of the profession. As you will note, being a good detective, or problem solver, is one of the skills that is needed. Websites of interest are found at the end of the chapter.

Credentials for Audiologists

At the present time, the educational requirement for an audiologist is 3 to 5 years of professional education beyond the bachelor's degree. An audiologist's studies will culminate in a doctoral degree that may be an audiology doctorate (AuD) or a doctor of philosophy degree (PhD) or doctor of education degree (EdD) in audiology.

After a person has earned a doctorate, obtained the required preprofessional as well as paid clinical experience, and passed a national examination, she or he is eligible for the Certificate of Clinical Competence in Audiology (CCC-A) awarded by ASHA. The ASHA CCC-A (sometimes referred to as ASHA "Cs") is the

BOX 1.1 | An Audiologist Reflects

I chose to become an audiologist because I enjoyed the challenge. Most clients come in and are frightened or apprehensive. I try to set them at ease while I explain each test I will perform. At each step, I try to bring the client along and make sure that he or she understands what I will be doing and why. Children are often the biggest challenge and sometimes refuse to cooperate. This is when I have to be at my best. If I confirm the presence of a hearing loss, then my task becomes one of counseling and referral. It takes time to walk a client

through the results and the possibilities. Older clients are often not willing initially to accept a diagnosis of hearing loss. Counseling is very important, especially for family members. It is all too easy for family members to adopt an “I told you so” attitude, but we must be sensitive to the needs of the client with the loss who will need time to adjust to his or her now-diagnosed disorder. It is this detective work and the counseling that give me satisfaction and motivate me to come to work every day.

generally accepted standard for most employment opportunities for audiologists in the United States. In addition, states require audiologists to obtain a state license. The requirements for state licensure tend to be the same as or similar to the ASHA standards (ASHA, 2001b, 2001c).

You can further explore a career in audiology at three websites. The Acoustical Society of America (<http://asa.aip.org>) has materials of special interest to hearing scientists and audiologists. The American Academy of Audiology (www.audiology.org) provides consumer and professional information regarding hearing and balance disorders as well as audiological services. Finally, ASHA (www.asha.org) provides information for professionals, students, and others who are interested in careers in audiology or hearing science. Simply click on “Careers” in the upper-left corner of the website.

Speech-Language Pathologists

Speech-language pathologists (SLPs) are professionals who provide an assortment of services related to communicative disorders. The distinguishing role of an SLP is to identify, assess, treat, and prevent communication disorders in all modalities (including spoken, written, pictorial, and manual), both receptively and expressively. This includes attention to physiological, cognitive, and social aspects of communication. SLPs also provide services for disorders of swallowing and may work with individuals who choose to modify a regional or foreign dialect. Like audiologists, licensed SLPs are independent professionals who practice without a prescription from any other health care provider (ASHA, 2000a, 2000b, 2000c). Box 1.2 contains reflections by two SLPs; the first one has been in private practice as a clinician for over 25 years. Although sometimes frustrated by the lack of support in his work setting, he believes in setting his imagination free and not giving up in the challenge to help others.

BOX 1.2 | A Speech-Language Pathologist Reflects

For me, the exciting part of my job is the problem solving and the satisfaction of helping others. Similar to a fictional detective who collects all the clues, synthesizes the information, and deduces the guilty party, I evaluate each client and determine the best course of intervention. The more severe the impairment, the greater the challenge, and I love a challenge. How can I help a young man who attempted suicide, and is now brain injured, to access the language within him? How can a young child with autism begin the road through communication to

language? How can I help parents communicate with their infant who has deafness, blindness, and cerebral palsy? When is the best time to introduce signing with a nonspeaking client? These are all challenges for me and the children and adults I serve. We work together as I try to solve each communication puzzle and propose and implement possible intervention strategies. Sometimes I'm very successful and sometimes I have to reevaluate my methods, but as I said, I love a challenge.

Credentials for Speech-Language Pathologists

With technology, the task of an SLP is changing. Technologies for digital speech recording and analysis are now readily available, as are new and exciting assistive technologies for those with great difficulty communicating via speech (Ingram et al., 2004). SLPs have a master's or doctoral degree and have studied typical communication and swallowing development; anatomy and physiology of the speech, swallowing, and hearing mechanisms; phonetics; speech and hearing science; and disorders of speech, language, and swallowing.

Three types of credentials are available for SLPs:

1. Public school certification normally stipulates basic and advanced coursework, clinical practice within a school setting, and a satisfactory score on a state or national examination. At the least, prospective school SLPs need a bachelor's degree, although in most states, a master's degree either is the entry-level requirement or is mandated after a certain number of years of employment. The exact requirements to become a school SLP vary from state to state. ASHA encourages the same standards for SLPs in all employment settings, as described in the following paragraph.
2. ASHA issues a Certificate of Clinical Competence in Speech-Language Pathology (CCC-SLP) to an individual who has obtained a master's degree or doctorate in the field, completed a monitored clinical fellowship year, and successfully passed a national qualifying examination. Ongoing professional development must be demonstrated through a variety of continuing education options. Since 2004, the United States, the United Kingdom, Australia, and Canada have allowed mutual recognition of certification in speech-language pathology (Boswell, 2004).
3. Individual states have licensure laws for SLPs that are usually independent of the state's department of education school certification requirements. A license may be needed if you plan to engage in private practice or work in a hospital, clinic, public school, or other setting. Most states accept a person with a ASHA CCC-SLP as having met licensure requirements, although you will need to check with your state licensing board on the specifics.

Table 1.1 shows the credentials that are needed in the professions of audiology and speech-language pathology. These are also found on the ASHA website.

If you want to further explore a career in speech-language pathology, check out the ASHA website (www.asha.org). You'll find a wealth of information, as well as discussion of various disorders that affect children and adults who may benefit from the help of a SLP. Type in the disorder you wish to explore in the search box in the upper right of the website. If you wish to read about a career as a SLP, click on "Careers" at the top left of the website.



Thought Question 1.1

Were you surprised by the scope of possible intervention for SLPs and audiologists? Did you begin reading thinking only of speech and hearing? What surprised you the most, and why?

Speech, Language, and Hearing Scientists

Individuals who are employed as speech, language, or hearing scientists typically have earned a doctorate degree, either a PhD or an EdD. They are employed by universities, government agencies, industry, and research centers to extend our knowledge of human communication processes and disorders. Some may also serve as clinical SLPs or audiologists.

What Speech, Language, and Hearing Scientists Do

Speech scientists may be involved in basic research exploring the anatomy, physiology, and physics of speech-sound production. Using various technologies, these researchers strive to learn more about typical and pathological communication. Their findings help clinicians improve service to clients with speech disorders. Recent advances in knowledge of human genetics provide fertile soil for continuing investigation into the causes, prevention, and treatment of various speech impairments. Some speech scientists are involved in the development of computer-generated speech that may be used in telephone answering systems, substitute voices for individuals who are unable to speak, and fulfill many new purposes. Box 1.3 contains some observations by a speech-language scientist who enjoys the interdisciplinary nature of his work.

The professions of speech-language pathology and audiology require lifelong learning. Clinicians need to be able to intelligently use relevant research findings in their practice.

TABLE 1.1

Credentials for speech-language pathologists and audiologists

Credentialing Organization	Speech-Language Pathologist	Audiologist
American Speech-Language-Hearing Association (ASHA)	Certificate of Clinical Competence in Speech-Language Pathology (CCC-SLP)	Certificate of Clinical Competence in Audiology (CCC-A)
State department of education	Certification as teacher of students with speech and language disabilities*	—
State professional licensing board	License as speech-language pathologist	License as audiologist

*The title for the school-based speech-language pathologist varies from state to state.

BOX 1.3 | A Speech-Language Scientist Reflects

I work as a speech scientist and college professor specializing in voice science. In this profession I'm able to combine my love of communication with my interest in biology. As a student I hadn't realized the possibilities that would be open to me in this profession. I instruct students in the structure and functioning of the speech mechanism and in voice disorders. In the clinic, I use instrumentation to

measure different parameters of voice. This enables me to objectify my diagnosis and provide accurate measurement of speech changes that may result from any number of disorders as varied as laryngeal cancer and neuromuscular dysfunction. I also work with transgender clients, helping them adopt a new voice. I love my work because it combines science and technology with speech-language pathology.

Language scientists may investigate the ways in which children learn their native tongue. They may study the differences and similarities of different languages. Over the past half a century or so, the United States has become increasingly linguistically and culturally diverse; this provides an excellent opportunity for cross-cultural study of language and communication. Some language scientists explore the variations of modern-day English (dialects) and how the language is changing. Others are concerned with language disabilities and study the nature of language disorders in children and adults. An in-depth knowledge of typical language is critical to understanding language problems.

Hearing scientists investigate the nature of sound, noise, and hearing. They may work with other scientists in the development of equipment to be used in the assessment of hearing. They are also involved in the development of techniques for testing the hard-to-test, such as infants and those with severe physical or psychological impairments. Hearing scientists develop and improve assistive listening devices such as hearing aids and telephone amplifiers to help people who have limited hearing. In addition, hearing scientists are concerned with conservation of hearing and are engaged in research to measure and limit the impact of environmental noise.

It's never too early to think about graduate school. Whether you eventually choose to become an audiologist, an SLP, or a speech, language, or hearing scientist, you will need advanced training. Consider cost, location, faculty, and practicum opportunities. Two websites can be helpful. The ASHA site (www.asha.org) lists graduate programs. Click on "Careers" to explore further. The Peterson's Guide site (www.petersons.com) can assist you with helpful advice about graduate school and a student planner. Type "speech-language pathology," "audiology," or "speech, language, or hearing science" in the *Find the School of Scholarship That's Right for You* box in the middle of the opening section of the website.

Related Professions: A Team Approach

Specialists in communication disorders do not operate in a vacuum. They work closely with family members, regular and special educators, psychologists, social workers, doctors and other medical personnel, and occupational, physical, and music therapists. They may collaborate with physicists and engineers. Box 1.4 contains a SLP's schedule, showing a tremendous amount of teamwork.

BOX 1.4 | A Team Approach

Alicia is the senior speech-language pathologist in a community-based rehabilitation center in New York State. During the mornings, Alicia works with infants, preschoolers, and school-age children at the center. In the afternoons, she directs the Augmentative/Alternative Communication Program and assists severely impaired individuals of all ages to improve their communication abilities. The schedule outlined below has a bit more collaboration than is normally found in any one day, but it suggests the kinds of activities that are typical within a workweek.

8:30 A.M.	Education staff meeting for preschool children: classroom teacher, psychologist, social worker, occupational therapist, physical therapist.		
9:00	Preschool class activity: eight children ages 3–4, one classroom teacher, two aides.		
10:00	Individual half-hour therapy sessions with children in the preschool and school programs.		
11:30	Combined physical and speech therapy for Jeramy, age 4, diagnosed with spastic cerebral palsy; work with physical therapist.		
		noon	Lunch
		12:30 P.M.	Prepare for the afternoon.
		1:00	Consult with engineer on wheelchair switch for Lucretia, age 7, who is multiply disabled.
		1:30	Outpatient, David, aged 24, had been in a motorcycle accident and experiences some speech and language difficulties.
		3:00	Conference with Sally Brown, Bettina's foster mother, and Barbara Sloane, the social worker for the family.
		3:30	Communication Disorders Department meeting. Malcolm, an audiologist, reports on a 3-hour course he took on Saturday on cochlear implants.
		4:30	The workday is officially over, but Alicia stays until 5:00 to read the professional journal <i>Language, Speech, and Hearing Services in the Schools</i> , which arrived today. Alicia is especially interested in the article about using children's books in working with preschoolers, and photocopies it to share with other staff members.

SERVICE THROUGH THE LIFESPAN

This text mentions two things—lifespan and evidence-based practice—in the subtitle. Before we move on, let's discuss each one briefly and why it's important.

Individuals with communication and swallowing disorders may be of any age, and professionals address their needs from birth through old age. According to U.S. Census Bureau reports, 1 in 5 people has a disability. This translates into over 65 million people in the U.S. In general, the likelihood of having a disability increases as we age. Although the exact number of individuals in the United States who have speech, voice, and swallowing and/or language disorders is difficult to determine (ASHA, 2008), they are in the tens of millions.

The U.S. Census Bureau reports that about 2% of all children born in the United States have some existing disabling condition, and that hearing loss occurs