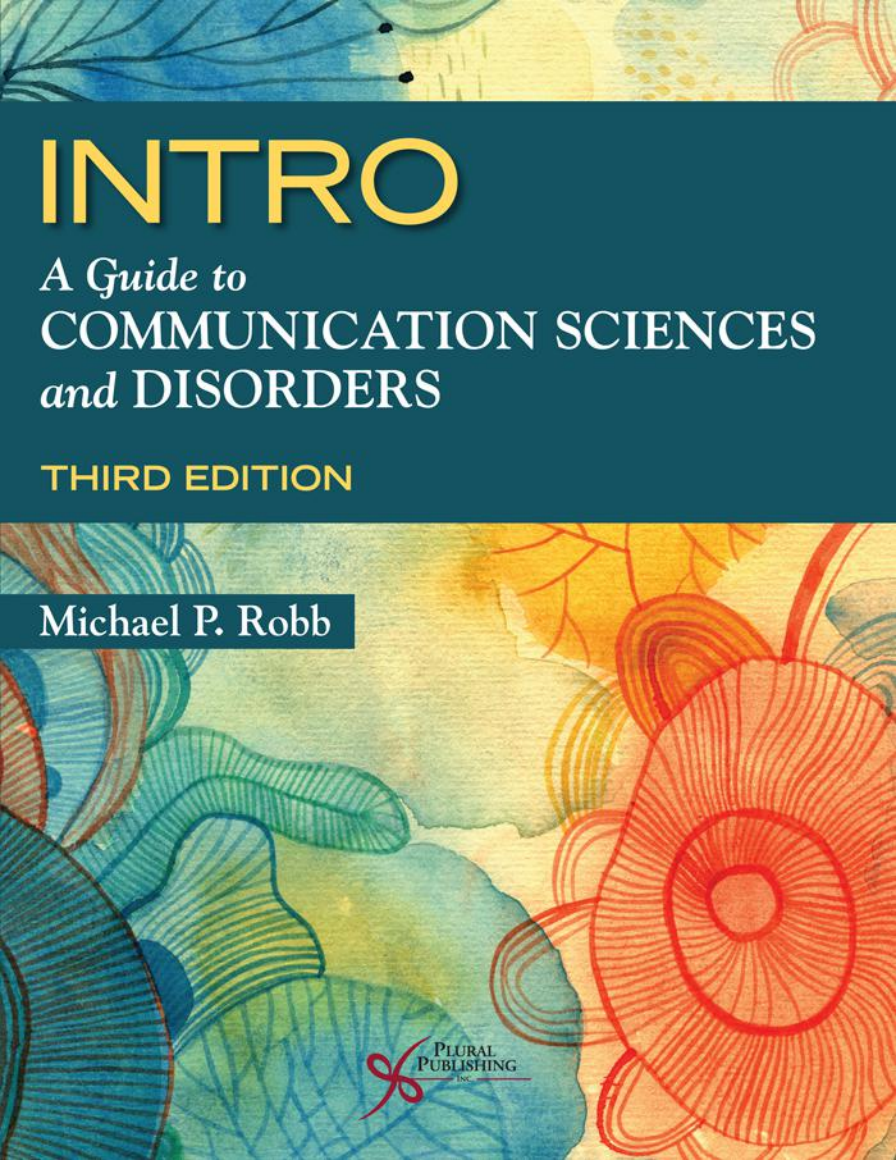
INTRO

A Guide to COMMUNICATION SCIENCES *and* DISORDERS

THIRD EDITION

Michael P. Robb



Plural Publishing Inc.

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5521 Ruffin Road
San Diego, CA 92123

e-mail: information@pluralpublishing.com
website: http://www.pluralpublishing.com

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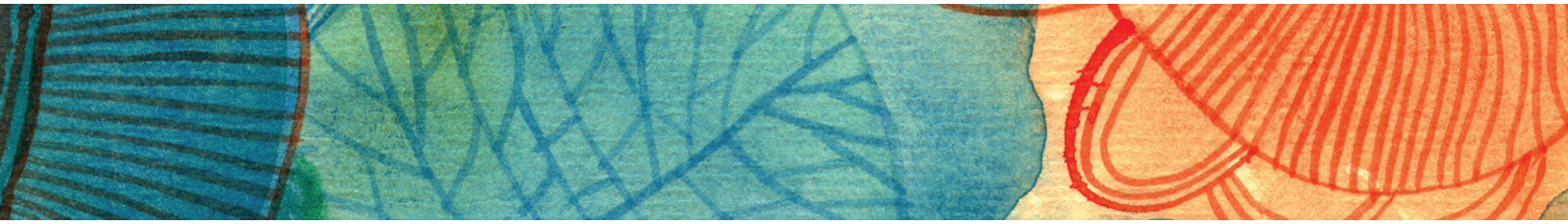

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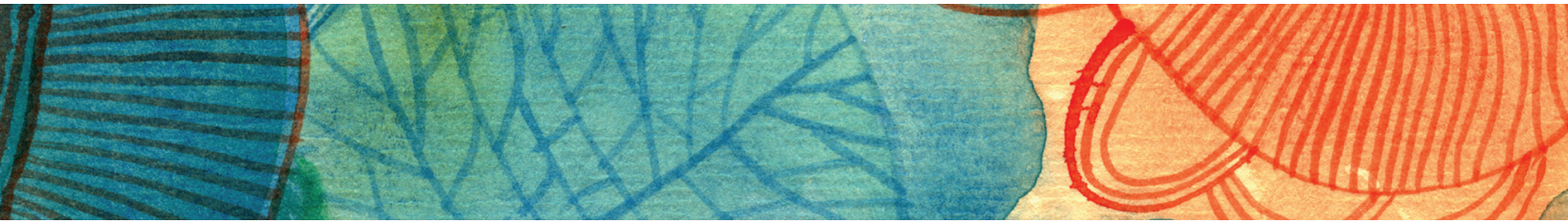
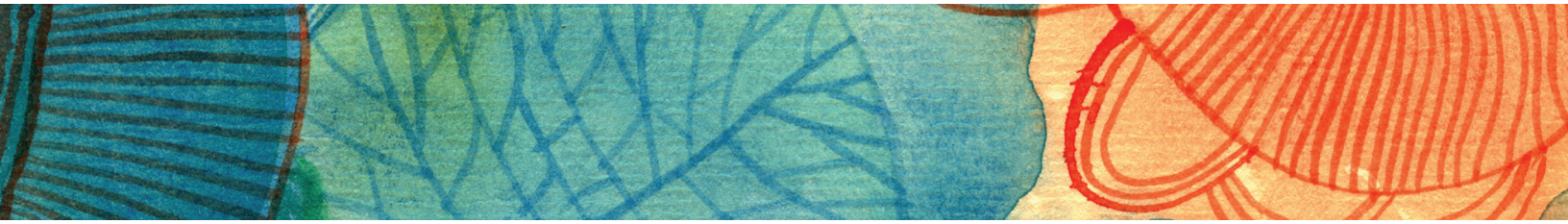


FOREWORD

What a pleasure it is to see the new edition of Professor Robb's *INTRO: A Guide to Communication Sciences and Disorders*. As someone who has taught the introductory course over many years and watched the incredible scientific and professional development of this field of study, I can vouch for this text as a comprehensive overview of Communication Sciences and Disorders. One of the several features that makes this text special is placing it within an international framework. Disorders of Communication have no national boundaries. Professor Robb has brought to the introductory student a broad and current understanding of the science that underlies the study of communication disorders, the nature of the various disorders that can occur, and the current best practices for their remediation. He brings the experience of his long career in this field at several distinguished academic programs throughout the United States and New Zealand to aid the beginning student in understanding and appreciating this important field of study. I have long appreciated his academic prowess and personal friendship.

John H. Saxman, PhD
Professor Emeritus
Speech-Language Pathology and Audiology
Teachers College, Columbia University
New York, New York



PREFACE

First released in 2010, ***INTRO*** is designed for the beginning university-level student who has an interest in entering the field of communication sciences and disorders, or for a student who may be interested in entering one of the companion health professions. As is the case for any book claiming to be *introductory*, the aim is to paint a picture for the student using broad strokes. This book provides straightforward and essential information concerning a wide range of communication disorders found in children and adults. The sole authorship of the book ensures a balanced writing style that is missing from existing introductory texts. Now in its 3rd edition, the book remains a core source of information for beginning students entering the profession of audiology or speech-language pathology.

The format of the 3rd edition is similar to earlier editions, but each chapter has been extensively updated. The 13 chapters are organized into four sections. Section 1 provides background information related to communication disorders. The chapters in this section cover the topics of communication science, the professions of audiology and speech-language pathology, and anatomy and physiology. Section 2 is concerned with developmental communication disorders, and includes chapters on child language disorders, child phonological disorders, fluency disorders, and cleft lip and palate. Section 3 covers acquired and genetic communication disorders. The chapters in this section describe voice disorders, neurogenic communication disorders, dysphagia, and genetic-based communication disorders. A new chapter dedicated to Augmentative and Alternative Communication is now included in Section 3. Section 4 addresses audition and contains chapters on hearing disorders and aural rehabilitation.

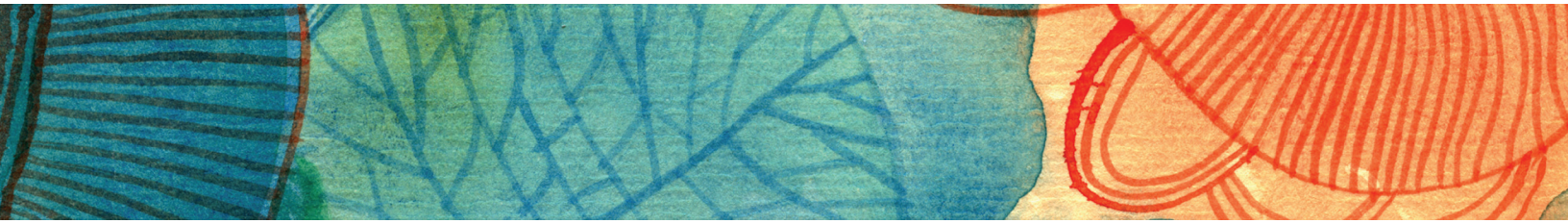
Unique aspects of the book include its use of an identical structure for each chapter to assist beginning students in grasping new vocabulary and concepts. Each chapter also provides a focus on "past and present." An introduction to each of the various disorders would not be complete without knowing some of the fascinating historical background surrounding each disorder, as well as current theories and research. In the years that have passed since the 2nd edition, there have been exciting research advancements in communication sciences and disorders. Each chapter highlights some of the very latest research findings.

The book holds worldwide appeal and is written for an international audience. A portion of each chapter is dedicated to cultural aspects of communication disorders, as well as prevalence information about various communication disorders as found in English-speaking countries around the world, including Australia, Canada, New Zealand, India, the United Kingdom, and the United States. The chapters include a series of FYIs (for you information), which present interesting and novel information about the particular topic area. A number of websites are listed at the end of the chapters that provide students with an opportunity to learn more about each topic. Many of these websites provide real-life examples in the form of video links.

INTRO is a clear and concise primer for students wishing to obtain fundamental information about the myriad of communication disorders that

occur across the lifespan. For some, this information will serve as a springboard for pursuit of a professional career in audiology or speech-language pathology. For others, my hope is that you will acquire an appreciation of the gift of communication that we so often take for granted.

—M. Robb



REVIEWERS

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Jane Bickford, BAppSc (SpPath), PhD, CPSP
Lecturer
Speech Pathology and Audiology
Flinders University
South Australia, Australia

Angela D. Haendel, PhD Candidate, CCC-SLP
Clinic Director & Assistant Professor
Speech-Language Pathology
Concordia University Wisconsin
Mequon, Wisconsin

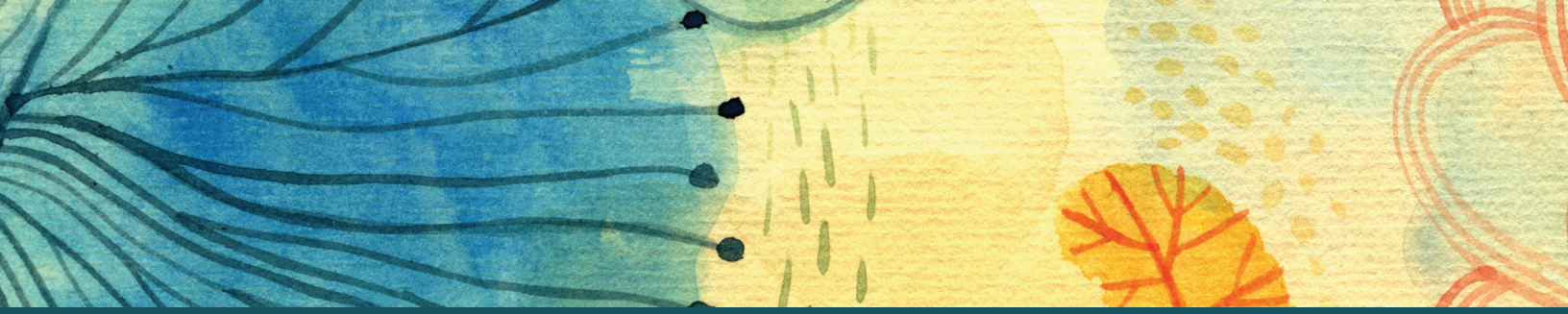
Melissa Johnson, PhD, CCC-SLP
Assistant Professor
Communication Sciences and Disorders
Nazareth College
Rochester, New York

Breanna Krueger, PhD CCC-SLP
Assistant Professor
Communication Disorders
University of Wyoming
Laramie, Wyoming

Lisa Rickard, AuD, CCC-A
Assistant Clinical Professor
Department of Hearing and Speech Sciences
University of Maryland
College Park, Maryland
Carmen Larimore Russell, PhD, CCC-SLP
Professor and Chairperson
Communication Disorders and Deaf Education
Fontbonne University
Saint Louis, Missouri

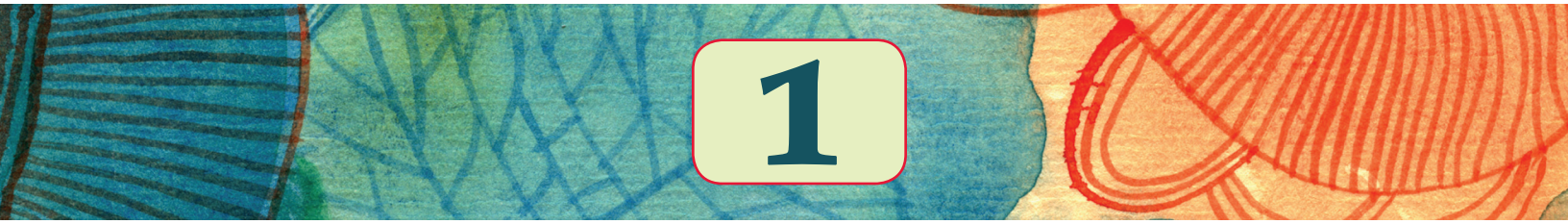
Mohammed Safi, PhD, CCC-SLP
Assistant Professor
College of Applied Medical Sciences
King Saud University
Riyadh, Saudi Arabia

To Jenne



SECTION 1

Background to Communication Sciences and Disorders



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COMMUNICATION DISORDERS AND THE PROFESSIONS

OBJECTIVES

After reading this chapter, the student should be able to:

- Recognize the different forms and types of communication.
- Demonstrate an understanding of the audiology and speech-language pathology professions.
- Describe the various work settings for audiologists and speech-language pathologists.
- Demonstrate an understanding of developmental and acquired communication disorders.
- Demonstrate an understanding of organic and functional communication disorders.
- Demonstrate an understanding of epidemiology, including prevalence and incidence.
- Demonstrate an understanding of the Code of Ethics.
- Describe cultural competency in audiology and speech-language pathology

INTRODUCTION

Communication is any act involving the exchange of information related to a person's needs, wants, perceptions, knowledge, or feelings. At birth we are equipped with the physical attributes to communicate. Our earliest forms of communication are quite basic and revolve around fundamental needs and desires between infant and caregiver. As we grow, we learn to communicate more effectively by observing other people communicating. We model our communication on what we see, hear, and experience. Our communication skills grow in complexity and sophistication through formal education, and by practicing those skills and having them evaluated.

Most of us take communication for granted. We tacitly assume that when we speak, we will be understood, or when someone speaks to us, we will understand them. Only when a breakdown in communication occurs do we realize how special and vital this act is to our daily lives. A **communication disorder** is a diagnosed condition in which a person is unable to say correctly what he or she wants to say and/or is unable to understand some or most of what is being said. Some individuals may have an isolated impairment in speech or hearing; others may have impairment in both domains. Simply stated, a communication disorder is any impairment in the exchange of information that deviates from what might be considered normal. The nature of the disorder may range from mild to severe. However, the impact of the disorder upon a person's ability to communicate may be profound, regardless of the severity. The focus of this book concerns situations when the process of speaking and listening is somehow impaired. A communication disorder is one of the most common types of disabilities found throughout the world. When communication fails, misunderstandings occur, and sometimes people become frustrated, worried, or even angry. Some communication impairments are minor and can be easily corrected, whereas others are more severe and may require an extensive period of treatment. This first chapter is intended to introduce the nature and type of communication disorders found across the lifespan—from children to adults. In addition, the professions dedicated to helping individuals with communication disorders are profiled.

The most widely used language in the world is Mandarin with more than 1.2 billon speakers. Next on the list is Spanish with more than 700 million speakers. English is the third most widely used language with 500 million speakers.

TERMINOLOGY AND DEFINITIONS

As a prerequisite to understanding various communication disorders, it is important to first have a grasp of normal communication. Knowledge concerning the normal process of communication serves as the foundation for the identification and management of communication disorders. The word **communicate** is related to the word **common**. The word has its origin in the Latin verb *communicare*, which means "to share" or "to make common." When we communicate, we make things common. Communication is one of those activities that we take for granted. It seems to occur naturally, and we spend the majority of our living hours engaged in some form of communication. Although we tend to think of communication as talking to someone, communication also occurs in other ways, like when we watch television or send a text message. We communicate to others by the way we dress, the style of our hair, and the tattoos we choose (or choose not) to wear. At a fundamental level, communication can be defined as a two-way process in which a message is sent and received. The sender's role in the process of communication is to generate (or **encode**) a message. The receiver's role is to translate (or **decode**) this message. Communication is never a one-way process. Both the sender and the receiver need to participate. If the sender is unable to clearly encode a message, then a breakdown in communication occurs. Similarly, if the receiver is unable to suc-

cessfully decode a message, then communication is likely to fail. Excellent communicators are those who have mastered the process of both sending and receiving messages. It is estimated that 75% of a person's day is spent communicating in some way. Most of our daily communication involves speaking and listening to others. The remaining portion of the day is spent communicating via reading and writing.

Verbal communication is at the core of what most of us do; it is the expression of language using spoken words. Our verbal communication varies depending on the particular communication act, as well as the formality of communication. Acts of verbal communication include: (1) discussion, (2) dialogue, and (3) debate. **Discussion** is an act of verbal communication to make decisions. Discussions are likely to involve the exchange of facts and opinions between communicating partners. **Dialogue** refers to the free-flowing conversational exchange of ideas. These ideas involve the sharing of perspectives and understandings. The act of **debate** differs from discussion and dialogue because this form of verbal communication is used to achieve agreement on a topic, which other participants of the communication may not share. We often think of debate as the verbal communication found in the political arena. One person states a point of view, which is subsequently challenged by an opposing view.

Verbal communication also varies in its formality. The level of formality can be found in the vocabulary and grammar characterizing spoken language. Formal verbal communication follows a specific code of communicating that might be found in settings such as classrooms, courtrooms, job interviews, or formal parties. Alternatively, informal communication also has a specific code of communication, but allows for a much varied manner of speaking. Situations such as hanging out with friends and informal parties are likely to reflect a markedly different form of speaking compared with more formal settings.

Nonverbal communication refers to the features of communication that occur aside from what is actually spoken or heard. There are at least six different types of nonverbal communication that we use and experience on a daily basis. These include: (1) paralanguage, (2) sign language, (3) body language, (4) tactile communication, (5) proxemics, and (6) appearance. **Paralanguage** refers to factors such as tone of voice, loudness, inflection, and pitch. By altering these various parameters of voice, the message conveyed is likewise altered. A simple example would be to communicate an identically worded message, such as "Watch your step," in a soft comforting voice versus a loud, alarming voice. A listener of this same message would likely interpret these messages quite differently.

Sign language is a form of expressive communication where words are replaced by gestures. Commonly used gestures include waving, pointing, and using fingers to indicate number amounts. There are also fully developed language systems that rely exclusively on signs, as are often found in the deaf community. This form of sign language is discussed further in Chapter 13.

Body language pertains to our use of facial expressions or postures to communicate information. Facial expressions are responsible for a huge proportion of nonverbal communication. One need simply smile or frown to communicate a clear nonverbal message. One way of concealing our communication via body language would be to put on a "poker face," which is a face that shows no emotion or change in expression. Expert card players are masters in the use of body language to prevent other card players from knowing the strength of their card hand.

Tactile communication refers to communication that occurs via touch. The use of touch can play a comforting role when paired with verbal communication such as consoling a grieving spouse. Use of touch between parent and child during the infancy period has also been shown to play an integral part in establishing social interaction. **Proxemics** concerns how space and time are used to communicate. A common example is our need for interpersonal space when communicating with others. The amount of personal space needed when having a casual conversation with another person usually varies between 18 inches and 4 feet. In contrast, the personal distance needed when speaking to a crowd of people is around 10 to 12 feet. Our **physical appearance** plays an important role in communication. Physical appearance such as clothes and hairstyle serves to convey a message regarding a person's attitude, mood, wealth, and cultural background, which subsequently affects the judgment and interpretations of others.

FYI

Before the development of speech, the most primitive form of human communication was likely to have been shouting. A group of primates would construe loud sounds as associated with danger.

FYI

The first vocalization produce by infants is a cry. Babies cry for various reasons: when they are uncomfortable, hurt, hungry, or for no reason at all. Researchers are now exploring whether the early crying of infants is language-specific. For example, do German babies cry differently than Chinese babies? If so, it would seem that babies are acquiring this ability prior to birth—in their mother's womb.

MODELS OF COMMUNICATION

The term **model** has a wide range of uses. It can refer to a type of product, a person who poses for photographers, or a miniature version of an object. From an academic standpoint, a model refers to an abstract idea. The **transmission model** of communication is an idea regarding the way in which humans communicate. This classic model was proposed by Claude Shannon and Warren Weaver (1949), who were electrical engineers working for Bell Telephone Laboratories in the United States. The essence of the model is that the successful transmission of a message requires both a sender and a receiver. A simplified version of the transmission model is shown in Figure 1–1. The model depicts the process of communication as one in which a person affects the behavior or state of mind of another person. If the effect was smaller or different from what was originally intended, than a failure in communication takes place. A modification of the transmission model was proposed

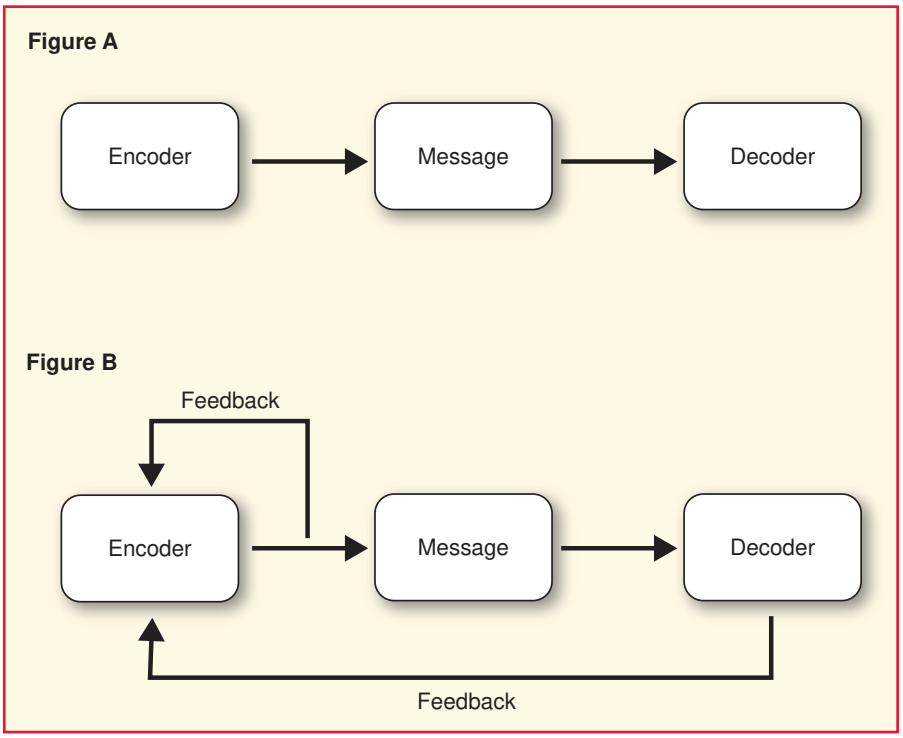


Figure 1–1. Models of communication. **A.** Classic transmission model of communication. **B.** Revised transmission model that includes feedback loops.

by Wilbur Schramm in 1954 through the inclusion of **feedback loops**. Feedback refers to the activity whereby information is sent back to the source from where the message came. As a reaction to this information, the speaker adjusts his or her message by strengthening, deemphasizing, or changing the content or form of the original message. The feedback can come from either the speaker or the listener. As speakers, we are constantly monitoring and evaluating our personal communication behavior. During the encoding of a message, we may revise our message mentally before actually speaking, or we may even choose to revise our message midstream to ensure the message is clearly presented. Feedback from the listener can take many shapes and forms. The listener may send nonverbal body language cues (e.g., eye contact, head nod) indicating that the message was understood, or the listener might simply state back to the original speaker that the message was not understood. The use of feedback is critical to the successful communication of messages. An example of the modified transmission model that includes feedback is shown in Figure 1–1.

A more detailed version of the transmission model was proposed by Denes and Pinson (1973) with particular reference to the linguistic and physiological contributions to speaking and listening. They referred to this model as the **speech chain** (Figure 1–2). According to the speech chain model, the process of encoding a message is organized across three levels: (1) linguistic (2) physiological, and (3) acoustic. The linguistic level is the first step in the speech chain, whereby the message is organized in the brain. It is the point in the chain where we think about speaking. Once we determine the message to be spoken, various motor nerves required to produce the sounds and

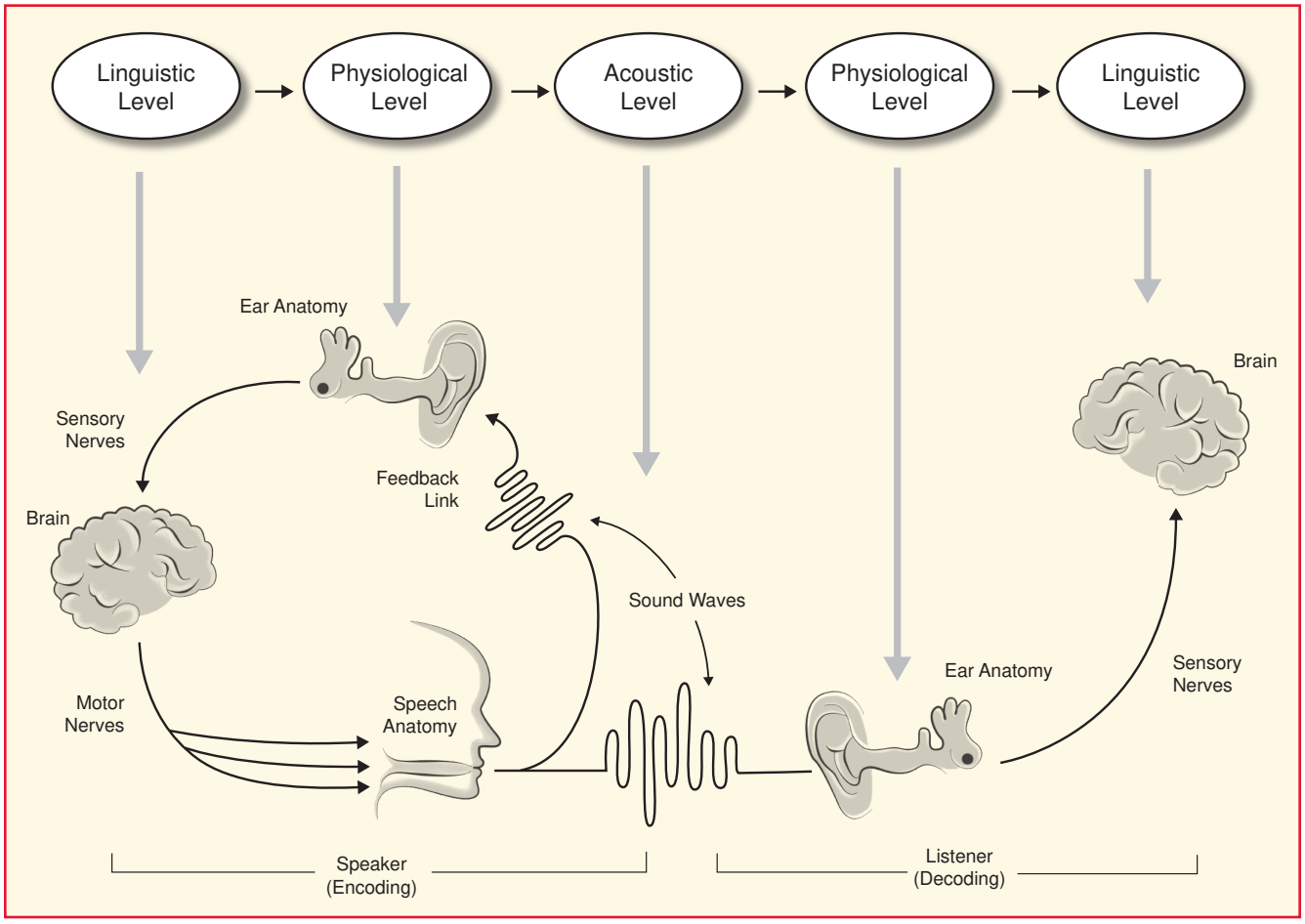


Figure 1–2. The process of communication depicted at linguistical, physiological, and acoustic levels.

words of the message send impulses from the brain to the speech musculature. Structures such as the lips, tongue, and jaw are set into motion. This physiological process represents the next link in the speech chain. Once these words leave our mouth, they become an airborne acoustic signal, thus representing the third and final link in the process (chain) of speech encoding. There is also a side, or ***feedback,*** link in the process of speech encoding. We naturally listen to our own voices when talking. By doing so, the message spoken is compared with what was originally intended to be spoken. An example of this type of feedback is evident when we produce a **spoonerism** (or slip-of-the-tongue). The phrase "mix up your words" spoken as "wix up your mords" is one such example. If we judge the message to be incorrectly spoken, the message can be modified and corrected The remaining links of the speech chain are related to the process of decoding.

The steps involved in decoding the message occur in the reverse order of those just described for speech encoding. When listening to a message, our ears are exposed to the acoustic signal after it leaves the mouth of the speaker. At a physiological level, the muscles, bones, and nerves of the ear transform this acoustic signal into electrical impulses along auditory (sensory) pathways leading to the brain. Once the sensory impulses reach the brain, they are deciphered into individual sounds, words, and sentences. This deciphering of the acoustic signal into a linguistic message represents the final link in the speech chain.

The speech chain model is useful to illustrate communication disorders. Any breakdown or disruption in the process of encoding that occurs along the pathway from the brain to the actual execution of speech can result in a communication disorder. Similarly, any breakdown in the decoding process between the ear and the brain can result in a communication disorder.

FYI

Many of the characters from the classic Looney Tunes cartoons were developed based on a speech pattern. Porky Pig produced speech with a stutter. daffy duck, Tweety Bird, and Elmer Fudd all produced speech with some form of unique articulation disorder.

Classification of Communication Disorders

Communication disorders can be grouped into two general categories. The first grouping is characterized by the timing of when the disorder first occurred. Specifically, did the disorder occur before or after birth? Any medical or health condition, including a communication disorder that occurs prior to birth, during birth, or shortly after birth, is referred to as a **developmental** or **congenital disorder**. An example of a developmental communication disorder is a child who is born with a cleft of the lip or palate (Figure 1–3). This cleft, if left unrepaired, can greatly impair speech production. The second grouping of communication disorders is characterized by a medical or health condition found to occur later in life (i.e., after birth); if that is the case, the disorder is referred to as an **acquired disorder**. Most often, an individual with an acquired communication disorder demonstrates normal communication prior to experiencing the disorder. An example of an acquired communication disorder is an individual who suffers a traumatic brain injury following a motor vehicle accident (see Figure 1–3). As a result of this accident, the individual may experience a marked impairment in the ability to produce or understand speech. Prior to the accident, the person's communication most likely was normal.

Communication disorders can also be classified by the cause (i.e., **etiology**) of the disorder. A medical or health condition with a known physical cause is called an **organic disorder**. In most cases, the physical condition is visible to the naked eye. Such is the case in a typical 7-year-old child who has lost her two front (central incisor) teeth. This condition is likely to pose a problem for the correct articulation of speech sounds that involve these physical structures (e.g., /s/ and /th/ sounds; Figure 1–4). An organic disorder, such as an impairment resulting from a brain abnormality (e.g., a stroke), can be invisible to the naked eye. If there is no known anatomical, physiological, or neurological basis for the observed disorder, the

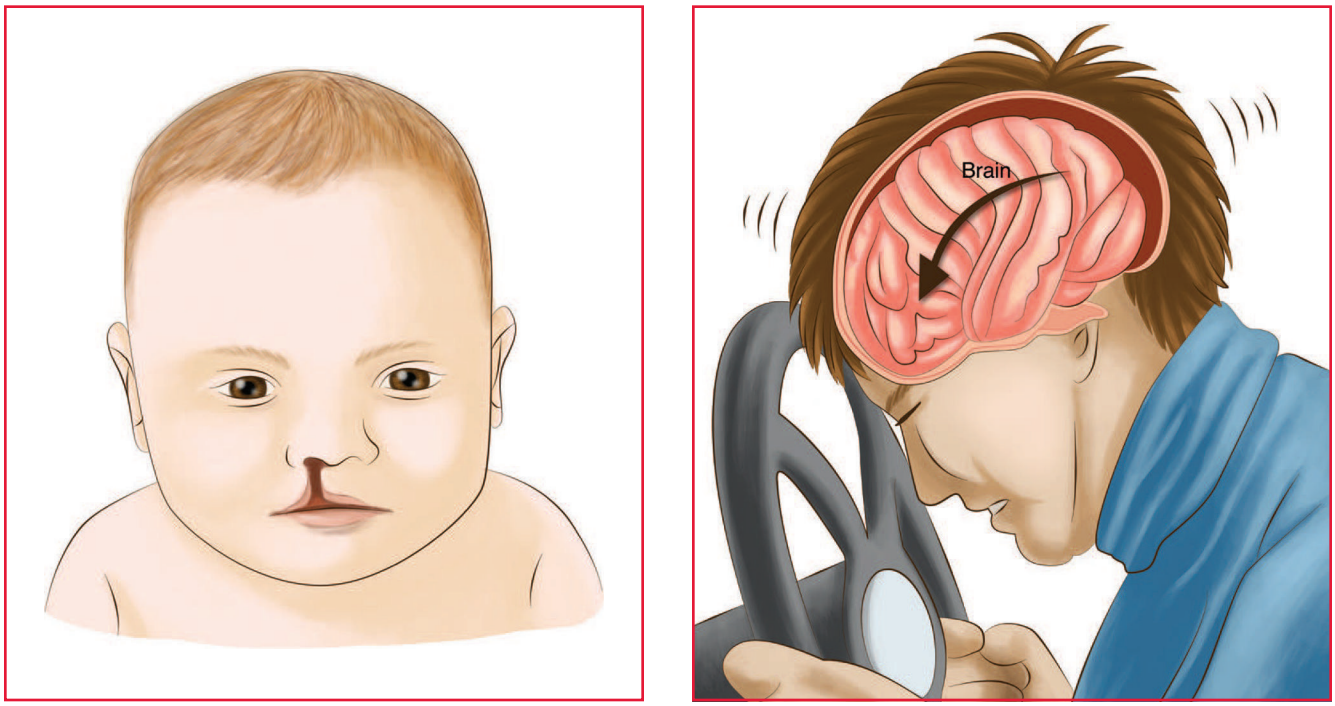


Figure 1–3. Examples of developmental and acquired communication disorders. **A.** Shows a child born with a cleft lip and palate. **B.** depicts an individual with a head injury resulting from a motor vehicle accident.

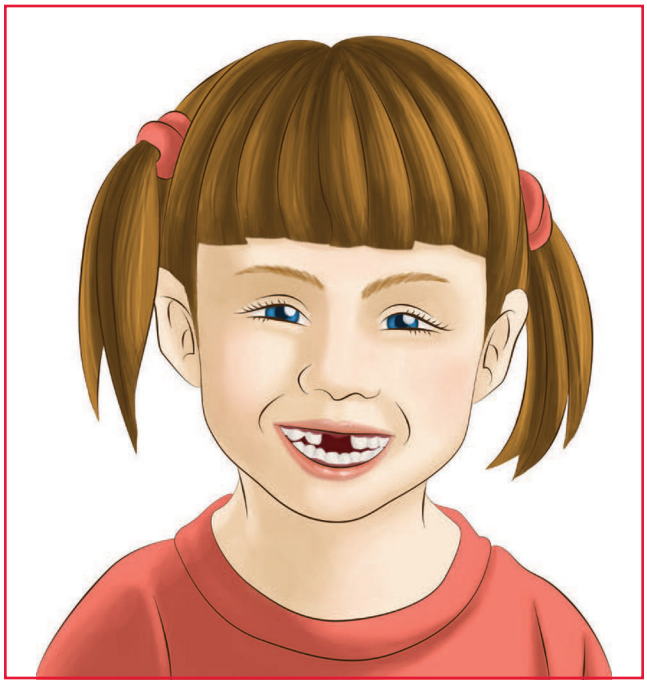


Figure 1–4. Example of an organic communication disorder found in most normally developing children. The absence of upper central incisors is likely to affect speech sound production, but only temporarily.

term **functional disorder** is used. A closely related term is **idiopathic**, which denotes a condition that has an unknown cause. School-age children who mispronounce speech sounds, such as "wabbit" for "rabbit," and who show no apparent physical problems would be classified as demonstrating a functional communication disorder. A number of communication disorders have no readily identifiable cause. Although we may not know the precise cause of these functional disorders, they still can be successfully treated. An illustration of the overlap of developmental and acquired disorders that have a functional or organic basis is shown in Figure 1–5. These terms can be used collectively to refer to communication disorders. The ensuing chapters categorize each type of communication disorder according to both the timing and cause of the disorder.

A final comment about classifying communication disorders relates to the way we may label a person who is demonstrating a disorder. In the past, it was common to reference the disorder (or label) first and the person second. For example, we might have referred to an individual as being

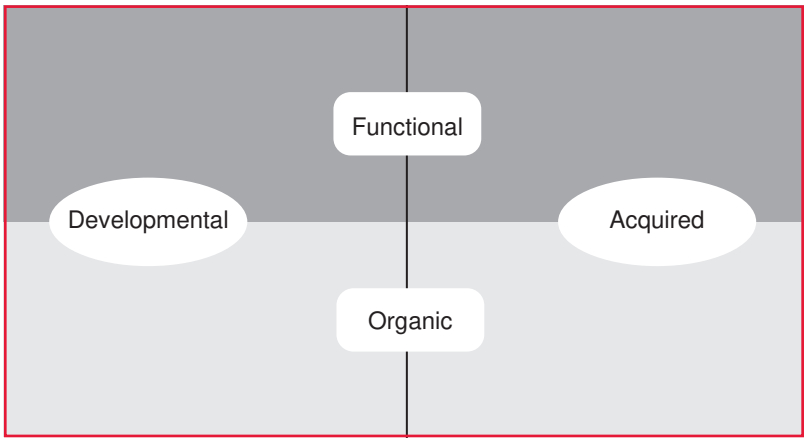


Figure 1–5. Categorization of communication disorders according to when the disorder occurred (developmental vs. acquired) and how the disorder occurred (functional vs. organic).

a "cleft palate child." In other instances, an individual was simply labeled by the disorder, where we referred to the person as a "stutterer." These days, the more appropriate manner of referring to a communication disorder is to recognize the person first and the disorder second. So as professionals in the field of communication disorders, we may encounter a child *with* a cleft palate or a person *who* stutters. Clearly, this form of labeling is not unique to communication disorders. In practice, placing the individual first should be applied when referring to any medical or health-related condition.

Occurrence of Communication Disorders

Epidemiology refers to the study of how often diseases and conditions occur in people and why. A common way of charting the occurrence of a disorder or disease is in reference to the overall population. **Prevalence** is a frequently used epidemiological measure of how commonly a disease or condition occurs in a population at a particular point in time. The prevalence is calculated by dividing the number of persons with the disease or condition at a particular time by the number of individuals examined. Prevalence often is expressed as a percentage. The **incidence** of a disease is another epidemiological measure. Incidence measures the rate of occurrence of new cases of a disease or condition, and is likewise expressed as a percentage. Incidence is calculated as the number of new cases of a disease or condition within a specified time period (usually 1 year) divided by the size of the population. So prevalence is a measure of all the cases of a disease at a point of time, and incidence is the measure of new cases of a disease in a time period. In the context of communication disorders, prevalence refers to the estimated population of people who are managing communication disorders at any given time, whereas incidence refers to the annual diagnosis rate of new cases of communication disorders.

Most epidemiology information on communication disorders relates to prevalence. Approximately one out of every seven individuals has some form of a communication disorder. This number encompasses disorders of either speech or hearing, ranging in severity from mild to profound. The prevalence of communication disorders in the United States is about 46 million people. Approximately 2.7 million Australians have a communication disorder. There are also prevalence data regarding certain types of communication disorders, which might be further categorized by age groups. Specific prevalence information for various communication disorders is presented in Chapters 3–12. Some types of communication disorders occur more often than others. For example, 2.5 million people in the United Kingdom are estimated to have speech and language disorders. Of this number, 800,000 have a disorder

so severe that it is difficult for most people to understand them. The worldwide prevalence of communication disorders in children is approximately 25% of the population, but decreases with increasing age. This lowering in prevalence presumably reflects a large number of children outgrowing or receiving treatment to alleviate the disorder.

Communication Disorders in Boys and Girls

A well-known fact is that boys tend to be more susceptible than girls for a large number of childhood diseases. This vulnerability is evident early in life, with male infants showing significantly higher rates of premature birth and congenital abnormalities than female infants. Developmental disorders such as autism are three to four times more common in boys than girls, and behavioral disorders are at least twice as common. The same is true for communication disorders. Take, for example, the condition of stuttering; boys are three times more likely to develop a stuttering disorder than girls. The precise reason why males are more prone to various health disorders remains unknown. Some genetics experts believe there probably is a biological difference that gives females a health advantage over males. One suggestion is that males are disadvantaged by not having the second X sex chromosome found in women. Having two X chromosomes may help to protect women against disease. This vulnerability is apparent in male mammals of all species, indicating a likely evolutionary explanation. It could well be that nature provides a health advantage to females because the survival of the species depends on them. Males simply may be more expendable than females!

THE PROFESSIONS

Speech-language pathology and audiology are health professions that collectively contribute to the field of human communication sciences and disorders. The profession of **speech-language pathology**, also referred to as speech-language therapy, encompasses the study of human communication, swallowing, speech and language development, and related disorders. The profession of **audiology** encompasses the study of human communication, normal processes of hearing, and hearing loss. A **speech-language pathologist** is a professional educated in the study of human communication, swallowing, speech-language development, and related disorders. By evaluating the speech, language, and swallowing skills of children and adults, the speech-language pathologist determines what communication or swallowing problems exist and the best way to treat them. An **audiologist** is a professional educated in the study of human communication, normal hearing processes, hearing loss, balance, and other related disorders. The audiologist determines whether a person has a hearing loss, the type of loss, and the best way to treat the loss. Speech-language pathology and audiology are distinct disciplines, but they have considerable overlap. To be fully skilled in either discipline, one should be familiar with both. Each discipline deals with impairments that disrupt the ability of the individual to communicate normally.

The audiology and speech-language pathology professions are found worldwide, but are not uniform across nations. A listing of some of the professional associations for audiologists and speech-language pathologists around the world is shown in Table 1–1. There are approximately 165,000 speech-language pathologists and 14,000 audiologists currently working in the United States. Approximately 7,000 speech-language pathologists and 2,500 audiologists work in Australia, and approximately 1,100 speech-language pathologists and 400 audiologists are found in New Zealand. The combined number of speech-language pathologists and audiologists currently practicing in Canada is 9,000. The

Most audiologists and speech-language pathologists engage in clinical practice. They often are referred to as **clinicians.** The people with communication disorders seen by these professionals are referred to as **clients.**

Table 1–1. Some of the Professional Associations in Audiology and Speech-Language Pathology

Australia	Audiological Society of Australia (ASA) Speech Pathology Australia (SPA)
Britain	British Academy of Audiology (BAA) British Society of Audiology (BSA) Royal College of Speech and Language Therapists (RCSLT)
Canada	Canadian Academy of Audiology (CAA) Speech-Language and Audiology Canada (SAC)
India	Indo-International Society of Communication and hearing Sciences (IISChS) Indian Speech and hearing Association (IShA)
Ireland	Irish Society of Audiology (ISA) Irish Association of Speech and Language Therapists (IASLT)
Malaysia	Malaysian Association of Speech-Language and hearing (MAShA)
New Zealand	New Zealand Audiological Society (NZAS) New Zealand Speech-Language Therapists Association (NZSTA)
Singapore	Speech-Language and hearing Association, Singapore (ShAS)
South Africa	South African Association of Audiologists (SAAA) South African Speech-Language-hearing Association (SASLhA)
United States of America	American Academy of Audiologists (AAA) American Speech-Language and hearing Association (AShA)

number of speech-language pathologists and audiologists in India is approaching 3,000. Both speech-language pathologists and audiologists are in high demand, and there are insufficient numbers to meet the demand, which is likely to increase because the number of people with communication disorders is predicted to grow. Members of the baby boomer generation are now entering their retirement years, and this large population is likely to contribute to an increase in the number of communication disorders that accompany old age. In addition, medical advances are resulting in improved survival rate for premature infants as well as for elderly stroke victims. The increase in survival rate will undoubtedly increase the number of individuals likely to require the services of a speech-language pathologist or audiologist.

A BRIEF HISTORY OF THE PROFESSIONS

The field of communication sciences and disorders has evolved over time. The first audiologists and speech-language pathologists were not given formal professional titles. They were researchers and teachers who took an interest in helping individuals with speaking and hearing difficulties. The foundation of the audiologist and speech-language pathologist professions was influenced by many disciplines, including biology, psychology, medicine, physics, linguistics, rhetoric, and education. A number of individuals contributed to the field, and some of the more noteworthy contributions are highlighted here.

John Thelwall (1764–1834) is recognized as a pioneering speech scientist and therapist in the United Kingdom (Figure 1–6). Thelwall was part of the Elocutionary Movement in the early 1800s, which stressed high standards of education and high standards in the use of language. Thelwall was well-known for giving radical political speeches. In addition to his oratory skills, he also published a number of works dealing with elocution, the acquisition of language, the anatomy of the speech organs, and the link between speech and mental illness. Thelwall noted that some children with speech defects respond better in therapy to a female rather than a male. He also was the first to classify speech disorders as being either natural (organic) or habitual (functional).

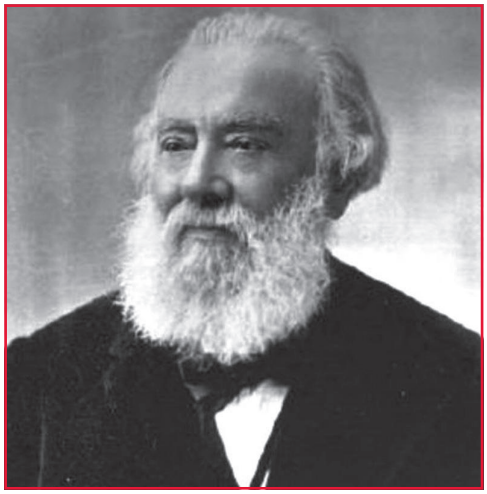
Alexander Melville Bell (1819–1905) and **Alexander Graham Bell** (1847–1922) were father and son who were both eminent English scientists and inventors. The family eventually settled in Canada and the United States. Although most people know of the contribution made by Graham Bell to the development of the first practical telephone, few know of the contributions made by his father. Melville spent the majority of his life assisting others with their speech, through formal elocution lessons or correction of speech disorders (Figure 1–7). His wife Eliza was severely hearing impaired, which influenced his own work as well as that of his son. Melville developed a transcriptional system known as **visible speech** that included drawings of the head and neck showing the physical movements behind the articulation of individual speech sounds. Following his father's death, Graham published the transcription system and taught it to teachers of the deaf.

Figure 1–6. John Thelwall, a pioneering speech scientist and orator.

Henry Sweet (1845–1912) was a pioneer in modern transcriptional phonetics (Figure 1–8). He was an Oxford graduate and studied speech through an interest in the English language. He developed the Broad Romic symbol system that eventually led to the International Phonetic Alphabet. He established England as the birthplace of the science of phonetics. The 1913 play *Pygmalion*, written by George Bernard Shaw, which later became the theatrical musical *My Fair Lady*, is thought to be based loosely on the life of Henry Sweet (aka Henry Higgins).

One person who contributed to the development of the professions in Germany was **Hermann Gutzmann** (1865–1922). He helped to establish the field of **logopedics**, which is the science and study of dealing with speech defects in children. Gutzmann studied speech disorders from a medical point of view. He went on to create the Berlin School for Speech and Voice Therapy. The services provided by the Berlin School attained worldwide acclaim. The term logopedics is still in use today. A well-known professional society for speech-language pathologists and audiologists is the International Association of Logopedics and Phoniatrics (IALP).

Wilhelm Wundt (1832–1920) was a German medical doctor, psychologist, physiologist, and professor who attended the Leipzig School in Germany (Figure 1–9). The Leipzig School was a research center in Germany that was responsible for training the first generation of psychologists. Sigmund Freud was influenced by the Leipzig School. The school also dabbled in techniques for quantitatively measuring aspects of hearing and speech. Upon graduation, Wundt remained at the Leipzig School and developed a psychology laboratory. He is widely regarded as the "Father of Experimental Psychology." In particular, he is credited with developing the science of psychophysics, which forms the basis for the testing of



A

PROFESSIONAL CARD.

Mr A. MELVILLE BELL, Author of 'Visible Speech' may be consulted in all Cases of Impediment or Defect of Speech, Vocal Weakness, Monotony, Oratorical Ineffectiveness, &c.

STAMMERING AND STUTTERING.

The experience of upwards of Twenty-five years' Practice enables Mr A. MELVILLE BELL to undertake the permanent, and, in most cases, the speedy Removal of Stammering and other forms of Vocal Impediment.

References of the highest class are furnished to inquirers.

A limited number of Pupils can be accommodated as Boarders; but residence in the Establishment is not required in order to effect a Cure.

DEFECTS OF ARTICULATION.

In cases of Lisping, Burring, and other Single Elementary Defects, the entire Removal of the Faculty Habit rarely needs more than from Six to Twelve Lessons.

Children who are backward in acquiring the power of Speech are trained to the perfect use of their Vocal Organs. Parents or Governesses are invited to be present at the Lessons, and are directed in the means of carrying on the improvement, which is always rapidly commenced.

ELOCUTION.—PRONUNCIATION, READING, DELIVERY AND ACTION.

Clergymen, Barristers, Members of Parliament, and other Public Readers and Speakers, are Privately Instructed in the Principles and Practice of Effective Delivery, Oratorical Composition, &c.

Ladies and Non-professional Pupils, receive Special Lessons in the art of Reading, &c., according to individual requirements.

VISIBLE SPEECH—UNIVERSAL ALPHABETICS.

Pupils are practically initiated in the Physiology of Speech, and in the use of the Universal Alphabet, so as to be enabled to produce, and to record, all varieties of Native or Foreign Sounds.

Dialectic peculiarities are corrected; and Foreigners are taught to pronounce English with the characteristics of vernacular utterance;

TERMS.

Single Lessons in any Department,	-	-	One Guinea.
Cure of Stammering, Stuttering, &c.,	- (Twelve Lessons,)	-	Ten Guineas.
Removal of Lisping, Burring, &c.,	- (Six Lessons,)	-	Four Guineas.
Elocution, Reading, Delivery, &c.,	- (Six Lessons,)	-	Three Guineas.
Visible Speech,—Vocal Physiology, &c.,	- (Six Lessons,)	-	Three Guineas.

The following additional Establishments for the Cure of Stammering and for Elocutionary Instruction are conducted (in Edinburgh) by Mr MELVILLE J. BELL; and (in Dublin) by Mr D. C. BELL.

Edinburgh: No. 13 South Charlotte Street.
Dublin: No. 1 Kildare Place.

B

Figure 1–7. **A.** Alexander Melville Bell. **B.** A copy of Bell's business (professional) card as published in his textbook *Visible Speech* in 1867.

Figure 1–8. Henry Sweet, an expert in phonetics (aka Henry Higgins).

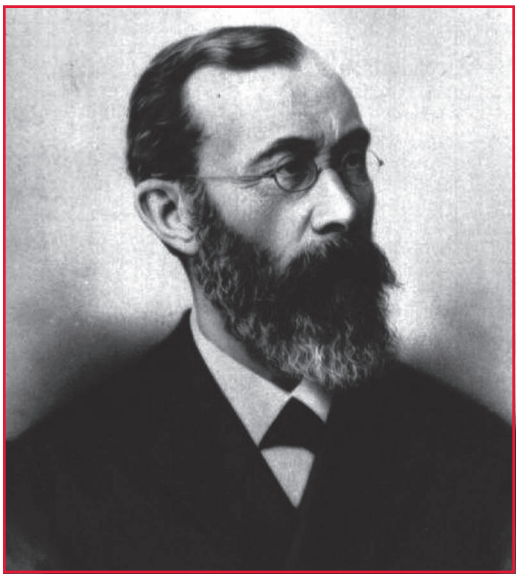


Figure 1–9. Wilhelm Wundt, known as the "Father of Experimental Psychology."

hearing. Some of Wundt's students were influential in the field of communication disorders.

Edward Wheeler Scripture (1864–1945) graduated from Leipzig in 1888 under the supervision of Wundt. He was an American who developed skills in hearing measurement such as threshold testing and magnitude estimation. Scripture eventually developed a psychology laboratory at Yale University and wrote a book comparing stuttering with lisping, or "super-energetic versus sub-energetic" speech production.

Carl Seashore (1866–1949), who was born in Sweden, traveled to America and studied under Scripture at Yale University (Figure 1–10). Seashore had interests in music, voice, and hearing. He built the first audiometer with the help of Scripture. He is also the individual who developed the concept of the decibel by separating loudness magnitude into units of 40 steps each. He later became the head of the psychology department at the University of Iowa.

In 1920, Seashore was approached by **Samuel Orton** (1879–1948), who was a physician interested in learning disabilities. Orton's daughter had difficulties in speaking and reading. He suggested to Seashore that someone should be specifically educated to work with individuals having these types of difficulties. Seashore selected the most promising student from the undergraduate psychology class at the University of Iowa and offered the chance to earn this specialized PhD to **Lee Edward Travis** (1896–1987; Figure 1–11). Travis received his PhD in 1924 and is recognized as the founding father of the speech-language pathology profession in the United States. Travis established himself as a particular expert in the area of stuttering and had many well-known students who went on to establish educational programs across the United States, including Charles Van Riper, who established the program at Western Michigan University, and Max Steer, who established the program at Purdue University.

Around the same time that Travis was completing his studies, **Sara Stinchfield Hawk** (1885–1977) was awarded a masters degree in 1920 from the department of psychology at the University of Iowa (Figure 1–12). Her thesis topic pertained to the area of stuttering. In 1922, Hawk became the first person in the United States to receive a PhD degree specifically designated in the area of speech pathology, awarded by the University of Wisconsin. Both Hawk and Travis were among the 25 founding members of the American Speech and Hearing Association established in 1925.

Raymond Carhart (1912–1975) is referred to by many as the "Father of Audiology" in the United States (Figure 1–13). He is credited with coining the word *audiology* to designate the science

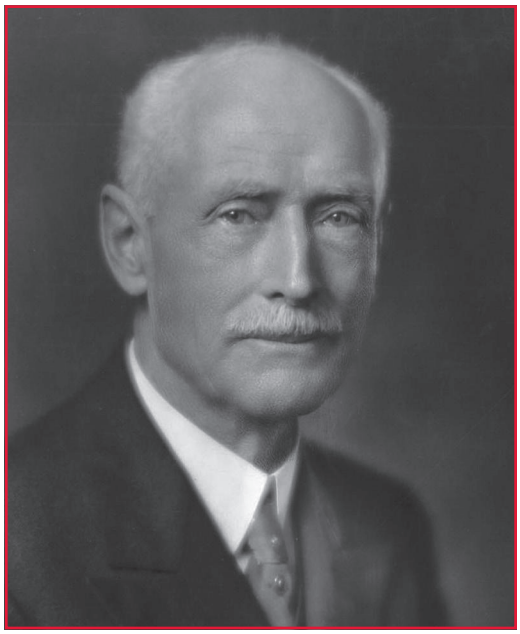


Figure 1–10. Carl Seashore, inventor of the audiometer.

Figure 1–11. Lee Edward Travis, known as the "Father of Speech-Language Pathology." Reprinted with permission from Van Riper, C. (1981). An early history of ASh A. *ASHA Magazine, 23*(11), 855–858.)

Figure 1–12. Sara Stinchfield h awk, the first person to obtain a Phd in speech-language pathology.

Figure 1–13. Raymond Carhart, known as the "Father of Audiology."

of hearing. Carhart was a professor of speech at Northwestern University. When World War II broke out, he was commissioned as an officer in the U.S. Army where he developed an aural rehabilitation program for individuals who were deafened as a result of war exposure. His war-

time efforts working with thousands of hearing-impaired soldiers served as the basis for the development of a new discipline that is now audiology. Upon conclusion of the war, he returned to Northwestern and proceeded to develop a specific program in audiology.

Lastly, the efforts of **Hallie Quinn Brown** (1849–1949) have been overlooked by many historians in regard to her contributions to speech-language pathology in the United States (Figure 1–14). She was a renowned American elocutionist and educator in the late nineteenth century and a significant figure in the history of speech-language pathology in the United States. She was born the daughter of two former slaves. She taught reading and provided elocution training to children and women, most notably African Americans from plantations who had been denied the opportunity of a proper education.

Figure 1–14. Hallie Q. Brown, American elocutionist and educator in the late nineteenth century.

EDUCATIONAL PREPARATION

People who choose to become either audiologists or speech-language pathologists are entering a clearly defined field of professional practice. So what does it mean to be a *professional*? A professional can be defined as a person who is trained to do a special job in exchange for payment. This often is the case when considering people in the sports world, where it is easy to distinguish a professional athlete, who is paid, from an amateur athlete, who is not. Another form of professionalism is in regard to occupations that require education or training pertinent to a specialized field, as distinguished from general education. Training for professionals who work in communication disorders has developed from different starting points and within different philosophical contexts in various countries. The educational requirements to become an audiologist or speech-language pathologist share many commonalities, but they are not identical. There also are differences between countries in regard to the educational requirements for each profession. The differences between countries can be broadly categorized as reflecting an American model or British model of education. These models are presented separately.

The American Model

A primary feature of the model of education used in the United States is the emphasis on a liberal arts and sciences education at the undergraduate level followed by a period of intensive and concentrated education at the (post)graduate level. To become eligible to practice as either an audiologist or speech-language pathologist in the United States, a graduate-level education is required.

An example of the typical educational model for both degrees is provided in Table 1–2. As undergraduates, students pursue a bachelor's degree in a major usually called Communication Disorders. This major encompasses fundamental aspects of both audiology and speech-language

Table 1–2. American Model for the Education of Audiologists and Speech-Language Pathologists

Audiology	*Speech-Language Pathology*
u ndergraduate e ducation	**u ndergraduate e ducation**
4-year Bachelors (BS or BA) degree	4-year Bachelors (BS or BA) degree
Years 1 & 2 "related" areas of study	Years 1 & 2 "related" areas of study
Years 3 & 4 "major" areas of study	Years 3 & 4 "major" areas of study
Minimal fieldwork	Minimal fieldwork
g raduate e ducation	**g raduate e ducation**
3–4-year d octor of Audiology (Aud) degree	2-year Masters (MS or MA) degree
Years 1–3 Audiology coursework	Years 1 & 2 Speech-Language Pathology coursework
1800 hours of fieldwork	400 hours of fieldwork
Year 4 externship	3 one-semester externships
	Clinical Fellowship (CF)
National examination	National examination
Obtain CCC-A or equivalent	Obtain CCC-SLP

FYI

There are hundreds of university programs worldwide that educate audiologists and speech-language pathologists. Yet, there are still many countries that offer no formal educational programs, requiring residents of those countries to travel abroad to obtain their professional qualification. One of the newest communication disorders programs can be found at the University of Guyana. The university offers a combined audiology and speech-language pathology degree. The first group of students graduating from the program entered the workforce in 2019.

pathology. The first two years of undergraduate education involve coursework covering a wide range of general education courses. These courses serve to satisfy the liberal arts and sciences foundation for the bachelor's degree. The final two years of undergraduate education focus more specifically on courses in audiology and speech-language pathology, which satisfy the major requirements for the degree. The bulk of this coursework centers on normal aspects of hearing and speech and an introduction to some of the more common communication disorders, such as child language disorders and phonological disorders. Upon graduation, the student holds a pre-professional bachelor's degree in communication disorders. To satisfy the educational requirements

FYI

Universities that offer educational degrees in audiology and speech-language pathology usually have their own clinic, which provides diagnostic and therapeutic services to the local community and an opportunity for students to work alongside experienced clinicians as part of their clinical training.

to become an audiologist or speech-language pathologist professional, the student must obtain a graduate degree. Students are allowed to choose freely whether to pursue graduate education in audiology or speech-language pathology.

To become a qualified audiologist, the requisite degree is a Doctor of Audiology (AuD), which spans three to four years of graduate study beyond the bachelor's degree. The first two years involve detailed coursework and on-site clinical education in audiology and hearing science. The final year involves an extensive off-campus full-time clinical experience (an externship), where students acquire a considerable number of fieldwork hours. The AuD degree also requires students to complete a research project.

For those wishing to become a speech-language pathologist, the requisite degree is a master's degree, which takes two years of full-time study to complete. Across the two years of study, students complete coursework in speech, language, and swallowing disorders, and engage in a mix of on-campus and off-campus clinical experiences. Students who complete either the AuD or masters in speech-language pathology are eligible to work after graduation. The first year of professional employment for a speech-language pathologist is referred to as the clinical fellowship (CF). During the CFY the individual works in his or her respective profession; however, periodic oversight is provided by a work colleague who holds professional membership status in the American Speech-Language-Hearing Association (ASHA). Membership status is designated by the acronym CCC, which refers to the **Certificate of Clinical Competence**. Individuals who complete the one-year clinical fellowship make a formal application to ASHA to be awarded the CCC. Audiologists may choose to obtain the CCC from ASHA or, alternatively, obtain board certification from the American Academy of Audiology. All audiologists and speech-language pathologists working in the United States generally are expected to hold national certification in order to practice in their respective professions. There is also an expectation that these individuals will continue to up-skill throughout their professional careers. ASHA requires audiologists and speech-language pathologists to attain a minimum of 30 hours of professional development education every three years. Failure to do so can result in a loss of CCC status and limits a person's ability to practice professionally.

The British Model

The British model of audiologist and speech-language pathologist education is in widespread use throughout the United Kingdom, Australia, India, Ireland, New Zealand, and South Africa. The British model places less emphasis on a liberal arts education compared with the American model. Instead, education is more concentrated on the essential coursework and clinical competencies for becoming either an audiologist or speech-language pathologist. The British model for the education of audiologists and speech-language pathologists allows for one of two paths. One path involves completion of a concentrated four-year undergraduate degree. In the first year, university students immediately begin studying their major. By the conclusion of the four-year degree, these students are likely to have taken the same number of courses in audiology or speech-language pathology as an American student. The second path involves completion of a two-year master's degree in audiology or speech-language pathology. To obtain a master's degree, it is not mandatory to hold a bachelor's degree in communication disorders; this prerequisite requirement can be met by any degree that is compatible with audiology or speech-language pathology, such as psychology, health, linguistics, biology, engineering, or education. Similar to the U.S., most countries require audiology graduates to complete a clinical

fellowship year as part of the first year of professional experience prior to becoming full-fledged members of their respective professional associations. This is not necessarily the case for speech-language pathology graduates. Examples of the typical British educational models for audiology and speech-language pathology degrees are provided in Table 1–3.

Qualities of an Audiologist and Speech-Language Pathologist

Individuals who work as either audiologists or speech-language pathologists interact with people of all ages and backgrounds. One of the prime attributes of becoming a successful professional is having good people skills, such as knowing how to interact effectively with others who have various disorders and a range of backgrounds. People are individuals, with as many similarities from one person to the next as there are differences. An effective audiologist or speech-language pathologist is able to relate to a wide range of clients while consistently bringing out their best performance, whether it is related to testing the hearing of an elderly individual or promoting language development in a young nonverbal child. The two professions are not physically demanding, but they can be emotionally and intellectually challenging. These professionals need to approach problems objectively and provide support to their clients and families. Many disorders are complex and not fully understood, so professionals should be able to tolerate challenge and uncertainty. Because a client's progress may be slow, audiologists and speech-language pathologists must have patience and compassion. Another quality of being a good audiologist or speech-language pathologist is to have sharp listening skills and exceptional observational skills. These professionals also should be able to effectively communicate test results and possible treatment choices to their clients and families in a manner that is easily understood.

Table 1–3. British Model for the Education of Audiologists and Speech-Language Pathologists

Audiology	*Speech-Language Pathology*
Path 1 undergraduate Degree	**Path 1 undergraduate Degree**
4-year Bachelor's degree in related area (psychology, biology, engineering, health) Year 1 "related" areas of study Years 2–4 Audiology coursework 350 hours of fieldwork 3 one-semester externships	4-year Bachelor's degree in related area (psychology, biology, engineering, health) Year 1 "related" areas of study Years 2–4 Speech-Language Pathology coursework 350 hours of fieldwork 3 one-semester externships
Path 2 graduate Degree	**Path 2 graduate Degree**
2-year Master's degree Years 1 & 2 Audiology coursework 350 hours of fieldwork 3 one-semester externships – Clinical Fellowship Year – National examination – Obtain CCC	2-year Master's degree Years 1 & 2 Speech-Language Pathology coursework 350 hours of fieldwork 3 one-semester externships

PROFESSIONAL WORK SETTINGS

Speech-language pathologists and audiologists can be found in a range of work settings, some of which are quite unique. Sometimes, the professionals work side by side. A description of the more common work settings is provided here.

Education

By far, the largest employer of speech-language pathologists are public and private schools, and specialized schools such as those designated for hard of hearing and deaf children. The type of work performed by a speech-language pathologist in educational settings may involve employment at a single school; in contrast, serving as an **itinerant speech-language pathologist** entails traveling between many schools and having a caseload of clients in each school. Some audiologists are employed in deaf education centers or in public school systems where they may be involved in performing routine audiological assessments on students. Higher education settings such as colleges and universities also employ audiologist and speech-language pathologist lecturers and professors to teach students pursuing a career in communication disorders. Approximately 50% of the speech-language pathologist workforce and 10% of the audiologist workforce can be found in educational settings.

Medical

Approximately 40% of speech-language pathologists and 60% of audiologists are employed in health care settings, including hospitals and residential or nonresidential health care facilities. The two primary medical settings are: (1) acute care and (2) rehabilitation care. An **acute care hospital** is one where the patient has recently been admitted because of a planned surgery or an accident or trauma. The type of patient seen by the speech-language pathologist in an acute setting may be someone who has had his or her larynx removed as a result of throat cancer, or possibly an individual who recently experienced a stroke or motor vehicle accident. In these situations, the speech-language pathologist often will initially visit the patient in the hospital bed shortly after the medical condition has been treated. The speech-language pathologist will diagnose whether a communication disorder exists and assess swallowing function. A patient might eventually transfer from an acute care hospital to a **rehabilitation hospital** where he or she now being managed on a longer term basis. The speech-language pathologist typically is employed to provide treatment to the patient, assisting with the individual's eventual discharge from the hospital and transition to communicating in the another environment. Once discharged, the individual could still have a communication disorder and likely would receive services via a residential (e.g., nursing home) or nonresidential facility. When clients and clinicians are not in the same physical location, there is a **telehealth** option, which involves the delivery of speech and language services via telecommunications (e.g., phone, Internet). The type of client seen by an audiologist in a hospital setting may be an individual who receives a hearing assessment as part of a routine physical examination. Newborn infants routinely receive a hearing assessment prior to being discharged from the hospital. Sometimes audiologists can be found in the operating room of hospitals where they may monitor a patient's hearing during a delicate operation that can affect the hearing mechanism.

Private Practice

Individuals engaged exclusively in private practice account for approximately 5% of the speech-language pathology workforce and 20% of the audiology workforce. The type of client seen by a speech-language pathologist private practitioner is generally one who is not in a medically acute condition. Rather, the speech-language pathologist may see children with mild communication disorders that typically do not qualify for therapy services in a school setting. Or the speech-language pathologist may offer a unique or specialty type of service, such as working exclusively with individuals who have voice problems or individuals who may speak English as a second language and are receiving

assistance with reducing the strength of their foreign accent. Audiologists may work independently or with other private practitioners such as ear, nose, and throat physicians. A major facet of this type of job setting is the prescription and fitting of hearing aids. It is not unusual for some audiologists to hold full-time employment in another setting, but also engage in a minimum level of private practice.

Research

A small percentage (approximately 5%) of speech-language pathologist and audiologist professionals work exclusively in research settings. These individuals are not engaged in clinical practice or education, but rather in scientific investigations of basic and applied aspects of communication sciences and disorders. One well-known institution in the United States is the Boys Town National Research Hospital in Omaha, Nebraska that focuses on childhood deafness, visual impairment, and related communication disorders. A well-known hearing research laboratory in Melbourne, Australia is the Bionic Ear Institute.

Industry

One particular work setting that is unique to audiologists is common when they are employed in the hearing aid industry. Around 5% of audiologists work in the industry and may serve as sales representatives for large hearing aid companies. These individuals are experts on current hearing aid devices on the market and provide consultation to practicing audiologists about the latest product advancements.

FYI

There is a severe shortage of audiologists and speech-language pathologists worldwide, including university-level lecturers and professors. In addition to this overall shortage, less than 25% of the workforce is made up of males. This sex imbalance is also found in other allied health professions such as nursing, physiotherapy, and occupational therapy.

PROFESSIONAL CODE OF ETHICS

To be a professional involves behaving with dignity and in an ethical manner, and in such a way that people trust your judgment. **Ethical behavior** refers to doing the right thing and encompasses attributes such as: (1) honesty, (2) respect, and (3) responsibility. Being honest involves truthfulness and refraining from lying and cheating. Respect involves tolerance and openness toward others regardless of personal or cultural differences. Responsibility means taking your professional duties seriously and accepting culpability for your decisions. Many professional organizations have established a series of behavioral guidelines that govern the day-to-day activities of a professional. These guidelines are referred to as a **code of ethics**, consisting of a list of commonsense rules and regulations concerning doing the right thing when individuals are engaged in their chosen professional practice (Appendix 1–A, ASHA Code of Ethics [2016]).

Most professional associations establish an ethics board that is designed to handle any complaints raised against individual members. Individuals who are found to be in violation of any of the established codes may run the risk of being sanctioned by their professional association. The level of sanctioning can range from a reprimand that could involve payment of a fine, to the temporary suspension of professional licensure, and, in extreme cases, to being adjudicated by state or national law enforcement agencies.

The audiologist and speech-language pathologist professions adhere to a code of ethics, an example of which is established by ASHA as provided in Appendix 1–A. There are slight differences in the code of ethics developed by audiologist and speech-language pathologist associations worldwide, but some of the common tenets are that audiologists and speech-language pathologists should:

1. Safeguard the welfare of the clients they serve.
2. Maintain high standards of professional competence.
3. Maintain accurate and up-to-date information about the nature, management, and treatment of communication disorders.
4. Uphold the dignity of the profession and accept the profession's self-imposed standards.

CULTURAL CONSIDERATIONS AND COMMUNICATION DISORDERS

Population centers throughout the world are becoming increasingly diverse both culturally and linguistically. To effectively meet the needs of a diverse population, audiologists and speech-language pathologists need to be **culturally competent**. This competency involves sensitivity to issues that can influence both the identification and management of communication disorders. Multilingual and culturally diverse clients are those who use languages and dialects other than that of the audiologist or speech-language pathologist, or do not share the same cultural background as the audiologist or speech-language pathologist. Clients may belong to a different culture and communicate in a language different from the audiologist or speech-language pathologist, or may share the same language to some degree while belonging to a different culture. By misunderstanding or misinterpreting a client, the audiologist or speech-language pathologist may inadvertently mistake certain communication behaviors as signs of a disorder. There also are cultural differences in beliefs about health, disability, and delivery of clinical services. The differences can influence how an individual would either perceive a communication disorder or accept certain treatment for the disorder. Professionals providing services to individuals from different cultural backgrounds need to be aware of unique perspectives or communication styles common to those cultures. The complexities of communication in a multicultural environment are depicted as a series of layers in Figure 1–15. These layers apply to both the client and the professional providing services to the client. Some observations about different cultural styles that should be considered by audiologists and speech-language pathologists when communicating with individuals of differing cultural and linguistic backgrounds are listed below (Roberts, 2001).

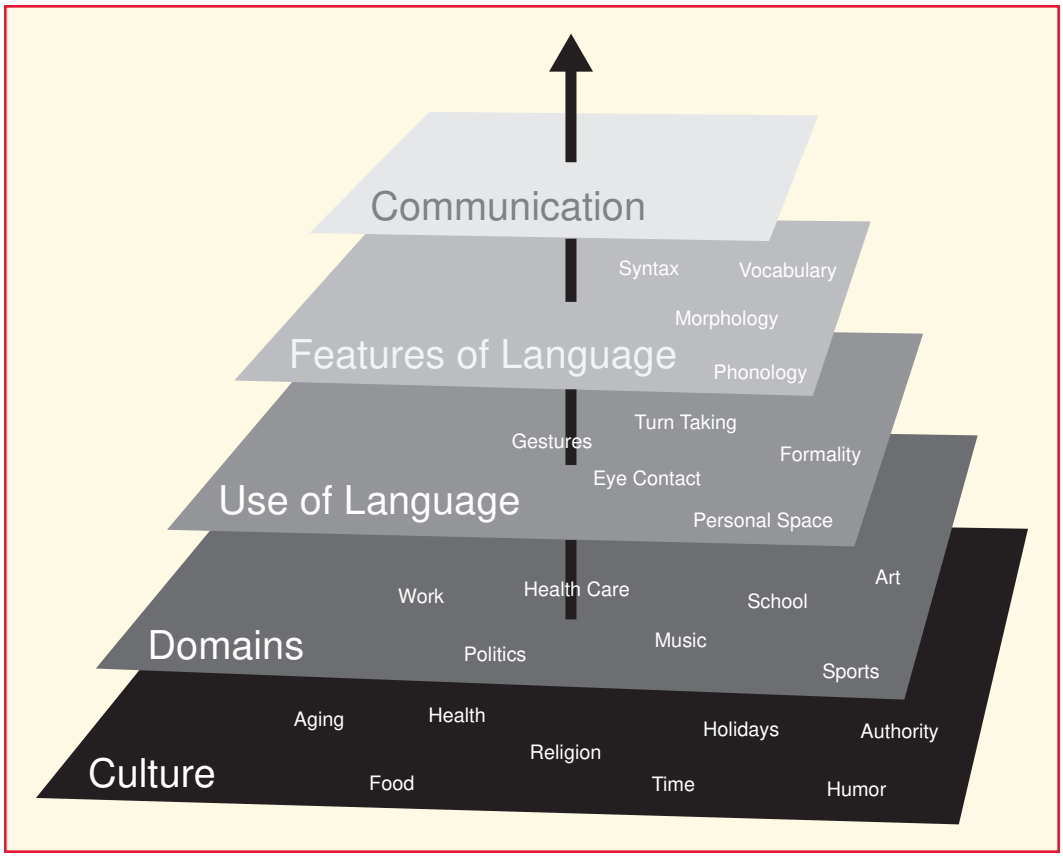


Figure 1–15. depiction of the various layers of communication within a cultural context.

THE PROFESSIONS OF AUDIOLOGY AND SPEECH-LANGUAGE PATHOLOGY ON THE WORLD WIDE WEB

Following are websites that provide further information on the professions of audiology and speech-language pathology. At the time of publication, each website was freely accessible.

Exploring Nonverbal Communication Video
http://nonverbal.ucsc.edu

AT&T Archives: The Speech Chain
https://www.youtube.com/watch?v=puYbFENTBYI

A Guide to Internet Resources in Audiology
http://www.worldaudiology.com

A Guide to Internet Resources in Speech Pathology
https://www.speechpathologyaustralia.org.au

American Speech-Language-Hearing Association
http://www.asha.org/students

Audiology and Speech-Language Pathology Professions Videos

http://education-portal.com/degree_in_speech_therapy.html

http://study.com/audiology_training.html

http://www.youtube.com/user/UniCanterburyCMDS/videos

STUDY QUESTIONS

1. Describe the speech chain.
2. List and describe the verbal and nonverbal forms of communication.
3. Describe the classifications used for the various types of communication disorders.
4. Who are some of the pioneers that contributed to the creation of the audiologist and speech-language pathologist professions?
5. Compare and contrast the two models for educating audiologists and speech-language pathologists.
6. What are the qualities that make for a good audiologist or speech-language pathologist?
7. What is cultural competency?

REFERENCES

American Speech-Language-Hearing Association. (2016). *Code of ethics* [Ethics]. Retrieved from http://www.asha.org/policy

Denes, P., & Pinson, E. (1973). *The speech chain: The physics and biology of spoken language.* New York, NY: Anchor Books.

Roberts, P. (2001). Aphasia assessment and treatment for bilingual and culturally diverse patients. In R. Chapey (Ed.), *Language intervention strategies in adult aphasia* (3rd ed.; pp. 208–232). St. Louis, MO: Lippincott, Williams & Wilkins.

Shannon, C., & Weaver, W. (1949). *Mathematical theory of communication.* Urbana: University of Illinois Press.

Van Riper, C. (1981). An early history of ASHA. *ASHA Magazine, 23*(11), 855–858.

Appendix 1–A
ASHA CODE OF ETHICS (2016)

PREAMBLE

The American Speech-Language-Hearing Association (ASHA; hereafter, also known as "The Association") has been committed to a framework of common principles and standards of practice since ASHA's inception in 1925. This commitment was formalized in 1952 as the Association's first Code of Ethics. This Code has been modified and adapted as society and the professions have changed. The Code of Ethics reflects what we value as professionals and establishes expectations for our scientific and clinical practice based on principles of duty, accountability, fairness, and responsibility. The ASHA Code of Ethics is intended to ensure the welfare of the consumer and to protect the reputation and integrity of the professions.

The ASHA Code of Ethics is a framework and focused guide for professionals in support of day-to-day decision making related to professional conduct. The Code is partly obligatory and disciplinary and partly aspirational and descriptive in that it defines the professional's role. The Code educates professionals in the discipline, as well as students, other professionals, and the public, regarding ethical principles and standards that direct professional conduct.

The preservation of the highest standards of integrity and ethical principles is vital to the responsible discharge of obligations by audiologists, speech-language pathologists, and speech, language, and hearing scientists who serve as clinicians, educators, mentors, researchers, supervisors, and administrators. This Code of Ethics sets forth the fundamental principles and rules considered essential to this purpose and is applicable to the following individuals:

- a member of the American Speech-Language-Hearing Association holding the Certificate of Clinical Competence (CCC)
- a member of the Association not holding the Certificate of Clinical Competence (CCC)
- a nonmember of the Association holding the Certificate of Clinical Competence (CCC)
- an applicant for certification, or for membership and certification

By holding ASHA certification or membership, or through application for such, all individuals are automatically subject to the jurisdiction of the Board of Ethics for ethics complaint adjudication. Individuals who provide clinical services and who also desire membership in the Association must hold the CCC.

The fundamentals of ethical conduct are described by Principles of Ethics and by Rules of Ethics. The four Principles of Ethics form the underlying philosophical basis for the Code of Ethics and are reflected in the following areas: (I) responsibility to persons served professionally and to research participants, both human and animal; (II) responsibility for one's professional competence; (III) responsibility to the public; and (IV) responsibility for professional relationships. Individuals shall honor and abide by these Principles as affirmative obligations under all conditions of applicable professional activity. Rules of Ethics are specific statements of minimally acceptable as well as unacceptable professional conduct.

The Code is designed to provide guidance to members, applicants, and certified individuals as they make professional decisions. Because

the Code is not intended to address specific situations and is not inclusive of all possible ethical dilemmas, professionals are expected to follow the written provisions and to uphold the spirit and purpose of the Code. Adherence to the Code of Ethics and its enforcement results in respect for the professions and positive outcomes for individuals who benefit from the work of audiologists, speech-language pathologists, and speech, language, and hearing scientists.

PRINCIPLE OF ETHICS I

Individuals shall honor their responsibility to hold paramount the welfare of persons they serve professionally or who are participants in research and scholarly activities, and they shall treat animals involved in research in a humane manner.

Rules of Ethics

A. Individuals shall provide all clinical services and scientific activities competently.
B. Individuals shall use every resource, including referral and/or interprofessional collaboration when appropriate, to ensure that quality service is provided.
C. Individuals shall not discriminate in the delivery of professional services or in the conduct of research and scholarly activities on the basis of race, ethnicity, sex, gender identity/gender expression, sexual orientation, age, religion, national origin, disability, culture, language, or dialect.
D. Individuals shall not misrepresent the credentials of aides, assistants, technicians, support personnel, students, research interns, Clinical Fellows, or any others under their supervision, and they shall inform those they serve professionally of the name, role, and professional credentials of persons providing services.
E. Individuals who hold the Certificate of Clinical Competence may delegate tasks related to the provision of clinical services to aides, assistants, technicians, support personnel, or any other persons only if those persons are adequately prepared and are appropriately supervised. The responsibility for the welfare of those being served remains with the certified individual.
F. Individuals who hold the Certificate of Clinical Competence shall not delegate tasks that require the unique skills, knowledge, judgment, or credentials that are within the scope of their profession to aides, assistants, technicians, support personnel, or any nonprofessionals over whom they have supervisory responsibility.
G. Individuals who hold the Certificate of Clinical Competence may delegate to students tasks related to the provision of clinical services that require the unique skills, knowledge, and judgment that are within the scope of practice of their profession only if those students are adequately prepared and are appropriately supervised. The responsibility for the welfare of those being served remains with the certified individual.
H. Individuals shall obtain informed consent from the persons they serve about the nature and possible risks and effects of services provided, technology employed, and products dispensed. This obligation also includes informing persons served about possible effects of not engaging in treatment or not following clinical recommendations. If diminished decision-making ability of persons served is suspected, individuals should seek appropriate authorization for services, such as authorization from a spouse, other family member, or legally authorized/appointed representative.
I. Individuals shall enroll and include persons as participants in research or teaching demonstrations only if participation is voluntary, without coercion, and with informed consent.
J. Individuals shall accurately represent the intended purpose of a service, product, or research endeavor and shall abide by established guidelines for clinical practice and the responsible conduct of research.
K. Individuals who hold the Certificate of Clinical Competence shall evaluate the effectiveness of services provided, technology employed, and products dispensed, and they shall provide services or dispense products only when benefit can reasonably be expected.

L. Individuals may make a reasonable statement of prognosis, but they shall not guarantee—directly or by implication—the results of any treatment or procedure.
M. Individuals who hold the Certificate of Clinical Competence shall use independent and evidence-based clinical judgment, keeping paramount the best interests of those being served.
N. Individuals who hold the Certificate of Clinical Competence shall not provide clinical services solely by correspondence, but may provide services via telepractice consistent with professional standards and state and federal regulations.
O. Individuals shall protect the confidentiality and security of records of professional services provided, research and scholarly activities conducted, and products dispensed. Access to these records shall be allowed only when doing so is necessary to protect the welfare of the person or of the community, is legally authorized, or is otherwise required by law.
P. Individuals shall protect the confidentiality of any professional or personal information about persons served professionally or participants involved in research and scholarly activities and may disclose confidential information only when doing so is necessary to protect the welfare of the person or of the community, is legally authorized, or is otherwise required by law.
Q. Individuals shall maintain timely records and accurately record and bill for services provided and products dispensed and shall not misrepresent services provided, products dispensed, or research and scholarly activities conducted.
R. Individuals whose professional practice is adversely affected by substance abuse, addiction, or other health-related conditions are impaired practitioners and shall seek professional assistance and, where appropriate, withdraw from the affected areas of practice.
S. Individuals who have knowledge that a colleague is unable to provide professional services with reasonable skill and safety shall report this information to the appropriate authority, internally if a mechanism exists and, otherwise, externally.
T. Individuals shall provide reasonable notice and information about alternatives for obtaining care in the event that they can no longer provide professional services.

PRINCIPLE OF ETHICS II

Individuals shall honor their responsibility to achieve and maintain the highest level of professional competence and performance.

Rules of Ethics

A. Individuals who hold the Certificate of Clinical Competence shall engage in only those aspects of the professions that are within the scope of their professional practice and competence, considering their certification status, education, training, and experience.
B. Members who do not hold the Certificate of Clinical Competence may not engage in the provision of clinical services; however, individuals who are in the certification application process may engage in the provision of clinical services consistent with current local and state laws and regulations and with ASHA certification requirements.
C. Individuals who engage in research shall comply with all institutional, state, and federal regulations that address any aspects of research, including those that involve human participants and animals.
D. Individuals shall enhance and refine their professional competence and expertise through engagement in lifelong learning applicable to their professional activities and skills.
E. Individuals in administrative or supervisory roles shall not require or permit their professional staff to provide services or conduct research activities that exceed the staff member's certification status, competence, education, training, and experience.
F. Individuals in administrative or supervisory roles shall not require or permit their professional staff to provide services or conduct clinical activities that compromise the staff

member's independent and objective professional judgment.
G. Individuals shall make use of technology and instrumentation consistent with accepted professional guidelines in their areas of practice. When such technology is not available, an appropriate referral may be made.
H. Individuals shall ensure that all technology and instrumentation used to provide services or to conduct research and scholarly activities are in proper working order and are properly calibrated.

PRINCIPLE OF ETHICS III

Individuals shall honor their responsibility to the public when advocating for the unmet communication and swallowing needs of the public and shall provide accurate information involving any aspect of the professions.

Rules of Ethics

A. Individuals shall not misrepresent their credentials, competence, education, training, experience, and scholarly contributions.
B. Individuals shall avoid engaging in conflicts of interest whereby personal, financial, or other considerations have the potential to influence or compromise professional judgment and objectivity.
C. Individuals shall not misrepresent research and scholarly activities, diagnostic information, services provided, results of services provided, products dispensed, or the effects of products dispensed.
D. Individuals shall not defraud through intent, ignorance, or negligence or engage in any scheme to defraud in connection with obtaining payment, reimbursement, or grants and contracts for services provided, research conducted, or products dispensed.
E. Individuals' statements to the public shall provide accurate and complete information about the nature and management of communication disorders, about the professions, about professional services, about products for sale, and about research and scholarly activities.
F. Individuals' statements to the public shall adhere to prevailing professional norms and shall not contain misrepresentations when advertising, announcing, and promoting their professional services and products and when reporting research results.
G. Individuals shall not knowingly make false financial or nonfinancial statements and shall complete all materials honestly and without omission.

PRINCIPLE OF ETHICS IV

Individuals shall uphold the dignity and autonomy of the professions, maintain collaborative and harmonious interprofessional and intraprofessional relationships, and accept the professions' self-imposed standards.

Rules of Ethics

A. Individuals shall work collaboratively, when appropriate, with members of one's own profession and/or members of other professions to deliver the highest quality of care.
B. Individuals shall exercise independent professional judgment in recommending and providing professional services when an administrative mandate, referral source, or prescription prevents keeping the welfare of persons served paramount.
C. Individuals' statements to colleagues about professional services, research results, and products shall adhere to prevailing professional standards and shall contain no misrepresentations.
D. Individuals shall not engage in any form of conduct that adversely reflects on the professions or on the individual's fitness to serve persons professionally.
E. Individuals shall not engage in dishonesty, negligence, fraud, deceit, or misrepresentation.
F. Applicants for certification or membership, and individuals making disclosures, shall not knowingly make false statements and shall

complete all application and disclosure materials honestly and without omission.

G. Individuals shall not engage in any form of harassment, power abuse, or sexual harassment.

H. Individuals shall not engage in sexual activities with individuals (other than a spouse or other individual with whom a prior consensual relationship exists) over whom they exercise professional authority or power, including persons receiving services, assistants, students, or research participants.

I. Individuals shall not knowingly allow anyone under their supervision to engage in any practice that violates the Code of Ethics.

J. Individuals shall assign credit only to those who have contributed to a publication, presentation, process, or product. Credit shall be assigned in proportion to the contribution and only with the contributor's consent.

K. Individuals shall reference the source when using other persons' ideas, research, presentations, results, or products in written, oral, or any other media presentation or summary. To do otherwise constitutes plagiarism.

L. Individuals shall not discriminate in their relationships with colleagues, assistants, students, support personnel, and members of other professions and disciplines on the basis of race, ethnicity, sex, gender identity/gender expression, sexual orientation, age, religion, national origin, disability, culture, language, dialect, or socioeconomic status.

M. Individuals with evidence that the Code of Ethics may have been violated have the responsibility to work collaboratively to resolve the situation where possible or to inform the Board of Ethics through its established procedures.

N. Individuals shall report members of other professions who they know have violated standards of care to the appropriate professional licensing authority or board, other professional regulatory body, or professional association when such violation compromises the welfare of persons served and/or research participants.

O. Individuals shall not file or encourage others to file complaints that disregard or ignore facts that would disprove the allegation; the Code of Ethics shall not be used for personal reprisal, as a means of addressing personal animosity, or as a vehicle for retaliation.

P. Individuals making and responding to complaints shall comply fully with the policies of the Board of Ethics in its consideration, adjudication, and resolution of complaints of alleged violations of the Code of Ethics.

Q. Individuals involved in ethics complaints shall not knowingly make false statements of fact or withhold relevant facts necessary to fairly adjudicate the complaints.

R. Individuals shall comply with local, state, and federal laws and regulations applicable to professional practice, research ethics, and the responsible conduct of research.

S. Individuals who have been convicted; been found guilty; or entered a plea of guilty or nolo contendere to (1) any misdemeanor involving dishonesty, physical harm—or the threat of physical harm—to the person or property of another, or (2) any felony, shall self-report by notifying ASHA Standards and Ethics (see Terminology for mailing address) in writing within 30 days of the conviction, plea, or finding of guilt. Individuals shall also provide a certified copy of the conviction, plea, nolo contendere record, or docket entry to ASHA Standards and Ethics within 30 days of self-reporting.

T. Individuals who have been publicly sanctioned or denied a license or a professional credential by any professional association, professional licensing authority or board, or other professional regulatory body shall self-report by notifying ASHA Standards and Ethics (see Terminology for mailing address) in writing within 30 days of the final action or disposition. Individuals shall also provide a certified copy of the final action, sanction, or disposition to ASHA Standards and Ethics within 30 days of self-reporting.

2

ANATOMY OF SPEECH AND HEARING

OBJECTIVES

After reading this chapter, the student should be able to:

- Identify major anatomical structures related to speech, language, and hearing.
- Describe the physiological functions of these structures.
- Name individuals who have made historical contributions to our understanding of the anatomy of speech and hearing.
- Describe the essential physiological processes involved in the production of speech.
- Describe the essential physiological processes involved in hearing.
- Understand how impairments in one or more anatomical structures can contribute to a communication disorder.

INTRODUCTION

Anatomy is the study of the structure of the body and its parts. The word **anatomy** comes from the Greek *ana* meaning "up" or "through," and *tomie* meaning "a cutting." The early science of anatomy was based on "cutting up" structures of the body because our knowledge of the body was learned through **dissection** of human cadavers. However, less invasive methods are now available to examine the living body, using such devices as endoscopic cameras and body scans (e.g., CAT-scan, MRI-scan). **Physiology** is the study of the functions of the body and its parts. This word is also Greek in origin with *physis* meaning "nature" and *logia* meaning "to speak." So physiology involves describing the nature of things. **Gross anatomy** and physiology involve examination of the structure and function of body parts that can be seen with the naked eye. **Cellular anatomy and physiology** (or histology) entails examining those body parts best seen under the microscope. Traditionally, both gross and cellular anatomy and physiology are foundation courses that beginning medical students are required to take as part of their degree program. This is no different for students of the audiology and speech-language pathology professions. To fully appreciate the nature of normal communication and disorders of communication, knowledge about the structure and function of the speech and hearing mechanism is essential. This chapter provides some introductory exposure to speech and hearing anatomy and physiology. The material presented is referenced again in later chapters concerning communication disorders resulting from anatomical and physiological abnormalities of the speech and hearing mechanisms.

SPEECH ANATOMY

The anatomy we use for the production of speech is also the same anatomy used for doing nonspeech things such as breathing, swallowing, and coughing. The anatomical structures can be divided into three subsystems: (1) respiratory, (2) laryngeal, and (3) articulatory. As humans, we have learned to exploit these structures that were originally designed for basic survival and to use them to communicate with other humans. A survey and description of the structure and function of the respiratory, laryngeal, and articulatory systems is provided.

Respiratory System

The respiratory system consists of the lungs, diaphragm, rib cage, trachea, pharynx, and oral and nasal passages. The general location of each of these anatomical structures is shown in Figure 2–1. When referring to human anatomy, a **tract** is an area of the body that consists of a series of related structures. The respiratory system is divided into two tracts: the **upper respiratory tract** (including the oral and nasal cavities, and pharynx) and the **lower respiratory tract** (the trachea, bronchi, and lungs). Air is inhaled primarily through the nostrils into the **nasal cavity**. The nasal cavities are lined with mucous membranes that are covered with tiny hairs known as **cilia.** These features within the nasal cavity serve to warm, moisten, and filter the air of possible contaminants. For most of us, breathing is breathing, and it does not matter whether it is from the mouth or nose. **Mouth breathing** may appear to be a harmless form of breathing; however, there are many negatives associated with breathing through the mouth. Excessive mouth breathing is problematic because air is not filtered and warmed as much as when inhaled through the nose, as it bypasses the nasal cavity. The dust and dirt deposited in the membranes cannot be disposed of as they would typically be by the nasal cavity. Consequently, these contaminants remain to produce irritation and inflammation. Mouth breathing is thought to contribute to a higher than average occurrence of upper respiratory infections and may also exacerbate the occurrence of asthma. Excessive mouth breathing may also be indicative of situations in which the nasal cavity is obstructed, thereby preventing nasal breathing to occur naturally. In cases such as this, mouth breathing is done out of necessity. Situations like enlarged adenoids can lead to excessive mouth breathing. **Adenoids** (e.g., ton-

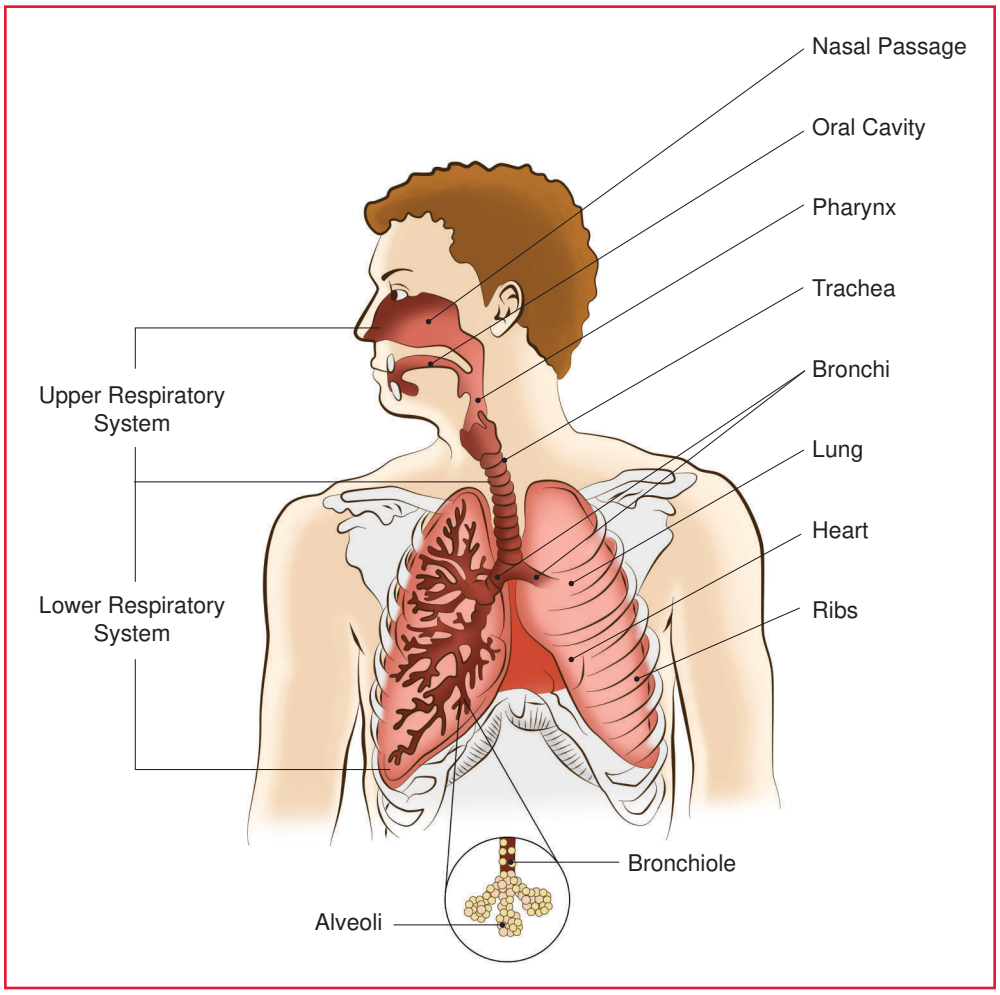


Figure 2–1. Anatomical features of the human respiratory system.

sils) consist of a paired mass of tissue in the back of the nasal cavity that serves to filter out debris that is inhaled through the nose.

The **pharynx** is a hollow tube about five inches (12.7 cm) long that starts behind the nose and ends at the top of the trachea. The tube is made of a series of overlapping muscles that encircle the throat. At the bottom of the pharynx the tube splits, with one tube running down the front of the neck to form the trachea (i.e., windpipe), and the second tube running down the back of the neck to form the **esophagus** (i.e., food tube). The pharynx serves a twofold purpose. During the process of eating, food enters the oral cavity and is readied for swallowing. When swallowing begins, the food is directed down the pharynx. The muscles surrounding the pharynx contract and push the food toward the esophagus and onward to the stomach. During the process of breathing, air inhaled through the nose is directed toward the pharynx and down through the trachea to the lungs.

The trachea is the principal tube that carries air to and from the lungs and is made up of elastic tissues and about 20 rings of cartilage. This anatomical structure is designed to be flexible so that

FYI

At rest, a healthy adult breathes about 14 to 16 times per minute. After exercise, the rate could increase to more than 60 times per minute. New babies at rest breathe between 40 and 50 times per minute. By age five, the rate decreases to about 25 times per minute.

we can twist and turn our head and neck while, at the same time, being able to breathe normally. The trachea branches into two main tubes supplying air to the right and left lobes of the lung, respectively. These are called **bronchial tubes**. An inflammation of these airway tubes results in a serious health condition known as **bronchitis.** The tubes continue to divide again and again becoming narrower and narrower tubes, referred to as **bronchioles**. The very end of these airway tubes look like spongy sacs termed **alveoli**. Tiny blood vessels surround each of the alveoli. It is at this point in the process of breathing when oxygen that is inhaled into the lungs is delivered to the bloodstream and carried to the rest of the body. Each cell in the body needs oxygen at all times. At the same time, these tiny sacs remove carbon dioxide from the blood, which is exhaled from the body.

Collectively, the bronchial tubes, bronchioles, and alveoli serve to make up the lungs. The **lungs** are so large that they occupy most of the space in the chest. The lungs are cone shaped. Although the lungs come as a pair, they are not exactly the same size, as is typical for other paired anatomical structures such as our eyes, ears, or nostrils. Instead, the lung on the left side of the body is a bit smaller than the lung on the right. This extra space on the left leaves room for the heart to occupy space within the chest. The lungs, as well as the heart and other internal organs, are protected by 12 sets of rib bones, creating the **rib cage**. Beneath the lungs is the **diaphragm** muscle, which extends across the bottom of the rib cage. The diaphragm is the principal muscle of respiration. When we inhale to take a breath, the diaphragm is drawn downward and the rib cage is expanded and elevated. The combined actions of the rib cage and diaphragm serve to enlarge the overall chest area, and air then passes into the lungs to fill the larger space. We rely heavily on the diaphragm for our respiratory function. When the diaphragm is impaired, it can seriously compromise our breathing.

FYI

Lung cancer is the second most common cancer in both men and women. Roughly two out of three people diagnosed with lung cancer are older than 65 years. In 2017, approximately 155,000 people in the United States died of lung cancer—about 85,000 men and 70,000 women.

The primary functions of the respiratory system are to help sustain life through the exchange of gases. When a person takes a breath, the air taken in consists of several gases. The mixture is mostly composed of oxygen, nitrogen, and carbon dioxide. Oxygen is an odorless gas that makes up about 20% of air and is essential to life because it is used for chemical reactions that occur in the cells of the body. Oxygen is brought in and utilized by the body, whereas carbon dioxide and nitrogen are expelled from the body.

A single breath occurs during a **respiratory cycle**. This cycle consists of two phases: an inhalation phase and an exhalation phase. During the **inhalation phase**, the muscles are used to expand the size of the lungs so that outside air naturally flows inward toward the lungs. The process of inhalation requires us to actively engage a number of respiratory muscles. During the **exhalation phase**, the lungs recoil back to their original size and naturally expel air out toward the oral/nasal cavities. The process of exhalation is viewed as a passive muscular process. An example of **active** and **passive** muscular processes is seen by raising your arm to the side. The process of arm raising involves active muscular movement. Lowering of the arm simply involves passively releasing control of these same muscles.

During quiet, relaxed breathing, the amount of time dedicated to each phase of the respiratory cycle is approximately equal. During the process of speaking, the respiratory cycle is dramatically altered. The inhalation phase uses only 10% of the overall time of the cycle, whereas exhalation consumes the remaining 90% of the cycle (Figure 2–2). The reason for this is obvious: We need to prolong exhalation in order to produce strings of words and sentences on one breath. Two ways in which we are able to prolong the exhalation phase are to: (1) inhale a larger amount of air than would normally occur during quiet breathing, and (2) prolong expiratory airflow by using vocal tract resistance. The balloon analogy is useful to consider in regard to understanding vocal tract resistance (Figure 2–3). Blowing up a large balloon is analogous to inhal-

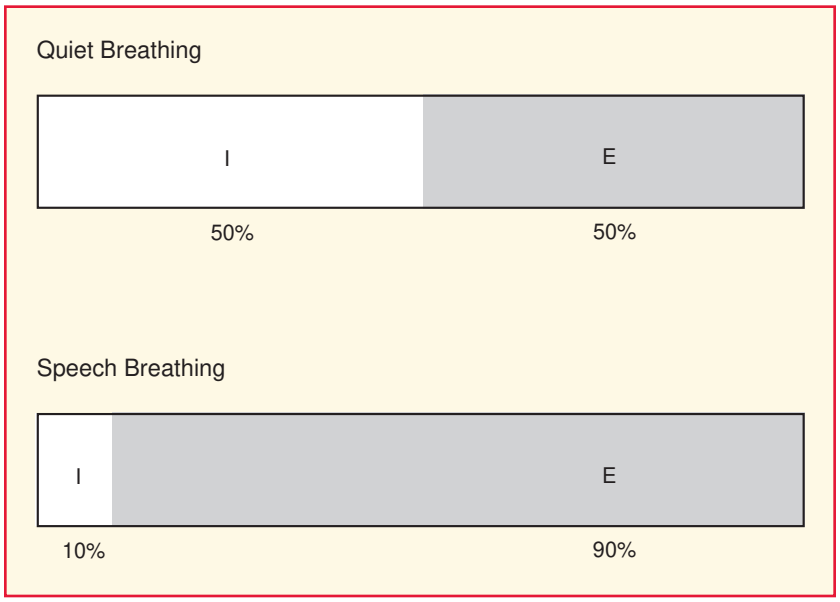


Figure 2 –2. Comparison of the inspiratory and expiratory proportions of the respiratory cycle required for quiet breathing and speech breathing.

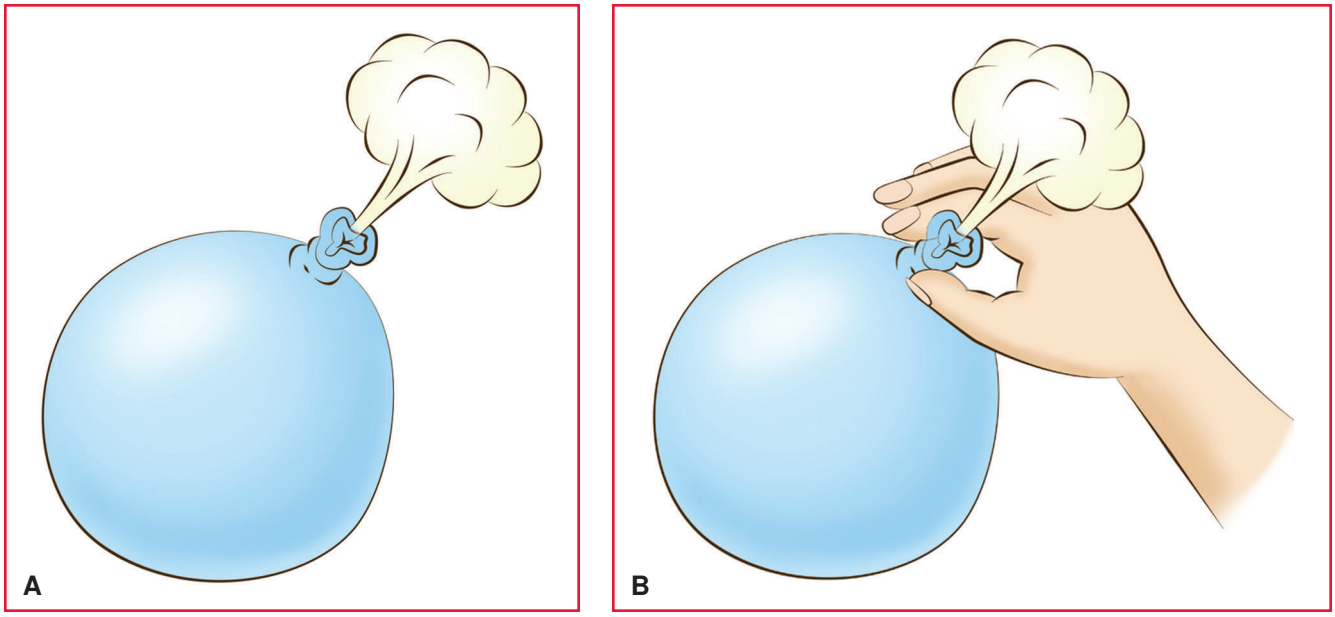
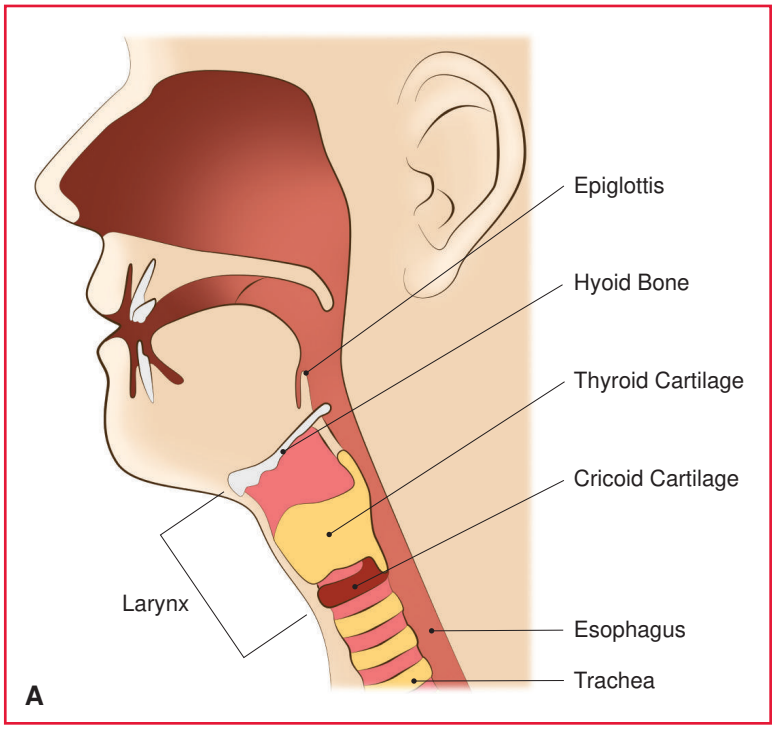


Figure 2–3. Balloon analogy for breathing during quiet and speech production. **A.** No resistance during expiratory airflow. **B.** Resistance to airflow resulting in longer expiratory airflow.

ing a large amount of air into the lungs. Upon releasing air from the balloon, one could either let the balloon naturally deflate or pinch the end of the balloon (i.e., create resistance) to prolong the expiratory airflow. Ways in which we prolong expiratory airflow for speech include vocal fold resistance (vibration) and oral cavity resistance (consonant articulation). These structures impede air flow and serve to alter the expiratory phase. In addition, the respiratory muscles relax gradually so that the air is not pushed out of the lungs in a short rush.

Laryngeal System

The anatomical structures that form the laryngeal system include cartilages, muscles, and bone. The **larynx** (pronounced "lare-rinks") is not a single structure, but rather a framework of many structures. These major structures are shown in Figure 2–4. The largest of these is the **thyroid cartilage**, which is approximately in the middle of the larynx. The thyroid cartilage is formed by two large plates that are joined anteriorly (in the front) to create a slight bump in the neck. This



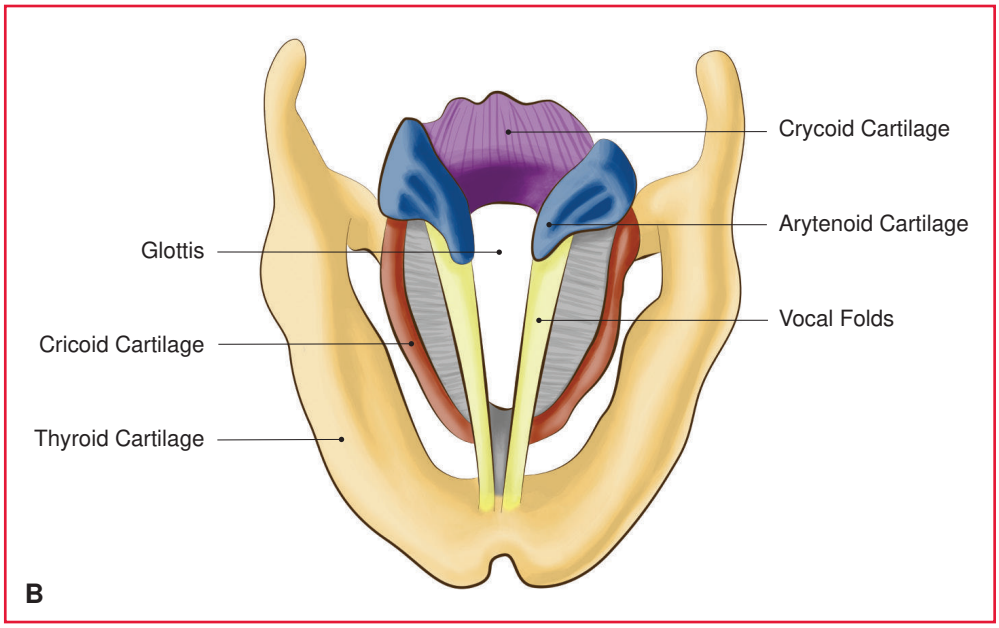


Figure 2–4. Anatomical features of the human laryngeal system. **A.** Side (lateral) view. **B.** View from above (superior).