

FIFTH EDITION

# Articulation and Phonology in Speech Sound Disorders

A CLINICAL FOCUS



JACQUELINE BAUMAN-WAENGLER

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A Clinical Focus

Jacqueline Bauman-Waengler

*Speech-Language Specialist, Pleasant Valley School District  
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**Composition:** Jouve  
**Printer/Binder:** Edwards Brothers Malloy Jackson Road  
**Cover Printer:** Edwards Brothers Malloy Jackson Road  
**Text Font:** 10/12 Charis SIL Regular

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#### **Library of Congress Cataloging-in-Publication Data**

Bauman-Wängler, Jacqueline Ann, author.

[Articulatory and phonological impairments]

Articulation and phonology in speech sound disorders : a clinical focus / Jacqueline Bauman-Waengler. – Fifth edition.  
p. ; cm.

Preceded by Articulatory and phonological impairments / Jacqueline Bauman-Waengler. 4th ed. c2012.

Includes bibliographical references and indexes.

ISBN 978-0-13-381037-0—ISBN 0-13-381037-2

I. Title.

[DNLM: 1. Articulation Disorders. 2. Phonetics. WL 340.2]

RC424.7

616.85'5—dc23

2014043309

10 9 8 7 6 5 4 3 2 1

Loose Leaf Version ISBN 10: 0-13- 394891-9  
ISBN 13: 978-0-13-394891-2

E-text ISBN 10: 0-13-404192-5  
ISBN 13: 978-0-13-404192-6

Package ISBN 10: 0-13-409262-7  
ISBN 13: 978-0-13-409262-1

Traditional Book ISBN 10: 0-13-381037-2  
ISBN 13: 978-0-13-381037-0

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To the children I work with  
who make my job really a joy.

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# About the Author

**J**ACQUELINE BAUMAN-WAENGLER has been a professor for more than 25 years. Her main teaching and clinical emphases are phonetics and phonology, including disorders of articulation and phonology in children and child language disorders. She has published and presented widely in these areas both nationally and internationally. In addition to the fifth edition of *Articulation and Phonology in Speech Sound Disorders: A Clinical Focus*, Bauman-Waengler has also published *Introduction to Phonetics and Phonology: From Concepts to Transcription* (2009) with Pearson. She is currently working as a speech/language specialist for Pleasant Valley School District (Camarillo, California).

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# Preface

The concept for this book grew out of a perceived need to create a bridge between theoretical issues in speech-language pathology and their clinical application. The goal for the fifth edition has remained the same: to tie strong academic foundations directly to clinical applications. To this end, every chapter contains suggestions for clinical practice as well as clinical examples and clinical applications. These features will assist the reader in developing an understanding of how basic concepts and theoretical knowledge form the core for clinical decision making in the assessment and remediation of speech disorders. Learning aids located at the end of every chapter include case studies, further readings, critical thinking, and multiple-choice questions.

## New to This Edition

The fifth edition of *Articulation and Phonology in Speech Sound Disorders: A Clinical Focus* has several significant changes.

- *A modified title.* The title has changed somewhat to reflect the current use of “speech sound disorders,” which is a new umbrella term that is critical to the field of articulation- and phonemic-based speech disorders.
- *Expanded topics of study.* In our constantly changing population, far more clinicians are dealing directly with individuals with varying dialects and children/adults who speak English as a second language. This edition includes updated research that reflects the changing landscape of the field, including expanded coverage on phoneme information in dialects in the United States as well as the needs of learners of English as a second language.
- *New clinical exercises.* This text includes a number of new, revised, or expanded clinical exercises to allow the student to master theoretical concepts by applying them to real-life situations. The eText edition of this text also contains embedded videos that can be used in conjunction with these clinical exercises, allowing for additional analysis or transcription opportunities.
- *Refined chapter organization.* A new chapter order has been developed so that Chapter 7 on Diagnosis now follows Chapter 6 on Assessment: Appraisal—Collection of Data. This change has been made to aid in the flow of concepts.
- *Categorical learning objectives.* These have been fine-tuned in each chapter so that the reader begins each chapter with a set of easily identifiable goals for his or learning. Each set of learning objectives provide the scaffolding to prepare readers for tests and quizzes and compartmentalize key concepts.
- *Chapter 1.* This has been revised to include a section on phonotactics of General American English. In addition, Chapter 1 reviews the most recent guidelines and definitions of the American Speech-Language-Hearing Association (ASHA) for establishing communication, language, articulation, and what is now considered to be “speech sound disorders.” These definitions provide a more basic foundation for understanding later concepts, and the guidelines will be helpful in later clinical practice.



- *Chapter 8.* This chapter outlines several new features pertaining to dialects and English as a second language. First, Appalachian and Ozark English are detailed and contrasted. Second, the statistics on limited English proficient students have been updated, and new content on the Filipino/Tagalog phonemic system has been added. It is one of the five most frequently spoken languages by limited English proficient students.
- *Chapter 10.* The treatment of phonemic-based speech sound disorders has been expanded to include the concepts of the matrix for predicting phonological generalization. This concept is a radical departure from the traditional, phonetic-based treatment approaches and has much to offer children with a severe speech sound disorder.
- *Chapter 11.* This chapter is devoted to disorders that are traditionally considered speech sound disorders. Although a summary of assessment and remediation procedures appears in the text, each section contains updated references to lead the reader to additional possibilities.
- *Updated references.* References in each chapter have been updated to reflect the most recent research in the field.
- *The new DSM-5.* The nomenclature in this book reflects DSM-5 updates.

### The eText edition of this text offers interactive digital features, including

- *Digital functionality.* The digital eText version of this title provides interactive tools to enhance students' experience with the material, including tools that allow students to search the text, make notes online, print important activities, and bookmark passages for later review.
- *Video links in each chapter.* Videos have been added to the eText edition. They give students an inside look at the world of communication disorders. These videos, chosen specifically for this text, illustrate critical concepts in easily digestible 2- to 3-minute clips.



Videos in each chapter offer opportunities for students to transcribe words and sounds in children and adults that demonstrate multiple dialects and disorders. Additionally, students are exposed to real-life speech therapy lessons and dynamic interviews with professionals who specialize in articulation and phonology.

- *Linked glossary.* Key terms throughout the text are linked, giving students one-click access to crucial definitions.

## Instructor's Resource Manual

To help instructors in preparing their courses, we have provided an Instructor's Resource Manual. This supplement is available online or can be obtained by contacting a Pearson sales representative. To download and print the Instructor's Resource Manual, go to [www.pearsonhighered.com](http://www.pearsonhighered.com) and then click on "Educators."

## Acknowledgments

Preparing the fifth edition—as with previous editions—might appear at first to be a simple process but actually was a large time investment supported by many people. First, I would like to acknowledge Ann Davis who is the editor of this fifth edition; Joe Sweeney, program manager; John Shannon, project manager; and Jon Theiss, digital development editor. They have all been supportive and helpful as I have proceeded through this, at times, daunting task. A special thank you to Jon Theiss, digital development editor, who has really been patient with my struggles to prepare this edition for an enhanced eText version. Also thanks to Sharynne McLeod, PhD, Professor in Speech and Language Acquisition, Charles Sturt University, Australia, for responding to many questions and being a true colleague.

For this edition, I would like to say a special thanks to my reviewers: Stephen N. Calculator; University of New Hampshire; Toni B. Morehouse, University of Nebraska; and Steven Long, Marquette University. I hope that you can recognize many of the wonderful suggestions that guided me through these revisions.

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### LEARNING OBJECTIVES

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

- Define communication, language, and speech.
- Define phonology, morphology, syntax, semantics, and pragmatics.
- Define communication disorder, speech disorder, and language disorder.
- Distinguish between articulation—articulation disorder, speech sound—speech sound disorder, phoneme—phonological disorders.
- Delineate phoneme and allophone.
- Compare and contrast terms that are used clinically and in research such as phonological disorder, speech sound disorder, speech delay, speech impairment, and residual speech sound disorder, for example.

### Communication, Speech, and Language

Communication is central to our lives. We communicate in a number of ways—from text messaging to facial expressions. Simply defined, communication is the process of sharing information between individuals (Pence & Justice, 2008). When we think about the diversified population that we encounter within the discipline of communication disorders, a broader definition might be helpful. **Communication** is a process that consists of two or more people sharing information including facts, thoughts, ideas, and feelings. Early communication includes how to interact with other people and things, how to understand spoken language, and how to exchange information with others using gestures or symbols. Communication does not have to involve language and does not have to be vocalized (Justice & Redle, 2014; National Joint Committee for the Communicative Needs of Persons with Severe Disabilities, 2010). Deaf people communicate through gestures; babies communicate basic wants through crying. Communication refers to any way that we convey information from one person to another. For example, we use e-mail, text messaging, or phone calls as ways to communicate. In addition, smiling, waving, or raising your eyebrows at a comment are all examples of nonverbal communication. Sign languages, such as American Sign Language or Seeing Essential English, are nonverbal conventional linguistic systems used to communicate.

The most widely used means of communication is speech. **Speech** is the communication or expression of thoughts in spoken words, that is, in oral, verbal communication. Speech can be further divided into *articulation*, the motor production of speech sounds, *fluency*, the flow of speaking including rate and rhythm, and *voice* including vocal quality, pitch, loudness, and resonance (American Speech-Language-Hearing Association, 1993). The term *speech* is employed in various ways. Speech can be a more formal, spoken communication to an audience. For example: *Having to give a speech to her class was always frightening for Andrea*. Speech can indicate a manner of speaking: *Her speech was marked by a distinct Australian accent*. Speech is also used together with the term *language* to indicate the mental faculty of verbal communication: *The child's speech and language skills were tested as a portion of the diagnostic*. Based on this last example, it seems important to differentiate between speech and language. What are the distinctions between these two terms: *speech* versus *language*?

According to the American Speech-Language Hearing Association, **language** can be defined as a complex and dynamic system of conventional symbols that is used in various modes for thought and communication (American Speech-Language-Hearing Association Committee on Language, 1983). Among other variables, this definition further states that language is rule governed and is described by at least five linguistic parameters: phonological, morphological, syntactic, semantic, and pragmatic. Language is intricate and includes variability and change. In addition, all members of a language agree on the symbolic system that is used, and language is used to communicate in a variety of ways.

Within our definition of language are the terms *phonology*, *morphology*, *syntax*, *semantics*, and *pragmatics*. A brief definition of these words should be helpful in our understanding of language. One of these parameters, phonology, is of major importance in this text.

## Subdivisions of Language

**Phonology** is the study of the sound system of language and includes the rules that govern its spoken form (Parker & Riley, 2010). Therefore, phonology analyzes which sound units are within a language. The sound system of English contains different vowels and consonants than that of Spanish, for example. Phonology also examines how these sounds are arranged, their systematic organization, and rule system. According to the English phonological rule system, no more than three consonants can be at the beginning of a syllable or word, such as in “street.” In addition, certain consonant sounds cannot be arranged together. For example, an “sp” combination is acceptable in English (“spot” or “wasp”), whereas a “pf” cluster is not.

Another area of language is morphology. **Morphology** studies the structure of words; it analyzes how words can be divided into parts labeled *morphemes* (Crystal, 2010), each of which has an independent meaning. A **morpheme** is the smallest meaningful unit of a language. The word “cycle” is one morpheme meaning circular or wheel; however, the word “bicycle” contains two morphemes, “bi-” and “cycle,” “bi” indicating two. In American English, plurality is often noted with the addition of an “s,” such as “book” – “books,” and “ed” can demonstrate past tense as in “cooked” or “talked.” All of these units, “cycle,” “bi-,” “book” “-s,” “cook,” “talk,” and “-ed” are morphemes of American English.

The third area of language is syntax. **Syntax** consists of organizational rules denoting word, phrase, and clause order; sentence organization and the relationship between words; word classes; and other sentence elements (Owens, 2008). We know that certain sentences, for example, are syntactically appropriate, such as “I really like to eat chocolate.” or even “Chocolate, I really like to eat.” However, a sentence such as “I eat like to really chocolate.” would not be an acceptable sentence of American English. Within communication

disorders, we examine the development of syntactical structures in children as well as the problems that certain populations, such as students learning English as a second language, might have when expressing themselves in complex syntactical sentences.

**Semantics** is the study of linguistic meaning and includes the meaning of words, phrases, and sentences (Parker & Riley, 2010). Semantics includes the fact that certain words have more than one meaning, such as “bat,” and that words can have similar meanings, for example, “dog” and “canine.” Also certain words share more or less common characteristics. “Cat,” “dog,” and “hamster” have certain commonalities, whereas “dog” and “boy” have properties that could be compared but seem not as related as the first three words. Semantics also includes phrase meanings as in the multiple interpretations of “a hot dog” and sentence meaning as in “She dressed and washed the baby.”

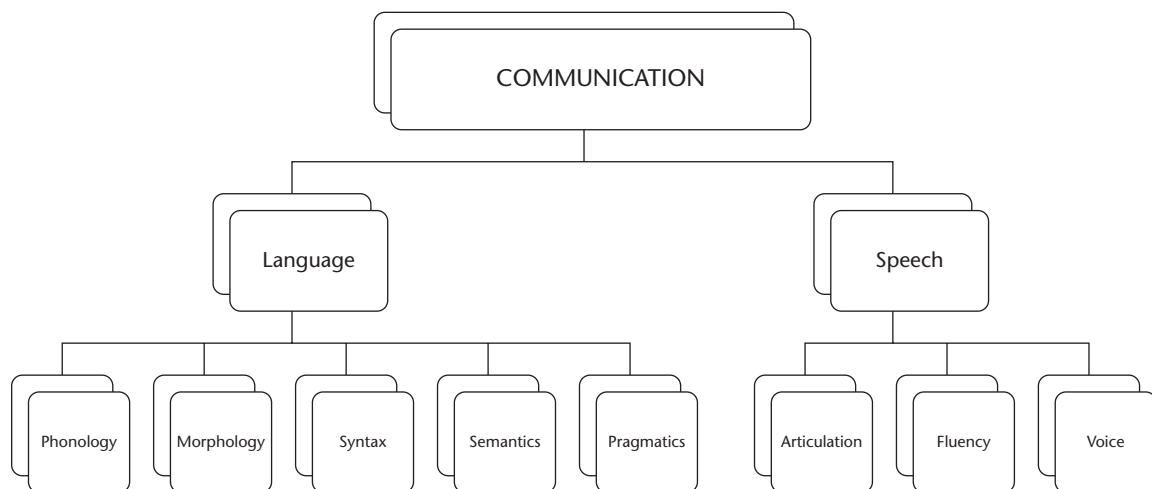
The last term, **pragmatics**, refers to the study of language used to communicate within various situational contexts. Pragmatics includes, among other things, the reasons for talking, conversational skills, and the flexibility to modify speech for different listeners and social situations (Paul, 2007). Included in pragmatics would be the understanding that we talk differently to small children versus older adults; that certain situations typically dictate how and what we say (such as the communication in an interview will be quite different from a night out with your friends); and that we use certain facial expressions, body gestures, and word emphases to communicate very different meanings. For example, think of the sentence “Last night was really something” said with a smile and positive head nods versus the same sentence said with a scowl, negative head movements, and a different emphasis on “really.” Within communication disorders, pragmatics may become a central issue when working with autistic children, for example. See Figure 1.1 for an overview of the divisions of communication.

To summarize, communication is the process of sharing information between/among individuals. Communication can be broadly divided into speech and language. Speech is the expression of thoughts in spoken words; it is oral, verbal communication. On the other hand, language is a complex, dynamic, and

### CLINICAL EXERCISES

List two types of morphological endings that a child who deletes “s” at the end of a word might have difficulties with.

The teacher refers a child to you from first grade. Based on an informal language sample, what could you analyze to examine each of the areas of language: phonology, morphology, syntax, semantics, and pragmatics?



**FIGURE 1.1** Divisions of Communication

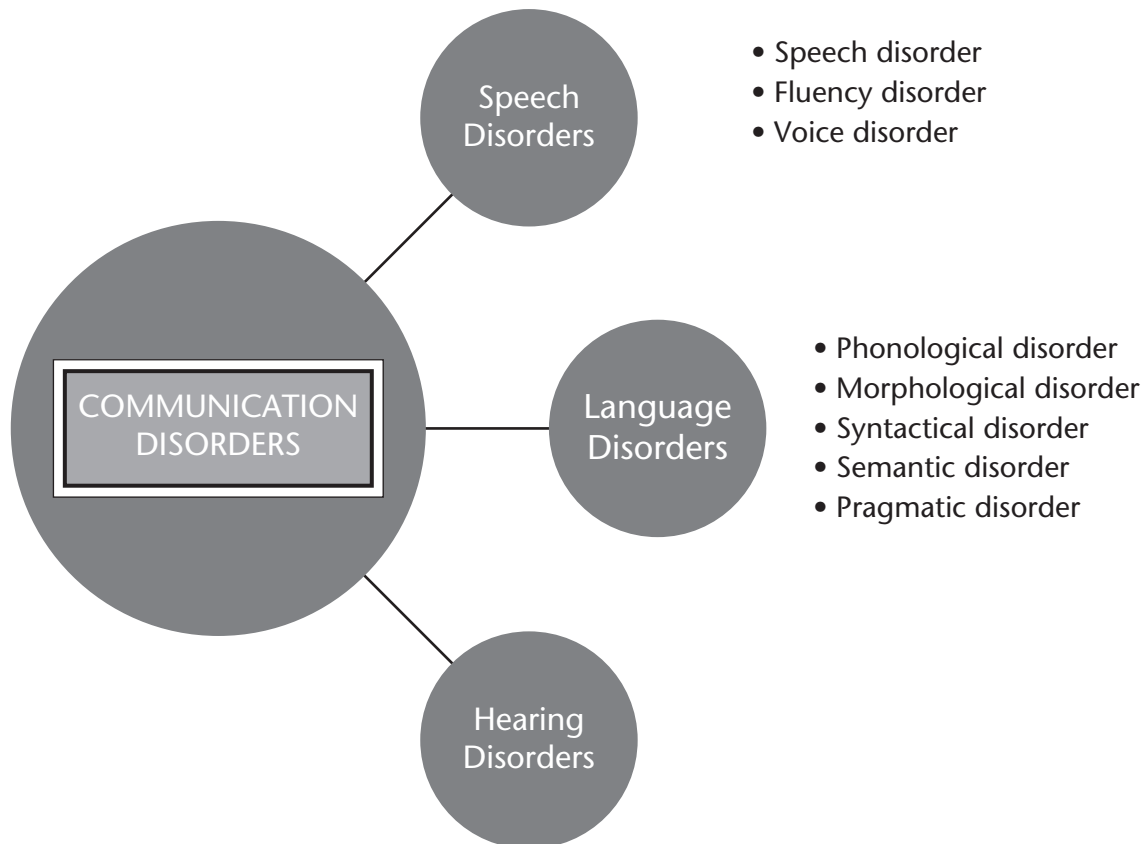


Watch the following video of 4-year-old Ben and try to make comments about each of the following areas: phonology, morphology, syntax, semantics, and pragmatics.

rule-based system of conventional symbols that is used in diverse modalities for thought and communication. However, as practitioners, we deal with communication, speech, and language *disorders*. What characteristics would a disordered system demonstrate?

According to the 1993 guidelines of the American Speech-Language-Hearing Association (ASHA), a **communication disorder** is the impairment in the ability to receive, send, process, and comprehend concepts including verbal, nonverbal, and graphic symbol systems. In addition to hearing disorders, communication disorders are categorized into speech and language disorders. A **speech disorder** is used to indicate oral, verbal communication that is so deviant from the norm that it is noticeable or interferes with communication. Speech disorders are divided into articulation, fluency, and voice disorders. On the other hand, a **language disorder** is impaired comprehension and/or use of spoken, written, and/or other symbol systems. A language disorder may involve one or more of the following areas: phonology, morphology, syntax, semantics, and pragmatics. See Figure 1.2 for the subdivisions of communication disorders.

According to this classification, an impairment of the articulation of speech sounds is one example of a speech disorder. To understand this definition, it would be important to examine the terms *articulation* and *speech sounds*. In clinical practice, important distinctions are made between articulation and speech sounds versus phonology and phonemes. The following section defines and gives examples of how these words are used in our clinical practice within communication disorders.



**FIGURE 1.2** Subdivisions of Communication Disorders

## Articulation and Speech Sounds: Phonology and Phonemes

The term *articulation* and its derivations are often used to describe an individual's speech. They might appear in a referral statement or within a diagnostic report; for example:

Sandy was referred to the clinic because her parents were concerned about her *articulation* skills.

Bob could *articulate* the sound correctly in isolation but not in word contexts.

Joe's *articulation* disorder affected his speech intelligibility.

For the purpose at hand, **articulation** refers to the totality of motor movements involved in production of the actual sounds that comprise speech (Bauman-Waengler, 2009). The learning of articulatory skills is a developmental process involving the gradual acquisition of the ability to move the *articulators* (those structures that are important in forming the individual sounds) in a precise and rapid manner. Thus, *learning to articulate is a specific kind of motor learning*. Just as children become more adept at certain motor skills as they grow older, their articulation skills develop as well. For example, we do not expect the same level of articulatory abilities from a 2-year-old child as from a 6-year-old. Second, the definition suggests that errors in articulation result from relatively peripheral disturbances of these articulatory processes. Thus, the peripheral motor processes involved in the planning and execution of articulation are impaired; the central language capabilities of the individual remain intact. In summary, articulation is a specific, gradually developing motor skill that involves mainly peripheral motor processes.

Speech sounds are central units in any discussion of disordered speech. Although the human vocal tract is capable of producing a wide array of sounds, including coughing and burping, speech sounds are special sounds because they are associated with speech. **Speech sounds** represent physical sound realities; they are end products of articulatory motor processes. When talking about a child's s-production in the context of an articulation test, for example, we refer to the *speech sound* production of [s].

Speech sounds then are real, physical sound entities used in speech. But in addition to their *articulatory form*, they also have a linguistic function. *Linguistic function* includes, for example, the rules that address how specific sound units can be arranged to produce appropriate words and the phoneme concept. A **phoneme** is the smallest linguistic unit that is able, when combined with other such units, to distinguish meaning between words (Small, 2012). For example, "tick" has three phonemes /t/, /ɪ/, and /k/. We know that these are phonemes of American English because the word they form is meaningful. In contrast, /s/ is also a phoneme of American English as can be seen in "sick," /s/, /ɪ/, /k/, which differs from "tick" in one phoneme: /t/ versus /s/. As far as notation is concerned, speech sound productions are usually placed within brackets in phonetic transcription, whereas phoneme values are symbolized by slanted lines, or virgules. For example, [s] indicates that it was a sound someone actually pronounced in a specific manner. On the other hand, /s/ signifies the phoneme "s."

The idea of the phoneme is considered to be an abstraction. A phoneme is not a single, concrete, unchanging entity. A phoneme is an abstraction that is based on the many variations that occur for a particular sound because it is heard in differing contexts of conversational speech. This does not necessarily make the phoneme concept complex or difficult to understand. We constantly deal with abstractions. Take, for example, the concept "cat." A cat is not a single, unchanging entity. There are big cats and small cats, cats that are striped or solid colored of various shades. However, there are certain characteristics that we accept as being typical to the concept of "cat." We could say that the *cat concept* embraces a whole family of units that are related yet somehow are distinct.



Even two cats of the same size, color, and build will have slight variations that could be detected most certainly by the owners. If we apply this to the phoneme concept, we find a similar abstraction. So when we speak of a particular phoneme, /t/ for example, we are referring to the typical “t” but we also take into consideration the varieties of “t” that are used in various contexts and by different speakers. The term *allophone* is used to refer to the changes that occur in a phoneme when produced by speakers in differing contexts. **Allophones** are variations in phoneme realizations that do not change the meaning of a word when they are produced in differing contexts. Allophones are phonetic variations of a phoneme (Crystal, 2010). Within the phonological system of American English, there are many examples of allophones.

Several allophonic variations can occur with the /p/ phoneme, for example. At the beginning of a word as a single sound unit, /p/ is typically aspirated. Aspiration is that slight puff of air that you hear if you pronounce the word “pie” or “pot.” This is transcribed as [p<sup>h</sup>],

### CLINICAL EXERCISES

Examples are given of allophonic variations with /p/. Can you think of similar allophonic variations with /t/ and /k/?

Say the word “leap” and then the word “cool” slowly. Concentrate on the production of [l]. Do you notice any differences between the first and the second [l] production? These two different productions are termed light “l” (leap) and dark “l” (cool) to denote the different types of productions. Discuss why this would be an allophonic variation in American English. In Russian, these two types of [l] productions have phonemic value.

the small raised <sup>h</sup> representing the puff of air or aspiration in phonetic transcription. However, /p/ is typically unaspirated following “s” as in “spy” or “spot,” for example. If you pronounce these words, you will find that the puff of air, the aspiration that you noticed in “pie,” is not present. However, these allophonic variations exemplified by aspiration or lack of aspiration do not have phonemic value within the phonological system of American English. In other words, we can hear these differences, but both aspirated and unaspirated p-sounds are considered one phoneme, /p/.

*Phonology* is the study of how phonemes are organized and function in a language. Phonology includes the inventory of phonemes of the language in question, thus a list of all the vowels and consonants that function in American English to differentiate meaning. However,

phonology also focuses on how these phonemes are *organized* to convey meaning within a language system. Such a description would include how the phonemes can and cannot be arranged to form meaningful words. **Phonotactics** refers to the description of the allowed combinations of phonemes in a particular language. A more complete discussion of the phonotactics of American English will be presented in Chapter 2.

If one wants to refer to the physical reality, to the actual production, the term *speech sound* is used. From early to contemporary publications, such phoneme realizations have also been labeled **phonetic variations**. Speech sounds or phonetic variations can be

Phonotactics of General American English include the fact that some phoneme combinations do not occur in American English words. An example would be /ʃ/ + /v/. General American English does have other /ʃ/ combinations, such as /ʃ/ + /r/ (e.g., shrink) or /ʃ/ + /t/ (e.g., wished). The /ʃ/ + /v/ combination does, however, occur in the phonological system of German. Words such as *Schwester* (/ʃvestəR/ “sister”) document this as a *phonotactic* possibility in German.

Phonotactics also restricts some consonant clusters occurring in General American English to their use in certain word positions, for example, the clusters /sk/ and /ks/. Words or syllables can begin or end with /sk/ (e.g., *skate*, *risk*), however, this is not the case with /ks/. This cluster can occur only at the end of a syllable or word (e.g., *kicks*). This is a *phonotactic* characteristic of the phonological system of General American English.

**TABLE 1.1** Phoneme versus Speech Sound

Phoneme	Speech Sound
The smallest unit within a language that is able, when combined with other units, to establish word meanings and distinguish between them	Actual realizations of phonemes; referred to as <i>allophonic variations</i> or <i>phonetic variations</i>
Linguistic unit, an abstraction	Concrete, produced, transmitted, and perceived
Used in reference to a particular language system	Can be examined without referring to a specific language system
Basic unit within phonology	Basic unit within phonetics
Notation is within virgules / / (e.g., “the /s/ phoneme”)	Notation is within brackets (e.g., “the [f] speech sound”)

examined without reference to a given language system. This is not the case with phonemes. When using the term *phoneme*, we refer exclusively to the function of the sound in question: to its ability to signify differences in word meaning within a *specific* language (see Table 1.1). Two words that differ in only one phoneme value are called **minimal pairs**. Examples of minimal pairs are *dog* versus *log* and *dog* versus *dot*.

How do these terms relate to our clinical decision making? Speech sounds as end products of articulatory motor processes are the units we are describing when we use phonetic transcription to capture an individual’s actual productions on an articulation test or spontaneous speech sample. Speech sounds and speech sound errors relate to articulatory deviations. However, what if we notice that a child’s productions of *swing*, *sing*, *ring*, and *wing* all sound the same, for example, that they all sound like *wing*? The child is not using the necessary phonemic contrasts to signal differences between these words. Both listener and speaker will probably not be able to differentiate between these words because they sound identical. Now we are analyzing the child’s phoneme system, the child’s ability to use phonemes to establish and distinguish between word meanings. If this occurs consistently throughout the child’s speech, we could conclude that the child’s phoneme system is limited—that is, restricted when compared to the norm. Difficulties in using phonemes contrastively to distinguish meanings relate to *linguistic* abilities, to the individual’s phonological system as one subcategory of language.

Speech sounds, then, are related to our motor, articulatory skills. On the other hand, phonemes represent our understanding of the phonological system of our particular language. Table 1.1 summarizes the differences between the phoneme and speech sound. Moving a step further, what would constitute an articulation disorder versus a phonological disorder? The next section defines each of these terms and provides clinical examples.

### Speech Sound Disorders: Articulation and Phonological Disorders

Depending on the age of the child, most make some sound errors as they learn to say new words. A **speech sound disorder** occurs when difficulties making certain sounds continue past a certain age. Every sound has a different range of ages when a child should produce the sound accurately. If an individual’s articulation deviates significantly from the norm, it may be diagnosed as an **articulation disorder**. An *articulation disorder*, as a subcategory of a speech disorder, is the atypical production of speech sounds characterized by substitutions, omissions, additions, or distortions that may interfere with intelligibility (American Speech-Language-Hearing Association, 2014). Articulation errors are typically

According to ASHA (2008), the term *phonological disorder* is a subset of a language disorder. In a different document, which is information for the public, ASHA states that a speech sound disorder includes problems with articulation (making sounds) **and** phonological processes (sound patterns) (2014). It appears that the present nomenclature has shifted slightly to include phonological difficulties under the category of speech sound disorders. This can be aptly summarized by Strand & McCauley (2008), who state that the term

*phonological disorder* is used to refer to the entire range of developmental communication disorders in which sound production is primarily affected. In addition they add that more recently this broad range of disorders is referred to as *speech sound disorders*. However, this usage reserves the term *phonological disorders* to refer to a linguistic level of impairment. For the purpose at hand, these terms will be separated with the understanding that both terms could be under a broad terminological umbrella of speech sound disorder.

classified relative to a child's age, which translates into stages within this developmental process. Younger children are at an earlier stage in this development, whereas older children are at a later stage or may have completed the process. Depending on the age of the child, certain articulation errors may be considered to be typical (age-appropriate errors) or atypical (non-age-appropriate errors). When assessing an individual, we often gather information on the inventory of speech sounds used. The phonetic inventory is a list of all the speech sounds including their variations.

On the other hand, the term *phonology* is basic to the understanding of phonological disorders. When an individual's phonology deviates enough from the norm, this could lead to a phonological disorder. A **phonological disorder** refers to impaired comprehension of the sound system of a language and the rules that govern the sound combinations (ASHA, 2008; ASHA Ad Hoc Committee on Service Delivery in the Schools, 1993).

Phonology is closely related to other constituents of the language system, such as morphology, syntax, semantics, and pragmatics. A child's phonological system, therefore, can never be regarded as functionally separate from other aspects of the child's language growth. Several studies (e.g., Cummings, 2009; Edwards, Beckman, & Munson, 2004; Edwards, Fox, & Rogers, 2002; Morrisette & Gierut, 2002; Mortimer, 2007; Munson, Edwards, & Beckman, 2005a; Roberts, 2005; Storkel, 2001, 2003, 2004; Storkel & Rogers, 2000) have documented that delayed phonological development occurs concurrently with delayed lexical and grammatical development. Although the direct relationship between phonological and grammatical acquisition remains unclear, interdependencies certainly exist between these areas.

### CLINICAL EXERCISES

Assume that a child produces the following variations: An s-sound produced with the tongue tip too far forward, transcribed as [s], an s-production with the tongue too far back, a so-called palatalized [s], [s<sup>h</sup>], and a lateral production of [s], [ɬ]. These three variations would be a portion of the phonetic inventory. What would be in the phonemic inventory?

Be careful to examine whether something is a variation of the same speech sound or a different phoneme when you construct the phonemic inventory.

Assessment of a child with a phonological disorder would include gathering information about all phonemes that the child uses to distinguish meaning—the phonemic inventory. The **phonemic inventory** is the repertoire of phonemes used contrastively by an individual. When compared to the phonemic inventory of General American English, we might find that certain phonemes are not present in the child's speech—that is, the child's phonemic inventory is restricted.

In addition, we might analyze the child's phonotactics by examining the position in the word in which these phonemes occur—at the beginning, middle, or end of the word. Children who have

difficulties with the organization of their phoneme system might not realize the phonotactics that are typical for American English. Their speech may demonstrate *phonotactic constraints*; in other words, the phoneme use is restricted, so the phonemes are not used in all possible word positions. The distinction between a speech sound/articulation disorder versus a phonological disorder remains decisively important. It keeps definitions clear and is applicable to diagnostic and intervention procedures. Therefore, for the purpose at hand, a distinction is made between articulation disorders, those in which the peripheral motor processes are disturbed, and phonological disorders, those in which the organization and function of the phonological system is impaired. This delineation is not without problems; delineating articulation from phonological difficulties is clinically not an either/or proposition. Often, a child will seem to display characteristics of both disorders. Although this division between articulation and phonological disorder may remain at times unclear, a systematic attempt to distinguish between them is one important aspect of clinical decision making. This dichotomy is used throughout this text and more fully developed in later chapters. Table 1.2 outlines several different terms that are used clinically and in the research in reference to speech sounds and speech sound disorders.



As you view this video of 5-year-old Tessa, make notes on which sounds the child can produce and which ones are still difficult for her to produce. Do you think her articulation is within normal limits for her age, or would you suggest one of the terms from Table 1.2 to describe her speech?



Now view this video of 5-year-old Caitlin. Do you notice any differences between Tessa and Caitlin in relationship to their speech and intelligibility?

**TABLE 1.2** Speech Sounds and Speech Sound Disorders: Terminology

Term	Definition	Examples
Articulation	The totality of motor processes involved in the planning and execution of speech.	Describes the speech sound production of individuals (e.g., “The <i>articulation</i> of [s] was incorrect.”). Describes tests that examine the production of speech sounds (e.g., “The clinician administered an <i>articulation</i> test.”).
Articulation disorder	Difficulty with the motor production aspects of speech or an inability to produce certain speech sounds.	A diagnostic category that indicates that an individual’s speech sound productions vary widely from the norm (e.g., “Tony was diagnosed as having an <i>articulation</i> disorder.”).
Phonology	The study of the sound system of a language, examines the sound units of that particular language, how these sounds are arranged, their systematic organization, and rule system.	Describing the inventory and arrangement of sound units (e.g., the Spanish <i>phonological system</i> has fewer vowels than American English. The phoneme /s/ is present in Spanish, but not /z/).
Phonological disorder	Impaired comprehension and/or use of the sound system of a language and the rules that govern the sound combinations.	The inventory of phonemes may be restricted (e.g., “Jonathan used the phoneme /t/ for /d, k, g, s, z, ʒ, tʃ, dʒ/. He was diagnosed as having a phonological disorder.”).
Persistent speech sound disorders	Errors that persist past the typical age of acquisition (i.e., 8 or 9 years old).	Children with this disorder show little spontaneous improvement, and their response to intervention is poor. There is commonly no known cause (Wren, Roulstone, & Miller, 2012).

(Continued)