

Clinical Framework

BASIC TERMS AND CONCEPTS

LEARNING OBJECTIVES

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

- Define articulation and articulation disorders.
- Define phonetics and the three branches of phonetics: articulatory, acoustic, and auditory.
- Define and differentiate speech sounds and phonemes.
- Define phonology.
- Differentiate between an articulation and a phonological disorder.
- Explain why articulation impairments are considered to be phonetic disorders, whereas phonological disorders are noted as phonemic problems.

Every discipline has a core vocabulary that provides a knowledge base within that particular field of study. Communication sciences and disorders also has such a set of terms. Integral to this discipline, speech and speech disorders represent important constructs. Speech, the exchange of information through speaking or talking, is the most widely used means of communication. One of the main emphases of this book is speech and speech disorders. A speech disorder is a general term that is used to indicate oral, verbal communication that is so deviant from the norm population that it is noticeable or interferes with communication.

Individuals with speech disorders constitute a large percentage of the population with communicative difficulties.

The goal of this beginning chapter is to define and distinguish between certain basic terms. These distinctions will be important when identifying two core concepts within this chapter: articulation and phonological disorders. The term *articulation disorder* is historically older and dates back to the early foundations of what is currently designated as the field of communication disorders. On the other hand, a *phonological disorder* is a more recent label which evidences in part the

influence of linguistics on the field of communication disorders. These two different concepts will be important when defining and distinguishing varying types of speech disorders. The following section will define articulation and articulation disorders as well as illustrate their clinical relevance.

ARTICULATION AND ARTICULATION DISORDERS

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 processes involved in the planning and execution of sequences of overlapping gestures that result in speech (Fey, 1992). The definition of *articulation* entails, first, that the learning of articulatory skills is a developmental process involving the gradual acquisition of the ability to move the articulators 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

Articulation is rooted in the Latin word *articulatio*, which stood for the "joining of separate entities." In anatomy, zoology, and biology, this basic definition is preserved, as in "The thyroid cartilage articulates with the cricoid cartilage." Musicians, too, use the word to refer to the joining of separate entities, for example, tone groupings, as in "She played the sonata with feeling and superb articulation." When used by dentists, *articulation* alludes to the joining of teeth, as in "The articulation of the new dentures was better than that of the patient's set of natural teeth." Within communication disorders, the original *articulatio* is exemplified by the joining of the many separate movements needed to establish speech, as in "The child's articulation was characterized by multiple sound errors."

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.

If an individual's articulation deviates significantly from the norm, it may be diagnosed as an articulation disorder. An **articulation disorder** refers to difficulties with the motor production aspects of speech, or an inability to produce certain speech sounds (Elbert and Gierut, 1986). Articulation errors are typically classified in light of 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).

Articulation and its disorders represent problems with the production of speech sounds. One other basic term relevant to this discussion is *phonetics*, which is the study of speech and speech sounds. Phonetics pro-

vides a conceptual foundation for analyzing articulation as well as a clinical framework for assessing and treating articulation disorders. The following section will discuss phonetics and its link to articulation.

PHONETICS AND ITS RELATIONSHIP TO ARTICULATION DISORDERS

The description and classification of speech sounds is the main aim of phonetic science, or phonetics. Sounds may be identified with reference to their production (or “articulation”) in the vocal tract, their acoustic transmission, or their auditory reception. The most widely used descriptions are articulatory, because the vocal tract provides a convenient and well-understood reference point. . . . (Crystal, 1987, p. 152)

Generally stated, phonetics is the science of speech (Grunwell, 1987). Such broad definitions delineate speech in its entirety while also effectively indicating the various divisions of phonetics. Thus defined, **phonetics** is the study of speech emphasizing the description and classification of speech sounds according to their production, transmission, and perceptual features. These three branches of phonetics are labeled *articulatory phonetics*, exemplifying speech production, *acoustic phonetics*, the study of speech transmission, and *auditory phonetics*.

Articulatory phonetics deals with the production features of speech sounds and their categorization and classification according to specific parameters of their production. Central aspects include how speech sounds are actually articulated, their objective similarities, and their differences. Whereas articulation represents all motor processes resulting in speech in its entirety, articulatory phonetics describes and classifies the specific motor processes responsible for the production of speech sounds. Articulation is typically used

as a more general term to describe the overall speech production of individuals. Articulatory phonetics is a field of study that attempts to document these processes according to specific parameters, such as the manner or voicing of the speech sound. This branch of articulatory phonetics is closely aligned with articulation and its disorders and will be the main emphasis of this text. Definitions and clinical examples are outlined in Table 1.1.

The transmission properties of speech are dealt with in **acoustic phonetics**. Here, the frequency, intensity, and duration of speech sounds, for example, are described and categorized. Within **auditory phonetics**, investigators focus on how we perceive sounds. Our ears are not objective receivers of acoustic data. Rather, many factors influence our perception. Such factors are examined in the area of auditory phonetics.

In the context of this book, we are primarily interested in articulatory phonetics. This specialty area deals with the actualities of how speech sounds are formed. Directly related to this area of phonetics is, of course, articulation.

The description and classification of speech sounds is an integral portion of both the assessment and the treatment of articulation disorders. Knowledge of the production features of speech sounds, information mediated in articulatory phonetics, will guide clinicians when they are evaluating the various misarticulations noted in a clinical evaluation. One important step involves gathering phonetic information on the exact way an individual misarticulates sounds. This type of clinical work involving articulatory phonetics is indispensable in the assessment and treatment of our clients with articulation disorders.

The concept of speech sound is important in our work with articulation and its disorders. However, there is another central term, the *phoneme*, that is connected to phonology and its disorders. The next section will define

Table 1.1 Articulation, Articulation Disorder, and Articulatory Phonetics

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., "He <i>articulated</i> the [s] sound correctly." Describes tests that examine speech sound production ability, e.g., "He administered an <i>articulation</i> test."
Articulation disorder	Difficulties 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., "He was diagnosed as having an <i>articulation disorder</i> ."
Articulatory phonetics	Categorization and classification of speech sounds according to specific production parameters.	How individual sounds are formed, e.g., their place, manner, and voicing characteristics; e.g., clinicians might use their knowledge of articulatory phonetics to determine that the place of articulation, specifically the tongue placement, was deviant from the norm production.

and distinguish between speech sounds and phonemes.

SPEECH SOUNDS VERSUS PHONEMES: CLINICAL APPLICATION

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* refers to how speech sounds function within a spe-

cific language. For example, which sounds are included in a language and how they are arranged to form meaningful words belong to the linguistic function of speech sounds. Therefore, linguistic function also includes the rules that address how speech sounds can be arranged to produce appropriate words. The term *phoneme* is used in relationship to linguistic function. A **phoneme** is the smallest linguistic unit that is able, when combined with other such units, to establish word meanings and distinguish between them.

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 **allophonic variations** (e.g., Shriberg and Kent, 2003; Trubetzkoy, 1939) or **phonetic variations** (Grunwell, 1987). As far as notation is concerned, speech sound productions are usually placed within

The conceptual nature of the phoneme is more fully developed in Chapter 4.

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.” Speech sounds or phonetic variations can be 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. 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*. See Table 1.2.

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 articulation distortions. 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 the same. 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. Phonemes and difficulties in using phonemes contrastively to distinguish meanings relate to *linguistic* abilities, to the individual’s language system. This leads us directly into a discussion of phonology, the language-based study of sound systems.

PHONOLOGY AND PHONOLOGICAL DISORDERS

The term *phonology* is basic to the understanding of phonological disorders. **Phonology**, a branch of linguistics, pertains to the description of the systems and patterns of phonemes that occur in a language. It involves determining

Table 1.2 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 allophonic variations or phonetic variations
Linguistic unit	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”

the language-specific distinctive phonemes and the rule-governed nature of these systems (Mackay, 1987). Phonology is the study of how phonemes are organized and function in communication (Lowe, 1994). 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.

When an individual's phonology deviates enough from the norm, this could lead to a phonological disorder. A **phonological disorder** refers to an impaired system of phonemes and phoneme patterns within the context of spoken language. The term represents an individual's impairment of the understanding and organization of phonemes within the lan-

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* (/ʃvɛstɐʀ/) document this as a *phonotactic* possibility in German.

Phonotactics also includes that some consonant clusters occurring in General American English are restricted in use to certain positions. For example, the clusters "sk" and "ks" cannot occur in the same places. Words or syllables can begin or end with "sk" (e.g., *skate*, *risk*). This, though, 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.

guage system. It is hypothesized that a phonological disorder reflects a language deficiency, specifically a neurolinguistic dysfunction at the phonological level (Grunwell, 1987).

Assessment of a child with a phonological disorder would include gathering information about all the 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, the phonemes are not used in all possible word positions.

CLINICAL APPLICATION

Inventory and Phonotactics

Jeff was referred to the school speech-language pathologist by his kindergarten teacher, who was worried about the lack of intelligibility of his speech. The clinician noted that Jeff's phonemic inventory was very restricted. The following phonemes were present in Jeff's speech: /p, b, t, d, k, g, m, n, ŋ, f, v, h, w/. Jeff's phonemic inventory did not include the following phonemes: /s, z, ʃ, ʒ, θ, ð, j, l, r, ʃ, ɔ/. In addition, certain phonotactic constraints were noted. At the beginning of a word, Jeff realized the above noted speech sounds. However, at the end of a word or syllable, only voiced sounds were used. Jeff's phonotactics did not employ voiceless sounds to terminate a word or syllable. Not only was Jeff's phonemic inventory limited, but phonotactic constraints were also discovered.

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., Edwards, Fox, and Rogers, 2002; Morrisette and Gierut, 2002; Paul and Jennings, 1992; Ratner, 1994; Rescorla and Ratner, 1996; Roberts, 2005; Scarborough and Dobrich, 1990; Stoel-Gammon, 1989; Storkel, 2001, 2003, 2004; Storkel and 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.

PHONETICS VERSUS PHONOLOGY: FORM AND FUNCTION

The speech sounds which are investigated within the area of phonetics have a great many acoustic and articulatory properties which are all important for the phonetician. . . . However, for the phonologist most of them are totally irrelevant as long as they do not function as distinguishing marks between words. Therefore, the speech sound of the phonetician does not coincide with the sound segment of the

phonologist. The phonologist considers the sound segment only insofar as it fulfills a certain linguistic function. (Translated from Trubetzkoy, 1939, p. 14)

Any understanding of phonology presupposes its distinction from phonetics. The difference between *form* and *function* has often been used to characterize this distinction. Whereas phonetics emphasizes the form of speech sounds, that is, their concrete actualities, phonology stresses their function as phonemes within the language system. See Table 1.3.

How do we practically differentiate between the form and the function of a specific sound segment in question? When analyzing the speech sound form, a clinician examines all the distinct properties that are associated with its production. It might be noted that [j] is produced without the normal lip rounding or that [s] is produced with the tongue too far forward. The **phonetic inventory** is the repertoire of speech sounds for a particular client, including all the characteristic production features the client utilizes.

On the other hand, if the phoneme function is the goal of the assessment, the clinician would examine the child's phoneme system to determine whether specific phonemes are used contrastively—that is, for the purpose of differentiating between word meanings. A phonemic analysis ignores detailed production characteristics of the sound segment except

Table 1.3 Phonetics versus Phonology

Term	Major Emphasis	Examples
Phonetics	The actualities of speech production	Describes how individual speech sounds are produced, their form
Phonology	The function and organization of phonemes within a given language system	Includes inventory of phonemes within a specific language that functions to differentiate meaning in that language Examines how phonemes can and cannot be arranged to establish meaningful words, i.e., phonotactics

those that distinguish between word meanings in that language. In a phonemic analysis, if a child produces [ʃ] without lip rounding but the sound segment is still perceived as /ʃ/, then the lack of lip rounding would not be relevant. However, if the child's production of [ʃ] is so far off that it is perceived as /s/, this would be important. Its importance lies in the fact that /ʃ/ and /s/ are two separate phonemes in American English; they can be used contrastively to differentiate word meanings, as in *ship* versus *sip*. A phonemic analysis would also examine the phonotactics of a particular client to determine if all sound segments are used in all possible positions.

ARTICULATION DISORDERS VERSUS PHONOLOGICAL DISORDERS

Although the term *phonology* has been a conceptual entity for linguists at least since the beginning of the twentieth century, it is only within the last few decades that it has gained wide usage by speech-language pathologists. For example, describing *phonological processes* when analyzing a child's speech sound error patterns or diagnosing a child as having a *phonological disorder* have their theoretical basis in phonology. In addition, a gradual shift occurred in the 1970s and 1980s away from the label *articulation disorder* to using the term *phonological disorder*. For some, this change was considered necessary as "phonological notions provided a much richer framework for describing normal and disordered speech development" (Kamhi, 1992, p. 262). However, for many, this change in terminology created confusion. One reason for this confusion was the various ways in which the term *phonological disorder* was defined. Another unclear issue related to *how* these new theoretical concepts were to be applied to the assessment and management of children with speech sound/phoneme difficulties. Based on the concep-

tual framework discussed earlier, articulation disorders were defined as disturbances in the relatively peripheral speech motor processes. They result in sounds that are notably different from norm productions. When comparing these characteristics to the previously given definitions, it becomes clear that *articulation disorders are phonetic in nature*.

On the other hand, phonological disorders represent impairments of the understanding and organization of phonemes within a language system. They result in an inadequate phoneme system or in phoneme patterns that are different from those normally noted within a particular language. Phonological disorders are seen as deficiencies in *phoneme function*. For example, the child may demonstrate the ability to produce the sound in question but may be unable to use it appropriately within the phoneme system. *Phonological disorders are phonemic in nature*. See Table 1.4.

Although it does not seem difficult to separate an articulation disorder from a phonological disorder definitionally, opinions vary as to the relationship and interdependencies between the two. The importance in distinguishing between the two terms within the assessment and remediation process is questioned as well as preference among professionals for one term.

For specific speech sound problems, many believe that the term *phonological disorder* is a better label. First, it places speech sound disorders into the broader framework of language. Within this broader framework, attention is focused on the whole system rather than on only one part of the system (Elbert, 1992). This viewpoint also seems more in line with findings that suggest that phonological performance is influenced by pragmatic, morphosyntactic, and semantic levels of organization (e.g., Barlow, 2002; Gierut and Morrisette, 2005; Hoffman, 1990; McCune and Vihman, 2001; Shriberg and Kwiatkowski, 1994; Storkel, 2001; Storkel and Morrisette,

Table 1.4 Articulation Disorders versus Phonological Disorders

Articulation Disorders	Phonological Disorders
Phonetic errors	Phonemic errors
Problems in speech sound production	Problems in the language-specific function of phonemes
Difficulties with speech sound form	Difficulties with phoneme function
Disturbances in relatively peripheral motor processes that result in speech	Disturbances represent an impairment of the understanding of the organization of phonemes within the language system
Speech sound production difficulties do not typically impact other areas of language development such as morphology, syntax, or semantics	Phoneme difficulties may impact other language areas such as morphology, syntax, or semantics

2002; Storkel and Rogers, 2000; Velleman and Vihman, 2002). Phonological development is seen as directly linked to the child's developing cognitive and language systems. In addition, it seems clear that some of the sound errors made by children cannot be due to faulty control of the articulators; that is, they cannot be viewed as articulation disorders (Edwards, 1992; Fey, 1992). Although these children may demonstrate adequate production of speech sounds, their rule-governed use in specific contexts or word positions is impaired. For these children, then, the speech sound form is adequate; speech sound function, however, is not.

In an attempt to resolve this labeling issue, Shriberg and Kwiatkowski (1982a) suggested that the term *phonological disorder* be used as a

Historically, the term *articulation disorder* has been used as a label for all clients who evidenced speech sound production difficulties. Observed errors were thought to be caused by faulty control of the peripheral articulators. Remediation consisted of increasing precision, speed, and/or mobility of these articulators within the context of speech production. This viewpoint did not emphasize the decisively important fact that speech sounds function within the language system as phonemes. This limited understanding of disordered articulation probably set the stage for embracing a new, more encompassing concept.

cover term for any problem that involves the speech production process. Thus, both groups of children, those with faulty control of the articulators *and* those with faulty phonemic system organization, would be considered to have a phonological disorder.

Using the term *phonological disorder* in such a broad manner creates several theoretical and practical problems. Definitionally, a phonological disorder represents difficulties with the organization and function of the phoneme system. Does this mean that all children who have speech impairments, even those with so-called simple problems—for example, a distorted [s] or an [r] that is not quite correct—now have problems with the organization and function of their phoneme system? Certainly not. And what about those disorders that have historically been considered as articulation problems, such as the dysarthrias or cerebral palsy? Should these now be considered phonological disorders, too? By labeling all children with speech production problems as “phonologically disordered,” more confusion than coherence is gained.

The distinction between articulation and phonological disorders remains decisively important. It keeps definitions clear and is practically applicable to diagnostic and intervention procedures. For the purpose at hand, therefore, a distinction will be made between *phonetic*

errors, those in which the peripheral motor processes are disturbed, and *phonemic errors*, those in which the organization and function of the phoneme system is impaired. Although this description of phonetic versus phonemic sound errors is not without problems, the distinction between the two will be applied throughout this text: Phonetic errors result in articulation disorders, whereas phonemic errors represent phonological disorders.

Delineating phonetic from phonemic problems is clinically not an either/or proposition. Often, a child will display characteristics of both phonetic and phonemic errors. Although this division between phonetic and phonemic difficulties may remain at times unclear, a systematic attempt to distinguish between them is one important aspect of clinical decision making.

There is no doubt that the application of phonological principles has added considerably to our understanding of speech errors in children. However, by zealously embrac-

ing these newer concepts, many professionals have started to ignore phonetics due to its alignment with traditional motor-based approaches. The conceptual framework offered by phonetics continues to be a central portion of the assessment and treatment process. "Clearly one cannot employ phonological concepts and techniques without phonetic knowledge, and that knowledge informs clinical assessment and treatment" (Grunwell, 1997, pp. 63–64). Accordingly, after analyzing various treatment perspectives, Shelton (1993) concluded that "both articulatory and phonological concepts contribute to the understanding of children's speech-sound system and related language disorders, but neither is sufficient by itself as a framework for clinical work" (p. 175). For decades, phonetic principles have been the core of assessment and treatment of speech disorders in children and adults. Although phonological principles add to our understanding, they do not replace the valuable knowledge phonetics has to offer.

SUMMARY

This chapter refamiliarized the reader with several terms that are fundamental to the assessment and treatment of articulatory and phonological disorders. Definitions and clinical applications were provided for *articulation*, *phonetics*, *speech sound*, *phonology*, and the *phoneme* as a foundation for this understanding. Form versus function was used to distinguish between phonetics, with its basic unit the speech sound, and phonology, represented by

the phoneme. Phonetics emphasizes the form of speech sounds, whereas phonology stresses the function of phonemes within a language system. Based on these definitions, a differentiation between articulation disorders and phonological disorders was presented. The problems of such a division were discussed in light of the diversity of viewpoints on the subject as well as of the clinical consequences of such a separation.

CASE STUDY

PHONETIC DISORDER

Sandy is a 6-year-old child who was seen in a diagnostic session at the speech and hearing

clinic. Her parents were concerned about her inability to produce an "s" sound. Based on an analysis of a spontaneous speech sample and

an articulation test, it was found that Sandy misarticulated “s” and “z” in all transcribed situations. The child was also able to differentiate her mispronunciations from norm productions of [s] and [z]. No other speech sounds were in error, and language skills were found to be within normal limits. Sandy used her distorted realizations in every position in which [s] and [z] should occur. Thus, she seemed to understand the organization of /s/ and /z/ within the language system. The clinician hypothesized that this child was having difficulties with the actual production level only, with the speech sounds [s] and [z], whereas the understanding of their phoneme functions was intact.

PHONEMIC DISORDER

Travis, a 6-year-old first-grader, was referred by his classroom teacher to the speech-language pathologist. The teacher said that although Travis’s speech was fairly intelligible, she was concerned about speech and language problems she had noticed in class. Her second concern was that these difficulties might be impacting Travis’s emerging literacy skills. According to the teacher, Travis was having difficulty distinguishing between certain sounds and words as the class progressed with elementary reading tasks.

An articulation test and a spontaneous speech sample were analyzed with the following results: Travis had difficulties with s-productions. At the end of a word or syllable, [s] was always deleted. At the beginning of a word or syllable, [s] was produced as [ʃ]. Interestingly enough, when the clinician analyzed other words, she found that Travis could produce [s], but not in its proper context. Thus, several words that contained [f] were articulated with a normal sounding [s] realization. Testing of minimal pairs containing /s/ and /ʃ/ revealed that Travis was having difficulty distinguishing between the phonemic value of the two sounds.

On language tests and in spontaneous conversation, Travis deleted the plural -s and the third person singular -s (e.g., “He, she, it walk”). Comprehension of these grammatical forms was often in error.

The clinician hypothesized that Travis had a phonological disorder—that he had difficulties with the phoneme function and the phonotactics of /s/. This problem was impacting his morphological development. Due to the noted problems in discrimination, this could also have an effect on his beginning reading skills.

THINK CRITICALLY

The following small speech sample is from Tara, age 4;3.

rabbit	[wæbət]	ready	[wedi]
feather	[fedəp]	arrow	[ɛwoʊ]
green	[gwin]	toothbrush	[tutbwəʃ]
this	[ðɪs]	thinking	[θɪŋkɪŋ]
that	[ðæt]	round	[waʊnd]
rope	[woʊp]	bridge	[brɪdʒ]
rooster	[wustə]	street	[stwit]
bathing	[beɪdɪŋ]	thin	[θɪn]
nothing	[nʌtɪŋ]	them	[ðem]
bath	[bæt]	breathe	[brɪd]

Which speech sound errors are noted in this sample?

Which sounds are substituted for the sounds in error?

Can any phonotactic restraints be noted in the correct productions of “th” and “r”?

Based on this limited information, do you think the child has an articulation disorder or a phonological disorder? Why?

TEST YOURSELF

1. The definition of articulation includes which one of the following?
 - a. describes the systems and patterns of phonemes in a particular language
 - b. includes phonotactics
 - c. refers to the totality of motor processes involved in speech
 - d. all of the above
2. The definition of articulation disorder reflects
 - a. peripheral motor processes
 - b. gradually developing motor skills
 - c. mainly peripheral motor processes
 - d. all of the above
3. Which one of the following is not included in the definition of phonetics?
 - a. the production features of speech sounds
 - b. the organizational system of speech sounds
 - c. the transmission properties of speech sounds
 - d. the perceptual bases of speech sounds
4. Which one of the subdivisions of phonetics would examine the frequency, intensity, and duration of speech sounds?
 - a. articulatory phonetics
 - b. acoustic phonetics
 - c. auditory phonetics
5. If you were studying how foreign students perceive various speech sounds of American English, you would be in which branch of phonetics?
 - a. articulatory phonetics
 - b. acoustic phonetics
 - c. auditory phonetics
6. If you were studying how the production of [s] varies in American English versus Spanish, you would be in which branch of phonetics?
 - a. articulatory phonetics
 - b. acoustic phonetics
 - c. auditory phonetics
7. The definition of phonology includes
 - a. the description of the system and patterns of phonemes within a language
 - b. the classification and description of how speech sounds are produced
 - c. speech sound form
 - d. relatively peripheral motor processes involved in speech
8. The allowed combinations of phonemes in a particular language refers to the
 - a. phonetic inventory
 - b. phonemic inventory
 - c. phonotactic constraints
 - d. minimal pairs
9. Which one of the following is not included in the definition of phonological disorder?
 - a. problems in the language-specific function of phonemes
 - b. disturbances in the relatively peripheral motor processes that result in speech
 - c. disturbances represent an impairment of the understanding and organization of phonemes
 - d. phonemic errors
10. The smallest linguistic unit which is able, when combined with other such units to establish word meanings, is referred to as the
 - a. allophonic variation
 - b. speech sound
 - c. phoneme
 - d. phonotactic constraint

WEBSITES

www.phonologicaldisorders.com

This website, created by the author of this textbook, contains basic definitions and characteristics of articulation versus phonological disorders. It also provides references to articles and books which delineate the two. Links are given to other websites and resources.

www.speech-language-therapy.com/phonetic_phonemic.htm

This website distinguishes in an easy-to-read manner between articulation and phonological disorders. Several links are given to areas such as functional speech disorders and a discussion group, which can be accessed from the author's (Carol Bowen) website.

<http://scholar.google.com/scholar?q=articulation%20and%20phonological%20disorders&hl=en&lr=&oi=scholart>

This website has a list of articles and books that deal with articulation and phonological disorders. Although many references are duplicated and more than ten years old, there are over 5,000 references on this website.

www2.hu-berlin.de/angl/ling_pages/phonology_phonetics.html

This website has some basic definitions of phonetics and phonology. It also lists information on several branches of phonetics (articulatory, acoustic, and auditory phonetics) as well as makes the distinction between segmental and suprasegmental phonology. Several references are also included.

www.unibuc.ro/eBooks/filologie/mateescu/pdf21.pdf

This website, among other things, distinguishes between phonetics and phonology and defines articulatory, auditory, and acoustic phonetics. The definitions appear easy to understand. This appears to be Chapter 2 of a book or manuscript from the University of Bucharest.

www.answers.com/topic/phonology and
www.answers.com/topic/phonetics

These websites provide basic definitions and examples of phonology and phonetics. They also provide links to related topics. The website for phonetics gives definitions of articulatory, acoustic, and auditory phonetics.

FURTHER READINGS

Ball, M., & Rahilly, J. (1999). *Phonetics: The science of speech*. London: Arnold.

Catford, J. (2002). *A practical introduction to phonetics* (2nd ed.). Oxford: Oxford University Press.

Handke, J. (2000). *The Mouton interactive introduction to phonetics and phonology*. Berlin, New York: Mouton de Gruyter.

Mackay, I. (1987). *Phonetics: The science of speech production* (2nd ed.). Boston: Allyn & Bacon.

Reid, N. (with H. Fraser). (1996). *Phonetics: An interactive introduction*. Armidale, Australia: The University of New England.