Instructor’s Resource Manual
to accompany

Articulatory and Phonological Impairments:
A Clinical Focus
Fourth Edition

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Clinical Framework

BASIC TERMS AND CONCEPTS

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, speech sounds, and articulation disorders.
- Differentiate between speech sounds and phonemes.
- Delineate phoneme and allophone.
- Differentiate between phonology and a phonological disorder.

Summary

This chapter introduced the reader to several fundamental terms that are important when assessing and treating articulatory and phonological disorders. Introductory terms such as communication, speech, and language were defined based on their normal processes and what a disorder of each would entail. Language divisions of phonology, morphology, syntax, semantics, and pragmatics provided a further delineation which could aid the reader in understanding these basic concepts. A distinction was made between articulation and speech sounds on the one hand and phonology and phonemes on the other. This distinction becomes important as a further division between articulation and
phonological disorders was generated. Speech sound form versus linguistic function was used to distinguish between articulation, with the speech sound as its basic unit, and phonology, represented by the phoneme. Based on these definitions, a differentiation between articulation disorders and phonological disorders was presented.

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**Emphases**

1. Review basic terms and concepts, such as communication, language, and speech. These terms were defined according to their professional usage, for example, as referenced by the American Speech-Language-Hearing Association, and their practical application.
2. Examine the subdivisions of language: phonology, morphology, syntax, semantics, and pragmatics. Definitions were given as well as the application of these terms to the specific areas of language.
3. Define the broader term communication disorder as well as speech sound and language disorder. These divisions will be relevant within our clinical practice.
4. Introduce the concepts of articulation and speech sounds versus phonology and phonemes. This is an important delineation which will be important in the discussion of articulation disorders and phonological disorders.
5. Define and delineate the phoneme, allophone, phonotactics and minimal pairs as they apply to phonology. This discussion will later be applied to the clinical differentiation between articulatory and phonological disorders.
6. Distinguish between articulatory and phonological impairments with beginning emphases on assessment information which is needed and how it applies to this differentiation.

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**Key Concepts**

**Communication** is any act in which information is given to or received from another person concerning that persons needs, desires, perceptions, knowledge, or affective states (p. 1). Communication may be a) intentional or unintentional, b) involve conventional or unconventional signals, c) take linguistic or nonlinguistic forms, and d) occur through spoken or other modes.

**Speech** is the communication or expression of thoughts in spoken words (p. 2). It is oral, verbal communication.
**Language** can be defined as a complex and dynamic system of conventional symbols that is used in various modes for thought and communication (p. 2). It is rule governed, includes variability and change, and can be used to communicate in many different ways. Language is described by at least five linguistic parameters: phonology, morphology, syntax, semantics, and pragmatics.

**Phonology** is the study of the sound system of language, and includes the rules that govern its spoken form (p. 2). Phonology a) analyzes which sound units are within a language, b) examines how these sounds are arranged, their systematic organization and rule system.

**Morphology** studies the structure of words; it analyzes how words are built out of morphemes, the basic unit of morphology (p. 2).

**Morpheme** is the smallest meaningful unit of a language (p. 2).

**Syntax** consists of organizational rules denoting word, phrase, and clause order. It also examines the organization and relationship between words, word classes, and other sentence elements (p. 2-3).

**Semantics** is the study of linguistic meaning and includes the meaning of words, phrases, and sentences (p. 3).

**Pragmatics** is the study of language used to communicate within various situational contexts (p. 3). Pragmatics examines language use in context.

**Communication disorder** is the impairment in the ability to receive, send, process, and comprehend concepts including verbal, nonverbal, and graphic symbol systems (p. 3).

**Speech disorder** indicates oral, verbal communication that is so deviant from the norm that it is noticeable or interferes with communication (p. 3-4). According to the American Speech-Language-Hearing Association, speech disorders are divided into articulation, fluency, and voice disorders.

**Language disorder** refers to impaired comprehension and/or use of spoken, written, and/or other symbol systems (p. 4). A language disorder may involve one or more of the following areas: phonology, morphology, syntax, semantics, and pragmatics.

**Articulation** refers to the totality of motor processes that result in speech (p. 4). It represents a highly complex activity in which - respiratory, phonatory, resonatory, and articulatory mechanisms included - as many as 100 muscles
may be involved. In the articulatory mechanism alone up to 22 muscles may alter their degree of tension many times during the utterance of a simple sentence (Hanson, 1983). The sequencing and timing of speech muscle activity is an integral portion of articulation.

**Speech sounds** represent physical sound realities; they are end products of articulatory motor processes (p. 5).

**Phoneme** is the smallest linguistic unit that is able, when combined with other such units, to establish word meanings and distinguish between them (p. 6). For example, in General American English /p/ and /s/ are phonemes because they function to distinguish between words such as "pat" and "sat". On the other hand, in General American English the aspiration of stop/plosives does not have phonemic relevance. [pʰɪt] and [pit], in spite of their differences in production, do not result in two words with different meanings. However, aspiration versus nonaspiration of stop/plosives is phonemically relevant in many languages. For example, in Swahili [pɑ] is the word for "climb" while [pʰɑ], with an aspirated [p], signifies the name for a specific type of antelope. As linguistic units, phonemes characterize how speech sounds function within a language to differentiate word meaning.

In everyday usage, professionals often do not distinguish between the terms speech sound and phoneme. One could hear someone say that they transcribed a particular phoneme, for example. However, theoretical and definitional differences do exist; these terms represent two distinct concepts. While the technical term speech sound stands for the physical reality of sound form, the term phoneme refers exclusively to how these forms function within a given language as linguistic units to differentiate between word meanings.

**Allophones** are variations in phoneme realizations that do not change the meaning of a word when they are produced in differing contexts (p. 6).

**Phonotactics** refers to the description of the allowed combinations of phonemes and in a particular language (p. 7). Both the inventory of phonemes and their possible combinations are unique and vary according to the particular language.

**Phonetic variation** is another label for speech sound (p. 7).

**Minimal pairs** are two words that differ in only one phoneme (p. 7). The words “cat” and “hat” are minimal pairs.

**Articulation disorder** designates difficulties with the motor production aspects of speech, or an inability to produce certain speech sounds (p. 8). This term has
been used historically to denote all children who demonstrated an inability to produce certain speech sounds. However, with the introduction of the term *phonological disorder* a new dimension was added to the categorization of these children. Although many professionals use the two terms interchangeably, or use the newer term phonological disorder to encompass all children with speech sound difficulties, a theoretical and practical differentiation is important.

*Phonological disorder* refers to impaired comprehension of the sound system of a language and the rules that govern the sound combinations (p. 8). Several reports (for example Fey, 1992; Pollack and Rees, 1972) have documented that children with phonological disorders can say the particular sound (thus, they do not have difficulties with the actual speech sound production) but, for some reason, do not understand the pattern of phoneme usage within the language system.

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**Learning Materials: Answers to Questions from Textbook**

**Think Critically (page 11)**

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

<table>
<thead>
<tr>
<th>Word</th>
<th>Pronunciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>rabbit</td>
<td>[wæbət]</td>
</tr>
<tr>
<td>ready</td>
<td>[wɛdɪ]</td>
</tr>
<tr>
<td>feather</td>
<td>[fɛdə]</td>
</tr>
<tr>
<td>arrow</td>
<td>[evoʊ]</td>
</tr>
<tr>
<td>green</td>
<td>[ɡwin]</td>
</tr>
<tr>
<td>toothbrush</td>
<td>[tʌtbwɔʃ]</td>
</tr>
<tr>
<td>this</td>
<td>[ðɪs]</td>
</tr>
<tr>
<td>thinking</td>
<td>[θɪŋkɪŋ]</td>
</tr>
<tr>
<td>that</td>
<td>[ðæt]</td>
</tr>
<tr>
<td>round</td>
<td>[waˈnd]</td>
</tr>
<tr>
<td>rope</td>
<td>[woʊp]</td>
</tr>
<tr>
<td>bridge</td>
<td>[bɹɪdʒ]</td>
</tr>
<tr>
<td>rooster</td>
<td>[wʊstə]</td>
</tr>
<tr>
<td>street</td>
<td>[stwɪt]</td>
</tr>
<tr>
<td>bathing</td>
<td>[beˈdiŋ]</td>
</tr>
<tr>
<td>thin</td>
<td>[θɪn]</td>
</tr>
</tbody>
</table>
nothing  [nʌtɪŋ]  them  [ðəm]
bath  [bæt]  breathe  [braɪt]

Which speech sound errors are noted in this sample?
Answer: Sounds in error are [r], [ð], and [θ]

Which sounds are substituted for the sounds in error?
Answer: Substituted sounds are [w] for [r], [d] for [ð], and [t] for [θ]

Can any phonotactic restraints be noted in the correct productions of “th” and “r”?
Answer: The [ð] and [θ] are produced correctly at the beginning of a word, however, [d] and [t] are used as substitutions when the sound is in the middle of a word or at the end of the word. The [w] is used as a substitution for [r] in all positions including in consonant clusters. It should be noted that the central vowel with r-coloring [ə] is produced correctly.

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

The [r] is a later developing sound and could be an articulation error. The fact that the child can produce the central vowel with r-coloring could support the fact that this sound is gradually appearing in Tara’s speech. Although phonotactic constraints can be noted on the [θ] and [ð] productions, these errors could also be articulation-based. It is an easier task in the speech sound development of
children to produce the sound correctly at the beginning, as opposed to the middle or end of words.

Test Yourself (page 12):
1. (c) 2. (d) 3. (b) 4. (a) 5. (b)
6. (c) 7. (a) 8. (c) 9. (b) 10. (c)

Additional Learning Materials

Discussion Topics and Clinical Applications

1. Discuss how you could use minimal pairs to collect information about the phonemic inventory in the following example: A child substitutes [w] for /j/, /v/, and /r/. Which minimal pairs could you use to test the child's phonemic inventory?

2. What information could be a portion of the phonemic inventory? Discuss how you would gather information about the inventory of phonemes and phonotactic constraints.

3. What type of material could you use to examine the phonotactics of a child's inventory in the following example: A child has difficulties with the production of "s" in consonant clusters. Which words would test the possible phonotactics of s-clusters in American English occurring at the beginning and end of syllables?

4. Based on the results of an articulation test and/or a spontaneous speech sample have the students determine the phonetic inventory, the phonemic inventory, and the phonotactics of a child with an articulatory or phonological impairment. Note any patterns or constraints which are demonstrated.

5. Give one example of what could be assessed within each of the five areas of language (phonology, morphology, syntax, semantics, and pragmatics).

6. The following is a portion of a language sample from Jeannette, age 4;6.

I want some jelly beans and some chocolate.
I don’t know.

I don’t know who that is.

Ninja turtles fight the evil Ninjas.

Then Shredder just comes.

And all of these other things.

a) Write down the phonemic inventory of Jeanette using both the vowels and consonants that are presented in this small sample.

b) Note which vowels and consonants that are normally a portion of the American English inventory are not demonstrated in Jeanette’s speech sample.

c) Make a list of the words that Jeanette pronounces differently than would be expected when compared to the adult model of pronunciation.

d) Note any consistent patterns of substitution of one sound for another.

Multiple Choice Questions

1. The totality of motor processes involved in the planning and execution of sequences of overlapping gestures which result in speech refers to
   a) phonology
   b) phonetics
   c) articulation
   d) phonotactics
2. The subdivision of language dealing with the meaning of words, phrases, and sentences is
   a) morphology
   b) syntax
   c) semantics

3. The end products of articulatory motor processes that represent physical sound realities are called
   a) phonetic variations
   b) speech sounds
   c) allophonic variations
   d) all of the above

4. The repertoire of phonemes which are used contrastively by an individual is the
   a) phonetic inventory
   b) phonemic inventory
   c) phonotactics of a language
   d) allophonic variations of a language

5. The clusters [sk] and [ks] cannot occur in the same word positions in General American English. This is an example of the
   a) phonetic inventory
   b) phonemic inventory
   c) phonotactics of a language
   d) allophonic variations of a language

6. Minimal pairs are exemplified by which of the following set of words?
   a) [hit] and [sit]
   b) [sit] and [sut]
   c) [lun] and [mun]
   d) all of the above

7. Which one of the following concepts would be associated with the assessment of a phonological impairment?
   a) phonemic inventory
   b) phonotactics
   c) phonotactic constraints
   d) all of the above would be important in assessing a phonological impairment

8. Articulation disorders reflect difficulties with
   a) central linguistic abilities
   b) phoneme function
c) relatively peripheral motor processes
d) phonemes and phoneme patterns within a particular language

9. Communication disorders include which of the following?
a) speech disorders
b) language disorders
c) hearing disorders
d) all of the above

10. Which one of the following is not a typical phonotactic possibility of General American English?
a) [sk] at the beginning of a word or syllable
b) [ŋ] at the end of a word or syllable
c) [lt] at the beginning of a word or syllable
d) [mp] at the end of a word or syllable

True/False Questions

1. Articulation difficulties result from an impairment of central linguistic abilities.
2. Three subdivisions of language include pragmatics, articulation, and syntax.
3. Phonetic variations and allophonic variations are both phonemic realizations.
4. Speech sounds and phonemes represent exactly the same concepts.
5. Impaired comprehension of the sound system of a language and the rules that govern the sound combinations represents a phonological disorders.
6. Speech sounds are transcribed using brackets [ ] while phoneme values are symbolized by slanted lines or so-called virgules //.
7. The phonemic inventory refers to the inventory of phonemes an individual uses contrastively.
8. Phonology is not related to the other constituents of the language system such as morphology, syntax, semantics, or pragmatics.
9. The phonetic inventory includes all the speech sounds the individual uses including their specific production features.
10. Articulation and phonological disorders never co-occur.
Short Answer Questions

1. Define communication disorder.

2. Explain why a child with "s" difficulties, might have problems in the area of morphology.

3. Contrast the terms speech sound and phoneme.

4. Contrast the terms articulation disorder versus phonological disorder.

5. Write a brief definition and give an example of each of the following terms: phonology, morphology, syntax, semantics, and pragmatics.

Essay Questions

1. Discuss how articulation disorders represent difficulties with the physical production aspects of speech sounds. Utilize the terms "articulation, "physical sound realities", and "speech sounds" when developing your discussion.

2. Discuss how phonological disorders represent difficulties with the linguistic function of phonemes. Utilize the terms "phoneme" and "phonology" when developing your discussion.

3. Discuss the differences between a language and a speech disorder. Give specific examples for each type.

4. Articulation errors are referenced by a child's age. Referring to the definition and characteristics of the term “articulation” state why this is a meaningful reference point.

5. Based on the definition of a phonological disorder, state why a child with a phonological impairment may have difficulties with other areas of language such as morphology, syntax, semantics, or pragmatics.

Bibliography

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Phonetics –
Articulatory Phonetics

SPEECH SOUND FORM

Learning Objectives

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

- Define phonetics and the branches of phonetics.
- List the differences in production and function of vowels versus consonants.
- Identify the three descriptive parameters that are used for vowel articulations, and classify the vowels of American English using those three parameters.
- Differentiate between the various types of vowels.
- Identify and define the four parameters that are used to describe the articulation of consonants.
- Classify the consonants of American English according to their active and passive articulator, manner, and voicing characteristics.
- Define coarticulation and assimilation, and describe the different types of assimilatory processes.
- Understand the importance of syllable structure in the assessment process.
Summary

This chapter presented a definition of phonetics and three subdivisions: articulatory, acoustic, and auditory phonetics. Within articulatory phonetics an overview of vowels and consonants was given and the form and function of vowels and consonants of General American English were discussed. Both vowels and consonants were classified according to their articulatory production features and their linguistic functions. Phonetic descriptors were given to provide the clinician with a detailed account of articulatory action during norm production of vowels and consonants. These features can later be contrasted to those noted in the impaired sound realizations of children and adults with articulatory-phonological impairments.

In the second portion of this chapter, coarticulation, assimilation processes, and syllable structure were defined and examined. Coarticulation and resulting assimilatory processes were described as normal articulatory consequences that regularly occur in the speech of individuals. Assimilatory processes were defined according to the type and degree of sound modification. Examples were given of assimilatory processes in children as well as of the possible impact these processes could have on articulation test results. The last section, on syllable structure, defined the parts of the syllable. It was suggested that an analysis of syllable structures could provide the clinician with additional knowledge when evaluating individuals with articulatory-phonological disorders.

Emphases

1. Define phonetics and three subdivisions of phonetics: Articulatory phonetics, acoustic phonetics, and auditory phonetics.
2. Review basic vowel and consonant definitions. Both production aspects and linguistic function are highlighted.
3. Classify the vowels of General American English according to phonetic production parameters. These include the portion of the tongue involved in the vowel articulation (front versus back), the position of the tongue relative to the palate (high versus low), and the degree of lip rounding or unrounding. In addition, the terms tense versus lax and open versus close were used to specify these vowels.
4. Classify the consonants of General American English according to phonetic production parameters. These include the active articulator (organ), the passive articulator (place), the type of constriction established between the active and passive articulators (manner), and the presence or absence of vocal fold vibration (voiced versus voiceless).
5. Describe coarticulation and to identify various types of resulting assimilation processes and the implication for the assessment of children with speech sound disorders
6. Categorize the various parts of a syllable noting the impact syllable structure has on the articulation possibilities of children.

Key Concepts

**Phonetics** is the study of speech emphasizing the description and classification of speech sounds according to their production, transmission and perceptual features (p. 15).

**Articulatory phonetics** deals with the production features of speech sounds, 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 (p. 15). The motor processes which result in speech sounds are categorized according to several different parameters. For example, categories may include those speech motor processes which are coupled with vocal fold vibration (voiced sounds) versus those which are not (voiceless sounds), or those speech motor movements which result in a partial or total hindrance within the vocal tract (consonants) versus those which demonstrate a relatively open vocal tract, a vocal tract without significant obstructions (vowels).

**Acoustic phonetics** is the area of study related to speech sound transmission. The frequency, intensity, and duration of speech sounds, for example, are described and categorized (p. 15). The transmission of speech sounds can be exemplified by a display of the acoustic constituents of a particular speech sound. For example, the frequency of a voiced sound, i.e., the number of complete repetitions (cycles) of variations in air pressure occurring within a second’s time, is directly related to the opening and closing of the glottis by vocal fold vibration. Or, the intensity of a sound is mirrored by the amplitude of these variations in air pressure.

**Auditory phonetics** pertains to speech sound perception (p. 15). For example, pitch and loudness are terms which are used to describe the perceptual categorization of frequency and intensity, noted parameters in acoustic phonetics. Although pitch and loudness are related to frequency and intensity, equal steps of increasing frequency or intensity do not produce the perceptual effect of equal steps of pitch and loudness. These discrepancies between acoustic facts and their perceptual impressions are typical for studies within...
auditory phonetics.

**Vowels** are speech sounds produced without a significant constriction of the oral (and pharyngeal) cavities (p. 16). The airflow from the vocal folds to the oral opening remains relatively unimpeded. Because of this production feature, vowels are often labeled *open* sounds.

**Consonants** are speech sounds produced with a significant constriction within the oral (and pharyngeal) cavities, foremost along the sagittal midline of the oral cavity (p. 16). The sagittal midline is the median plane dividing in this case the vocal tract, into right and left halves. Sagittal midline constriction can be noted when articulating [s], or [l], for example. With [s], the air stream is directed over the tongue tip, while actual contact between the tongue tip and the alveolar ridge can be noted for [l] productions. For both sounds the primary place of constriction is the sagittal midline. Due to these production features consonants are often labeled *constricted* sounds.

**Sonority**, when referring to speech sounds, is the loudness of a particular speech sound relative to others of equal length, stress, and pitch (p. 17). "There is roughly a 700-to-1 range of intensities between the weakest and strongest speech sounds made while speaking at a normal conversational level. The vowels are the strongest sounds but, even among these, there is a three-to-one range. The strongest vowel is the "aw" (as in "talk"), which is usually pronounced at three times the intensity of the weakest vowel, "ee" (as in "see"). The strongest of the consonants, the "r" sound, has about the same intensity as the "ee" vowel, but is two and a half times more intense than "sh" (as in "shout"); six times more intense than "n" (as in "no"); and 200 times greater than the weakest consonant, "θ" (as in "thin") " (Denes and Pinson, 1973, p. 150-151).

**Sonorants** are another name for vowels and diphthongs due to their greater sonority in relationship to consonants (p. 17).

**Sonorant consonants** are a group of consonants which have a relatively open expiratory passageway; they are produced with less obstruction of the air stream (p. 17). Sonorant consonants include the *nasals, liquids*, and the *glides*.

**Obstruent consonants** are a group of consonants which are characterized by a complete or narrow constriction between the articulators hindering the expiratory air stream (p. 17). The obstruents include the *stops, fricatives*, and the *affricates*.

**Syllabics** are a small group of consonants which can function as the nucleus of the syllable (p. 17). Certain sonorant consonants can be syllabics. For example,
if the second syllable of “button” is reduced and pronounced without the vowel, as in [bɔtŋ], [n] now becomes the nucleus of the syllable and is termed a syllabic. This also occurs with the second syllable of “bottle” when said as [bɔtl], [l] is a syllabic in this case. Syllabics are indicated by a small line placed under the symbol in question.

**Vowels** of General American English can be described according to the following parameters (p. 18-19):

1) **the portion of the tongue that is involved in the articulation** which is correlated to the phonetic descriptors of front, central, and back vowels;

2) **the tongue’s position relative to the palate** translates phonetically into the labels high, mid, and low vowels (p. 18). These descriptions can be directly related to the vowel quadrilateral (p. 18) with front vowels being at the far left of the quadrilateral, central vowels in the center, and back vowels on the right axis. The high vowels are at the top of the quadrilateral, the mid vowels further down when moving vertically, while the low vowels are at the bottom of the quadrilateral. The last parameter which is used to describe the articulation of vowels is

3) **the degree of lip rounding or unrounding** (p. 18). The high-back vowels, such as [u] and [ʊ] have a relatively high degree of lip rounding. As you move down the vowel quadrilateral with the back vowels the lip rounding decreases until [ɑ], which is considered an unrounded vowel. The front vowels are considered to be unrounded vowels or those produced with lip spreading. The high-front vowels [i] and [ɪ] have a high degree of lip spreading while the low-front vowels have less.

**Tense** and **lax** describe vowels as well (p. 18-19). **Tense** vowels have 1) relatively more muscle activity during their production and 2) a longer duration than lax vowels. The terms tense and lax are used to refer to similar types of vowels. Thus, the following vowel pairs are usually compared: [i] - [ɪ], [e] - [ɛ], [u] - [ʊ], and [o] - [ɔ]. In each of the vowel pairs the first vowel is considered tense while the second one is lax. Please note that there are variations in the definitions of tense versus lax. According to which definition is used, [ɑ] and [ɔ] are sometimes labeled as tense while in other references they are classified as lax vowels.

**Close** and **open** are used as vowel descriptors (p. 18-19). **Close** vowels are produced with a relatively small distance between the tongue and the roof of the mouth while **open vowels have more distance**. Again, similar vowel pairs are usually compared, thus, [u] is a close vowel while [ʊ] is an open vowel, for example.
Monophthongs are vowels with a relatively constant quality throughout their production (p. 19). Monophthongs are also known as pure vowels. The vowel [i] is typically produced as a pure vowel.

Diphthongs, on the other hand, are vowels in which the quality changes during their production (p. 19). The term diphthong, meaning having two sounds, is used to refer to those vowels which vary in quality during the length of their production but are seen as representing one phoneme.

Onglide is the initial portion of a diphthong (p. 19).

Offglide is the second or end portion of the diphthong (p. 19). Thus, the diphthong that is typically heard in the word pie, [pai], has [a] as the onglide and [i] as the offglide. Since diphthongs represent one phoneme (and not two), it is important to distinguish their transcription from two distinct vowels which occur one after the other. There are various ways to transcribe this distinction (see page 21).

Rising diphthongs are those that the tongue moves from a lower positioned onglide portion to an offglide which has a higher tongue position. Thus, relative to the palate, the tongue moves in a rising motion (p. 20).

Centering diphthongs are a special class of diphthongs in which the offglide or less prominent element of the diphthong is a central vowel (p. 21). Depending upon the dialect of the speaker this may be a schwa vowel or a central vowel with r-coloring. Thus farm could be pronounced as [fɔːm] or [fəm].

Rhotic diphthongs are centering diphthongs with [ɔː] as their offglide (p. 21).

Nonphonemic diphthongs are those that do not demonstrate phonemic value, i.e., the meaning of the word does not change, if the diphthong is reduced to a monophthong with only its onglide portion (p.21). For example, whether one pronounces cake, [keɪk] or [kek], the same word meaning will be perceived. The diphthongization of these vowels does not have phonemic value.

Phonemic diphthongs are those that do demonstrate phonemic value; the meaning of the word does change, if the diphthong is reduced to a monophthong.
with only its onglide portion (p. 21). For example, [ɔɾ] is a phonemic diphthong in that if it is produced as a monophthong, the phonemic value changes. The two words [sɔɾ], soy, and [sɔɾ], saw exemplify this, when the diphthong is produced without the offglide, a word with a different meaning results.

**Consonants** can be categorized according to their
1) **active articulator** (organ of articulation),
2) **passive articulator** (place of articulation),
3) **manner** of articulation, and
4) **voicing** features (p. 23).

Note: Although most textbooks purport to use only place, manner, and voicing features, often the active articulator is included in the phonetic description (see page 23). There is, however, clinical value in using the somewhat cumbersome but far more exact system of active articulator, passive articulator, manner, and voicing. The phonetic approach (also called the motor or traditional approach) uses this knowledge extensively (see Chapter 9).

**Active articulators** or organs of articulation are parts within the vocal tract which actually move during consonant production (p. 23). The lower lip (known as labial) and parts of the tongue (apical, coronal, pre-, medio- and postdorsal) are active articulators in the production of General American English consonants.

**Passive articulators** or places of articulation are those portions of the vocal tract which do not move during the production of consonants (p. 23). The upper lip (labial), teeth (dental), parts of the palate (pre-, mediopalatal), and velum (velar) are passive articulators for General American English consonants.

**Manner of articulation** refers to the type of constriction the active and passive articulators generate (p. 24-25). This constriction may consist of a complete closure or a relatively wide opening between the articulators.

In General American English, the manners of articulation consist of the stop-plosives, fricatives, nasals, affricates, glides, laterals, and rhotics.

**Stop-plosives** ([p, b, t, d, k, g]) are signaled by a complete occlusion between the active and passive articulators (p. 25). This complete closure results in the build-up of air pressure (stop phase) followed by a release phase in which the separation of the articulators allows for a burst of air (plosive phase) (p. 25).

**Fricatives** ([f, v, s, z, ʃ, ʒ, θ, ð]) are the result of a very close approximation between the active and passive articulators, so close in fact that an audible friction-noise results (p. 25).
Sibilants \([s, z, \theta, \phi]\) (literally *hissing sounds*) are one subcategory of fricatives which have a sharper sound than others due to the presence of high frequency acoustic components (p. 25).

Nasals \([m, n, \mathfrak{n}]\) are produced with the velum lowered so that the air passes freely through the nasal cavity giving them their characteristic quality (p. 25). The nasals are the only consonants in American English that are produced with the velum lowered, for all other consonants the velum is raised, closing off the passageway between the oral and nasal cavities.

Affricates \([\mathfrak{t}\mathfrak{f}, \mathfrak{d}\mathfrak{j}]\) are a group of consonants that contain two phases: 1) a stop portion with a build-up of air pressure which is slowly released followed by 2) a friction portion of the speech sound (p. 25). Although they are transcribed with two separate symbols, they are not consonant clusters but rather have *one* phoneme value.

Glides \([\mathfrak{w}, \mathfrak{j}]\) are produced with a constriction that is wider than that necessary for fricative consonants. In addition, there is a gliding movement of the articulators to a more open position (p. 25-26). According to the International Phonetic Alphabet the glides are labeled as approximants. This term refers to those consonants which are produced with a wider passage of air resulting in a smooth, as opposed to a turbulent airflow (p. 26).

Laterals are characterized by a midline closure with simultaneous lateral airflow. Thus, the air stream passes around one or both sides of the tongue (p. 26). There is one lateral consonant in American English, \([l]\). According to the International Phonetic Alphabet \([l]\) is labelled a lateral approximant.

Liquids are collectively the lateral \([l]\) and the rhotic \([r]\) which are grouped together under this heading (p. 26).

Rhotic consonants are produced with the active and passive articulators approximating one another and creating an \(r\)-quality sound. These sounds are variable in their production; there are at least two different productions, a retroflexed and a bunched production (p. 26). According to the classification used within the International Phonetic Alphabet, the rhotics are considered central approximants (p. 26).

Voicing features refer to the presence or absence of simultaneous vocal fold vibration during the consonant production. This results in *voiced* or *voiceless* consonants (p. 26-27).
Coarticulation refers to the constant positioning of the articulators as they move over a stretch of speech (p. 30). Ladefoged and Johnson (2010) describes coarticulation as the overlapping of adjacent articulations while Shriberg and Kent (2003) use the term to refer to speech modifications in which the production of a sound is influenced by other sounds around it, that is, by its phonetic context. The effects of coarticulation are clinically significant in that the surrounding phonetic context may assert a positive or negative articulatory influence on a specific sound.

Assimilation refers to adaptive articulatory changes in which one sound becomes similar to (or identical to) a neighboring sound (p. 30). Many assimilatory changes are natural consequences of articulatory adjustments which make speech easier and faster.

Assimilation processes (also known as harmony processes) are categorized according to the type and degree of assimilatory changes (p. 30-31). Contact (or contiguous) assimilation denotes changes impacting directly adjacent sounds while remote (or noncontiguous) assimilation occurs when the assimilatory changes affect sounds separated by at least one other sound segment (p. 30). Progressive (or perseverative) assimilations refer to a sound impacting a following sound while regressive (or anticipatory) assimilations designate an assimilatory change of a sound influencing a preceding sound (p. 30-31). When the assimilatory change results in a completely different phoneme being perceived this is termed phonemic assimilation (p. 31). Phonetic similitude is the term used when the change in the segment is perceived as an allophonic variation of the original segment (p. 31). Total (or complete) assimilation occurs when two segments become identical while partial assimilation refers to changes in one or more phonetic features of the sound in question (p. 31). Coalescence is the term used when two neighboring segments are merged into a new and different segment. Examples of the different assimilation processes are contained in pages 30-32.

Peak is a term used to denote the most prominent, the most acoustically intense part of the syllable, in other words the syllable nucleus (p. 33).

Onset of a syllable consists of all segments prior to the peak (p. 33). Those segments are also termed syllable releasing sounds.

Coda refers to those segments following the peak (p. 33). These are also labeled syllable arresting sounds.

Rhyme consists of the peak and coda of a syllable (p. 33).
Syllable production is affected by four factors (1) the number of syllables an utterance contains (fewer syllables are easier to produce), (2) the type of syllable relative to open versus closed syllables (open syllables are easier to produce), (3) the degree of syllable stress (unstressed syllables are easier to produce then stressed ones) (4) the number of consonants that are grouped together (singletons are easier to produce than consonant clusters) (p. 34).

Learning Materials: Answers to Questions from Textbook

Case Study (page 35)

The following sample is from Tina, age 3:8.

dig [dɪɡ] ⇒ [dɛɡ] vowel change: high-front vowel [ɪ] changed to a mid-front vowel [ɛ]

house [haːs] ⇒ [haʰθ] consonant change: a voiceless apico-alveolar (or predorsal-alveolar fricative [s] changed to a voiceless interdental (or apico-dental) fricative [θ]

knife [naːf] ⇒ [naf] vowel change: diphthong vowel [aɪ] changed to a monophthong [a]

duck [dʌk] ⇒ [dʌt] vowel change: a central vowel [ʌ] changed to a high-back vowel [ʊ]

consonant change: a voiceless postdorsal-velar stop-plosive [k] changed to a voiceless coronal-alveolar stop-plosive [t]
<table>
<thead>
<tr>
<th>Word</th>
<th>Original</th>
<th>New</th>
<th>Vowel Change</th>
<th>Consonant Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>[jes]</td>
<td>[wet]</td>
<td>consonant change: a voiced mediopalatal-mediodorsal glide (or approximant) [j] changed to a voiced labio-velar glide (or approximant) [w]</td>
<td>consonant change: a voiceless apico-alveolar (or predorsal-alveolar) fricative [s] changed to a voiceless coronal-alveolar stop-plosive [t]</td>
</tr>
<tr>
<td>boat</td>
<td>[boʊt]</td>
<td>[bot]</td>
<td>vowel change: a diphthong [oʊ] is changed to a monophthong [o]</td>
<td>consonant change: voiced apico-alveolar lateral (liquid, lateral approximant) [l] changed to a voiced labio-velar glide (approximant) [w]</td>
</tr>
<tr>
<td>cup</td>
<td>[kʌp]</td>
<td>[tʌp]</td>
<td>vowel change: a central vowel [ʌ] changed to a high-back vowel [u]</td>
<td>consonant change: a voiceless postdorsal-velar stop-plosive [k] changed to a voiceless coronal-alveolar stop-plosive [t]</td>
</tr>
<tr>
<td>lamp</td>
<td>[læmp]</td>
<td>[wæmp]</td>
<td>consonant change: voiced apico-alveolar lateral (liquid, lateral approximant) [l] changed to a voiced labio-velar glide (approximant) [w]</td>
<td></td>
</tr>
<tr>
<td>goat</td>
<td>[goʊt]</td>
<td>[got]</td>
<td>vowel change: a diphthong vowel, [oʊ] becomes a monophthong [o]</td>
<td>consonant change: a voiceless labio-velar stop-plosive [k] changed to a voiceless coronal-alveolar stop-plosive [t]</td>
</tr>
<tr>
<td>Word</td>
<td>Original Sound</td>
<td>Altered Sound</td>
<td>Consonant Change</td>
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<tr>
<td>-------</td>
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<td>---------------</td>
<td>------------------</td>
<td></td>
</tr>
<tr>
<td>cat</td>
<td>[kæt]</td>
<td>[tæt]</td>
<td>Consonant change: A voiceless postdorsal-velar stop-plosive [k] changed to a voiceless coronal-alveolar stop-plosive [t]</td>
<td></td>
</tr>
<tr>
<td>bath</td>
<td>[bæθ]</td>
<td>[bæt]</td>
<td>Consonant change: A voiceless interdental (or apico-dental) fricative [θ] changed to a voiceless coronal-alveolar stop-plosive [t]</td>
<td></td>
</tr>
<tr>
<td>red</td>
<td>[rɛd]</td>
<td>[lɛd]</td>
<td>Consonant change: A voiced mediodorsal-mediopalatal (or apico-prepalatal) rhotic (or liquid, central approximant) [r] changed to a voiced apico-alveolar lateral (liquid or lateral approximant) [l]</td>
<td></td>
</tr>
<tr>
<td>ship</td>
<td>[ʃɪp]</td>
<td>[sɪp]</td>
<td>Consonant change: A voiceless coronal-prepalatal (or coronal-postalveolar) fricative with lip rounding [ʃ] changed to a voiceless apico-alveolar (or predorsal-alveolar) fricative [s]</td>
<td></td>
</tr>
<tr>
<td>ring</td>
<td>[rɪŋ]</td>
<td>[wɪŋ]</td>
<td>Consonant change: A voiced mediodorsal-mediopalatal (or apico-prepalatal) rhotic (or liquid, central approximant) [r] changed to a voiced labio-velar glide (approximant) [w]</td>
<td></td>
</tr>
<tr>
<td>thumb</td>
<td>[θʌm]</td>
<td>[dʌm]</td>
<td>Consonant change: A voiceless interdental (or apico-dental) fricative [θ] changed to a voiced coronal-alveolar stop-plosive [d]</td>
<td></td>
</tr>
</tbody>
</table>
that     [ðæt]  ⇔  [zæt]  consonant change: a voiced interdental (or apico-dental) fricative [ð] changed to a voiced apico-alveolar (or predorsal-alveolar) fricative [z]

zip     [zip]  ⇔  [wɪp]  consonant change: a voiced apico-alveolar (or predorsal-alveolar) fricative [z] changed to a voiced labio-velar glide (or approximant) [w]

key     [ki]  ⇔  [di]  consonant change: a voiceless postdorsal-velar stop-plosive [k] changed to a voiced coronal-alveolar stop-plosive [d]

win     [win]  ⇔  [jɪn]  consonant change: a voiced labio-velar glide (or approximant) [w] changed to a voiced mediodorsal-mediopalatal glide (or approximant) [j]

Thinking Critically (page 36): Answers

1. The [θ] and [ð] sounds are produced with a more anterior constriction than [s] and [z]. Thus the th-sounds can be produced as interdental or as apico-dental fricatives. For the interdental production the tongue tip is located between the teeth, the air flow is between the bottom edge of the incisors and the tip of the tongue. For the apico-dental production the tip of the tongue is located slightly more posterior than for the interdental production. Here the tongue tip is located slightly behind the cutting edge of the incisors; the air flow is again between the teeth and the apex of the tongue.

To achieve an apico-alveolar [s] or [z], the child should be instructed to move the tongue back. The child could start by gliding the tongue tip back and forth from
the front to the back of the palate and then from the [θ] or [ð] productions back to a perceptually normal s-sound.

2. The lip rounding for [ʃ] and [ʒ] would be promoted by back vowels. The high back vowels [u] and [u] have relatively more lip rounding than the mid-back vowels such as [o] and [o], therefore, the progression from high-back to mid-back vowels would be helpful for the lip rounding of [ʃ] and [ʒ].

Word possibilities: shoe, shoot, shook, push, bush

3. news [nuz] however newspaper [nuspeipə]

The change that occurs is from a voiced [z] to a voiceless [s] in “newspaper”. This is contact assimilation, it is regressive in that the voiceless [p] is influencing the previous voiced [z] sound, it becomes voiceless. It is an example of phonemic assimilation as [z] and [s] are two different phonemes.

pantry [pæntri] ⇒ [pæni]

The change that occurs is that the [t] in “pantry” is completely gone (total assimilation). It is contact, progressive assimilation as the [n] (a coronal-alveolar nasal) has completely assimilated the [t] (a coronal-alveolar stop-plosive).

did you [did ju] ⇒ [didʒu]

This is progressive, contact assimilation as the [d] has influenced the [ʃ] in “you”. The resulting affricate with its homorganic fricative portion is productionally very similar to the [d]. This is an example of phonemic assimilation as the [ʃ] and [ʒ] are two different phonemes.

incubate [ɪŋkjuˈbeɪt] ⇒ [ɪŋkjuˈbeɪt]

This is regressive, contact assimilation as the placement of the [k] (postdorsal-velar) has changed the preceding nasal from a coronal-alveolar to a postdorsal-velar nasal [ŋ]. This is an example of phonemic assimilation as [n] and [ŋ] are two different phonemes.
misuse  \[\text{misju}z\]  \(\Rightarrow\)  \[\text{mi}fusc\]

This is a contact, regressive assimilation as the more posterior placement of the \[j\] (mediodorsal-mediopalatal) has influenced the placement of the \[s\]. The \[s\] is an apico-alveolar fricative which has now become a coronal-alveolar \[f\]. This could be considered an example of coalescence in that the placement of the \[j\] has combined with the fricative \[s\] resulting in a different sound.

4. Identify the following syllable structures:

telephone  \(\Rightarrow\)  \[\text{te.lə.fo}^{\prime}\text{n}\]  1\(^{st}\) syllable onset-peak, open syllable
2\(^{nd}\) syllable onset-peak, open syllable
3\(^{rd}\) syllable onset-peak-coda, closed syllable

wagon  \(\Rightarrow\)  \[\text{wæ.gən}\]  1\(^{st}\) syllable onset-peak, open syllable
2\(^{nd}\) syllable onset-peak-coda, closed syllable

shovel  \(\Rightarrow\)  \[\text{ʃə.vəl}\]  1\(^{st}\) syllable onset-peak, open syllable
2\(^{nd}\) syllable onset-peak-coda, closed syllable

banana  \(\Rightarrow\)  \[\text{bə.næ.nə}\]  1\(^{st}\) syllable onset-peak, open syllable
2\(^{nd}\) syllable onset-peak-coda, closed syllable
3\(^{rd}\) syllable onset-peak, open syllable

pajamas  \(\Rightarrow\)  \[\text{pə.dʒə.məz}\]  1\(^{st}\) syllable onset-peak, open syllable
2\(^{nd}\) syllable onset-peak, open syllable
3\(^{rd}\) syllable, onset-peak-coda, closed syllable

5. Two syllable words with \[k\] in comparable syllable and stressing situation in initial-, medial- and final-word positions.

Initial:  cow – boys  \['ka^u\,.bɔ\,'z\]  co - llies  \['ka.liz\]
Medial:  ta – cos  \['tə.ko\,'z\]  ro - cket  \['rə.kot\]
Final:  sea – hawk  \['sı.hɔk\]  sea - sick  \['sı.sık\]
Test Yourself (page 34-35): Answers

1. (b)  2. (b)  3. (c)  4. (a)  5. (c)  6. (d)
7. (c)  8. (a)  9. (a)  10. (c)  11. (b)  12. (b)

Additional Learning Materials

Discussion Topics and Clinical Applications

1. Difficulties with vowel productions may occur in children with phonological disorders. The following examples of vowel substitutions have been slightly modified from those presented in the article by Pollock and Keiser (1990). Students should compare the typical vowel production to the noted changes according to the parameters 1) the portion of the tongue which is involved in the articulation, i.e., front, central, back vowels; and 2) the tongue’s position relative to the palate, i.e., high, mid, low vowels.

<table>
<thead>
<tr>
<th>Example</th>
<th>Word</th>
<th>Target</th>
<th>Child's Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>pillow</td>
<td>[pɪloʊ]</td>
<td>[bəloʊ]</td>
</tr>
<tr>
<td>2.</td>
<td>eight</td>
<td>[et]</td>
<td>[ət]</td>
</tr>
<tr>
<td>3.</td>
<td>red</td>
<td>[rɛd]</td>
<td>[wɔd]</td>
</tr>
<tr>
<td>4.</td>
<td>cat</td>
<td>[kæt]</td>
<td>[kɑt]</td>
</tr>
<tr>
<td>5.</td>
<td>wagon</td>
<td>[wæɡən]</td>
<td>[wɔɡən]</td>
</tr>
<tr>
<td>6.</td>
<td>foot</td>
<td>[fut]</td>
<td>[fɔt]</td>
</tr>
<tr>
<td>7.</td>
<td>duck</td>
<td>[daŋk]</td>
<td>[dɑŋk]</td>
</tr>
<tr>
<td>8.</td>
<td>cow</td>
<td>[kɔʊ]</td>
<td>[kɑ]</td>
</tr>
<tr>
<td>9.</td>
<td>toy</td>
<td>[tɔɪ]</td>
<td>[dʌ]</td>
</tr>
<tr>
<td>10.</td>
<td>rock</td>
<td>[rɔk]</td>
<td>[wɔk]</td>
</tr>
</tbody>
</table>

2. Students should compare the typical consonant productions to the noted misarticulations according to active articulator, passive articulator, manner, and voicing changes.

<table>
<thead>
<tr>
<th>Example</th>
<th>Word</th>
<th>Target</th>
<th>Child's Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>swing</td>
<td>[swɪŋ]</td>
<td>[θwɪŋ]</td>
</tr>
<tr>
<td>2.</td>
<td>shovel</td>
<td>[ʃævl]</td>
<td>[ʃəbəl]</td>
</tr>
</tbody>
</table>

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3. Based on the results from question #2, discuss which production parameters have been altered for each of the misarticulations. For example, are all four articulatory parameters different, that is, are there changes in the active articulator, the passive articulator, manner, and voicing between the target realization and the actual production? Also, discuss in general terms what these changes mean. For example, have the active and/or passive articulators moved forward, backward, or has the manner of articulation changed from a complete closure to a wider opening?

4. Ingram (1974) and Smith (1973) offer case studies of children with assimilation processes. A few examples are offered here for discussion. What types of assimilation processes (progressive, regressive, contact, remote) are being seen in these examples?

<table>
<thead>
<tr>
<th>Example</th>
<th>Word</th>
<th>Target</th>
<th>Child's Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>talk</td>
<td>[tak]</td>
<td>[kak]</td>
</tr>
<tr>
<td>2.</td>
<td>doggie</td>
<td>[dagi]</td>
<td>[gagi]</td>
</tr>
<tr>
<td>3.</td>
<td>blankie</td>
<td>[blæŋki]</td>
<td>[bæmbi]</td>
</tr>
<tr>
<td>4.</td>
<td>stop</td>
<td>[stɔp]</td>
<td>[bɔp]</td>
</tr>
<tr>
<td>5.</td>
<td>snake</td>
<td>[snεk]</td>
<td>[ŋεk]</td>
</tr>
</tbody>
</table>

Assimilation Processes
1. Regressive (anticipatory), remote (noncontiguous) assimilation. This is called back assimilation in Ingram (1974) and velar harmony in Smith (1973).
2. Regressive (anticipatory), remote (noncontiguous) assimilation. This is similar to the first example.
3. Progressive (perseverative), remote (noncontiguous) assimilation. Note: The reduction of [bl] to [b] would be a normal production for a young child.
4. Regressive (anticipatory), remote (noncontiguous) assimilation. The changes in voicing from two voiceless sounds [st] to a voiced sound [b]
could be discussed. This might be a case of prevocalic voicing (in addition to the assimilation process) which is often seen in young children.

5. Regressive (anticipatory), remote (noncontiguous) assimilation.

5. Analyze an articulation test noting the number of syllables which are used to test the [s] and [z] sounds and how the syllable structures vary when analyzing the sounds tested in the *medial* position.

**Multiple Choice Questions**

1. Which group of speech sounds is produced with a significant constriction within the vocal tract?
   a) consonants
   b) onsets
   c) vowels
   d) syllable nuclei

2. Within the group of consonants, which specific speech sounds are produced with a relatively more open expiratory passageway?
   a) fricatives
   b) obstruents
   c) sonorants
   d) affricates

3. Which one of the following sounds is not considered a sonorant?
   a) [r]
   b) [m]
   c) [w]
   d) [s]

4. A consonant that functions as a syllable nucleus is referred to as a
   a) releasing sound
   b) syllabic
   c) obstruent
   d) coda

5. Which of the following is not a parameter used to describe vowel productions?
   a) the part of the tongue that is raised
   b) the extent to which the tongue is raised
   c) the manner of articulation
   d) the kind of opening made at the level of the lips
6. Vowels which are labeled *front* vowels are
   a) acoustically more intense
   b) occur more often at the beginning of words
   c) are produced with the front articulators such as the teeth and lips
   d) are produced by articulatory adjustments made by more anterior portions of the tongue

7. The terms open and close refer to
   a) the degree of muscular activity involved in the articulation
   b) the relative closeness of the tongue to the roof of the mouth
   c) the degree of opening of the lips
   d) the position of the vowel within the syllable

8. Which one of the following is a diphthong?
   a) the vowel usually produced in "beet"
   b) the vowel usually produced in "in"
   c) the vowel usually produced in "pie"
   d) the vowel usually produced in "moon"

9. Which one of the following diphthongs is considered to be a nonphonemic diphthong?
   a) [eɪ]
   b) [aʊ]
   c) [ɔɪ]
   d) [aɪ]

10. Which one of the following diphthongs has a back vowel offglide?
    a) [eɪ]
    b) [aʊ]
    c) [ɔɪ]
    d) [aɪ]

11. Which one of the following vowels is a high-back vowel that is close and tense?
    a) [u]
    b) [ʊ]
    c) [ʊ]
    d) [ɑ]
a) phonemic diphthongs  
b) falling diphthongs  
c) centering diphthongs  
d) rising diphthongs

13. During consonant production, which one of the following refers to the active articulator?  
a) organ of articulation  
b) place of articulation  
c) manner of articulation  
d) voicing

14. Sibilants are a subcategory of  
a) stop-plosives  
b) fricatives  
c) nasals  
d) affricates

15. According to the International Phonetic Alphabet, what is the label given to consonants in which there is a much wider passage of air resulting in a smooth (as opposed to turbulent) airflow?  
a) laterals  
b) approximants  
c) stop-plosives  
d) fricatives

16. Why are rhotic consonants difficult to describe?  
a) because there is a gliding movement during their production  
b) because they occur infrequently in General American English  
c) because their production is context- and speaker dependent  
d) because there is confusion between the rhotic consonants and the central vowels with r-coloring

17. According to the International Phonetic Alphabet, which one of the following consonants is not considered an approximant?  
a) [j]  
b) [ɾ]  
c) [w]  
d) [n]

18. Which one of the following descriptions describes the consonant [l]?  
a) voiced apico-alveolar lateral  
b) voiced mediodorsal-mediopalatal lateral
c) voiceless apico-prepalatal lateral

d) voiced apico-dental lateral

19. Which consonant is described as a voiceless postdorsal-velar stop-plosive?
  a) [t]
  b) [p]
  c) [k]
  d) [f]

20. If the word "unpredictable" is pronounced as [ɔm.præ.dək.tə.blə], this is an example of a
  a) progressive assimilation
  b) regressive assimilation
  c) noncontiguous assimilation
  d) perseverative assimilation

21. If the phrase "want to" is pronounced [wʌ.ŋə], this is an example of a
  a) noncontiguous assimilation
  b) contact assimilation
  c) regressive assimilation
  d) remote assimilation

22. Given the typical pronunciation, which one of the following words has two unchecked syllables?
  a) away
  b) captain
  c) balloon
  d) upset

23. What are the syllable arresting sounds of the two syllables in the word "today"?
  a) [t] and [d]
  b) [u] and [eɪ]
  c) [i]
  d) the word "today" has no codas, therefore, it does not have syllable arresting sounds

**True/False Questions**

1. Only vowels can function as syllable nuclei.

2. Typically consonants have more acoustic intensity than vowels.
3. The vowel [i] is a close, tense vowel that is unrounded.

4. In the standard pronunciation of General American English, only rising diphthongs are typically produced.

5. There is no difference in the transcription of diphthongs versus two vowels following one another.

6. The manner of articulation describes what type of constriction the active and passive articulators produce for the realization of a particular consonant.

7. Assimilation processes are typically classified as sound errors.

8. A syllable must have a peak and either an onset or a coda.

9. The number of syllables, the type of syllable, and the degree of syllable stress affect syllable production.

10. Articulation tests account for syllable structure when establishing the words that will be used in the testing procedure.

Short Answer Questions

1. Give the definition of vowels.

2. Which vowels are considered rounded vowels?

3. Define monophthong.

4. Which four phonetic categories are used to describe consonants?

5. Define phonetics and the three subdivisions of phonetics which were discussed.

6. What are the active articulators for consonants of General American English?

7. What are the passive articulators for consonants of General American English?

8. Define coarticulation.

10. List the peak, onset, and coda for the word "stretch".

Essay Questions

1. List the production and linguistic function differences between vowels and consonants.

2. The vowel quadrilateral reflects the production features of the various vowels. Discuss how the quadrilateral reflects the oral dimensions of vowel production.

3. Distinguish between nonphonemic and phonemic diphthongs. Give word examples for both phonemic and nonphonemic diphthongs.

4. A child says [sɪp] for "ship". Explain the difference phonetically between the child's production and the typical pronunciation.

5. How might syllable structure be helpful when structuring word materials for therapy?

Bibliography


Teaching Resources.
Learning Objectives

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

- Define phonetic transcription and explain why it is a notational system.
- Describe how the International Phonetic Alphabet is used.
- Explain the value of transcription for speech-language therapists.
- Define diacritics.
- Identify the diacritics used to delineate consonant sounds.
- Identify the diacritics used to mark vowels.
- Identify the diacritics used to mark stress, duration, and syllable boundaries.

Summary

Assessment procedures and results should be accurate, professional, and accomplished in an objective manner. This chapter introduces the International Phonetic Alphabet (IPA) as a widely used system that can provide these requisites for the assessment of articulatory and phonological disorders. The IPA system was developed to document actual phonetic realizations of speech events. It is a means of transferring highly impermanent speech events into more durable graphic representations. Such a system offers the speech-language specialist a way to substantiate assessment results as well as to communicate effectively with other professionals. Transcription should never be considered as an option; accurate transcription is a necessity for professional evaluations.
To increase the effectiveness of the IPA system, certain diacritic markers are used to add production details to the meaning of the basic symbol. These markers are indispensable to the documentation of many of the unusual realizations of our clients. One current diacritic system used for disordered speech, the extIPA, is introduced. Such diacritics are itemized, explained, and exemplified in the second section of the chapter. This section also offers clinical comments on many of the diacritics as well as actual phonetic transcriptions utilizing these marks.

The last section of this chapter demonstrates how phonetic transcription and the detailed knowledge acquired through its use in assessment procedures also benefit the intervention process. First, the accuracy needed for the transcription task promotes the fine-tuning of perceptual skills, a clinical proficiency that will, by its very nature, enhance the likelihood of successful intervention. Second, the specificity gained through phonetic transcription, including diacritics, translates into a far more goal-directed treatment approach, which increases clinical efficacy.

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**Emphases**

1. Underline the importance of phonetic transcription and its role in the assessment of articulatory and phonological impairments.
2. Introduce diacritic markers (narrow transcription) for the transcription of aberrant speech sound production.
3. Demonstrate how these diacritics can be used by providing examples of their clinical application.
4. Promote discussion on how phonetic transcription, and especially the diacritics, can be used within the assessment process.

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**Key Concepts**

**Phonetic transcription systems** were devised to document real speech events (p. 40). There is a long history of attempts to develop phonetic notation systems. One of these systems is the *International Phonetic Alphabet (IPA)* which originated at the end of the 1800's. The IPA has been revised several times, most recently in 2005. It is important to realize that the IPA is a dynamic, evolving system.

**International Phonetic Alphabet (IPA)** is the most widely accepted transcription
system in the world (p. 40). (Note: This system was largely attributed to Paul Passy who was the Secretary of the International Phonetic Association. It was first published in 1888 and was originally designed as an aid in teaching the exact pronunciation of foreign languages.)

**Broad transcription** is a more general type of transcription based on the phoneme system of a specific language. Each symbol represents a phoneme (p. 42). Due to the fact that this system represents phonemes, broad transcription is also referred to as **phonemic transcription** (p. 42).

**Narrow transcription** is a system based on recording as much production detail as possible (p. 42). This notation uses both the symbols of broad transcription as well as extra ones. These extra symbols are added to give a specific phonetic value, in other words, to exemplify explicit production features. This type of transcription is also referred to as **phonetic transcription** to denote the inclusion of phonetic production features (p. 42).

Phonetic transcription is a **descriptive not a prescriptive system** (p. 43). The term descriptive implies that *actual articulatory events are described*. All symbols used stand for a defined articulatory event. For example, [b] stands for a voiced bilabial stop-plosive. If there is not voicing or if this articulation changes in any way, these variations must be noted. It is not a prescriptive system in that "words" are not transcribed in an invariable manner. For example, the word "tan" is often produced and thus transcribed as [tæn]. However, if someone says [tɛn], which can be heard in Pittsburgh, ([ju hɛv ə naʃtɛn]), then it must be transcribed accordingly. Letters cannot be equated to transcribed symbols.

There are many reasons why phonetic transcription should be used (pp. 43-44). First and foremost, it is **the basis for the assessment of individuals with articulatory/phonological impairments**. Although articulation tests are often used as a portion of the assessment process, they are only as good as the transcription skills of the examiner. Learning phonetic transcription is a skill. It not only is an indispensable portion of the education of speech-language specialists, it is also a means by which auditory perceptual competency is trained. As practitioners become more trained in transcription, their perceptual and discrimination proficiency for speech sounds becomes more fine-tuned.

**Diacritics** are additional transcription marks which are added to sound symbols to demonstrate a particular phonetic value, to denote modifications of the original sound (p. 44). When diacritics are added, this is known as **narrow transcription**. Many of the diacritics used in this text are from the IPA, however, due to the range of speech aberrations practitioners encounter; often new diacritics must be
devised. Various revisions have attempted to correct some of these problems. Recently specialized diacritics were developed to specifically address the transcription of disordered speech. These extensions to the IPA (extIPA) were published in 1990 and revised in 2002 (p. 45).

**Diacritics Used With Consonants**

**Dentalization** refers to an articulatory variation in which the tongue approaches the upper incisors (p. 44). It is only used with consonants that are not normally articulated with this place of articulation. Dentalized sounds are those produced with the tongue tip further forward than is normally the case.

**Palatalization** refers to an articulatory variation in which the tongue approaches the palate (p. 44). This diacritic is only used for sounds in which their articulation does not involve the palate, for example dental or alveolar sounds. In this case, palatalized sounds are those produced with the tongue tip further back than is normally the case. Velar sounds, such as [k] and [g], can also be palatalized. In this case, palatalization refers to a more forward placement of active and passive articulators. Palatalized [k] and [g] sounds may be produced if they are in a phonetic context with [i], for example, in [kip]: The high-front vowel placement can move the [k] production more anteriorly.

**Velarization** refers to an articulatory variation in which the tongue approaches the velum (p. 46). A prominent example of a velarized sound is the production of the so-called dark l-sound. See pages 291-292 for additional information about the dark l-sound.

**Lateralization** refers to an articulatory variation in which the airstream is released laterally (p. 46). There is one lateral sound in General American English, [l]; for this sound the lateralization symbol would not be used. Clinicians often encounter lateral [s] and [z] which are considered misarticulations. The IPA symbols [l] (voiceless) and [ɬ] (voiced) lateral alveolar fricatives, are used to transcribe these sounds (p. 41).

There are two types of **voice symbols**: **Partial devoicing** (of voiced consonants) and **partial voicing** (of voiceless consonants) (pp. 47-48). Partial devoicing and voicing are perceptually difficult to discern. There is a general tendency for partial devoicing at the end of words or utterances. This can often be heard in citation form articulation tests. Shriberg and Kent (2003) note that children have a tendency to devoice (or partially devoice) final obstruents, [bɛd] for bed, [drəʊz] for dishes. In normal adult speech, there is also a tendency for liquids and glides to be devoiced following voiceless sounds, for example [pɹɪ] for play or [tɹɪ] for
Test Bank

ANSWERS TO QUESTIONS IN INSTRUCTOR’S RESOURCE MANUAL
1

Clinical Framework

BASIC TERMS AND CONCEPTS

Discussion Topics and Clinical Applications

1. See pages 10-11

2. See page 9

3. See material on page 274 for consonant clusters

4. See pages 8-10

5. See pages 2-4

6. a) Vowels: [aɪ, ʌ, ɪ, æ, ə, oʊ, u, ʊ]

Consonants: [w, l, r, m, n, ñ, b, t, d, k, h, f, v, s, j, ʒ]

b) Not in inventory Vowels: [ə, ɜ, əʊ, ɛ] Consonants: [p, g, j, z, tʃ, ɹ, ʒ, θ]

c) jelly, chocolate, that, turtles, the, then, Shredder, just, these, other, things

d) [t/ ɵ], [v/ δ], [ʒ/ ɹ]
Multiple Choice Questions

1) c  
2) c  
3) d  
4) b  
5) c
6) d  
7) d  
8) c  
9) d  
10) c

True/False Questions

1. FALSE  
2. FALSE  
3. TRUE  
4. FALSE  
5. TRUE
6. TRUE  
7. TRUE  
8. FALSE  
9. TRUE  
10. FALSE

Short Answer Questions

1. Define communication disorder. See page 3.
2. Explain why a child with “s” difficulties, might have problems in the area of morphology. See pages 2-3.
3. Contrast the terms speech sound and phoneme. See pages 5-6.
4. Contrast the terms articulation disorder versus phonological disorder. See page 8.
5. Write a brief definition and give an example of each of the following terms: phonology, morphology, syntax, semantics, and pragmatics. See pages 2-3.

Essay Questions

1. Discuss how articulation disorders represent difficulties with the physical production aspects of speech sounds. Utilize the terms "articulation, "physical sound realities", and "speech sounds" when developing your discussion. Refer to pages 4, 5, and 8.
2. Discuss how phonological disorders represent difficulties with the linguistic function of phonemes. Utilize the terms "phoneme" and "phonology" when developing your discussion. Refer to pages 6 and 8.
3. Discuss the differences between a language and a speech disorder. Give specific examples for each type. Refer to pages 3 and 4.
4. Articulation errors are referenced by a child's age. Referring to the definition and characteristics of the term "articulation" state why this is a meaningful reference point. Refer to page 8.

5. Based on the definition of a phonological disorder, state why a child with a phonological impairment may have difficulties with other areas of language such as morphology, syntax, semantics, or pragmatics. Refer to pages 8 and 9.
Discussion Topics and Clinical Applications

1. Difficulties with vowel productions may occur in children with phonological disorders. The following examples of vowel substitutions have been slightly modified from those presented in the article by Pollock and Keiser (1990). Students should compare the typical vowel production to the noted changes according to the parameters 1) the portion of the tongue which is involved in the articulation, i.e., front, central, back vowels; and 2) the tongue’s position relative to the palate, i.e., high, mid, low vowels.

Vowel Changes
1. High-front vowel is changed to a low-back vowel.
2. Onglide portion of diphthong is changed; mid-front vowel is changed to a low-front vowel.
3. Mid-front vowel is changed to a low-back vowel.
4. Monophthong is changed to a diphthong; low-front monophthong is changed to a diphthong with a low-front onglide and a high-front offglide.
5. Monophthong is changed to a diphthong; low-front monophthong is changed to a diphthong with a mid-back onglide and a high-front offglide.
6. High-back vowel is changed to a mid-back vowel.
7. Central vowel is changed to a low-back vowel.
8. Diphthong is changed to a monophthong; low-front onglide is changed to a
low-back vowel.
9. Diphthong is changed to a monophthong; mid-back onglide is changed to a central vowel.
10. Monophthong is changed to a diphthong; low-back monophthong is changed to a diphthong with a low-back onglide and a high-front offglide.

2. Students should compare the typical consonant productions to the noted misarticulations according to active articulator, passive articulator, manner, and voicing changes.

Consonant Changes
1. Voiceless apico-alveolar (or predorsal-alveolar) fricative is changed to a voiceless apico-dental (or interdental) fricative.
2. Voiced labiodental fricative is changed to a voiced bilabial stop-plosive.
3. Voiced mediodorsal-mediopalatal (or apico-prepalatal) rhotic (or liquid or central approximant) is changed to a voiced labio-velar glide (or approximant).
4. Voiceless apico-dental (or interdental) fricative is changed to a voiceless labiodental fricative.
5. Voiced coronal-alveolar nasal is changed to a voiced coronal-alveolar stop-plosive.
6. Voiceless postdorsal-velar stop-plosive is changed to a voiceless coronal-alveolar stop-plosive.
7. Voiceless coronal-prepalatal (or coronal-postalveolar) fricative with lip rounding is changed to a voiceless coronal-alveolar stop-plosive.
8. Voiced apico-alveolar lateral (liquid or lateral approximant) is changed to a voiced labio-velar glide (or approximant).
9. Voiced apico-alveolar (or predorsal-alveolar) fricative is changed to a voiced coronal-alveolar stop-plosive.
10. Voiceless apico-dental (or interdental) fricative is changed to a voiceless coronal-alveolar stop-plosive.

3. Based on the results from question #2, discuss which production parameters have been altered for each of the misarticulations.

1. swing  [swɪŋ]  [θwɪŋ]
Change in active and passive articulators: active articulator has moved forward, the passive articulator has moved forward from the alveolar ridge to the upper teeth.
2. shovel  [ʃəvəl]  [ʃəbəl]
Change in active articulator and manner of articulation: the articulatory constriction has moved forward, manner of articulation has changed from a narrow opening (fricative) to a complete closure (stop-plosive).
3. frog    [frɔg]    [fɾɔg]  
Change in active, passive articulators and manner of articulation: active articulator has moved forward, there is lip rounding, passive articulator has moved back to include a high-back tongue placement for [w], manner of articulation has changed from a liquid to a glide or from an approximant to a central approximant.

4. thumb    [θʌm]    [fʌm]  
Change in active articulator: active articulator has moved from the tip of the tongue to the bottom lip.

5. knot    [nɒt]    [dɒt]  
Change in manner of articulation: manner has changed from a nasal to a stop-plosive, the velum has moved from an open to a closed position.

6. coat    [kəʊt]    [təʊt]  
Change in active and passive articulators: both have been moved to a more forward position.

7. fishing    [fɪʃɪŋ]    [fɪʃɪŋ]  
Change in passive articulator and manner of articulation: passive articulator has moved forward, manner of articulation has changed from a narrow opening (fricative) to a complete closure (stop-plosive).

8. lamp    [læmp]    [wæmp]  
Change in active and passive articulators: the active articulator has moved from the tip of the tongue to a labial position for [w] (lip rounding), the passive articulator has moved back to a high-back tongue elevation.

9. zoo    [zu]    [du]  
Change in active articulator and manner of articulation: the active articulator has moved somewhat back from the tip of the tongue to the coronal edges of the tongue, manner of articulation has changed from a narrow opening (fricative) to a complete closure (stop-plosive).

10. three    [θri]    [tri]  
Change in active, passive articulators and manner of articulation: the active articulator has moved somewhat back from the tip of the tongue to the coronal edges of the tongue, the passive articulator has moved back from the upper teeth to the alveolar ridge, manner of articulation has changed from a narrow opening (fricative) to a complete closure (stop-plosive).

4. Ingram (1974) and Smith (1973) offer case studies of children with assimilation processes. A few examples are offered here for discussion. What types of assimilation processes (progressive, regressive, contact, remote) are being seen in these examples?

Assimilation Processes
1. Regressive (anticipatory), remote (noncontiguous) assimilation. This is called back assimilation in Ingram (1974) and velar harmony in Smith (1973).

2. Regressive (anticipatory), remote (noncontiguous) assimilation. This is similar to the first example.

3. Progressive (perseverative), remote (noncontiguous) assimilation. Note: The reduction of [bl] to [b] would be a normal production for a young child.

4. Regressive (anticipatory), remote (noncontiguous) assimilation. The changes in voicing from two voiceless sounds [st] to a voiced sound [b] could be discussed. This might be a case of prevocalic voicing (in addition to the assimilation process) which is often seen in young children.

5. Regressive (anticipatory), remote (noncontiguous) assimilation.

5. For example, the following words from the Weiss Comprehensive Articulation Test (1980) are used to test [t] and [d].

<table>
<thead>
<tr>
<th>Initial position</th>
<th>Words used to test [t]</th>
<th>Words used to test [d]</th>
</tr>
</thead>
<tbody>
<tr>
<td>table</td>
<td>door</td>
<td></td>
</tr>
<tr>
<td>Santa Claus</td>
<td>ladder</td>
<td></td>
</tr>
<tr>
<td>coat</td>
<td>bed</td>
<td></td>
</tr>
</tbody>
</table>

The number of syllables varies from one to three for testing [t] and [d]. In the medial position [t] is tested as the onset of an unstressed syllable but may frequently be assimilated to [səntə]. The medial [d] in ladder is often produced not as [d] but as a flap (tap, or one-tap trill) (see page 55). Although this is an acceptable allophonic variation of [d], it does not really test [d] per se.

Multiple Choice Questions

1) a  2) a  3) d  4) b  5) c
6) d  7) b  8) c  9) a  10) b
11) a  12) c  13) a  14) b  15) b
16) c  17) d  18) a  19) c  20) b
21) b  22) a  23) d

True/False Questions
1) FALSE  2) FALSE  3) TRUE  4) TRUE  5) FALSE
6) TRUE  7) FALSE  8) FALSE  9) TRUE  10) FALSE

**Short Answer Questions**

1. Give the definition of vowels. See page 16
2. Which vowels are considered rounded vowels? See pages 19-20.
4. Which four phonetic categories are used to describe consonants? See page 23.
5. Define phonetics and the three subdivisions of phonetics which were discussed. See pages 15-16.
10. List the peak, onset, and coda for the word "stretch". Refer to page 33.

**Essay Questions**

1. List the production and linguistic function differences between vowels and consonants. Refer to pages 17 and 18.
2. The vowel quadrilateral reflects the production features of the various vowels. Discuss how the quadrilateral reflects the oral dimensions of vowel production. Refer to page 18.
3. Distinguish between nonphonemic and phonemic diphthongs. Give word
examples for both phonemic and nonphonemic diphthongs. Refer to page 21.

4. A child says [sɪp] for "ship". Explain the difference phonetically between the child's production and the typical pronunciation. Refer to page 28.

5. How might syllable structure be helpful when structuring word materials for therapy? Refer to page 34.