

CLINICAL PHONETICS

FIFTH EDITION



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LAWRENCE D. SHRIBERG • RAYMOND D. KENT

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Clinical Phonetics

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Fifth Edition

Clinical Phonetics

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Director and Publisher: Kevin Davis
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Portfolio Management Assistant: Maria Feliberty and Casey Coriell
Development Editor: Carolyn Schweitzer
Executive Product Marketing Manager: Christopher Barry
Executive Field Marketing Manager: Krista Clark
Manufacturing Buyer: Deidra Smith
Cover Design: Carie Keller, Cenveo
Cover Art: Josep Curto/Shutterstock, KidStock/Blend Images/AGE Fotostock, Iakov Filimonov/Shutterstock, Jedimaster/123RF.com
Media Producer: Lauren Carlson
Editorial Production and Composition Services: SPi Global, Inc.
Editorial Project Manager: Precious Yora Jacalan, SPi Global, Inc.
Full-Service Project Manager: Billu Suresh, SPi Global, Inc.
Text font: Times LT Pro

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Library of Congress Cataloging-in-Publication Data

Names: Shriberg, Lawrence D., author.

Title: Clinical phonetics / Lawrence D. Shriberg, University of Wisconsin-Madison, Raymond D. Kent, University of Wisconsin-Madison, Tara McAllister, New York University, Jonathan L. Preston, Syracuse University.

Description: Fifth edition. | Boston : Pearson, [2019] | Revised edition of: Clinical phonetics / Lawrence D. Shriberg, Raymond D. Kent. 4th ed. c2013. | Includes bibliographical references and index.

Identifiers: LCCN 2017050941 | ISBN 9780134746142 (alk. paper) | ISBN 0134746147 (alk. paper)

Subjects: LCSH: Speech therapy. | Phonetics. | English language—Phonetics.

Classification: LCC RC423 .S515 2019 | DDC 616.85/506—dc23 LC record available at <https://lcn.loc.gov/2017050941>

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Preface

Clinical Phonetics had its provenance in the classroom and clinic. The authors of the first edition (Shriberg and Kent) wanted a phonetics text that provided knowledge and skills training that was clinically oriented. There were many general phonetics texts to choose from, but none of them delivered the information and exposure we thought our students should have as preparation for clinical coursework and clinical practica. Therefore, we undertook to write our own text based on our experience in teaching and clinical research. The first edition, published in 1982, was followed by updated editions in 1995, 2003, and 2013. Each new edition was a significant revision as we took into account the opinions and advice we received from students, book reviewers, and professional colleagues. We are grateful for the continuing adoptions of our book, which in its various editions has spanned the decades since 1982 and generations of students.

The fifth edition of *Clinical Phonetics* is still another major revision, which we hope retains the strengths of the previous editions but offers updated knowledge and increased convenience to the reader. The most important and exciting change is the addition of two new authors, Tara McAllister and Jonathan Preston, both of whom have valuable teaching experience and a keen interest in the application of phonetics to clinical education and research. Our quartet of authors worked together in a substantial reworking of *Clinical Phonetics*. In doing so, we drew on our collective experience of applying the principles and methods of phonetics to speech development, speech sound disorders in children, speech disorders associated with craniofacial anomalies, and neurogenic speech disorders in children and adults.

We coined the book title *Clinical Phonetics* in 1982 in part because it seemed like an appropriate way to distinguish our book from the raft of other phonetics texts. Since that time, clinical phonetics as a specialty has matured along with its sibling, clinical linguistics, to become a highly productive field. The inaugural issue of the journal *Clinical Linguistics & Phonetics* was published in 1987. A few years later, in 1991, the International Clinical Phonetics and Linguistics Association (ICPLA) was founded in Cardiff, Wales, at the symposium *Advances in Clinical Phonetics*. In 2015, ICPLA published an extended set of symbols for the transcription of

disordered speech (*extIPA Symbols for Disordered Speech*). Numerous articles on clinical phonetics have appeared in a number of scholarly journals, including those published by the American Speech-Language-Hearing Association.

All of which is to say that “clinical phonetics” is a vibrant and growing field of knowledge and practice. One of the essential tools of this field is the representation of disordered speech using phonetic transcription, which is the process of putting speech sounds in written or printed form using a standard alphabet (the International Phonetic Alphabet supplemented by a set of special marks called *diacritics*). A primary goal in the clinical application of phonetics is to transcribe the modifications of speech sounds that are encountered in speech disorders and the variants (dialects) of English. *Clinical Phonetics*, including this fifth edition, was written for this purpose.

WHAT'S NEW IN THIS EDITION?

We now take a look at the major changes in this new edition.

The text is rich with multimedia materials that highlight various aspects of speech production. Videos are provided to enhance students' understanding of speech production using modern technologies, including ultrasound imaging of the tongue, electropalatography, and spectrograms. Authentic audio examples of speech errors are embedded within several chapters to highlight the use of phonetic symbols and clinically relevant diacritics.

Every chapter was revised to some degree, some chapters were retitled, and several chapters underwent significant revision to provide new content and better flow. There is new or expanded content on topics such as:

- Instrumental methods in phonetics that supplement listening skills
- Acoustic aspects of phonetics, with many new illustrations
- Clinical directions in describing prosody
- Diversity and multicultural issues
- Articulatory features of vowels and consonants, with many new illustrations

We have added new opportunities for skills training with transcription experiences related to:

- Diversity
- Persistent distortions of sibilants and rhotics (the *s* and *r* sounds)
- Motor speech disorders in children
- Nonwords
- A full standardized test of articulation/phonology: *Hodson Assessment of Phonological Patterns—third edition (HAPP-3)*
- Subtopics within each chapter to provide an integrated learning experience

To enhance the reader experience and learning efficiency, we have woven several changes throughout the text and online materials:

- Increased use of bulleted text; less dense prose
- Improved organizational structure with new sidebars for supplementary content
- Reorganized chapters for maximal clarity and ease of learning
- Audio samples linked to the text, accessible in the eText
- Videos on selected topics that illustrate speech production imaging and analysis

In this edition, as in its predecessors, we emphasize authenticity. Illustrations of the formation of speech sounds were derived from methods such as cinefluorography and ultrasound to ensure accuracy of representation. Sound files used for clinical skill training were recorded from children and adults who have speech disorders or who use different dialects to ensure that users of the text have experience that is suited to clinical needs. Transcriptions by experts are given as standards for instruction, and various tips are offered on how to make the process of transcription effective and efficient. *Clinical Phonetics* is about both the *what* and *how* to in applying phonetics to clinical needs.

The structure and basic content of this new edition can be seen in the following brief chapter summaries. The chapters proceed from basic information on phonetics to clinical applications.

1. Overview of Clinical Phonetics. A brief introduction to the topic.
2. Linguistic Phonetics. A discussion of how phonetics fits into the general study of language, along with basic terminology used in linguistics and phonetics.
3. The Three Systems of Speech Production. An introduction to the anatomy and physiology of speech.

4. Vowels: Monophthongs and Diphthongs. Definitions and phonetic symbols for the vowel sounds of American English.
5. Consonants. Definitions and phonetic symbols for the consonant sounds of American English.
6. Suprasegmentals and Prosody. Discussion of the melody and rhythm of speech, which extend beyond segments (vowels and consonants) and are therefore called *suprasegmentals*. Clinically relevant examples are provided.
7. Narrow Transcription. Definitions and phonetic symbols for speech sound modifications, with audio exemplars.
8. Practicing Broad and Narrow Transcription of Children's Speech. Experience in applying phonetics to the speech of children.
9. Preparing to Collect and Transcribe Clinical Speech Samples. Advice on (a) eliciting and recording speech samples and (b) scoring and transcription for clinical purposes.
10. Phonetics in the Clinical Setting. Phonetics practice for a variety of clinical tasks.
11. Phonetic Variation. Discussion of variations of speech sounds in various dialects of English.

THE eTEXT ADVANTAGE

The eText is an affordable, interactive version of the print text. Publication of *Clinical Phonetics* in an eText format allows for a variety of advantages over a traditional print format, including a search function allowing the reader to efficiently locate coverage of concepts. **Boldface** key terms are clickable and take the reader directly to the glossary definition. Index entries are also hyperlinked and take the reader directly to the relevant page of the text. Navigation to particular sections of the book is also possible by clicking on desired sections within the expanded table of contents. Finally, sections of text may be highlighted, and reader notes can be typed onto the page for enhanced review at a later date.

To further enhance assimilation of new information, video clips are interspersed throughout chapters to demonstrate text concepts in action. At the end of most chapters, readers can access multiple-choice *Check Your Understanding* questions to assess comprehension of text concepts. Immediate feedback is provided on the appropriateness of responses. Transcription training allows readers to listen to examples of speech patterns and to practice transcribing what they hear, while additional audio examples demonstrate real-life speech errors.

To learn more about the enhanced Pearson eText, go to www.pearsonhighered.com/etextbooks.

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

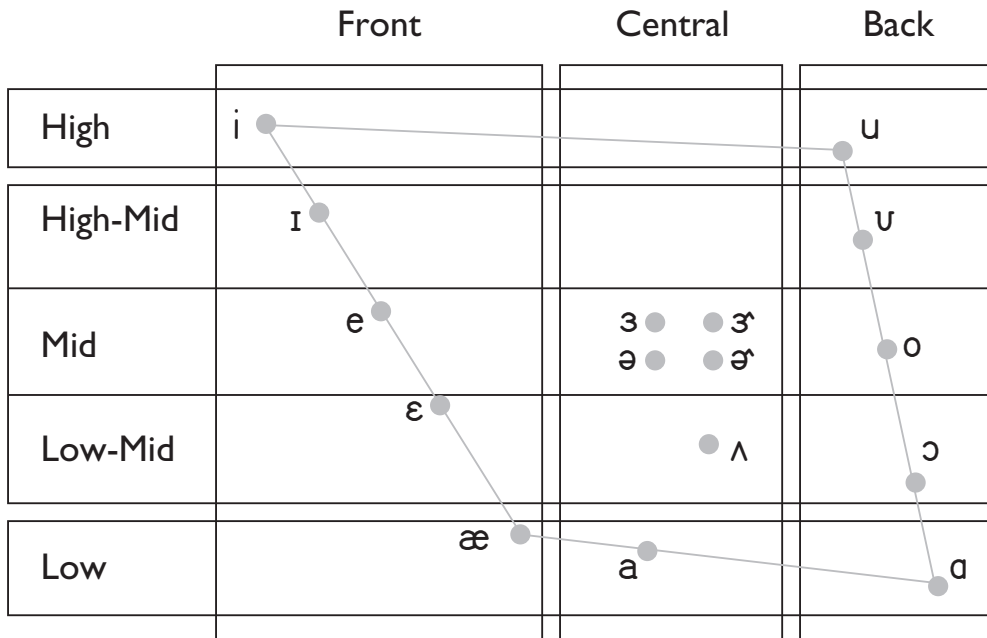
ACKNOWLEDGEMENTS

Through the various editions, many people have given advice, support, and assistance. We would like to acknowledge them all, but the list has simply become too large. For that reason, we mention here only those individuals who were most helpful to us in preparing this fifth edition, but we have by no means forgotten those who helped in the earlier editions. We are grateful to the following for their individual contributions to the new edition: Sayumi Chico, Leah Fabiano-Smith, Peter Flipsen Jr., Jane McSweeny, Francesca Spinelli, Mialy Wells, David Wilson, Ferenc

Bunta, William R. Culbertson, Michelle Flippin, Steven Long, Anna Schmidt, and Juliet Weinhold. We are grateful for the many ways in which the team at Pearson worked with us to make this edition a reality. They always stood ready to answer questions and resolve problems. Our discussions with Julie Peters helped us to frame the revised edition and to understand how we could incorporate eText. Once the work on revising and updating was underway, we received support from Faraz Sharique Ali, Jesika Bethea, Johanna Burke, Maria Feliberty, Precious Yora A. Jacalan, Carolyn Schweitzer, and Billu Suresh.

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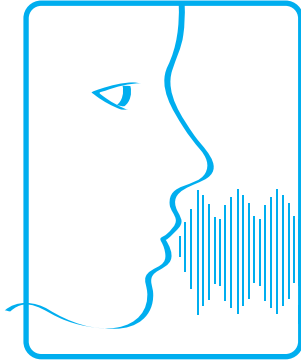
Vowel and Diphthong Sounds of English



Diphthongs: $\bar{a}\bar{i}$ $\bar{o}\bar{i}$ $\bar{a}\bar{u}$ $\bar{e}\bar{i}$ $\bar{o}\bar{u}$

Consonant Sounds of English

		MANNER	VOICING	PLACE						
				Bilabial	Labiodental	Lingua-Dental	Lingua-Alveolar	Lingua-Palatal	Velar	Glottal
OBSTRUENTS	Stop	Voiceless	p			t		k	ʔ	
		Voiced	b			d		g		
	Fricative	Voiceless		f	θ	s	ʃ		h	
		Voiced		v	ð	z	ʒ			
	Affricate	Voiceless					tʃ			
		Voiced					dʒ			
SONORANTS	Nasal	Voiced	m			n		ŋ		
	LIQUID	Lateral	Voiced				l			
		Rhotic	Voiced					r		
	Glide	Voiced	w				j	(w)		



OVERVIEW OF CLINICAL PHONETICS

CHAPTER 1

WELCOME

Beginning a new course of study is exciting. If this is one of your first courses in a program leading to a degree in communication disorders, we welcome you to a dynamic and challenging field. We hope that your interests and needs in phonetics will be met by this text. This opening overview is intended to help you get the “big picture” before you begin a chapter-by-chapter progression through the knowledge and skills that underlie proficiency in clinical phonetics.

What is **clinical phonetics**, and what role does it play in the training of a speech-language clinician?

CLINICAL PHONETICS

Phonetics is the study of the production and perception of speech sounds. Subdisciplines within phonetics, such as articulatory phonetics and acoustic phonetics, date back several centuries and are discussed in later chapters. An important aspect of phonetics is using a system of symbols that accurately and reliably represent the sounds of a language. In languages like English, the ordinary spelling of a word does not reliably indicate how the word is pronounced. As anyone who learns English quickly comes to realize, a given letter of the alphabet can represent different sounds (such as the various sounds represented by the letter *a* in *cake*, *father*, *many*, and *had*). The symbols used in phonetics permit an unambiguous coding of speech sounds, not only for English but also for any language. Phonetic symbols have a universal application and are an essential tool for the study of spoken language. Thus, as we progress, you will be exposed to symbols for phonetic transcription that come primarily from the **International Phonetic Alphabet**, or IPA. You will be happy to learn that one symbol is intended to always represent just one sound.

In coining the term *clinical* phonetics for the first edition of this book, we wanted to acknowledge that the application of phonetics to clinical populations is an important area of study in its own right. In the past four decades, this discipline has seen extensive growth, including an active research base and many scientific journals that publish papers of direct relevance to clinical practice. We divide your pursuit of

competence in using clinical phonetics in communication disorders into two major domains: knowledge and skill-based.

The Knowledge Domain of Clinical Phonetics

Clinical phonetics includes a wealth of descriptive information about speech sounds that is directly related to clinical assessment and remediation of speech disorders. We hope that this text will make it clear how important phonetic knowledge is for assessing and managing people with communication disorders. A personal anecdote might illustrate this point.

A student once asked one of the authors for an opinion on therapy materials she was preparing. Although this student was *not* a major in communication disorders, she was called upon in her student teaching practicum to help a child who had trouble “pronouncing his *s*’s.” She had constructed a word list for working on the *s* sound in the word-final position. Here are some of the items on her list:

base
face
hose

What’s wrong here? Without the benefit of some basic information in phonetics, this well-meaning student was going to ask the child to say the *z* sound, not the *s* sound, in the word *hose*. The point of this example is that knowledge about speech sounds plays a fundamental role in clinical situations, such as selecting target words for practice. Furthermore, knowledge of how speech sounds are formed will soon become crucial information in clinical situations, such as when teaching a child to correctly produce the *s* sound. Clinicians who are well grounded in phonetics will be more efficient and effective in their clinical management of individuals with communication disorders.

This text presents descriptive information about sound production both verbally and pictorially. Virtually all of the illustrations of speech sound production are based on imaging materials collected by author Raymond D. Kent and supplemented with video examples collected by Jonathan L.

Preston. Many phonetics texts rely on impressionistic drawings that, in our opinion, can lead to mistaken impressions about how sounds are actually formed. Therefore, we decided at the outset to emphasize illustrations that relate directly to anatomical reality. Careful study of these illustrations should give the student the ability to visualize the positions and motions of the speech structures. This ability is invaluable to the specialist in communication disorders.

Furthermore, knowledge of clinical phonetics from multicultural perspectives has become an increasingly important component of clinical competence. Chapter 11 includes a wide-ranging discussion of relevant concepts and terms for contemporary practice as a speech-language pathologist.

The Skill-Based Domain of Clinical Phonetics

In addition to acquiring knowledge in the informational domain of clinical phonetics, the future clinician must also acquire adequate skill in making perceptual discriminations and mapping those onto accurate ratings or transcriptions. This skill has several subcomponents and is affected by complexity in multiple domains.

Figure 1.1 illustrates three major domains that influence the difficulty of the task of discriminating and transcribing or scoring clinical speech samples. Each domain spans several levels of increasing skill, from those that can be learned fairly rapidly to those that require considerable training to acquire. Over the course of this textbook, you will have the

opportunity to acquire each level of skill in each of the areas depicted in Figure 1.1. Here we describe the subdomains that influence the skill-based component of clinical phonetics.

Linguistic Complexity. The top part of the figure, Figure 1.1(A), divides speech into four contexts of increasing **linguistic complexity**. The far left block requires the clinician to score or transcribe speech sounds in *isolation*. For example, a child is asked to say a sound, *s*, or a series of sounds, *s, f, z*, which the clinician scores or transcribes. When a sound is embedded in a *word*, *sentence*, or *continuous speech*, the task of discriminating and scoring/transcribing one or more sounds becomes more difficult. This left-to-right hierarchy also parallels a common progression in the clinical management of speech disorders, where clients may begin by practicing a sound in isolation and advance to more complex contexts. Clinicians must be competent in making perceptual judgments of speech sounds at all four linguistic levels.

Response Complexity. The middle portion of the model, Figure 1.1(B), represents different levels of **response complexity**. In some clinical tasks, the clinician is required only to discriminate and score or transcribe one **target sound** per linguistic unit. For other tasks, the clinician must attend to two or more sounds per word. For example, some tests of a child's articulation proficiency instruct the clinician to score one specific sound or cluster per word (for example, "pig," "cup," "cups"). Other articulation tests, however, require the clinician to score two or as many as four targets per word

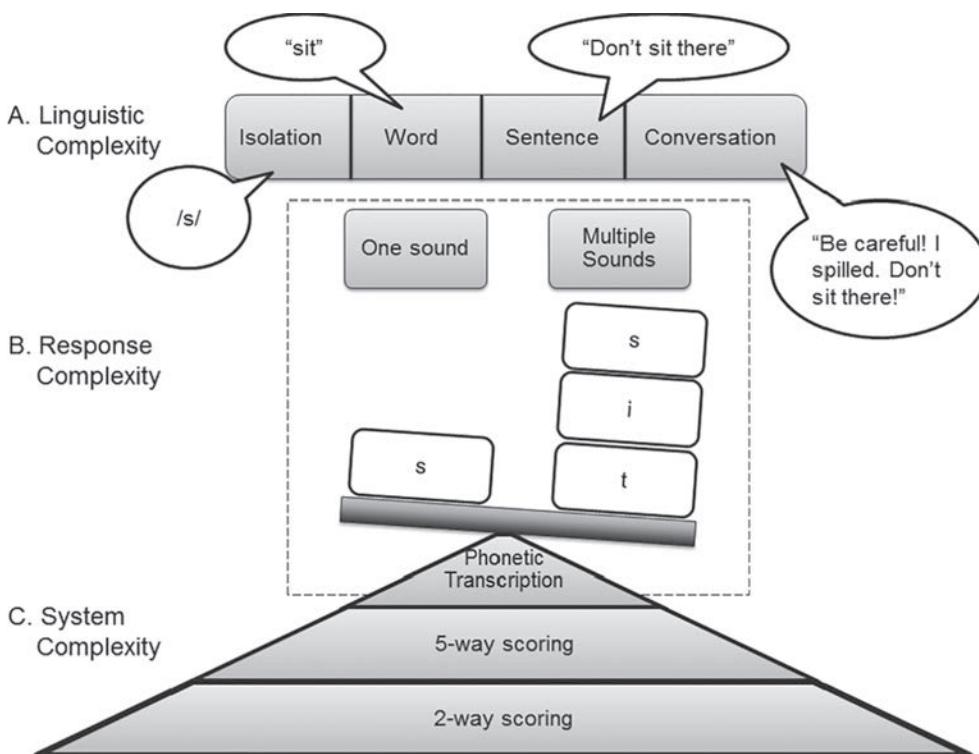


FIGURE 1.1

Factors that influence difficulty in the skill-based domain of clinical phonetics. A student who wishes to become competent in clinical phonetics must acquire the ability to discriminate and score or transcribe speech sounds in each level of complexity depicted in this representation.

(for example, “pig,” “cups,” “sits,” “squirrel,” “bus,” “fish”). Obviously, because of memory constraints and other task variables, the multiple-target tests represent a more challenging task for the clinician than the single-sound articulation tests.

System Complexity. The bottom portion, Figure 1.1(C), represents three different systems of scoring or transcription used in clinical phonetics. These systems are hierarchically arranged in a pyramid with the least complex task at the bottom and the most complex at the top. Each of these systems is appropriate in certain situations in assessing and managing individuals with communication disorders.

At the base of the pyramid, **two-way scoring** refers to tasks that require the clinician to make a binary decision about speech behavior. A clinician must decide whether a target behavior is “correct” or “incorrect,” “socially acceptable” or “socially unacceptable,” or some other dichotomous decision. Two-way scoring is considered the easiest of the three systems in terms of complexity. Two-way scoring is carried out not only by clinicians but also people who may be assisting with a child’s management program, such as speech aides (paraprofessionals) or the child’s parents, caregivers, or teachers.

Five-way scoring of speech behavior, the middle of the pyramid in Figure 1.1(C), is more descriptive than two-way scoring. For some clinical situations, a clinician needs to know not only whether a sound is right or wrong but also what type of error a speaker is making. Five-way scoring is a traditional system of scoring in speech pathology that provides such information. In addition to the “correct” category, four “incorrect” categories specify the type of error. First, a sound can be deleted altogether (**deletion** or **omission**), as when a child says *tee* for the word *tree*, omitting the *r* sound. Second, a sound can be replaced by another sound (**substitution**), as when a child says *wed* for the word *red*. Third, a sound can be said in a fashion that is not quite correct (**distortion**), as when a child says *sit* with the tongue a little too far forward for *s* but not far enough to represent a different sound. Finally, a sound can be said correctly but preceded or followed by another sound (**addition**), as when a child says *green* as *guhreen* with an extra “uh” sound. These five categories—“correct,” “deletion,” “substitution,”

“distortion,” and “addition”—constitute the five-way system of scoring. Practical information on matters pertaining to five-way scoring will be presented throughout this text.

Finally, the highest level of the pyramid presented in Figure 1.1(C) is **phonetic transcription**. There is a fundamental distinction between the two scoring systems (two-way scoring and five-way scoring) and phonetic transcription. The task in phonetic transcription is to describe what the child says rather than to score or judge it relative to some arbitrary standard. Phonetic transcription is accomplished with a standard set of symbols, typically using the International Phonetic Alphabet (IPA). Depending on the number and type of symbols used, clinicians can perform a **broad transcription** or a **narrow (close) transcription** of speech. Essentially, narrow transcription adds phonetic detail to broad transcription, using the set of diacritics presented in Chapter 7. The degree of precision required in transcription depends on the clinician’s purpose, as discussed in detail later in this book. As depicted in Figure 1.1(C), phonetic transcription is the system that requires the highest level of skill from a clinician, and therefore it sits at the top of the pyramid. Whereas speech assistants, parents, caregivers, teachers, and others may be trained for two-way and even five-way scoring, broad and narrow phonetic transcription is typically carried out only by clinicians.

Conclusion

As you begin your study of clinical phonetics, we hope you will keep in mind two objectives: to acquire a firm knowledge of descriptive information about the phonetics of American English and to acquire discrimination and scoring/transcription skills for all of the clinical situations represented in Figure 1.1. In our view, demonstrated competence in each of these areas of clinical phonetics is the ethical responsibility of anyone who tests or attempts to change the articulatory behavior of another person.

CHAPTER SUMMARY EXERCISES

Fill in the information that describes each clinical situation depicted in Figure 1.1.

1. A clinician asks a child to say some words, each of which contains one *r* sound (e.g., *rug*, *rabbit*, *car*). After each word, the clinician records whether the child said each *r* sound correctly.
2. A clinician is interested in knowing whether an adult client is saying *s* and *sh* correctly at work. The client obtains a 10-minute recording of her speech at the office. The clinician scores all *s* and *sh* sounds as correct or incorrect.

<i>Linguistic Complexity</i>	<i>Response Complexity</i>	<i>System Complexity</i>
(word)	(single sound)	(two-way scoring)
_____	_____	_____

	<i>Linguistic Complexity</i>	<i>Response Complexity</i>	<i>System Complexity</i>
3. As part of his management program, a boy reads 20 sentences, each of which is composed of several words containing one or more <i>l</i> sounds. After each sentence, the clinician scores each <i>l</i> sound as correct, distorted, substituted for, added to, or deleted.	_____	_____	_____
4. An audio recording is made of a 5-year-old girl with extremely delayed speech who is talking about her favorite television program. The clinician later transcribes the entire speech sample.	_____	_____	_____
5. A speech-language pathologist administers a word-level articulation test with multiple targets per word (e.g., <i>television</i> , <i>umbrella</i> , <i>scissors</i>). Each target sound is scored as correct, distorted, substituted for, added to, or deleted.	_____	_____	_____



Chapter Summary Exercises—Answers

[Click here to check your answers to the chapter summary exercises.](#)



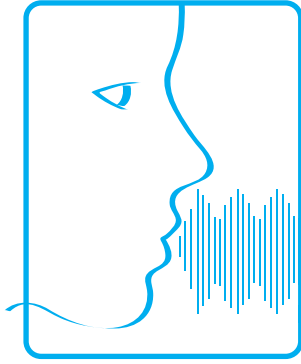
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Flashcards

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LINGUISTIC PHONETICS

CHAPTER 2

LANGUAGE, SPEECH, AND DIALECT

In the biblical story of the tower of Babel, people tried to build a city with a tower that would reach to the heavens. Concerned by the power that people could wield when they all spoke the same language, God decided to divide and weaken them by confusing their one language into many mutually unintelligible tongues. This story reflects the fact that, throughout history, people have been mystified by the diversity of languages that exist across cultures and aware of the critical role that a common language plays in the advances of civilization over time. It is difficult to take a precise count of the number of languages in the world, but the 2017 edition of the *Ethnologue* database estimates the number of living languages at over 7000 (Simons & Fennig, 2017).

We can formally define **language** as a socially shared code that uses arbitrary symbols and rule-governed combinations of symbols to represent ideas, thoughts, and feelings. Each language is unique in the rules dictating how sounds are combined into meaningful parts, how these meaningful parts are combined into words, and how words are combined into sentences. Someone who speaks a language fluently knows how the arbitrary symbols map onto real-world concepts and how the set of rules or **grammar** of the language can be used to combine units of meaning into novel utterances.

Languages can be transmitted through multiple modalities, including writing and manual signs, but this book focuses on the oral transmission of meaning through **speech**. We can define speech as a physical behavior that encompasses patterns of movement of the speech structures (tongue, lips, jaw, and so on) and the patterns of acoustic vibration that these movements generate. Therefore, the study of sounds in a spoken language typically includes both a description of how individual sounds are formed and information on the acoustic or auditory properties of each sound. For example, we might try to describe the sound at the beginning of the word *see* by observing the action of the tongue and by measuring the noise that we hear when this sound is uttered.

Although most people learn speech as their first and primary modality of language, individuals who learn a **sign language** (manual form of communication) from birth in connection with hearing impairment represent an important

exception. In addition, the articulatory and acoustic aspects of speech can be decoupled to some extent. For instance, expert speechreaders (also called lipreaders) can understand much of a spoken message simply by observing the visible movements that accompany speech. Meanwhile, computers can be used to synthesize intelligible speech that is not the product of physical movements of articulatory structures. Thus, although the articulatory and acoustic descriptions of speech in this text offer a reasonable representation of typical communication, it is important to recall that there are many routes to the communication of language.

Finally, although we have offered a definition of language as an abstract concept, we commonly speak of *a language* as the specific set of symbols and rules used by a community of individuals, such as a nation or a culture. We can define a **speech community** as a group of people who live within the same geographical boundaries and use the same language. The United States can be broadly described as an American English speech community. However, we can identify smaller speech communities within the United States, such as Mexican Spanish-speaking neighborhoods within the city of Los Angeles. In addition, in a country like the United States, we encounter variants of American English that differ in the details of pronunciation, vocabulary, or grammatical construction. These different usage patterns within a language are called **dialects**. Many dialects are **regional dialects** because they are characteristic of people who live in a particular geographic area. Other dialects are defined more by culture than geography, as we discuss in detail in Chapter 11 in connection with English varieties labeled “African-American English.” Chapter 11 will also look more closely at the question of when two speech patterns should be described as separate languages versus dialects of the same language—a distinction that turns out to be surprisingly hard to pin down. For present purposes, we can define the difference between language and dialect as one of degree. As two dialects of a language diverge more and more in pronunciation, vocabulary, and grammatical structure, they may come to be recognized as distinct languages.

Differences in dialect tend to be more apparent in speech than in writing. The authors of this book share American English as a language but differ in dialect, one being a native of

metropolitan Boston, one from Montana, one from western New York, and one from central New York. Although our writing styles may differ somewhat, our dialectal differences rarely interfered with the process of writing the text of this book. However, in preparing the audio samples that accompany the book, dialectal differences were immediately apparent. The author from Boston “dropped” his *r*’s (*car* became *caw* or *cah* to the other authors’ ears), and the author from Montana used the same vowel for the words *cot* and *caught*. To minimize confusion for our readers around the country, most of the transcription exercises in this textbook feature **Mainstream American English (MAE)**, a dialect considered relatively free of regional influences. However, we encourage our readers to avoid thinking of any dialect as a standard or “correct” dialect. As a dialect that is familiar to speakers around the United States, MAE is a convenient choice, but it is only one option among numerous equally valid dialects. If your pronunciation deviates from that described in this text, we encourage you to note and analyse these differences but not to attempt to change your typical speech style.

In addition to a dialect, each person has his or her own unique form of spoken language that is referred to as the person’s **idiolect** (*idio-* meaning personal or distinct, and *-lect* as in *dialect*). The idiolect is influenced by numerous factors, including regional and cultural background, social class, and various individual influences and experiences. When a comedian imitates a famous personality, the success of the act depends in large part on the impersonator’s ability to recreate the idiolect of the famous person. Whereas dialects may associate us with a regional or social class, our idiolects distinguish us as individuals.

The remainder of this chapter introduces concepts and terms useful in the study of written and spoken language. We begin with two basic units of linguistic analysis, the morpheme and the phoneme.

THE MORPHEME

The **morpheme** is defined as the smallest element of a language that carries meaning. Morphemes are the building blocks of words. For example, words like *teacher* and *baker* can be broken down into two component morphemes: a verb (*teach*, *bake*) and the suffix *-er*. *Teach* and *bake* are examples of morphemes that can stand on their own as words. On the other hand, *-er* by itself does not look like a word; it is an example of morpheme that must be combined with other morphemes to make a recognizable word. What both *teach* and *-er* have in common is that they cannot be divided into smaller units without either changing the meaning or yielding a meaningless fragment. In addition, each of the morphemes in *teacher* contributes one unit of meaning to the overall word, where the meaning contributed by *-er* might be paraphrased as “person who [verb].”

The two basic types of morphemes are free and bound. Free morphemes carry a specific meaning when they appear

alone. The words *teach*, *child*, and *bottle* are examples. Bound morphemes must be attached to other morphemes to produce a word with a specific meaning, as in the case of the morpheme *-er* cited in the preceding paragraph. A *base* or *root morpheme* is a part of a word that is associated with its primary meaning. The word *happy* is a base morpheme. Other words can be constructed by attaching additional morphemes, especially affixes. An affix is a bound morpheme that attaches to a base, either preceding it (i.e., a prefix) or following it (i.e., a suffix). For example, attaching the prefix *un-* to the base *happy* gives us the word *unhappy* (two morphemes), and attaching the suffix *-ness* gives us the word *happiness* (two morphemes).

Affixes in English can also be subdivided into two categories termed *derivational* and *inflectional*. Derivational affixes combine with a base to change the meaning in some way. In the example we just considered, adding the affix *un-* to the base *happy* produces a word with the opposite meaning of the base. Derivational affixes sometimes change the grammatical category a word belongs to. For example, adding the suffix *-ness* to the base *happy* changes the class of the word from adjective to noun. By contrast, inflectional affixes do not change the meaning or the grammatical category of the words they attach to. English has eight inflectional affixes, all of which are suffixes. They are: *-s* (noun plural), *-’s* (noun possessive), *-s* (verb present tense third person singular), *-ing* (verb present participle/gerund), *-ed* (verb simple past tense), *-en* (verb past perfect participle), *-er* (adjective comparative), and *-est* (adjective superlative). Inflectional affixes never change the class of a word. When a noun is pluralized, it is still a noun. When the tense of a verb changes, it is still a verb.

Here are some additional examples of morphemic decomposition.

restlessness = rest + less + ness

morpheme = morph + eme

subnormal = sub + norm + al

feather = feather

cupboards = cup + board + s

transmittal = trans + mit + al

permitting = per + mit + ing

teeth = tooth + [plural]

drew = draw + [past tense]

Your **lexicon** consists of meanings that you acquire when you learn a language. The lexicon is not a simple dictionary in the sense of a list of words. Rather, it contains both words and elements of meaning that do not occur on their own as words. The preceding examples hint at some of the complexities that arise in the study of morphemes (**morphology**). For example, some words have roots that are bound elements, as in the morpheme *mit* in *transmittal* and *permitting*. The example of *teeth* and *drew* reveals that it is not always

possible to draw clean boundaries between morphemes in a word. Languages differ greatly in their morphology, and these differences contribute to the complexity of this area of linguistic study. For the purposes of this text, it is sufficient to be aware of the morpheme as a unit of meaning and of a **morphemic transcription** as a written record of the morphemic content of an utterance. Such a transcription might be undertaken by a clinician who wants to analyze a language sample from a child. It should be emphasized that a morphemic transcription has as its goal the recognition of meaningful elements rather than individual speech sounds, to which we turn next.

THE PHONEME

Any particular utterance can be subdivided into individual segments or units of sound called **phones**. The word *phone* derives from Greek words for *voice* or *sound* and serves as the base morpheme for words like *phonetics*, *phonology*, and *phonics* (which refers to knowledge of the relationships between letters and sounds). The base *phone* is also encountered in many other words in our common experience, including *microphone*, *telephone*, and *saxophone*. In an upcoming section, we introduce a distinction between two classes of phones: **phonemes** and **allophones**.

You may be familiar with the word **phoneme** to refer to the sounds that make up a word. For now, we can define a phoneme as a basic sound segment that can signal a meaningful distinction between morphemes. For example, consider the words in the following list:

cat mat fat rat bat pat vat hat

First, notice that each of these words is a single morpheme because it is a meaningful unit that cannot be further subdivided into units of meaning.¹ However, it is possible to divide each of these morphemes into three component sounds. Notice further that any two of these words differ only in the initial sound, represented by the letters *c*, *m*, *f*, *r*, *b*, *p*, *v*, *h*. We say that the sounds represented by these letters are phonemes because they can be used to signal a meaningful contrast between morphemes in the English language. In fact, a linguist studying a new language identifies its inventory of phonemes by examining **minimal pairs**, or pairs of morphemes that differ in only one sound segment. The linguist knows that *p* and *b* are distinct phonemes in English because of their roles in contrasting pairs like *pay–bay* and *cup–cub*.²

¹ Although *at* is a morpheme, the isolated consonants *c*, *m*, *f*, etc., are not morphemes. Therefore, *at* is not a base form in these words.

² Of course, not every substitution of one phoneme for another will produce a separate word in our language. If we substitute a *w* for the *v* in *vat*, we do not get another meaningful word in English. But we know that *w* and *v* are different phonemes because some pairs of contrasting morphemes (like *wine–wine*) do exist.

The relationships between morphemic and phonemic compositions of words are shown for the word *cats* in Figure 2.1. The word *cats* is composed of two morphemes, *cat* + *s*. The morpheme *cat*, in turn, is composed of the three phonemes /k/ + /æ/ + /t/. Note that /s/ is only one phonemic realization of the plural morpheme: In a word like *dogs*, /z/ is the phonemic realization of the plural.

Phonemes can be either vowels or consonants. Vowels are sounds that are produced with an open airway extending from the voice box (larynx) to the lips. Consonants are produced with an airway that is narrowed or constricted to a considerable degree. More precise definitions of vowels and consonants are given in Chapter 4 and Chapter 5, respectively. For now, it is sufficient to note that vowels and consonants differ in whether the airway is relatively open or relatively constricted.

It is a basic principle of communication that messages are transmitted as a series of discrete units. The phoneme is a discrete unit of spoken language. It has analogs in other forms of communication. In sign language, the basic structural units that make up morphemes are called *cheremes*, and they can include handshapes, hand movements, and locations of the hands in relation to the body. In written language, the sequences of discrete units are written letters, also called **graphemes**. Many students learning phonetic transcription find it very challenging to shift from graphemes to phonemes as the units by which words are represented. We highlight some of these challenges in the next section.

SPELLING VERSUS PHONETIC TRANSCRIPTION

Over the course of this textbook, you will become aware of many ways in which phonetic transcription differs from conventional written spelling, also called **orthography**. An **alphabet** (from *alpha* + *beta*, the first two letters of the Greek alphabet) is a set of letters or other characters used for the writing of a language. The elements of an alphabet are not always transparently related to the way the language is pronounced—a fact that may be familiar to you from the challenges of learning to spell the words of the English language. A single letter (or grapheme) in English may be associated with several different sounds. For example, the grapheme *g* represents very different sounds in the words *go*, *gist*, and *weigh*. Similarly, the same sound can be represented by many different graphemes or combinations of graphemes. For

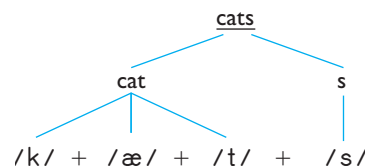


FIGURE 2.1

Morphemic and phonemic analyses of the word *cats*.

example, the sound that is most commonly represented by the letter combination *sh*, as in *ship*, is also represented by *s* as in *sugar*, *ss* as in *tissue*, *ch* as in *machine*, *ti* as in *creation*, *ci* as in *precious*, and *xi* as in *anxious*. Different letters or combinations of letters that are used to represent the same phoneme in the written form of a language are called **allographs** (from *allo* meaning “other” and *graph* meaning “write”). Thus, for the sound that occurs at the beginning of the word *ship*, a list of allographs would include *sh*, *s*, *ss*, *ch*, *ti*, *ci*, and *xi*. In this book, the allographs for the vowels and consonants of English are listed at the ends of the chapters for these two major sound classes.

As you saw in the preceding list, many allographs consist of more than one written letter. A sequence of two alphabetic characters that represent a single sound is called a **digraph**. It is important to be aware of the distinction between digraphs and consonant clusters. A consonant cluster is a sequence of two or more consonant phonemes occurring adjacent to each other. The consonants are pronounced as separate sounds. This contrasts with digraphs, where multiple written letters are used to represent a single phoneme. Digraphs can also occur for vowel sounds, such as *ea* in *leaf* and *oo* in *boot*. Thus, a word like *blush* has a consonant cluster at the beginning (two consonants, *b* and *l*, which form two separate sounds) and a digraph at the end (*sh*, which forms only one sound).

A further complication in the mapping between written and phonetic representations of language comes from the fact that letters in English orthography may be unpronounced or “silent.” Examples are the second *b* in *bomb*, *e* in *came*, *h* in *honor*, *gh* in *weigh*, *n* in *damn*, and *g* in *paradigm*. Interestingly, a letter that is “silent” in one word may be pronounced in a related word, as in pairs like *bomb*–*bombastic*, *damn*–*damnation*, and *paradigm*–*paradigmatic*.

In summary, phonetic transcription of the sounds of speech differs from written spelling in substantial ways. Because you have many years of practice in using English orthography but are new to phonetic transcription, you may find yourself making transcription errors that reflect the conventions of written spelling. For instance, you might forget to exclude silent letters when transcribing words like *bomb* or *came*. By the end of this textbook, you will have learned to shift your focus away from what you see (written spelling) and onto what you hear (phonemes).

THE INTERNATIONAL PHONETIC ALPHABET (IPA)

Sounds come in great variety in the world’s languages, but speakers of all languages share the same anatomical system as the mechanism of speech production. This physical system places limits on the range of possible sound types and provides a basis for their description. Recognizing that a standardized system of notation could be highly useful for the study of speech, the International Phonetic Association,

SOME ALPHABETS ARE MORE PHONETIC THAN OTHERS

*When the English tongue we speak
Why is break not rhymed with freak?
Will you tell me why it’s true
We say sew but likewise few?
And the maker of the verse,
Cannot rhyme his horse with worse?*

—Author unknown

As this poem suggests, English is notorious for the inconsistent nature of the relationship between spoken pronunciation and written spelling. In fact, not all languages are equally arbitrary in this regard. Spanish is an example of a language in which the mapping between graphemes and phonemes is generally consistent. Thus, once you learn what sounds all the letters of the Spanish alphabet represent, you can spell nearly any word based on its pronunciation. (“Spelling bee” contests, which are popular in English-speaking countries, are virtually non-existent for languages with more regular spelling.) There are even writing systems that were deliberately planned to provide a logical representation of the features of sound production. The Korean alphabet, known in Korea as *Hangul*, is regarded as the most recently invented and most scientifically designed alphabet in the world. It was developed in the 15th century by a team of scholars commissioned by King Sejong (1397–1450). Symbols for the consonants are graphical representations of the various articulators, such as tongue, lips, and teeth. Vowels are represented by vertical or horizontal lines, and consonant and vowel symbols are arranged together in syllable units.

which was established in Paris in 1886, worked to develop a standard alphabet that could be used to represent the sounds of any language. This standard is the International Phonetic Alphabet (IPA). Since its introduction in the late 1800s, the IPA has been revised and expanded in 1900, 1932, 1989, 1993, and 2005. The IPA currently includes over 100 symbols to represent consonants and vowels. These are supplemented with **diacritic marks** (special marks that indicate modifications of a sound) and signs used to represent variations in suprasegmental qualities such as length, tone, stress, and intonation. A copy of the IPA table of symbols is included in Appendix A. In addition to the standard IPA symbols, in 1994, the International Clinical Phonetics and Linguistics Association adopted a set of symbols designed to improve the

applicability of the IPA to disordered speech. These are known as the “Extensions to the IPA.”

When IPA symbols are used to represent phonemes of a language, they are placed between virgules, or slashes (/ /), to distinguish them from graphemes and other kinds of symbols. The IPA is an arbitrary alphabet insofar as the symbols themselves do not contain information about phonetic characteristics such as place of articulation. However, the IPA is based largely on the Roman alphabet. Therefore, conveniently for speakers of English and other languages that use that alphabet, many of the symbols are similar or identical to the alphabet characters often associated with a particular sound in conventional orthography. Thus, the phonemic symbols /p/, /b/, /f/, /v/, /t/, /d/, /k/, /g/, /s/, /z/, /m/, /n/, /l/, and /h/ represent the same sound segments that ordinarily are conveyed by these letters in printed words. However, students of phonetics must also learn some symbols that may not be familiar at all, such as /ŋ/, /ʒ/, /ð/, and /ʒ/. Because each of the world’s languages uses only a fraction of the possible sounds represented in the IPA, this textbook focuses primarily on the subset of 42 to 44 sounds (depending on which phonetician does the counting) used to represent the English language.

Previously, we discussed a number of limitations of English orthography: A single letter can be used to represent many different sounds, a single sound can be represented by many different letters, and the number of letters in a word does not necessarily correspond with the number of sounds in a word, as in the case of silent letters or digraphs. The IPA is designed to be free of all these limitations. The general principle of the IPA is to assign one symbol for each distinctive sound or speech segment. This principle is very important and underlies the universal application of the IPA (that is, to all natural languages).

PHONEMES AND ALLOPHONES

Earlier, we defined a phoneme as a unit of sound that can communicate a meaningful difference between morphemes. For example, changing the *p* sound in *mop* to a *b* sound yields a new word, *mob*, that is unrelated in meaning to *mop*. But are there examples of changes in sound that do not produce a change in meaning? Yes. For example, when you say the word *mop*, you can produce the final *p* sound with a little burst or explosion of air. However, it is also possible to say *mop* and keep your lips closed. Try producing the word both ways: you can feel a difference in what you are doing with your lips, and you can hear a subtle difference between the pronunciation with and without a burst of air. However, it is hard to imagine using this difference in sound to convey a difference in meaning—that is, assigning one meaning to the pronunciation *mop*_[with burst of air] and a different meaning to the pronunciation *mop*_[no burst of air]. Therefore, we cannot describe *p*_[with burst of air] and *p*_[no burst of air] as separate phonemes. Instead, we describe them as **allophones** of the phoneme /p/, where *allo-* means *other* or *different*. A phoneme

is really more like a class or family of sounds in which each member of the family is a different allophone.

When we are discussing a specific allophone or phonetic variant of a phoneme, we place the IPA symbol within square brackets ([]) rather than virgules, and we can use special marks called **diacritic marks** to represent the difference between allophones. For instance, if we wish to indicate that the *p* at the end of *mop* has been produced with no final burst of air, we can communicate this detail by adding the **unreleased diacritic**, [p̚]. You might wonder whether it is worthwhile to transcribe such subtle differences in pronunciation. In fact, knowing which allophones to use in which contexts is an important part of your linguistic knowledge as a native speaker of your language. Failure to use the appropriate allophone for a particular context can sometimes result in striking deviations, as we will discuss in Chapter 7.

The conditions under which a given allophone occurs are described as being either **free variation** or **complementary distribution**. Allophones are said to be in free variation when they can be exchanged for one another in a given phonetic context (where “phonetic context” describes the position of a sound relative to other sounds). In the preceding example, we saw that released and unreleased allophones of /p/ can occur in different productions of a single word such as *mop*. Therefore, these allophones are said to be in free variation for this phonetic context.

Allophones are said to be in complementary distribution when they are not normally exchanged for one another in a certain phonetic context. For example, consider the initial consonant sound in *key* and the initial consonant sound in *coo*. Despite the difference in spelling (*k* versus *c*), you probably will agree that both words *key* and *coo* begin with the same sound (call it a /k/ sound). However, as you can verify yourself, the initial /k/ sounds are not made in exactly the same way: the /k/ sound in *coo* is produced farther back in the mouth than the /k/ sound in *key*. If you try producing different words with initial /k/, you will observe that the more fronted allophone occurs when the adjacent vowel sound has a tongue position near the front of the mouth (as in *key*, *kit*, *cape*, *ken*, and *cat*) whereas the more backed allophone occurs in the context of vowel sounds with a tongue position near the back of the mouth (as in *coo*, *cook*, *coat*, and *cot*). Because the fronted and backed allophones do not occur in the same context, they are said to be in complementary distribution. This term indicates that the conditions of occurrence of one allophone *complement* the conditions of occurrence of another allophone.

It is important to be aware that two sounds can represent allophones of the same phoneme in one language but represent separate phonemes in another language. To most speakers of English, the fronted and backed allophones of /k/ that were just described sound very similar, if not identical. But to a speaker of Arabic, they may sound quite different. The Arabic language makes a phonemic distinction between fronted and backed variants on a /k/ sound; that is, these sounds can be used to form a minimal pair of words with