

SIXTH EDITION

Articulation & Phonology

in Speech Sound
Disorders

A CLINICAL FOCUS



Jacqueline Bauman-Waengler

Sixth Edition

Articulation and Phonology in Speech Sound Disorders

A Clinical Focus

Jacqueline Bauman-Waengler



Director and Publisher: Kevin Davis
Portfolio Manager: Aileen Pogran
Managing Content Producer: Megan Moffo
Content Producer (Team Lead): Faraz Sharique Ali
Content Producer: Deepali Malhotra
Portfolio Management Assistant: Maria Feliberty
Development Editor: Krista McMurray
Executive Product Marketing Manager: Christopher Barry
Executive Field Marketing Manager: Krista Clark
Procurement Specialist: Deidra Headlee

Cover Design: Pearson CSC, Jerilyn Bockorick
Cover Art: Tetra Images/Shawn O'Connor/Brand X Pictures/Getty Images
Full Service Vendor: Pearson CSC
Full Service Project Management: Pearson CSC, Prince John William Carey
Editorial Project Manager: Pearson CSC, Carmina Jimenez
Printer-Binder: LSC Communications, Inc./Willard
Cover Printer: Phoenix Color/Hagerstown
Text Font: 10/12 Charis SIL Regular

Copyright © 2020, 2016, 2012 by Pearson Education, Inc. 221 River Street, Hoboken, NJ 07030. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the publisher. Printed in the United States.

Acknowledgements of third-party content appear on page in text, which constitute an extension of this copyright page.

Unless otherwise indicated herein, any third-party trademarks that may appear in this work are the property of their respective owners and any references to third-party trademarks, logos, or other trade dress are for demonstrative or descriptive purposes only. Such references are not intended to imply any sponsorship, endorsement, authorization, or promotion of Pearson's products by the owners of such marks, or any relationship between the owner and Pearson Education, Inc., or its affiliates, authors, licensees, or distributors.

Library of Congress Cataloging-in-Publication Data

Names: Bauman-Waengler, Jacqueline Ann, author.

Title: Articulation and phonology in speech sound disorders : a clinical focus / Jacqueline Bauman-Waengler.

Description: Sixth edition. | Boston : Pearson Education, [2018] | Includes bibliographical references and indexes.

Identifiers: LCCN 2018046080 | ISBN 9780134990576 | ISBN 0134990579

Subjects: LCSH: Articulation disorders. | English language—Phonetics.

Classification: LCC RC424.7 .B378 2018 | DDC 618.92/855—dc23

LC record available at <https://lcn.loc.gov/2018046080>

*To all the speech-language pathologists who are
working hard to make a difference to the
children and adults they serve.*

About the Author

JACQUELINE BAUMAN-WAENGLER has been a professor for more than 25 years. Her main teaching and clinical emphases are phonetics and phonology, including disorders of articulation and phonology in children and child language disorders. She has published and presented widely in these areas both nationally and internationally. In addition to the sixth edition of *Articulation and Phonology in Speech Sound Disorders: A Clinical Focus*, Bauman-Waengler has also published *Introduction to Phonetics and Phonology: From Concepts to Transcription* (2009) with Pearson. A new book, coauthored with Diane Garcia, will be available at the end of November from Plural Publishing, San Diego, CA. It is titled *Phonological Treatment of Speech Sound Disorders in Children: A Practical Guide*.

Preface

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

New to This Edition

With the publication of this sixth edition, this book will have been in use for 20 years. Therefore, this edition of *Articulation and Phonology in Speech Sound Disorders: A Clinical Focus* has had a serious overhaul with significant changes.

- *Chapter Applications: Case Study at the beginning of each chapter.* These applications focus on real-life experiences that beginning students and clinicians will be confronted with. For example, what does a beginning clinician need to know to be able to choose one therapy approach versus another? They are all directly related to the content of the specific chapter.
- *American Speech-Language Hearing Association's (ASHA) position statements, definitions, and practice policies.* Several of the chapters have sections delineating new definitions, such as the current definition of speech sound disorder; practice policies, such as the alignment with ASHA and the World Health Organization's diagnostic practices; ASHA's position on dialects and cultural competence; and specific treatment overviews, such as for dysarthria. This will aid students as they transition into competent clinicians.
- *More user-friendly phonetic descriptors.* This edition has also seen a shift from describing and, in cases, transcribing vowels and consonants in a more user-friendly manner. An attempt has been made to align the descriptive process according to the International Phonetic Alphabet chart in its new 2015 revision. This will aid students in learning the specific descriptions without being unnecessarily burdened with cumbersome terminology.
- *New topic: Anatomy and physiology.* New to this edition is a brief overview of the anatomy and physiology of the speech mechanism (Chapter 2). This is applicable to the discussion of normal speech production as well as those disorders, for example, cleft palate, cerebral palsy, and acquired dysarthria, in which characteristic deviations of the processes underlying speech production are a portion of the clinical picture.
- *New topic: Principles of motor learning.* A new section has been added that discusses the conditions of practice and feedback for motor learning (Chapter 9). Therapeutic applications specific to articulation disorders are given as well as research documenting the efficacy of such principles in childhood apraxia of speech, for example.

- *New topic: Classification of speech sound disorders (Dodd, 2013).* This diagnostic classification system is now introduced (Chapter 1) and expanded upon in several chapters. For example, in Chapter 7 the characteristics of four of the categories—articulation disorder, phonological delay, consistent phonological disorder, and inconsistent phonological disorder—are noted. A case study example is given for each to provide the student with more information on how each of these categories could look clinically. This will give students a much needed structure of how to organize their diagnostic data. A clinical application is also given of a child demonstrating an articulation *and* a phonological disorder. This is often difficult for students to understand.
- *Expanded and reorganized topics: Diagnostic protocols.* Chapter 6, Assessment and Appraisal, provides expanded information on contextual testing and the use of multisyllabic words within the diagnostic process. Specific measures are noted that a clinician could use to assess these variables. In addition, updated lists of standardized speech assessment, language screening measures, prosodic assessment protocols, the testing or screening of phonological and phonemic awareness, and the assessment of a child’s communicative participation are given. The student or practitioner will have resources for a large number of formal and informal measures to assess each of these areas.
- *Expanded and reorganized topics: Summarizing data.* The analysis of collected data from a standardized speech assessment and spontaneous speech sample have been completely redone for Chapter 7. Thus, the analysis of the inventory, distribution, stimulability, and determining phonemic contrasts has been streamlined. New analysis forms and a new case study have been used to organize these data and demonstrate their use. Results have been tied to the previously noted classification of speech sound disorders. This will be especially valuable to beginning clinicians as they attempt to organize and categorize the data they have collected. Also new to this edition are measures of whole-word accuracy and variability. A case study is provided so that students can understand how to apply and calculate these measures.
- *Expanded and reorganized topics: Theoretical foundations and their clinical application.* Several of the theoretical constructs have been deleted from this chapter (Chapter 4), while others, such as feature geometry and optimality theory have been expanded to include more practical clinical applications that the student can work through easily. Sonority theory and implicational universals have also been included in this chapter as well as distinctive features and their use in maximal oppositions target selection. These principles are a major portion of specific phonological target selection and therapies which are presented in Chapter 10.
- *Expanded and reorganized topics: Treatment of Phonological Disorders (Chapter 10).* This chapter has been expanded to include more information on several of the therapies that are considered to be phonological in respect to the target selection or treatment options. However, this chapter has also been streamlined so that a clinician is able to obtain an overview of the treatment process. This includes returning to the classification system noted in Chapter 1, utilizing variables such as the age of the child and the severity of the disorder to determine who would maximally benefit from each type of treatment possibility. Also new to this chapter is the categorization “inconsistent speech disorder.” Diagnostic criteria and the treatment process are discussed. For each of these phonological treatment methods a case study new to this edition demonstrates how this child’s error patterns might be implemented to establish treatment targets and goals.

- *Expanded and reorganized topics: Speech Sound Disorders in Selected Populations (Chapter 11).* This chapter now includes a section on Down syndrome, which contains general as well as articulatory/phonological characteristics. In addition, when possible, the therapy section examines treatment efficacy studies that are based on reviews of controlled studies to determine which treatment protocols demonstrate maintenance and generalization of the treatment effects and increased performance. This is important information for clinicians as they are faced with a large number of treatment choices.
- *Categorical learning objectives.* These have been fine-tuned in each chapter so that the reader begins each chapter with a set of easily identifiable goals for the chapter's learning process. Each set of learning objectives provides the scaffolding for major divisions of the chapter and leads directly to quizzes and critical thinking components that compartmentalize key concepts.
- *New clinical exercises.* This text includes a number of new or revised clinical exercises to allow the student to master theoretical concepts by applying them to real-life situations. The eText edition of this text also contains embedded videos that can be used in conjunction with these clinical exercises, allowing for additional analysis opportunities.
- *Updated references.* References in each chapter have been updated to reflect the most recent research in the field.

Instructor's Resource Manual

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

Acknowledgments

Preparing the sixth edition—as with previous editions—might appear at first to be a simple process but it actually was a large time investment supported by many people. I have to admit, based on past experience, I was a bit skeptical about a "team". However, this team has been wonderful, helpful, knowledgeable, and efficient. First, I would like to thank Aileen (Berg) Pogran, who is the Executive Portfolio Manager of this sixth edition and relatively new to Pearson. Her support has been amazing. Other team members include Krista (Slavicek)

McMurray, Development Editor, whose eye for detail has been really very helpful; Faraz Sharique Ali, Content Producer US (Team Lead), who has been a behind the scenes person but could be relied on for all sorts of needs, thank you; Carmina Jimenez, Editorial Project Manager, who is so quick and efficient, great; Prince John William Carey, Project Manager, who has been so kind and helpful in spite of my having to change deadlines constantly; and Jon Theiss, Digital Development Editor, always providing a top notch video. A special thanks to Deepali Malhotra, Content Producer, who recently took a vague concept of mine and turned it into a cover design which is so perfect: a child who is happy and hopeful, representing to me the future and the possibilities. Thank you to Deepali and her team. All of these amazing people have been so supportive and helpful as I proceeded through this task.

For this edition, I would like to say a special thanks to my reviewers: Christine Fiestas from Texas A&M -Kingsville; Carol Tessel from Florida Atlantic University; Haralambia Kollia from William Paterson University; Maria Grigos from New York University; Peter Richtsmeier from Oklahoma State University; Tim Brackenbury from Bowling Green State University. I hope that you can recognize many of the wonderful suggestions that guided me through these revisions.

Brief Contents

1	Clinical Framework: Basic Terms and Concepts	1
2	Articulatory Phonetics: Speech Sound Form	17
3	Phonetic Transcription and Diacritics	46
4	Theoretical Considerations and Practical Applications	71
5	Normal Phonological Development	114
6	Assessment and Appraisal: Collection of Data	155
7	Diagnosis: Summarizing Data and Classifying Speech Sound Disorders	196
8	Dialects and English as a Second Language	230
9	Therapy for Articulation Disorders: Obtaining an Accurate Production of a Speech Sound	269
10	Treatment of Phonological Disorders	342
11	Speech Sound Disorders in Selected Populations	393
	Glossary	443
	References	453
	Index	477

This page intentionally left blank

Contents

About the Author	iv		
Preface	v		
1 Clinical Framework: <i>Basic Terms and Concepts</i>	1		
Communication, Speech, and Language Disorders of Communication, Speech, and Language	1		
Articulation and Speech Sounds (Phones): Phonology and Phonemes	3		
Defining Speech Sound Disorders: Articulation and Phonological Disorders	4		
Classifying Speech Sound Disorders	7		
Subtypes and Etiological Factors: Speech Disorders Classification System	10		
Examining Error Patterns: The Differential Diagnosis System	10		
Summary 15 • Case Studies 15 • Think Critically 16	12		
2 Articulatory Phonetics: <i>Speech Sound Form</i>	17		
Phonetics: Definitions and Classification	18		
Anatomical-Physiological Review of the Foundations of Speech Production	19		
The Respiratory System	19		
The Phonatory System	22		
The Resonatory System	24		
The Articulatory System	26		
Vowels Versus Consonants	27		
General American English Vowels: Descriptive Parameters	29		
Front Vowels	30		
Back Vowels	30		
Central Vowels	30		
Diphthongs	31		
General American English Consonants: Descriptive Parameters	33		
Sounds in Context: Coarticulation and Assimilation	38		
Syllable Structure	40		
Clinical Significance	41		
Summary 43 • Case Study 43 • Think Critically 44			
APPENDIX 2.1 Selected Readings in Anatomy and Physiology of the Speech and Hearing Mechanisms			45
APPENDIX 2.2 Phonetic Symbols Used in Current Phonetic Transcription Texts			45
3 Phonetic Transcription and Diacritics			46
Phonetic Transcription as a Notational System	47		
The Use and Value of Phonetic Transcription for Speech-Language Therapists	51		
Defining Diacritics	51		
Diacritics Used with Consonants	53		
Diacritics Used with Vowels	59		
Diacritics for Stress, Duration, and Syllable Boundaries	62		
Additional Symbols	63		
Clinical Implications	65		
Summary 68 • Case Study 68 • Think Critically 69			
4 Theoretical Considerations and Practical Applications			71
The Evolution of the Phoneme Concept	73		
How Did the Concept of the Phoneme Develop?	73		
Speech Sound Versus Phoneme: Form and Function as a Unity	74		
Distinctive Feature Theories	76		
How Do Distinctive Features Work?	77		
Generative Phonology	83		
How Does Generative Phonology Work?	83		
How Did Generative Phonology Develop?	84		
Naturalness, Markedness, and Implicational Universals	85		
Natural Phonology	88		
How Does Natural Phonology Work?	88		
How Did Natural Phonology Develop?	91		
Nonlinear Phonologies: Exemplified by Feature Geometry and Optimality Theory	92		
Feature Geometry	94		
Optimality Theory	100		

The Sonority Theory and Sonority Sequencing Principles	107	Standardized Speech Assessments and Supplemental Testing	165
Summary 111 • Case Study 111 • Think Critically 112		Advantages and Disadvantages of Standardized Speech Assessments	165
5 Normal Phonological Development	114	Factors to Consider When Selecting a Standardized Speech Measure	166
Aspects of Structural and Functional Development	116	Assessment Procedures to Supplement Standardized Speech Measures	170
Early Perceptual Development	118	Organizing Standardized Speech Assessment Results: Describing the Error	170
Prelinguistic Stages: Before the First Words	121	Stimulability Testing	172
Vocoids: Nonphonemic Vowel-like Productions	124	Contextual Testing	173
Contoids: Nonphonemic Consonant-like Productions	124	Testing Multisyllabic (3-Plus Syllable) Words	173
Syllable Shapes	125	Spontaneous Speech Sample	174
Babbling and Its Relationship to Later Language Development	125	Organization of the Continuous Speech Sample	174
Prosodic Feature Development	126	Selection of Additional Measures in Other Areas	177
Transition from Babbling to First Words and the First-50-Word Stage	127	Language Screening	177
The First-50-Word Stage	127	Prosodic Screening and Testing	178
Segmental Form Development	128	Phonological and Phonemic Awareness Screening and Testing	178
Prosodic Feature Development	133	Cognitive Appraisal	180
Consonant, Vowel, and Prosodic Development of the Preschool-Age Child	135	Assessment of a Child's Communicative Participation	181
Segmental Form Development: Vowels	135	Special Considerations: A Child with Emerging Phonology	182
Segmental Form Development: Consonants	136	Special Considerations: A Child with Unintelligible Speech	187
Phonological Processes	139	Summary 190 • Case Study 190 • Think Critically 191	
Prosodic Feature Development	142	APPENDIX 6.1 Speech-Motor Assessment Screening Form	192
Consonants, Consonant Clusters, and Prosodic Development of the School-Age Child	143	7 Diagnosis: Summarizing Data and Classifying Speech Sound Disorders	196
Segmental Form Development	144	Inventory, Distribution, and Stimulability of Speech Sounds	197
Consonant Cluster Development	144	Outcome Measures: Which Sounds the Child Can Produce, Which Sounds the Child Cannot Produce, and Stimulability	197
Prosodic Feature Development	145	What Do the Inventory, Distribution, and Stimulability Results Tell Us as Clinicians?	198
Phonological Awareness, Emerging Literacy, and Phonological Disorders	146	Phonemic Contrasts: Establishing a Phonemic Inventory	204
Summary 151 • Case Study 152 • Think Critically 153		Phonemic Pattern Analysis: Phonological Processes	208
6 Assessment and Appraisal: Collection of Data	155	Classifying Speech Sound Disorders	211
Guidelines for Assessment: Objectives of Appraisal and Diagnosis	157	Articulation Disorder	211
Initial Procedures: Hearing Evaluation and Speech Mechanism Examination	159	Phonological Delay	213
Initial Impression	159	Consistent Phonological Disorder	214
Procedures for a Hearing Screening	160	Inconsistent Phonological Disorder	216
Evaluation of the Speech Mechanism	161		
What to Look for When Evaluating the Speech Mechanism	162		

Factors Affecting Intelligibility and Measurements of Intelligibility	218		
Factors Affecting Intelligibility	218		
Measures of Intelligibility	219		
Measures of Severity, Whole-Word Accuracy, and Variability	221		
Measures of Whole Words	222		
Summary 223 • Case Study 223 • Think Critically 225			
APPENDIX 7.1 Transcription from Jonah, Age 7 Years 4 Months, from the Goldman-Fristoe Test of Articulation (Goldman & Fristoe, 2015)	226		
APPENDIX 7.2 Matrix for Spontaneous Speech Sample from Jonah, Age 7 Years 4 Months	227		
APPENDIX 7.3 Minimal Word-Pairs Ordered by Vowel	228		
APPENDIX 7.4 Intelligibility Grid	229		
8 Dialects and English as a Second Language	230		
Dialects	231		
Regional Dialects	232		
Characteristics of Appalachian English, Ozark English, and African-American Vernacular English	235		
Appalachian Versus Ozark English	235		
Ethnicity, Race, and Culture	237		
African-American Vernacular English	238		
ASHA's Position on Dialects	241		
The Speaker of English as a Second Language	243		
Factors to Consider in the Phonological Development of Children Learning English as a Second Language	243		
Limited English Proficient Students	245		
Speech Sound and Selected Prosodic Characteristics of Spanish, Vietnamese, Cantonese, Korean, Filipino, Hmong, and Arabic American English	247		
Spanish American English	247		
Vietnamese American English	252		
Korean American English	255		
Cantonese American English	257		
Filipino/Tagalog American English	259		
Hmong American English	261		
Arabic American English	263		
Cultural Competence and Implications for Appraisal	265		
Guidelines	266		
Summary 267 • Case Study 267 • Think Critically 268			
		9	Therapy for Articulation Disorders: <i>Obtaining an Accurate Production of a Speech Sound</i>
			269
		Defining the Traditional Motor Approach	271
		Guidelines for Beginning Therapy: Articulation Disorders	272
		General Overview of Therapy Progression	272
		Sensory-Perceptual Training	273
		Production of the Sound in Isolation	274
		Sounds in Context	276
		Dismissal and Re-evaluation Criteria	279
		Principles of Motor Learning and Their Application to Therapy	281
		Conditions of Practice	282
		Conditions of Feedback	284
		The Traditional Motor Approach and the Most Frequently Misarticulated Speech Sounds	285
		Misarticulations of [s] and [z]	286
		Misarticulations of [ʃ] and [ʒ]	298
		Misarticulations of [k] and [g]	302
		Misarticulations of [l]	306
		Misarticulations of [ɹ] and the Central Vowels with r-Coloring	311
		Misarticulations of [θ] and [ð]	319
		Misarticulations of [f] and [v]	322
		Affricate Problems	325
		Voicing Problems	327
		Consonant Cluster Problems	329
		Group Therapy with the Traditional Motor Approach	332
		Summary 334 • Case Study 335 • Think Critically 335	
		APPENDIX 9.1 Minimal Word-Pairs with Frequently Misarticulated Sounds	336
		10	Treatment of Phonological Disorders
			342
		Minimal Pair Therapy: Minimal Oppositions Contrast Therapy and the Multiple Oppositions Approach	344
		Minimal Opposition Contrast Therapy	344
		Multiple Oppositions Approach	349
		Target Selection for Minimal Pair Therapy: Maximal Oppositions and the Complexity Approach	353
		Maximal Oppositions	353
		The Complexity Approach	357

Cycles Phonological Remediation Approach	364	Articulatory and Phonological Characteristics	404
Inconsistent Speech Disorder and the Core Vocabulary Approach	369	Clinical Implications: Diagnostics	406
The Metaphon Approach	373	Clinical Implications: Therapeutics	407
Speech Sound Disorders with Concurrent Language Problems: The Treatment of Morphosyntax, Vocabulary, and the Child with Emerging Phonology	378	Cleft Palate	409
Connecting Phonology to Morphosyntax: Morphosyntax Intervention	378	Definition and General Features	409
Connecting Phonology to Semantics: Vocabulary Intervention	380	Articulatory and Phonological Characteristics	410
The Child with an Emerging Phonological System: Expanding the System and Vocabulary	381	Clinical Implications: Diagnostic	411
Treatment of Multiple Vowel Errors	383	Clinical Implications: Therapeutics	414
The Child with a Very Limited Vowel Inventory: Therapeutic Suggestions	384	Intellectual Disability (Intellectual Developmental Disorder)	417
The Child with a High Proportion of Vowel Substitutions: Therapeutic Suggestions	386	Definition and General Features	417
Summary 387 • Case Study 388 • Think Critically 389		Articulatory and Phonological Characteristics: General Information	418
APPENDIX 10.1 Probes for Initial Consonant Clusters That Could Be Targets	389	Down Syndrome: General Information	418
APPENDIX 10.2 Probes for Monitoring Generalization or Therapy Progress	390	Down Syndrome: Articulatory and Phonological Impairments	419
		Clinical Implications: Diagnostics	419
		Clinical Implications: Therapeutics	420
		Hearing Impairment	423
		Definition and General Features	423
		Articulatory and Phonological Characteristics	424
		Clinical Implications: Diagnostics	425
		Clinical Implications: Therapeutics	425
		Motor-Speech Disorders in Adults	428
		Acquired Apraxia of Speech	428
		The Dysarthrias	432
		Summary 438 • Case Study 438 • Think Critically 439	
11 Speech Sound Disorders in Selected Populations	393	APPENDIX 11.1 Protocol for Assessing Respiration, Phonation, Resonation, and Articulation of Dysarthric Speech	440
Childhood Apraxia of Speech: A Disorder of Speech Motor Control	394		
Definition and General Features	394	Glossary	443
Articulatory and Phonological Characteristics	395	References	453
Clinical Implications: Diagnostics	398	Index	477
Clinical Implications: Therapeutics	400		
Motor-Speech Disorders: Cerebral Palsy	403		
Definition and General Features	403		

Chapter 1

Clinical Framework

Basic Terms and Concepts



Learning Objectives

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

- 1.1** Define communication, speech, and language.
- 1.2** Define disorders of communication, speech, and language.
- 1.3** Distinguish between articulation and speech sounds (phones), phonology, and phonemes.
- 1.4** Define speech sound disorder and understand its relationship to articulation and phonological disorders.
- 1.5** Classify speech sound disorders according to specific parameters.

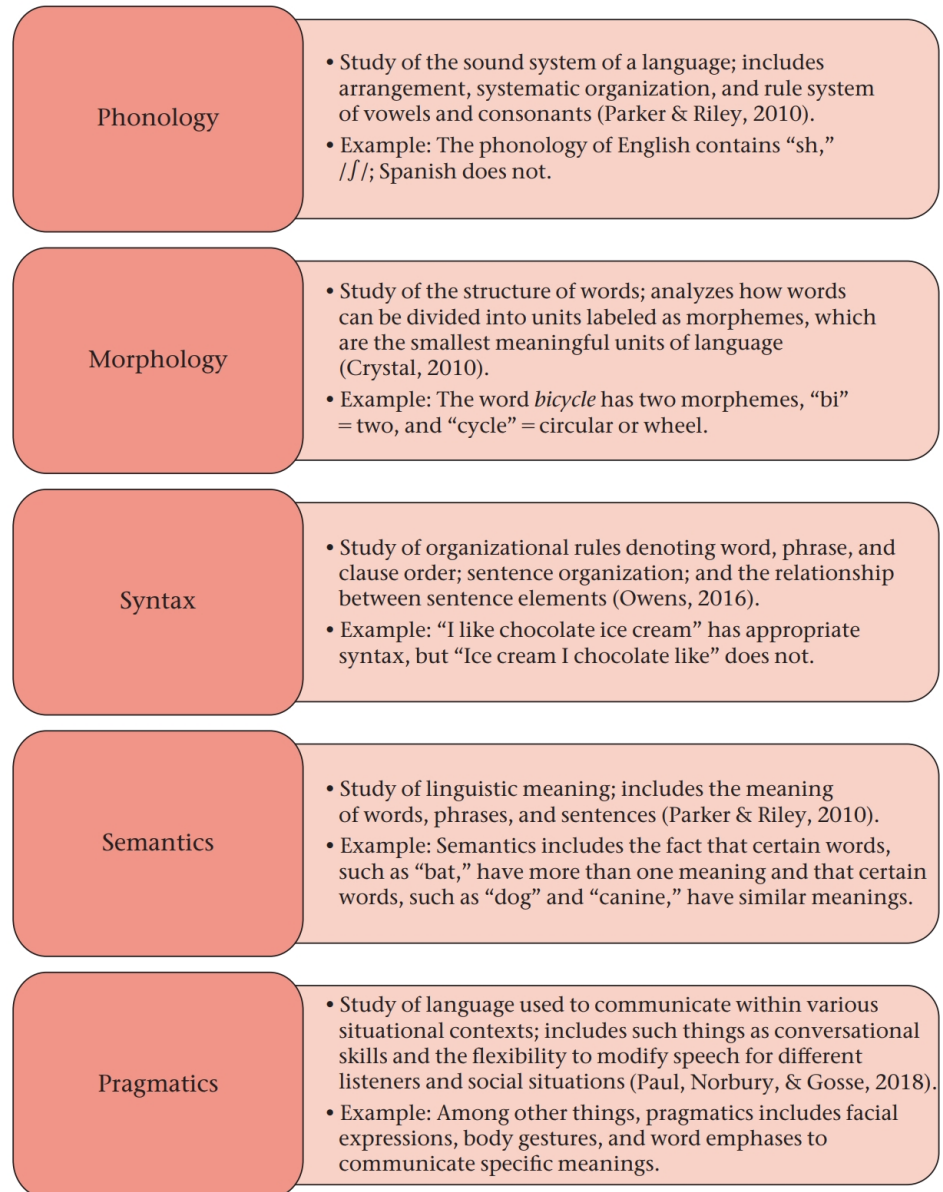
Communication, Speech, and Language

Communication is central to our lives. We communicate in a number of ways—from text messaging to facial expressions. Simply defined, communication is the process of sharing information between individuals (Pence Turnbull & Justice, 2017). When we think about the diversified population that we encounter within the discipline of communication disorders, a broader definition might be helpful. **Communication** is a process that consists of two or more people sharing information, including facts, thoughts, ideas, and feelings. Communication includes how to interact with other people and things, how to understand spoken language, and how to exchange information with others using gestures or symbols. Communication does not have to involve language and does not have to be vocalized (Justice & Redle, 2014; National Joint Committee for the Communicative Needs of Persons with Severe Disabilities, 2010). Communication refers to any way that we convey information from one person to another. For example, we use Twitter, Skype, and FaceTime as ways to communicate. In addition, smiling, waving, and raising your eyebrows at a comment are all examples of nonverbal communication. Sign languages, such as American Sign Language or Seeing Essential English, are nonverbal conventional linguistic systems used to communicate.

However, the most widely used means of communication is speech. **Speech** is the expression of thoughts in spoken words, that is, in oral, verbal communication. Speech can be further divided into *articulation*, the motor production of speech sounds; *fluency*, the flow of speaking, including rate and rhythm; and

voice, including vocal quality, pitch, loudness, and resonance (American Speech-Language-Hearing Association [ASHA], 1993). The term *speech* is used in various ways. Speech can be a more formal, spoken communication to an audience. For example: *Having to give a speech to her class was always frightening for Andrea*. Speech can also indicate a manner of speaking: *Her speech was marked by a distinct Australian accent*. Speech is also used together with the term *language* to indicate the mental faculty of verbal communication: *The child's speech and language skills were tested as a portion of the diagnostic*. Based on this last example, it seems important to differentiate between speech and language. What are the distinctions between these two terms: *speech* versus *language*?

Figure 1.1 Subdivisions of Language



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

Within our definition of language are the terms **phonology**, **morphology**, **syntax**, **semantics**, and **pragmatics**. Definitions and examples of each of these parameters are contained in Figure 1.1. One of these parameters, phonology, is of major importance in this text.

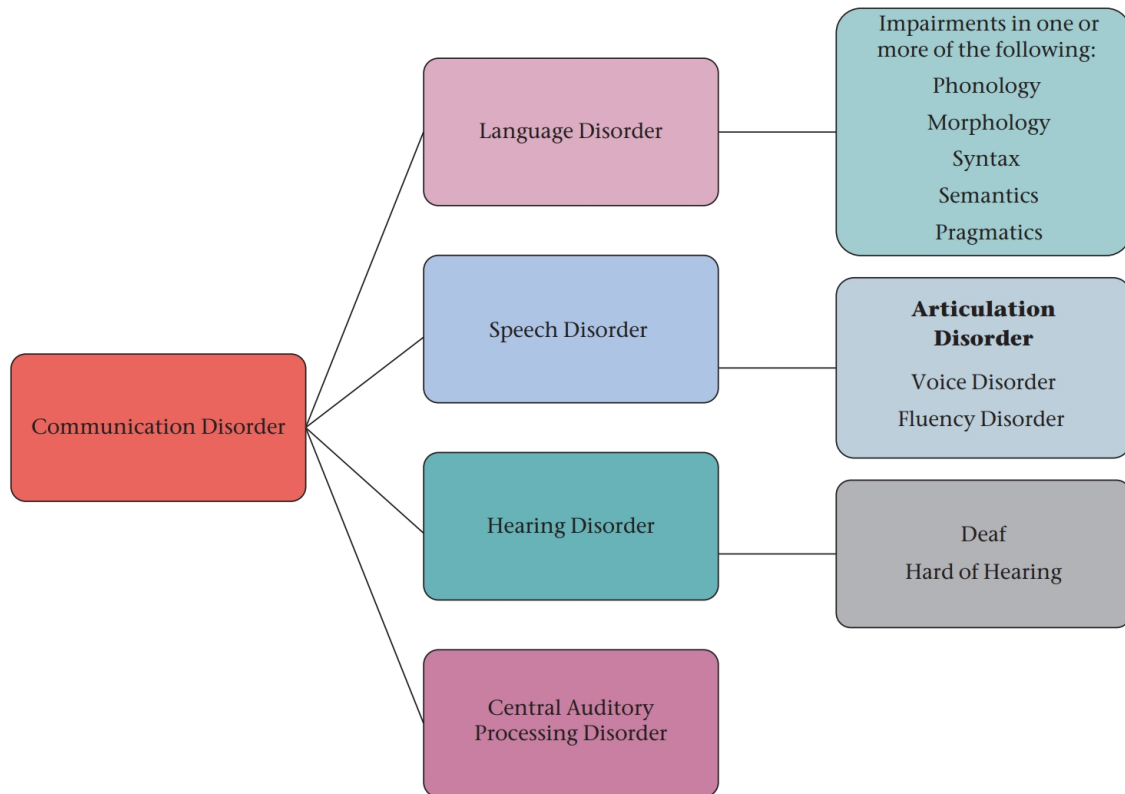
To summarize, communication is the process of sharing information between and among individuals. Communication can be broadly divided into speech and language. Speech is the expression of thoughts in spoken words; it is oral, verbal communication. On the other hand, language is a complex, dynamic, and rule-based system of conventional symbols that is used in diverse modalities for thought and communication. However, as practitioners, we deal with communication, speech, and language *disorders*. What characteristics would a disordered system demonstrate?

Disorders of Communication, Speech, and Language

According to the 1993 guidelines of ASHA, a **communication disorder** is the impairment in the ability to receive, send, process, and comprehend concepts, including verbal, nonverbal, and graphic symbol systems. Communication disorders are further subdivided into speech, language, hearing, and central auditory processing difficulties. A **speech disorder** is used to indicate oral, verbal communication that is so deviant from the norm that it is noticeable or interferes with communication. Speech disorders are divided into articulation, fluency, and voice disorders. On the other hand, a **language disorder** involves the impaired comprehension and/or use of spoken, written, and/or other symbol systems. A language disorder may involve one or more of the following areas: phonology, morphology, syntax, semantics, and pragmatics. Impaired auditory sensitivity leads to a **hearing impairment**. Individuals with hearing impairments are typically classified as either hard of hearing or deaf. The final area within this classification system is a **central auditory processing disorder**. These deficits result in difficulties with information processing of auditory signals that are not related to impaired sensitivity of the auditory system. Thus, these difficulties are not the result of a hearing impairment. Refer to Figure 1.2 for the subdivisions of communication disorders.

For the purpose at hand, we are primarily interested in speech disorders related to the impairment of the articulation of speech sounds and language disorders related to the category of phonology. In this context, it is important to examine the terms *articulation* and *speech sounds (phones)* as well as *phonology* and *phonemes*. The following section defines and gives examples of how these words are used in our clinical practice within communication disorders.

Figure 1.2 Subdivisions of Communication Disorders



Articulation and Speech Sounds (Phones): Phonology and Phonemes

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

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

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

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

For the purpose at hand, **articulation** refers to the totality of motor movements involved in production of the actual sounds that comprise speech (Bauman-Waengler, 2009). The learning of articulatory skills is a developmental process involving the gradual acquisition of the ability to move the **articulators** (those structures that are important in forming the individual sounds) in a precise and rapid manner. Thus, *learning to articulate is a specific kind of motor learning*. Just as children become more adept at certain motor skills as they grow older, their articulation skills develop as well. For example, a 2-year-old child and a 6-year-old child differ in their articulatory abilities. Errors in articulation can result from

difficulty with the motoric aspects of speech production (Small, 2020). Thus, the peripheral motor processes involved in the planning and execution of articulation are impaired; the central language capabilities of the individual remain intact. In summary, articulation is a specific, gradually developing motor skill that involves motor processes.

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

Speech sounds or phones are real, physical sound entities used in speech. However, in addition to their *articulatory form*, they also have a linguistic function. *Linguistic function* includes, for example, the rules that address how specific sound units can be arranged to produce appropriate words and the phoneme concept. A **phoneme** is the smallest linguistic unit that is able, when combined with other such units, to distinguish meaning between words (Bauman-Waengler & Garcia, 2020). For example, “tick” has three phonemes: /t/, /ɪ/, and /k/. We know that these are phonemes of American English because the word they form is meaningful. In contrast, /s/ is also a phoneme of American English, as can be seen in “sick,” /s/, /ɪ/, /k/, which differs from “tick” by one phoneme: /t/ versus /s/. As far as notation is concerned, speech sound (phone) productions are usually placed within brackets in phonetic transcription, whereas phoneme values are symbolized by slanted lines, or virgules. For example, [s] indicates that it was a sound someone actually pronounced in a specific manner. On the other hand, /s/ signifies the phoneme “s.”

The idea of the phoneme is considered to be an abstraction. A phoneme is not a single, concrete, unchanging entity. A phoneme as an abstraction is based on the many variations that occur for a particular sound unit as it changes in differing contexts of conversational speech. This does not necessarily make the phoneme concept complex or difficult to understand. We constantly deal with abstractions. Take, for example, the concept “cat.” A cat is not a single, unchanging entity. There are big cats and small cats, cats that are striped or solid colored of various shades. However, we accept certain characteristics as being typical to the concept of “cat.” We could say that the *cat concept* embraces a whole family of units that are related yet somehow distinct. Even two cats of the same size, color, and build will have slight variations that could be detected most certainly by the owners. If we apply this to the phoneme concept, we find a similar abstraction. So when we speak of a particular phoneme, /t/ for example, we are referring to the typical “t” but we also take into consideration the varieties of “t” that are used in various contexts and by different speakers. The term *allophone* is used to refer to the changes that occur in a phoneme when produced by speakers in differing contexts. **Allophones** are variations in phoneme realizations, in phones, that do not change the meaning of a word when they are produced in differing contexts. Allophones are phonetic variations of a phoneme (Crystal, 2010). Within the phonological system of American English, there are many examples of allophones.

Several allophonic variations can occur with the /p/ phoneme, for example. At the beginning of a word as a single sound unit, /p/ is typically aspirated. Aspiration is that slight puff of air that you hear if you pronounce the word “pie” or “pot.” This is transcribed as [p^h], the small raised ^h representing the puff of air or aspiration in phonetic transcription. However, /p/ is typically unaspirated following “s,”

Clinical Exercises In American English, [t] and [d] phones between two vowels are often produced as a flap (or referred to as a tap), [ɾ]. For example, say the word “butter” or “ladder” casually and note the quick movement of the tip of the tongue as it briefly taps the ridge on the roof of the mouth. Sometimes this movement is so casual that the tongue does not even touch the roof of the mouth. This is an acceptable production of [t] or [d]. It is an allophonic variation in this particular context. Does this change the meaning of the previously noted words? What would you think if a child said “ladder” this way on an articulation test?

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

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

As will be noted later, a current ASHA definition of “speech sound disorder” uses “speech sound” as an umbrella term to designate both the physical realities or forms (phones) and the linguistic functional abstraction of the phoneme. To not confuse this issue any further, within this text physical form realities will be referred to as phones and linguistic functional entities will be referred to as phonemes.

Phonology is the study of how phonemes are organized and function in a language. Phonology includes the inventory of phonemes of the language in question, thus a list of all the vowels and consonants that function in American English to differentiate meaning. However, phonology also focuses on how these phonemes are *organized* to convey meaning within a language system. Such a description would include how the phonemes can and cannot be arranged to form meaningful words. **Phonotactics** refers to the description of the allowed combinations of phonemes in a particular language.

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

Phonotactics also restricts some consonant clusters in General American English to their use in certain word positions, for example, the clusters /sk/ and /ks/. Words or syllables can begin or end with /sk/ (e.g., *skate*, *risk*), but this is not the case with /ks/. This cluster can occur only at the end of a syllable or word (e.g., *kicks*). This is a *phonotactic* characteristic of the phonological system of General American English. A more complete discussion of the phonotactics of American English will be presented in Chapter 2.

Table 1.1 Phoneme Versus Phone

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

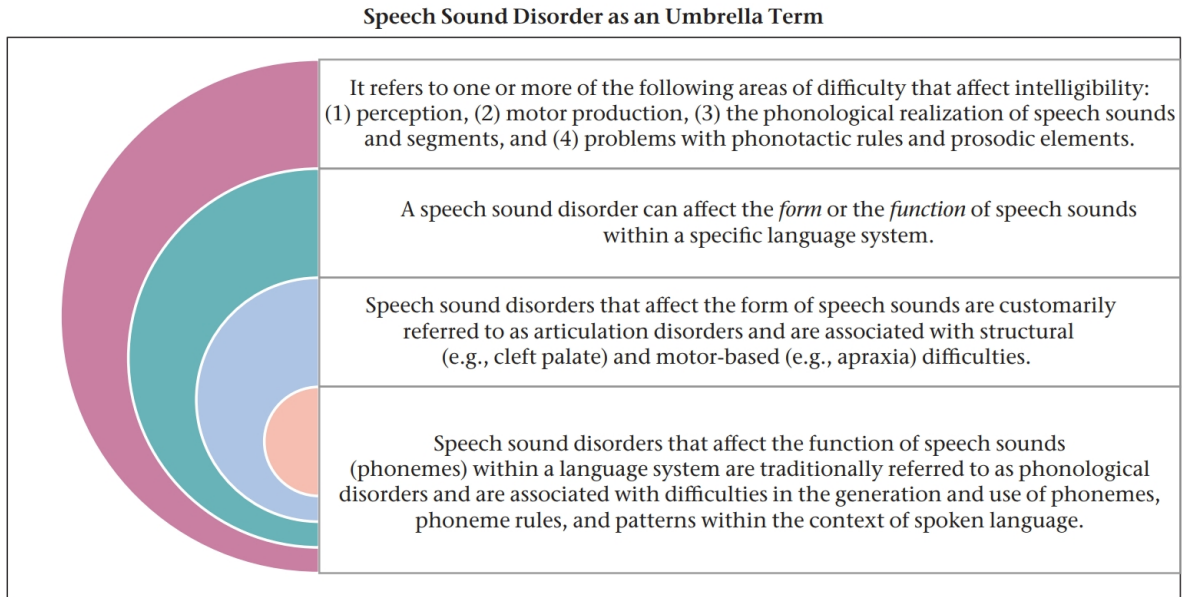
From early to contemporary publications, phoneme realizations have also been labeled **phonetic variations**. Phones or phonetic variations can be examined without reference to a given language system. This is not the case with phonemes. When using the term *phoneme*, we refer exclusively to the function of the sound in question: to its ability to signify differences in word meaning within a *specific* language (refer to Table 1.1). Two words that differ in only one phoneme value are called **minimal pairs**. Examples of minimal pairs are *dog* versus *log* and *dog* versus *dot*.

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

Phones, then, are related to motor, articulatory skills. On the other hand, phonemes represent an understanding of the phonological system of a particular language. Table 1.1 summarizes the differences between the phoneme and the phone. The next section will examine disorders that are related to phone production and phonemic differentiation. Current definitions as well as clinical examples will be provided.

Defining Speech Sound Disorders: Articulation and Phonological Disorders

The term **speech sound disorder** has been defined in various ways depending on the date and the source of the definition. To stay current with ASHA, its more recent definition of speech sound disorder will be used. This definition is located

Figure 1.3 Definition of Speech Sound Disorders

(Based on ASHA practice portal, n.d.-b American Speech-Language-Hearing Association)

on the Practice Portal of ASHA, which is a site intended to provide audiologists and speech-language pathologists with current information that can be used in their daily clinical practice. The goal of this website is to offer the best available evidence and expertise in client care by identifying resources that are relevant and credible. A portion of the definition of speech sound disorder is adapted from the website and contained in Figure 1.3.

First, according to this definition, a speech sound disorder is an umbrella term. Therefore, as a label, “speech sound disorder” is not just one entity but a term used to represent several variations of deviant “speech.” Different domains can affect intelligibility, and any one child may demonstrate difficulties in several of these areas. For example, perceptual difficulties may affect the child’s ability to accurately perceive the distinctions between “s” and “sh,” and motor production inconsistencies may also hinder the accuracy of articulating these two phones. Also inherent in the definition is the fact that a child could demonstrate motor problems together with phonological realization and phonotactic, rule-based usage problems.

An important distinction still contained within the definition is the form and function dichotomy. Although there seems to be some argument that this is not a valid dichotomy (Buckingham & Christman, 2006, 2008), it does provide a framework that can be useful for practitioners. Disorders that affect the form of speech sounds (phones) are historically referred to as articulation disorders, whereas phonemic functional difficulties are referred to as phonological disorders. Let’s examine articulation versus phonological disorders to see how they have been typically defined.

An **articulation disorder**, as a subcategory of a speech disorder, is the atypical production of phones characterized by substitutions, omissions, additions, or distortions that may interfere with intelligibility (ASHA, 2014). Articulation errors are typically classified relative to a child’s age, which translates into stages within this developmental process. Younger children are at an earlier stage in this

development, whereas older children are at a later stage or may have completed the process. Depending on the age of the child, certain articulation errors may be considered to be typical (age-appropriate errors) or atypical (non-age-appropriate errors). When assessing an individual, we often gather information on the inventory of phones used. The **phonetic inventory** is a list of all phones, including their variations.

On the other hand, a **phonological disorder**, as a subcategory of a language disorder, refers to the impaired comprehension of the sound system of a language and the rules that govern these sound combinations (American Speech-Language-Hearing Association Ad Hoc Committee on Service Delivery in the Schools, 1993; ASHA, 2008). When an individual's phonological system deviates enough from the norm, this could lead to a phonological disorder.

Phonology is closely related to other components of the language system, such as morphology, syntax, semantics, and pragmatics. A child's phonological system, therefore, can never be regarded as functionally separate from these aspects of the child's language growth. Several studies (e.g., Cummings, 2009; Edwards, Beckman, & Munson, 2004; Krueger & Storkel, 2017; Mortimer, 2007; Munson, Edwards, & Beckman, 2005a; Roberts, 2005) have documented that delayed phonological development can occur concurrently with delayed lexical and grammatical development. Although the direct relationship between phonological and grammatical acquisition remains unclear, interdependencies certainly exist between these areas.

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

In addition, we might analyze the child's phonotactics by examining the organization of her phoneme system. Children who have difficulties with the organization of their phoneme system might not realize the phonotactics that are typical for American English. Their speech may demonstrate **phonotactic constraints**; in other words, the phoneme use is restricted, and the phonemes are not used in all possible word positions. **Constraints** are any patterns noted that seem to limit or restrict the productional possibilities of our clients (Blache, 2000). Phonotactic constraints could be evidenced if a child uses only certain vowels or consonants in specific word positions. Thus, [k] could be used at the beginning of a word but not at the end: “cat” would be [kæt], but “cake” would be [ker]. Phonotactic limitations when producing consonant clusters could also be a constraint. For example, consonant clusters are used occasionally by a child at the end of a word but never at the beginning: “clown” would be [kaʊn], but “trains” would be [teɪnt]. Constraints can vary; therefore, the clinician will have to look at the transcription and see if any patterns of restrictions or limitations are specifically noted.

Although the distinction between an articulation disorder and a phonological disorder is important, it is not an either/or dichotomy. Many of the children with speech sound disorders will evidence characteristics of both types of difficulties. These two types of speech sound disorders should not be considered mutually exclusive, but rather consideration should be given to the impact that both articulatory and phonological difficulties may have in a child's distinctive profile. A child may demonstrate problems with physically producing phones *and* using phonemes contrastively to differentiate words. Both articulatory and phonological features

are merely different sides of the same coin. It is the clinician's task to identify the child's possibly changing and evolving areas of deficit and select strategies that will teach this child the necessary skills.

However, this dichotomy is theoretically useful and can be applied practically to diagnostic and intervention procedures. Therefore, for the purpose at hand, a distinction is made between articulation disorders, those in which the peripheral motor processes are disturbed, and phonological or phonemic-based disorders, those in which the organization and function of the phonological system are impaired. Although this division between articulation and phonological disorders may remain at times unclear, a systematic attempt to distinguish between them is one important aspect of clinical decision making. This dichotomy is used throughout this text and developed more fully in later chapters. Other classification systems of speech sound disorders have been developed and expanded upon over the years. The following section examines two of the prominent classification systems.

Classifying Speech Sound Disorders

There are many ways to classify speech sound disorders. That said, there is no universally agreed-upon system. One thing is agreed upon, however: Children with speech sound disorders represent a heterogeneous group. There is support for a broad-based division into those disorders with a known cause versus those with an unknown cause (e.g., Ruscello, 2008). Known causes include, among others, cerebral palsy, cleft lip/palate, and sensorineural hearing loss. However, this type of classification leaves most children in the "unknown" category. This diverse group of children, representing the majority of children with speech sound disorders, differs in disorder severity, speech characteristics, involvement of other aspects of the linguistic system, and response to treatment, to mention just a few factors (Baker, 2006; Bowen, 2009; Dodd, 2011). This type of broad-based etiological classification fails to subdivide this large and varied group of children.

Other systems have been developed to classify speech sound disorders. This section proposes to briefly discuss the classification of speech sound disorders according to two descriptions: (1) subtypes and etiologies of speech sound disorders, represented by the Speech Disorders Classification System (e.g., Shriberg et al., 2010) and (2) a descriptive-linguistic framework, represented by the Differential Diagnosis System (e.g., Dodd, 2013).

Subtypes and Etiological Factors: Speech Disorders Classification System

The Speech Disorders Classification System is a product of systematic research. It has evolved as a research tool and has been described by Shriberg and colleagues (e.g., Shriberg, 1980, 2010; Shriberg & Kwiatkowski, 1982a, 1982b; Shriberg et al., 2010). This classification system is divided into types of speech sound disorders and possible etiologies.

TYPES OF SPEECH SOUND DISORDERS. In addition to the categorization of normal speech acquisition, there are three types of speech sound disorders.

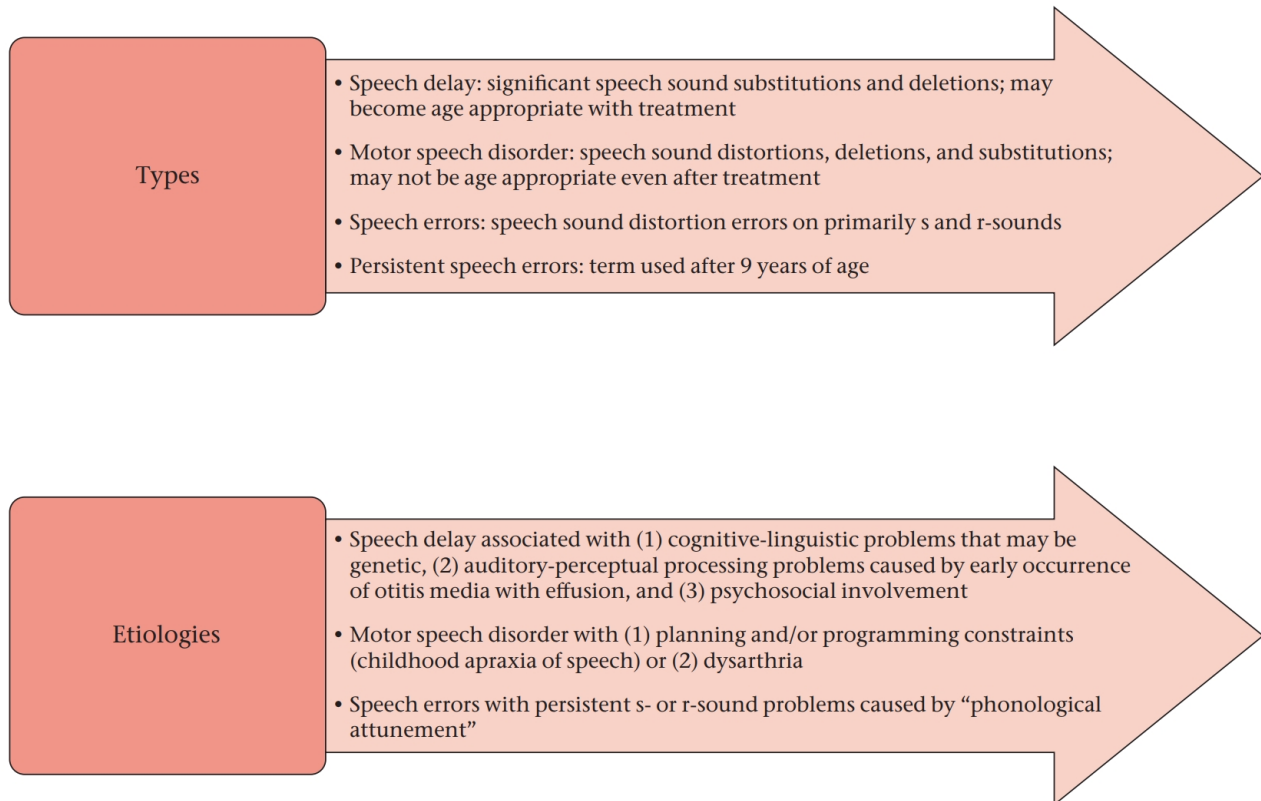
1. *Speech delay*. Onset between 3 and 9 years of age, represented by significant speech sound substitutions and deletions that may become age appropriate with treatment.
2. *Motor speech disorder*. Onset between 3 and 9 years of age, represented by significant speech sound distortions, deletions, and substitutions that may not be age appropriate even after treatment.
3. *Speech errors*. Onset between 6 and 9 years of age, represented by speech sound distortion errors that occur primarily on s- and r-sounds. Although these problems may persist throughout the lifespan, they are not associated with the social and academic consequences that are noted in (1) speech delay or (2) motor speech disorder.

For children over 9 years of age, the term *persistent speech disorder* is used.

ETIOLOGIES OF SPEECH SOUND DISORDERS. This list attempts to describe the causes of the various types of speech sound disorders.

1. *Speech delay*. Consists of three subcategories: (a) a speech delay associated with cognitive-linguistic difficulties that may be transmitted genetically, (b) a speech delay marked by auditory-perceptual processing problems that result from the fluctuating hearing loss associated with otitis media with effusion at a very early age, and (c) a speech delay with psychosocial involvement. This last group of children may be either aggressive or withdrawn, and it is hypothesized that their temperaments may make it more difficult for them to obtain the feedback they need to develop appropriate speech skills.
2. *Motor speech disorder*. Includes two subtypes of speech delay: (a) speech motor involvement with planning and/or programming restraints, which is consistent with apraxia of speech, and (b) speech delay-dysarthria.
3. *Speech errors*. Consists of two subtypes for English speakers: (a) the distortion of s-sounds and (b) the distortion of r-sounds. In their need to communicate, these children attempt to master some aspects of speech before they are ready to do so. They adopt a communication pattern (s- or r-sound distortions) that continues into the school years. This has been labeled as a phonological attunement causation factor. Refer to Figure 1.4 for an overview of this classification system.

However, Shriberg and colleagues (2010) point out that the noted etiological classification system is not intended for clinical practice until more research can validate these initial findings. In addition, the authors identify that the subtypes noted are not mutually exclusive. These complex developmental disorders could demonstrate difficulties in several of the domains. The overlapping and indistinct boundaries between subgroups, specifically the speech delay subgroups, is one reported problem of the Speech Disorders Classification System (Waring & Knight, 2013). Waring and Knight (2013) also note that these diagnostic labels provide little information about the nature, severity, or type of therapy indicated for children with these specific speech difficulties. Finally, it appears that the clinical feasibility of this system is questionable. In an attempt to label children within these parameters, Fox, Howard, and Dodd (2002) noted that more than half of the children within their study could not be classified. As more research is conducted with this classification system, the parameters will hopefully become clearer and this system could be more widely used with clinical populations.

Figure 1.4 Speech Disorders Classification System (SDCS)

(Adapted from Shriberg, 1980, 2010; Shriberg et al., 2010.)

The following section examines the second classification system, which is based on a descriptive-linguistic framework: the Differential Diagnosis System (e.g., Dodd, Holm, Crosbie, & McCormack, 2013).

Examining Error Patterns: The Differential Diagnosis System

The descriptive-linguistic framework consists of describing children’s speech sound difficulties according to the error patterns they demonstrate. The system is developmental and compares the child’s deviant productions to those of children of the same age with normal speech sound acquisition. This type of categorization caused a major shift in diagnosing children with speech sound disorders. Rather than labeling children as having multiple individual sound errors, clinicians began to talk about patterns and sound class errors (refer to Grunwell, 1997).

Dodd (1995, 2005) proposed a classification system that was based on the descriptive-linguistic model and consisted of five subgroups of speech sound disorders.

1. *Articulation disorder.* This is an inability to pronounce certain phones, typically s- and r-sounds. The child uses a consistent substitution or distortion for the target sound in both spontaneous and imitated productions.
2. *Phonological delay.* These children demonstrate phonological patterns that are evidenced in normal development but are typically noted at an earlier chronological age.

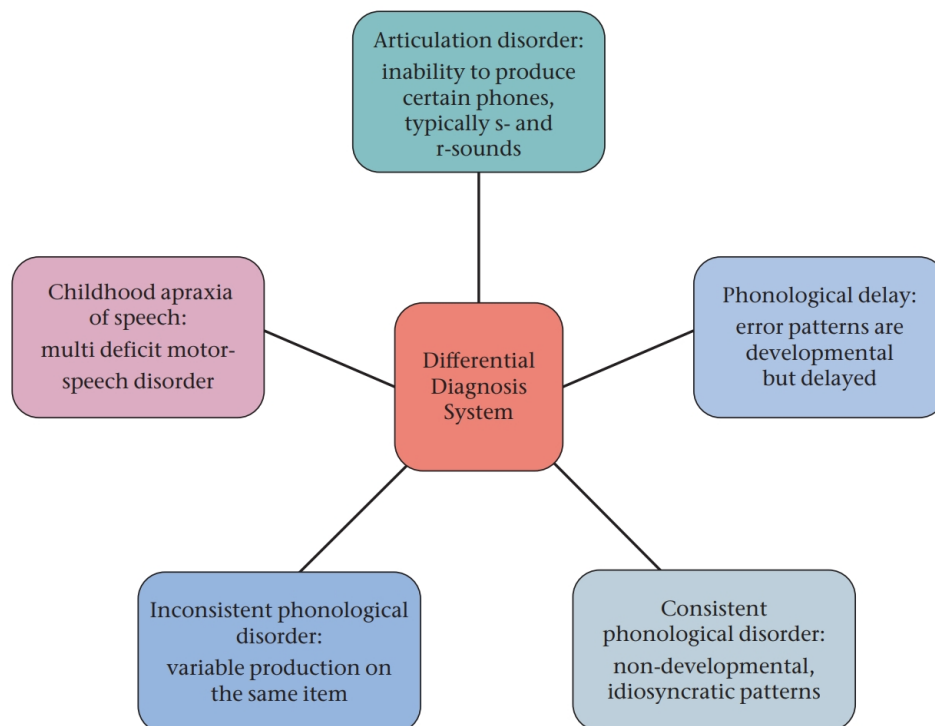
3. *Consistent phonological disorder*. This involves consistent use of some non-developmental error patterns. These children may demonstrate atypical and idiosyncratic error patterns.
4. *Inconsistent phonological disorder*. The phonological systems of these children show at least 40% variability of production when asked to name 25 pictures on 3 separate trials within a single session. Thus, multiple errors are demonstrated for the same word.
5. *Childhood apraxia of speech*. This is seen as a multi-deficit motor-speech disorder involving phonological planning, phonetic, and motor programming difficulties (Ozanne, 2013).

Refer to Figure 1.5 for an overview of the Differential Diagnosis System.

It appears that this system is useful clinically. Studies have demonstrated that children can be consistently classified according to these parameters (e.g., Broomfield & Dodd, 2004). Dodd and colleagues (2013) have constructed speech sound profiles that summarize the major features of the subgroups, the impact of intelligibility, and possible treatment strategies. Although additional research findings would further authenticate this model—especially the validity of inconsistent phonological disorder and its distinction from childhood apraxia of speech (Waring & Knight, 2013)—the model does provide clinical possibilities.

To summarize, Table 1.2 outlines several terms that are used clinically and in research in reference to speech sounds and speech sound disorders.

Figure 1.5 Differential Diagnosis System



(Adapted from Dodd, 1995; Dodd et al., 2013.)

Table 1.2 Speech Sounds and Speech Sound Disorders: Terminology

Term	Definition	Examples
Articulation	The totality of motor processes involved in the planning and execution of speech.	Describes the phone production of individuals (e.g., “The <i>articulation</i> of [s] was incorrect.”). Describes tests that examine the production of phones (e.g., “The clinician administered a standardized speech assessment, an <i>articulation</i> test.”).
Articulation disorder	Difficulty with the motor production aspects of speech or an inability to produce certain speech sounds.	A diagnostic category that indicates that an individual’s phone productions vary widely from the norm (e.g., “Tony was diagnosed as having an <i>articulation</i> disorder.”).
Phonology	The study of the sound system of a language; examines the sound units of that particular language, how these sounds are arranged, their systematic organization, and the rule system.	Describing the inventory and arrangement of sound units (e.g., the Spanish <i>phonological system</i> has fewer vowels than American English. The phoneme /s/ is present in Spanish, but /z/ is not.).
Phonological disorder	Impaired comprehension and/or use of the sound system of a language and the rules that govern the sound combinations.	The inventory of phonemes may be restricted (e.g., “Jonathan used the phoneme /t/ for /d, k, g, s, z, ʃ, ʒ, tʃ, dʒ/.”).
Speech sound disorder	An umbrella term that refers to disordered form (articulation) and/or function (phonological) of speech sounds within a specific language system (ASHA, n.d.-b).	The child’s speech sound disorder affected the articulation of his phones and the phonemic function of phonemes.
Persistent speech sound disorders	Errors that persist past the typical age of acquisition (9 years old).	Children with this disorder show little spontaneous improvement, and their response to intervention is poor. There is commonly no known cause (Wren, Roulstone, & Miller, 2012).
Inconsistent speech disorder/inconsistent phonological disorder	Phonological systems that demonstrate variability of production on the same item. This is determined by at least 40% variability on the production of 25 words repeated 3 times in a single session (Dodd, 1995, 2005).	These children do not respond to typical pattern-based treatment but seem to respond to first decreasing variability of their productions.
Speech sound delay	Speech sound errors that are often noted as “normal” errors found in young children as they acquire specific sounds. A “delay” usually has the premise that the child will catch up and achieve normal development.	A category that is typically used in young children to denote a mismatch between the child’s speech sound acquisition and what is considered to be a norm reference.
Deviant speech sound development	Speech sound errors that are not typically observed in the development of most young children.	A term that typically indicates a process that is not delayed but different (e.g., “Lindsey demonstrated substitutions, such as [s] for [p, b, t, d]. Her speech sound development appeared deviant.”).