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

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

• **Digital functionality.** The digital eText version of this title provides interactive tools to enhance students’ experience with the material, including tools that allow students to search the text, make notes online, print important activities, and bookmark passages for later review.

• **Video Examples.** Video Examples have been added to the eText edition. They give students an inside look at the world of communication disorders. These videos, chosen specifically for this text, illustrate critical concepts in easily digestible 2- to 3-minute clips.

• **Video Tool Exercises.** One Video Tool Exercise per chapter in the eText edition offers students an opportunity to engage with chapter content further. These activities consist of a video accompanied by short-answer questions to promote deeper understanding of key concepts.

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

**Instructor’s Resource Manual**

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

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

About the Author iv  
Preface v  

### 1  Clinical Framework: *Basic Terms and Concepts*

Communication, Speech, and Language  
Disorders of Communication, Speech, and Language  
Articulation and Speech Sounds (Phones): Phonology and Phonemes  
Defining Speech Sound Disorders: Articulation and Phonological Disorders  
Classifying Speech Sound Disorders  
Subtypes and Etiological Factors: Speech Disorders Classification System  
Examining Error Patterns: The Differential Diagnosis System  
Summary 15  •  Case Studies 15  •  Think Critically 16

### 2  Articulatory Phonetics: *Speech Sound Form*

Phonetics: Definitions and Classification  
Anatomical-Physiological Review of the Foundations of Speech Production  
The Respiratory System  
The Phonatory System  
The Resonatory System  
The Articulatory System  
Vowels Versus Consonants  
General American English Vowels: Descriptive Parameters  
Front Vowels  
Back Vowels  
Central Vowels  
Diphthongs  
General American English Consonants: Descriptive Parameters  
Sounds in Context: Coarticulation and Assimilation  
Syllable Structure  
Clinical Significance  
Summary 43  •  Case Study 43  •  Think Critically 44

### 3  Phonetic Transcription and Diacritics*

Phonetic Transcription as a Notational System  
The Use and Value of Phonetic Transcription for Speech-Language Therapists  
Defining Diacritics  
Diacritics Used with Consonants  
Diacritics Used with Vowels  
Diacritics for Stress, Duration, and Syllable Boundaries  
Additional Symbols  
Clinical Implications  
Summary 68  •  Case Study 68  •  Think Critically 69

### 4  Theoretical Considerations and Practical Applications*

The Evolution of the Phoneme Concept  
How Did the Concept of the Phoneme Develop?  
Speech Sound Versus Phoneme: Form and Function as a Unity  
Distinctive Feature Theories  
How Do Distinctive Features Work?  
Generative Phonology  
How Does Generative Phonology Work?  
How Did Generative Phonology Develop?  
Naturalness, Markedness, and Implicational Universals  
Natural Phonology  
How Does Natural Phonology Work?  
How Did Natural Phonology Develop?  
Nonlinear Phonologies: Exemplified by Feature Geometry and Optimality Theory  
Feature Geometry  
Optimality Theory  

### 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

APPENDIX 2.2  Phonetic Symbols Used in Current Phonetic Transcription Texts 45
5 Normal Phonological Development 114

Aspects of Structural and Functional Development 116
Early Perceptual Development 118
Prelinguistic Stages: Before the First Words 121
- Vocoids: Nonphonemic Vowel-like Productions 124
- Contoids: Nonphonemic Consonant-like Productions 124
- Syllable Shapes 125
- Babbling and Its Relationship to Later Language Development 125
- Prosodic Feature Development 126
Transition from Babbling to First Words and the First-50-Word Stage 127
- The First-50-Word Stage 127
- Segmental Form Development 128
- Prosodic Feature Development 133
Consonant, Vowel, and Prosodic Development of the Preschool-Age Child 135
- Segmental Form Development: Vowels 135
- Segmental Form Development: Consonants 136
- Phonological Processes 139
- Prosodic Feature Development 142
Consonants, Consonant Clusters, and Prosodic Development of the School-Age Child 143
- Segmental Form Development 144
- Consonant Cluster Development 144
- Prosodic Feature Development 145
Phonological Awareness, Emerging Literacy, and Phonological Disorders 146

6 Assessment and Appraisal: Collection of Data 155

Guidelines for Assessment: Objectives of Appraisal and Diagnosis 157
Initial Procedures: Hearing Evaluation and Speech Mechanism Examination 159
- Initial Impression 159
- Procedures for a Hearing Screening 160
- Evaluation of the Speech Mechanism 161
- What to Look for When Evaluating the Speech Mechanism 162

Standardized Speech Assessments and Supplemental Testing 165
- Advantages and Disadvantages of Standardized Speech Assessments 165
- Factors to Consider When Selecting a Standardized Speech Measure 166
- Assessment Procedures to Supplement Standardized Speech Measures 170
- Organizing Standardized Speech Assessment Results: Describing the Error 170
- Stimulability Testing 172
- Contextual Testing 173
- Testing Multisyllabic (3-Plus Syllable) Words 173
- Spontaneous Speech Sample 174
- Organization of the Continuous Speech Sample 174
Selection of Additional Measures in Other Areas 177
- Language Screening 177
- Prosodic Screening and Testing 178
- Phonological and Phonemic Awareness Screening and Testing 178
- Cognitive Appraisal 180
- Assessment of a Child’s Communicative Participation 181
Special Considerations: A Child with Emerging Phonology 182
Special Considerations: A Child with Unintelligible Speech 187

APPENDIX 6.1 Speech-Motor Assessment Screening Form 192

7 Diagnosis: Summarizing Data and Classifying Speech Sound Disorders 196

Inventory, Distribution, and Stimulability of Speech Sounds 197
- Outcome Measures: Which Sounds the Child Can Produce, Which Sounds the Child Cannot Produce, and Stimulability 197
- What Do the Inventory, Distribution, and Stimulability Results Tell Us as Clinicians? 198
Phonemic Contrasts: Establishing a Phonemic Inventory 204
Phonemic Pattern Analysis: Phonological Processes 208
Classifying Speech Sound Disorders 211
- Articulation Disorder 211
- Phonological Delay 213
- Consistent Phonological Disorder 214
- Inconsistent Phonological Disorder 216
9 Therapy for Articulation Disorders: Obtaining an Accurate Production of a Speech Sound 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] 288
Misarticulations of [k] and [ɡ] 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 Speech 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
<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycles Phonological Remediation Approach</td>
<td>364</td>
</tr>
<tr>
<td>Inconsistent Speech Disorder and the Core Vocabulary Approach</td>
<td>369</td>
</tr>
<tr>
<td>The Metaphon Approach</td>
<td>373</td>
</tr>
<tr>
<td>Speech Sound Disorders with Concurrent Language Problems: The Treatment of Morphosyntax, Vocabulary, and the Child with Emerging Phonology</td>
<td>378</td>
</tr>
<tr>
<td>Connecting Phonology to Morphosyntax: Morphosyntax Intervention</td>
<td>378</td>
</tr>
<tr>
<td>Connecting Phonology to Semantics: Vocabulary Intervention</td>
<td>380</td>
</tr>
<tr>
<td>The Child with an Emerging Phonological System: Expanding the System and Vocabulary</td>
<td>381</td>
</tr>
<tr>
<td>Treatment of Multiple Vowel Errors</td>
<td>383</td>
</tr>
<tr>
<td>The Child with a Very Limited Vowel Inventory: Therapeutic Suggestions</td>
<td>384</td>
</tr>
<tr>
<td>The Child with a High Proportion of Vowel Substitutions: Therapeutic Suggestions</td>
<td>386</td>
</tr>
<tr>
<td>Summary</td>
<td>387</td>
</tr>
<tr>
<td>APPENDIX 10.1 Probes for Initial Consonant Clusters That Could Be Targets</td>
<td>389</td>
</tr>
<tr>
<td>APPENDIX 10.2 Probes for Monitoring Generalization or Therapy Progress</td>
<td>390</td>
</tr>
<tr>
<td>11 Speech Sound Disorders in Selected Populations</td>
<td>393</td>
</tr>
<tr>
<td>Childhood Apraxia of Speech: A Disorder of Speech Motor Control</td>
<td>394</td>
</tr>
<tr>
<td>Definition and General Features</td>
<td>394</td>
</tr>
<tr>
<td>Articulatory and Phonological Characteristics</td>
<td>395</td>
</tr>
<tr>
<td>Clinical Implications: Diagnostics</td>
<td>398</td>
</tr>
<tr>
<td>Clinical Implications: Therapeutics</td>
<td>400</td>
</tr>
<tr>
<td>Motor-Speech Disorders: Cerebral Palsy</td>
<td>403</td>
</tr>
<tr>
<td>Definition and General Features</td>
<td>403</td>
</tr>
<tr>
<td>Articulatory and Phonological Characteristics</td>
<td>404</td>
</tr>
<tr>
<td>Clinical Implications: Diagnostics</td>
<td>406</td>
</tr>
<tr>
<td>Clinical Implications: Therapeutics</td>
<td>407</td>
</tr>
<tr>
<td>Cleft Palate</td>
<td>409</td>
</tr>
<tr>
<td>Definition and General Features</td>
<td>409</td>
</tr>
<tr>
<td>Articulatory and Phonological Characteristics</td>
<td>410</td>
</tr>
<tr>
<td>Clinical Implications: Diagnostic</td>
<td>411</td>
</tr>
<tr>
<td>Clinical Implications: Therapeutics</td>
<td>414</td>
</tr>
<tr>
<td>Intellectual Disability (Intellectual Developmental Disorder)</td>
<td>417</td>
</tr>
<tr>
<td>Definition and General Features</td>
<td>417</td>
</tr>
<tr>
<td>Articulatory and Phonological Characteristics: General Information</td>
<td>418</td>
</tr>
<tr>
<td>Down Syndrome: General Information</td>
<td>418</td>
</tr>
<tr>
<td>Down Syndrome: Articulatory and Phonological Impairments</td>
<td>419</td>
</tr>
<tr>
<td>Clinical Implications: Diagnostics</td>
<td>419</td>
</tr>
<tr>
<td>Clinical Implications: Therapeutics</td>
<td>420</td>
</tr>
<tr>
<td>Hearing Impairment</td>
<td>423</td>
</tr>
<tr>
<td>Definition and General Features</td>
<td>423</td>
</tr>
<tr>
<td>Articulatory and Phonological Characteristics</td>
<td>424</td>
</tr>
<tr>
<td>Clinical Implications: Diagnostics</td>
<td>425</td>
</tr>
<tr>
<td>Clinical Implications: Therapeutics</td>
<td>425</td>
</tr>
<tr>
<td>Motor-Speech Disorders in Adults</td>
<td>428</td>
</tr>
<tr>
<td>Acquired Apraxia of Speech</td>
<td>428</td>
</tr>
<tr>
<td>The Dysarthrias</td>
<td>432</td>
</tr>
<tr>
<td>Summary</td>
<td>438</td>
</tr>
<tr>
<td>APPENDIX 11.1 Protocol for Assessing Respiration, Phonation, Resonation, and Articulation of Dysarthric Speech</td>
<td>440</td>
</tr>
<tr>
<td>Glossary</td>
<td>443</td>
</tr>
<tr>
<td>References</td>
<td>453</td>
</tr>
<tr>
<td>Index</td>
<td>477</td>
</tr>
</tbody>
</table>