Children's Speech

An Evidence-Based Approach to Assessment and Intervention

Sharynne McLeod • Elise Baker

THE INTERNATIONAL PHONETIC ALPHABET (revised to 2015)

CONSONANTS (PULMONIC)

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d		ʈ ɖ	c ɟ	k g	q ɢ		ʔ
Nasal	m	ɱ		n		ɳ	ɲ	ŋ	ɴ		
Trill	ʙ			r					ʀ		
Tap or Flap		ⱱ		ɾ		ɽ					
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ
Lateral fricative				ɬ ɮ							
Approximant		ʋ		ɹ		ɻ	j	ɰ			
Lateral approximant				l		ɭ	ʎ	ʟ			

Symbols to the right in a cell are voiced, to the left are voiceless. Shaded areas denote articulations judged impossible.

CONSONANTS (NON-PULMONIC)

Clicks	Voiced implosives	Ejectives
ʘ Bilabial	ɓ Bilabial	’ Examples:
ǀ Dental	ɗ Dental/alveolar	pʼ Bilabial
ǃ (Post)alveolar	ʄ Palatal	tʼ Dental/alveolar
ǂ Palatoalveolar	ɠ Velar	kʼ Velar
ǁ Alveolar lateral	ʛ Uvular	sʼ Alveolar fricative

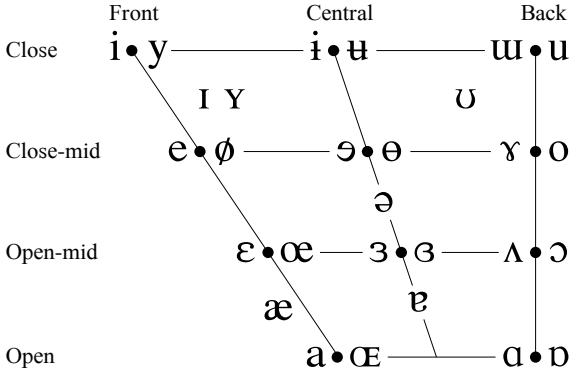
OTHER SYMBOLS

ʍ Voiceless labial-velar fricative
ɕ ʑ Alveolo-palatal fricatives
w Voiced labial-velar approximant
ɺ Voiced alveolar lateral flap
ɥ Voiced labial-palatal approximant
ʢ Simultaneous ʃ and x
ʜ Voiceless epiglottal fricative
ʡ Voiced epiglottal fricative
ʡ Epiglottal plosive

Affricates and double articulations can be represented by two symbols joined by a tie bar if necessary.

t͡s k͡p

VOWELS



Where symbols appear in pairs, the one to the right represents a rounded vowel.

SUPRASEGMENTALS

ˈ Primary stress ˌfoʊnəˈtɪʃən
ˌ Secondary stress
ː Long eː
ˑ Half-long eˑ
˘ Extra-short ĕ
| Minor (foot) group
‖ Major (intonation) group
. Syllable break ɹi.ækt
‿ Linking (absence of a break)

TONES AND WORD ACCENTS

LEVEL			CONTOUR		
é̋ or ˥	Extra high		ě or ˩˥	Rising	
é ˦	High		ê ˥˩	Falling	
ē ˧	Mid		e᷄ ˧˥	High rising	
è ˨	Low		e᷅ ˩˧	Low rising	
ȅ ˩	Extra low		ê ˥˩˧	Rising-falling	
↓	Downstep		↗	Global rise	
↑	Upstep		↘	Global fall	

DIACRITICS Some diacritics may be placed above a symbol with a descender, e.g. n̊ŋ̊

◌̥	Voiceless	n̥ d̥	◌̤	Breathy voiced	b̤ a̤	◌̪	Dental	t̪ d̪
◌̬	Voiced	s̬ t̬	◌̰	Creaky voiced	b̰ a̰	◌̺	Apical	t̺ d̺
◌ʰ	Aspirated	tʰ dʰ	◌̼	Linguolabial	t̼ d̼	◌̻	Laminal	t̻ d̻
◌̹	More rounded	ɔ̹	◌ʷ	Labialized	tʷ dʷ	◌̃	Nasalized	ẽ
◌̜	Less rounded	ɔ̜	◌ʲ	Palatalized	tʲ dʲ	◌ⁿ	Nasal release	dⁿ
◌̟	Advanced	u̟	◌ˠ	Velarized	tˠ dˠ	◌ˡ	Lateral release	dˡ
◌̠	Retracted	e̠	◌ˤ	Pharyngealized	tˤ dˤ	◌̚	No audible release	d̚
◌̈	Centralized	ë	~	Velarized or pharyngealized	ɫ			
◌̽	Mid-centralized	e̽	◌̝	Raised	e̝ (ɹ̝ = voiced alveolar fricative)			
◌̩	Syllabic	n̩	◌̞	Lowered	e̞ (β̞ = voiced bilabial approximant)			
◌̯	Non-syllabic	e̯	◌̘	Advanced Tongue Root	e̘			
◌˞	Rhoticity	ə˞ a˞	◌̙	Retracted Tongue Root	e̙			

Children's Speech

An Evidence-Based Approach to Assessment and Intervention

Sharynne McLeod
Charles Sturt University, Australia

Elise Baker
The University of Sydney, Australia

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Brief Contents

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Preface

Children's Speech: An Evidence-Based Approach to Assessment and Intervention is about children and a common communication difficulty—speech sound disorders. This book distills the world's research on speech sound disorders across the areas of speech acquisition, assessment, analysis, diagnosis, and intervention. It combines foundational knowledge and scientific evidence with practical knowledge to prepare speech-language pathologists (SLPs) to work with children and their families.

Our inspiration for this book stems from our passion for research to be accessible to students, clinicians, and faculty without compromising on academic rigor. It is based on our strong conviction that good clinical decisions are grounded in knowledge of empirical evidence underscored by theory and principles. It also comes from our desire for SLPs to work holistically with children and appreciate the impact that speech sound disorders can have on children's day-to-day activities and participation.

This book was shaped by the children and families we have worked with as SLPs, the students we have taught as university educators, and the children we have raised as parents. It is written for students and professionals of speech-language pathology, speech pathology, speech and language therapy, logopedics, and phoniatrics. This book may also be of interest to linguists, phoneticians, educators, audiologists, psychologists, physicians, doctors, and others who work with children with speech sound disorders. To this end, we hope the joy and inspiration we have experienced over many years in our various professional and personal roles translates to you across the text. We hope we instill in you a deep respect for empirical research, a passion to see every child as a unique individual, and a sense of excitement about the opportunity to make a difference in the lives of children and their families. As you read the pages of this text, we also hope you are inspired to think carefully and critically about the clinical decisions you make when working with children with speech sound disorders.

Text Philosophy and Organization

The content for this book was guided by two frameworks: evidence-based practice (EBP) (Dollaghan, 2007; Sackett, Rosenberg, Muir Gray, Hayes, & Richardson, 1996) and the International Classification of Functioning, Disability and Health—Children and Youth (ICF-CY) (World Health Organization, 2007). We use these two frameworks because we believe they help guide the successful management of speech sound disorders in children.

We have adopted Dollaghan's (2007) conceptualization of E^3BP. As part of E^3BP, you will learn that SLPs use expertise to make clinical decisions based on three sources of evidence: evidence from empirical research, evidence from day-to-day clinical practice, and evidence from client characteristics, values, and preferences. To this end, we provide you with comprehensive reviews of historical and current-day empirical research that underpins SLPs' clinical decisions. We do not try to simplify knowledge, but instead provide a breadth of views (that are sometimes conflicting) from different parts of the world so that you can make the best decision for each child and family you work with. We consider how you can generate and use your own evidence from clinical practice to guide clinical decisions. We also include detailed case-based data for five children, representing five different types of speech sound disorders: phonological impairment, articulation impairment, inconsistent speech disorder, childhood apraxia of speech, and childhood dysarthria. This information is included in the final chapter of this book (Chapter 16) as a resource for you to refer to as you learn about assessment, analysis, goal setting, intervention principles, plans, procedures, and approaches. These case studies will help you learn how to engage in EBP.

We have adopted the ICF-CY (World Health Organization, 2007) because it provides you with a way of thinking not only about the body structure (e.g., mouth, ears, and brain) and function (e.g., articulation, auditory perception, cognition), but the impact of an impairment on a child's activities and participation, the environmental barriers and facilitators, and personal factors relevant to individual children, such as age, gender, race, social background, education, and past and current experience.

We organized this text such that foundation knowledge is provided first. The foundation knowledge covers important topics such as children with speech sound disorders (Chapter 1), types of speech sound disorders (Chapter 2), anatomical structures (Chapter 3), articulation and transcription (Chapter 4), theoretical foundations of speech (Chapter 5), and speech acquisition (Chapter 6). Foundation knowledge is followed by practical, evidence-based knowledge that mirrors the stages of contact when working with children with speech sound disorders. These chapters address assessment (Chapters 7 and 8), analysis (Chapter 9), goal setting (Chapter 10), intervention principles and plans (Chapter 11), intervention procedures (Chapter 12), phonological interventions (Chapter 13), motor speech interventions (Chapter 14), and the conduct of EBP (Chapter 15). Case-based data is provided in Chapter 16. We deliberately organized the text in this way to help you appreciate the unfolding nature of the professional relationship between SLPs and children with speech sound disorders.

This is an international book. It not only includes information about English-speaking children and SLPs who live in the United States, it also includes information about English-speaking children and SLPs in countries such as Canada, the United Kingdom, Ireland, Australia, and New Zealand. Importantly, this book also goes beyond English, including information about the excellent work being undertaken by SLPs and researchers who speak Cantonese, French, German, Icelandic, Portuguese, Spanish, Swedish, Turkish, Vietnamese, and many other languages across the globe. Embedded within the book is a respect for cultural and linguistic diversity and the need to learn from children, families, and professionals who are multilingual or monolingual in languages other than English. We hope that you learn from the international speech-language pathology profession, and the children with speech sound disorders who are found across the world and speak many languages.

Pedagogical Elements

This book includes a range of unique pedagogical elements to facilitate your learning. Each chapter begins with a list of clearly specified **learning objectives**, **key words**, and an **overview** of the chapter. Each chapter ends with a concluding **summary**, **recommended reading**, **case application**, and **study questions**.

Throughout each chapter we include four types of boxes:

Comments: These boxes provide insights from our own clinical experience, observations about controversies in the field, or commentary about a particular issue.

Applications: These boxes provide you with an opportunity to stop reading and apply what you have learned. We encourage you to complete the application boxes—they will provide you an opportunity to develop a practical skill (e.g., analyze a speech sample, make a decision about an assessment result). The application boxes will also help you reflect on what you have learned and highlight what you need to learn more about in order to work with children with speech sound disorders and their families.

Children's insights: These boxes offer unique insights into what children think, do, draw, and say about their lives and living with speech sound disorders, and what they think about receiving speech-language pathology services. These boxes are designed to assist readers to engage in the lives of children with speech sound disorders and become reflective, compassionate clinicians. Listen to what children have to say. Consider children's insights so that you are ready to listen to the children you will work with.

Multicultural insights: These boxes provide you with knowledge, awareness, and confidence to with work with children and families from cultures different to your own.

These boxes remind you that you see the world and the children you work with through your own cultural lens and that as a communication specialist you need to be adept at understanding, respecting, and working with children from diverse cultures and linguistic backgrounds.

To conclude, the title of the book, *Children's Speech: An Evidence-Based Approach to Assessment and Intervention*, does not include terms such as speech sound disorders, articulation and phonological impairment, and other terms that focus on a problem. We have taken a person-first philosophy, foregrounding children and their ability to communicate and participate in society as the overarching focus of this book. We hope that your passion for making a difference in children's lives is fuelled by reading *Children's Speech: An Evidence-Based Approach to Assessment and Intervention*.

> Ui mai koe ki ahau he aha te mea nui o te ao,
> Māku e kī atu he tangata, he tangata, he tangata! (Māori proverb)
>
> *Ask me what is the greatest thing in the world, I will reply:*
> *It is people, it is people, it is people!*

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About the Authors

Sharynne McLeod, Ph.D., ASHA Fellow, Life Member SPA, CPSP /ʃæɹən məklæɔd/
Charles Sturt University, Australia

Sharynne McLeod is a speech-language pathologist and professor of speech and language acquisition at Charles Sturt University. She is an elected Fellow of the American Speech-Language-Hearing Association (ASHA) and a Life Member of Speech Pathology Australia. She is a board member of the International Association of Logopedics and Phoniatrics (IALP), Vice President of the International Clinical Linguistics and Phonetics Association (ICPLA), and was editor of the *International Journal of Speech-Language Pathology* (IJSLP), 2005–2013. She has received a Diversity Champion award from ASHA, an Australian Government Citation for Outstanding Contributions to Student Learning for her "sustained dedication, innovation and enthusiasm in university teaching that has had local, national and international impact," and teaching excellence awards from The University of Sydney and Charles Sturt University. Her coauthored books include *The International Guide to Speech Acquisition* (Cengage), *Interventions for Speech Sound Disorders in Children* (Paul H. Brookes), *Speech Sounds* (Plural), *Introduction to Speech, Language, and Literacy* (Oxford University Press), *Listening to Children and Young People with Speech, Language, and Communication Needs* (J&R Press), *Multilingual Aspects of Speech Sound Disorders in Children* (Multilingual Matters), and *Working with Families in Speech-Language Pathology* (Plural).

Professor McLeod's research focuses on monolingual and multilingual children's speech acquisition across the world. She applies the International Classification of Functioning, Disability and Health—Children and Youth (ICF-CY) (World Health Organization, 2007) to children with speech sound disorders, and she is listed as the only individual in Australia to have contributed to the development of the ICF-CY (WHO, 2007). Her research foregrounds the right of everyone (particularly children) to participate in society. Professor McLeod also researches the prevalence and impact of childhood speech sound disorders and links this to policy and service delivery issues. Professor McLeod has been topic chair and invited speaker at many ASHA conventions and has presented her research at conferences, professional associations, and universities in Australia, Canada, Greece, Hong Kong, Iceland, Ireland, Italy, Jamaica, New Zealand, Norway, Sweden, Turkey, Vietnam, the United Kingdom (England, Northern Ireland, Scotland), the United States, and Zambia. Additionally, she has visited and worked with children and families in Belgium, Fiji, France, Germany, Japan, and Tonga.

Elise Baker, Ph.D., CPSP /əliːs bæɪkɐ/
The University of Sydney, Australia

Elise Baker is a speech-language pathologist and senior lecturer with The University of Sydney. She is involved in the education and training of undergraduate and graduate speech-language pathology students, the supervision of graduate research students, and continuing education for qualified speech-language pathologists in her main area of interest: speech sound disorders in children. Dr. Baker has received awards for her excellence in teaching from The University of Sydney. She was the 2013 National Tour Speaker for Speech Pathology Australia and has served as a topic chair and invited speaker at ASHA conventions. Dr. Baker is passionate about knowledge translation and the importance of partnerships between speech-language pathologists and researchers in fostering knowledge generation, dissemination, and implementation. She nurtures this passion through service on the steering committee of a large, evidence-based practice network of practicing speech-language pathologists. Dr. Baker's research focuses on intervention for speech sound disorders in children, innovative service delivery solutions for children with speech sound disorder, speech-language pathologists' methods of practice with children who have speech sound disorders, and the conduct of evidence-based practice.

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Acknowledgments

Children's Speech: An Evidence-Based Approach to Assessment and Intervention has evolved over 20 years as we have worked with and learned from children and their families, our students, and colleagues around the world. We express gratitude and appreciation to all of these people who have shaped our understanding of ways to make a difference in the lives of children with speech sound disorders. In particular we would like to thank the anonymous reviewers and name the following people who have provided advice on specific chapters: Martin J. Ball, Kirrie Ballard, Caroline Bowen, Mark Cordato, Kathryn Crowe, Barbara Dodd, Leah Fabiano-Smith, David Fitzsimons, Brian A. Goldstein, Anne Hesketh, Lê Thị Thanh Xuân, Sarah Masso, Jane McCormack, Elizabeth Murray, Amelia Paterson, Ben Phạm (Phạm Thị Bền), Carol Kit Sum To, Sarah Verdon, A. Lynn Williams, and Yvonne Wren. We also thank students from Charles Sturt University (Bathurst and Albury, Australia), The University of Sydney (Sydney, Australia), Temple University (Philadelphia, PA), East Tennessee State University (Johnson City, TN), and Phạm Ngọc Thạch University of Medicine (supported by the Trinh Foundation in Ho Chi Minh City, Viet Nam), who have provided feedback on our teaching and explanations of the evidence underpinning our work with children and their families. Thanks also go to the children and adults who have allowed us to include their photographs, drawings, and insights, including Emily and Alex Wray, and Ookeditse Phaswana. Finally and most importantly, we acknowledge the constant support and encouragement of our families. Sharynne thanks David, Brendon, and Jessica. Elise thanks Michael, Harrison, and Adelaide.

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1

Children with Speech Sound Disorders

KEY WORDS

Speech sound disorders (SSD)

Prevalence, natural history

Longitudinal studies: Templin Longitudinal Study, Ottawa Language Study, Cleveland Family Speech and Language Study

Impact of SSD: educational, social, occupational

Risk and protective factors: child factors (sex, pre- and postnatal factors, oral sucking habits, psychosocial behaviors and temperament, minority status, race, and languages spoken), parent factors (family history of speech and language problems, maternal and paternal education level), family factors (socioeconomic status, family size and birth order)

Evidence-based practice: research evidence, clinical expertise, client values and preferences

LEARNING OBJECTIVES

1. Define the term *speech sound disorders* (SSD).
2. Outline the prevalence of SSD and the proportion of children with SSD on SLPs' caseloads.
3. Document the natural history of SSD and describe longitudinal studies of children with SSD.
4. Describe the impact of SSD from the perspectives of children, their parents, teachers, adults, and society.
5. List the risk and protective factors associated with SSD of unknown origin.
6. Provide a brief description of the components of evidence-based practice.

Overview

Children are important. They are the future of our world. They also contribute and belong to our communities now, before they grow up. Children need to communicate successfully to form relationships and interact with people within their family, school, and communities. Children's ability to communicate successfully also forms their foundation to learn to read, write, find employment, and contribute to society. Within a few short years, most children learn to speak intelligibly, pronouncing the consonants, vowels, and words that are appropriate for the languages and dialects that they are exposed to so that they can be competent communicators. However, some children have difficulty learning to speak. This book is about these children.

Children with speech sound disorders (SSD) have speech difficulties compared with their peers and include:

- those who have difficulty producing one or two speech sounds;
- those who have difficulty organizing and producing groups of speech sounds;
- those who have extremely unintelligible speech;
- those who have difficulty producing multisyllabic words such as *ambulance* and *hippopotamus*;
- those who have difficulty perceiving differences between speech sounds; and
- those who have difficulty with prosody (stress, rhythm, intonation) and tones.

These children often present with difficulties that are more complex than we first assume. For example, sometimes children can't use sounds in words that match the adult pronunciation (e.g., children may pronounce the /θ/ in *thing* /θɪŋ/ as [f] in *fing* [fɪŋ]) but can use these same sounds in words that do not match the adult pronunciation (e.g., pronounce the /s/ in *sing* /sɪŋ/ as [θ] in *thing* [θɪŋ]). Therefore, their difficulties do not necessarily arise from their inability to articulate sounds, but to perceive and organize sounds in their minds.

Children's ability to participate within the communities in which they belong is impacted by SSD. The extent of this impact may depend on the severity and nature of the SSD as well as the environmental and personal factors specific to the child. Figure 1-1 shows six drawings created by different preschool children with SSD after being asked to draw themselves talking to someone (McLeod, Harrison, Holliday, McCormack, & McAllister, 2010). These drawings demonstrate that the children are aware of the importance of mouths (row 1), ears (row 2), and proximity to one another (row 3) during communication. In most of the drawings, the children have drawn themselves as happy. Some indicated that they needed people with "listening ears" to be able to be understood (cf. McCormack, McLeod, McAllister, & Harrison, 2010). The final drawing in Figure 1-1 demonstrates one child's isolation and withdrawal from social situations. He indicated that he had to draw himself alone because "they don't let me play," possibly due to his SSD. Difficulties with speech production may impact children's socialization and literacy (McCormack, McLeod, McAllister, & Harrison, 2009). Difficulties with speech production may resolve in childhood, particularly after intervention; however, difficulties may continue into later childhood and adulthood (Law, Boyle, Harris, Harkness, & Nye, 1998), and may impact the ability to gain employment (Ruben, 2000).

This book draws on the principles of evidence-based practice to assist you to incorporate the research data with information about children and their families into your own clinical practice. Children with SSD form a large portion of the caseload of typical pediatric speech-language pathologists (SLPs), so it is likely that you will encounter many children with SSD in your practice. Indeed, in a US study of 6,624 pre-K students enrolled in speech-language pathology services across 25 states, 74.7% of students were receiving services for "articulation/intelligibility" (Mullen & Schooling, 2010). We will discuss the prevalence of children with SSD in greater detail later in this chapter; however, even these data demonstrate that as an SLP it is very likely that you will assess and provide intervention for many children with SSD.

FIGURE 1-1 Preschool children with speech sound disorders drawing themselves talking to someone

Notice the mouths (row 1), ears (row 2), and proximity to one another (row 3).

Source: Used by permission from Sharynne McLeod. Copyright 2012 by S. McLeod, L. McAllister, J. McCormack, & L. J. Harrison.

***COMMENT:** Reasons for knowing about children with SSD*

Understanding the population of children with SSD provides ways to:

- characterize features of SSD;
- explain SSD to parents and teachers;
- predict children at risk of having an SSD;
- design appropriate assessment and intervention strategies; and
- ultimately work towards the prevention of SSD (Shriberg & Kwiatkowski, 1994).

***APPLICATION:** Introducing Luke (4 years, 3 months)*

Throughout almost every chapter of this book we consider case descriptions of five children with SSD: Luke (4;3 years), Susie (7;4 years), Jarrod (7;0 years), Michael (4;2 years), and Lian (14;2 years). The full case studies are provided in Chapter 16. As a way of introducing the field of SSD to you and helping you remember that you are learning about children (and not just a difficulty that children can have), read the overview to Chapter 16 and Luke's case history. Write a reflection about Luke's case history. What did you learn about Luke? Write down your questions. What are some terms that you don't yet understand? Compare your written reflection with a peer. You will learn more about Luke and the other four children as you read through the pages of this book and complete application exercises.

Read more about Luke (4;3 years), Susie (7;4 years), Jarrod (7;0 years), Michael (4;2 years), and Lian (14;2 years) in Chapter 16.

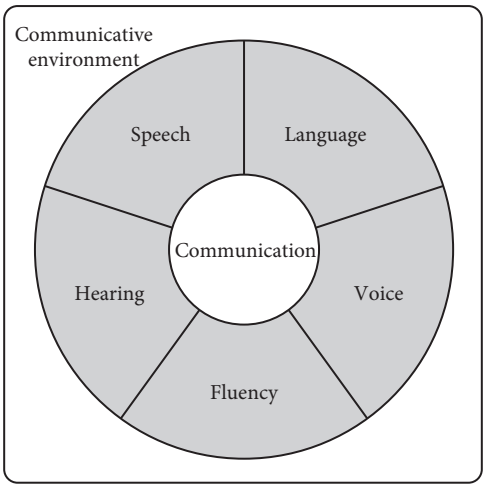
Defining SSD

Communication can be divided into the domains of speech, language, voice, fluency, and hearing (see Figure 1-2). Difficulties with communication can manifest as SSD, language disorders, voice disorders, stuttering, or hearing impairment. Some children have difficulties in one of these domains; others have difficulties across these domains. Successful communication is mediated by the communicative environment (e.g., listener characteristics and attitudes, language(s) spoken, level of background noise) that is shown in Figure 1-2 as surrounding the elements of communication.

SSD is a subcategory of communication impairment. According to the International Expert Panel on Multilingual Children's Speech (2012):

> Children with speech sound disorders can have any combination of difficulties with **perception**, **articulation/motor production**, and/or **phonological representation** of speech segments (consonants and vowels), **phonotactics** (syllable and word shapes), and **prosody** (lexical and grammatical tones, rhythm, stress, and intonation) that may impact speech **intelligibility** and **acceptability** . . . speech sound disorders is used as an umbrella term for the full range of speech sound difficulties of both known (e.g., Down syndrome, cleft lip and palate) and presently unknown origin. (International Expert Panel on Multilingual Children's Speech, 2012, p. 1, emphasis added).

FIGURE 1-2 Components of communication



This definition is comprehensive and inclusive, so it will be used within the current book; however, it is important to note that other authors have slightly different definitions. For example, Bowen (2015) stated, "Children with SSD have gaps and simplifications in their speech sound systems that can make what they say difficult to understand . . . the children's speech difficulties can encompass a mixture of phonetic (articulatory), phonemic (phonological or cognitive-linguistic), structural (craniofacial or syndromic), perceptual, or neuromotor bases" (p. 3). Lewis et al. (2006) included a statement about severity in their definition of SSD: "a significant delay in the acquisition of articulate speech sounds" (p. 1294).

The *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) also includes a definition of SSD that may be used by SLPs, particularly when coding children's areas of difficulty for health and insurance reporting. DSM-5 was developed by the American Psychiatric Association (2013) in consultation with mental health and medical professionals and members of the public. The American Speech-Language-Hearing Association also provided advice to the American Psychiatric Association on categories relating to communication. The fifth edition includes the term "speech sound disorder," replacing the term "phonological disorder" that was used in the fourth edition (DSM-IV, American Psychiatric Association, 2000), in concert with the trends within the speech-language pathology profession. According to the DSM-5 there are a number of components to the classification of SSD:

1. Persistent difficulty with speech sound production that interferes with speech intelligibility or prevents verbal communication of messages.
2. The disturbance causes limitations in effective communication that interfere with social participation, academic achievement or occupational performance, individually or in any combination.
3. Onset of symptoms is in the early developmental period.
4. The difficulties are not attributable to congenital or acquired conditions such as cerebral palsy, cleft palate, deafness or hearing loss, TBI [traumatic brain injury], or other medical or neurological conditions (American Psychiatric Association, 2013, p. 44).

There is one important difference between the DSM-5 definition of SSD and the definition used in this book. Within the current book children with SSD of known origins (e.g., cerebral palsy, cleft palate) are included in the definition of children with SSD; in the DSM-5 they are not.

Another international organization has included SSD in their most recent classification system. The World Health Organization has included SSD in the beta draft of the International Statistical Classification of Diseases and Related Health Problems 11th Revision (ICD-11 Beta Draft, World Health Organization, 2015a, to be finalized in 2017). ICD-11 has included "7A10 developmental speech sound disorder," replacing "F80.0 Specific speech articulation disorder" that was used in ICD-10 (World Health Organization, 2015b). This revision of the ICD-11 was developed in consultation with SLPs from around the world. The revised definition is:

> Developmental speech sound disorder is characterized by difficulties in the acquisition, production and perception of speech that result in errors of pronunciation, either in number or types of speech errors made or the overall quality of speech production, that are outside the limits of normal variation expected for age and level of intellectual functioning and result in reduced intelligibility and significantly affect communication. The errors in pronunciation arise during the early developmental period and cannot be explained by social, cultural, and other environmental variations (e.g., regional dialects). The speech errors are not directly attributable to a hearing impairment or to a structural or neurological abnormality. (World Health Organization, 2015a)

As with the DSM-5, the ICD-11 definition aligns closely with the definition used in this book. However, it does not include children with SSD of known origins (e.g., cerebral palsy, cleft palate), whereas these children are included in the definition of children with SSD in the current book.

Over the past century there have been many terms that have been used to describe the difficulties of children with SSD, including **articulation**, **phonological** or **speech**

delay, **disorder**, **impairment**, or **difficulty**. To assist your reading of other texts and journal articles, Table 1-1 provides a summary of some of the terms that have been used within the speech-language pathology literature that are synonymous with SSD. It should be noted that authors use some of these terms to refer to specific subgroups of children with SSD, while other terms are broad-based and refer to all children who have difficulty with speech sounds. Sometimes authors include difficulties with **voice** and **stuttering (fluency)** under the label of speech disorders; however, in this book voice and stuttering are not included. The word *sound* has been inserted in the middle of the term SSD to avoid confusion with information about speech disorders that includes voice and stuttering (fluency). You will learn more about the different types of SSD addressed in this book in Chapter 2.

***COMMENT:** A simple representation of SSD*

Children with SSD can have difficulty with:

- phonological representation and mental organization of speech [MIND];
- motor production/articulation of speech [MOUTH];
- perception of speech [EARS]; and
- intelligibility and acceptability of speech [ENVIRONMENT].

***APPLICATION:** Listen to a child with SSD*

At this early stage within the book, it is useful to consider a child with SSD. Jarrod is a 7-year-old child who had a severe SSD and is profiled as a case study in Chapter 16. A scientific forum within the *International Journal of Speech-Language Pathology*[1] was based around Jarrod (McLeod, 2006a). Within the scientific forum, a range of different assessments was undertaken (we will learn more about speech assessments in Chapter 8), then international experts considered his speech and results from assessments and generated intervention plans (we will learn about how to set goals in Chapter 10). The researchers' overarching goals for Jarrod were similar and included increasing his intelligibility and literacy skills. However, the specific goals differed and included ability to produce weak syllables (Bernhardt, Stemberger, & Major, 2006), correct tongue placement for /t, d/ using electropalatography (Müller, Ball, & Rutter, 2006), to produce /spɹ-/consonant clusters (Morrisette, Farris, & Gierut, 2006), to produce final consonants (Hodson, 2006), and to reduce inconsistency in production of words (Dodd, Holm, Crosbie, & McIntosh, 2006). A full comparison of the goals is provided in McLeod (2006a). One group of researchers worked with Jarrod using the Core Vocabulary approach and demonstrated improved speech outcomes (Crosbie, Pine, Holm, & Dodd, 2006). You will learn about a range of different intervention strategies in Chapters 13 and 14. You can see short videos of Jarrod talking and undertaking speech and oromotor assessments within the supplementary material attached to the editorial at the Taylor & Francis Online website.[2] For example, the video showing Jarrod engaging in conversational speech includes Jarrod's description of a movie he had enjoyed. Can you understand his speech? Could the assessor understand his speech? Did he use strategies to make himself better understood? This example of Jarrod shows you the range of information you are going to learn about in this book.

Read more about Jarrod (7;0 years), a boy with inconsistent speech disorder, in Chapter 16 (Case 3).

[1]http://www.tandfonline.com/toc/iasl19/8/3#.Vq6yVLQWpXs

[2]http://www.tandfonline.com/doi/suppl/10.1080/14417040600861086#tabModule

TABLE 1-1 Examples of terminology used within speech-language pathology literature to describe children with SSD

Category	Terms used in this book	Term	Authors who have used this term
Overarching terms	Speech sound disorders (SSD)	Speech sound disorders (SSD)	Lewis et al. (2015); Shriberg (2010a); Sices, Taylor, Freebairn, Hansen, & Lewis (2007); Smit (2004)
		Speech disorders	Williams (2003); Shriberg (2010a)
		Speech impairment	Dodd & Gillon (2001); Leitão & Fletcher (2004); McCormack et al. (2009); Roulstone, Miller, Wren, & Peters (2009)
		Speech disability	Broomfield & Dodd (2004a)
		Speech delay	Broomfield & Dodd (2004b); Shriberg, Tomblin, & McSweeny (1999)
		Speech difficulties	Wren, McLeod, White, Miller, & Roulstone (2013)
		Speech production difficulty	Beitchman et al. (1986a)
		Persistent speech disorder (PSD)[1]	Wren, Roulstone, & Miller (2012); Carrigg, Baker, Parry, & Ballard (2015); Wren (2015)
		Severe and persisting speech difficulties (SPSD)[1]	Newbold, Stackhouse, & Wells (2013)
		Persistent primary speech sound disorders[1]	Cleland, Scobbie, & Wrench (2015)
		Articulation/phonology disorder (APD)	Gibbon (1999); Shriberg, Tomblin, & McSweeny (1999)
		Developmental phonological disorders (DPD)[2]	Rvachew & Brosseau-Lapré (2012); Shriberg (1993)
		Childhood speech disorder	Keating, Turrell, & Ozanne (2001)
		Child speech disorders	Shriberg, Tomblin, & McSweeny (1999)
Phonology	Phonological impairment	Phonological delay	Broomfield & Dodd (2004b)
		Phonological disorder	Smit (2004); Sunderland (2004)
		Phonologically based speech sound disorders	Oliveira, Lousada, & Jesus (2015); Lousada, Jesus, Hall, & Joffe (2014)
		Consistent deviant phonological disorder	Broomfield & Dodd (2004b)
		Functional phonological disorders	Gierut (1998); Gierut & Morrisette (2010)
		Protracted phonological development	Bernhardt, Másdóttir, Stemberger, Leonhardt, & Hansson (2015); Hack, Marinova-Todd & Bernhardt (2012)
	Inconsistent speech disorder	Inconsistent deviant phonological disorder	Broomfield & Dodd (2004b); Peña-Brookes & Hegde (2015)
		Inconsistent phonological disorder	Dodd (2014)
		Inconsistent speech disorder	Dodd, Holm, Crosbie, & McIntosh (2006)

(*Continued*)

TABLE 1-1 *Continued*

Category	Terms used in this book	Term	Authors who have used this term
		Inconsistent deviant speech disorder	Bradford & Dodd (1996); Dodd (2005)
Motor speech	Motor speech disorders	Motor speech disorders	Maas et al. (2008); Mitchell (1995); Strand (2003); Weismer (2006)
		Motor speech disorders not otherwise specified	Shriberg, Fourakis et al. (2010a)
	Articulation impairment	Articulation delay	Broen, Strange, Doyle, & Heller (1983)
		Articulation disorder	Broomfield & Dodd (2004b); Sunderland (2004)
		Functional articulation disorder	Shriberg, Tomblin, & McSweeny (1999)
		Residual error	Shriberg, Austin, Lewis, McSweeny, & Wilson (1997b); Smit (2004)
		Residual /ɹ/ misarticulation	Hitchcock & McAllister (2015)
		Speech errors (SE-/s/ and SD-/ɹ/)	Shriberg, Lohmeier, Strand, & Jakielski (2012); Vick et al. (2014)
		Common clinical distortions	Shriberg (1993); Wren, McLeod, White, Miller, & Roulstone (2013)
		Phonetic disorder	Hewlett (1985)
	Childhood apraxia of speech (CAS)	Childhood apraxia of speech (CAS)	Ballard, Robin, McCabe, & McDonald (2010); Morgan & Vogel (2008a); Murray, McCabe, Heard, & Ballard (2015); Shriberg, Potter, & Strand (2011); Teverovsky, Bickel, & Feldman (2009)
		Developmental dyspraxia	Hall (1992); McCabe, Rosenthal, & McLeod (1998)
		Developmental apraxia of speech	Blakeley (2001)
		Developmental verbal dyspraxia	Adegbola, Cox, Bradshaw, Hafler, Gimelbrant, & Chess (2015); Royal College of Speech and Language Therapists (2011); Stackhouse (1992); Stackhouse & Snowling (1992a, b)
	Childhood dysarthria	Dysarthria	Enderby (2014); Morgan & Vogel (2008b); Pennington, Miller, & Robson (2009); Oommen & McCarthy (2014)
		Developmental dysarthria	Hodge (2010)
		Childhood dysarthria	Levy (2014); Murdoch (1998)
		Pediatric dysarthria	Levy, Ramig, & Camarata (2012)

[1]Persistent speech disorder is included here as an overarching term for speech difficulties that is persistent beyond approximately 8 years. It is not intended as an overarching term for a speech disorder at any age.

[2]Developmental phonological disorders (DPD) is included as an overarching term in keeping with use by Rvachew and Brosseau-Lapré (2012) and Shriberg (1993).

***COMMENT:** Historical changes in terminology*

Terminology surrounding SSD can be confusing. Not only do different authors use different terms, but the same authors may use a different term to mean the same group of children depending whose theoretical frameworks underpin the particular paper they are writing, the country their paper was published in (e.g., US versus UK), or whether they were writing in the 1900s or 2000s. Over time, the terminology to describe children's speech difficulties has changed (Bowen, 2009). Historically, all children were described as having articulation delay/disorder/impairment; that is, difficulty producing consonants and vowels. Then it was realized that children produced patterns of errors; for example, some children deleted all final consonants from words. So, many children did not have a simple articulation delay/disorder/impairment, but a phonological delay/disorder/impairment that required an appreciation of children's phonological knowledge. The introduction of phonology introduced a dichotomy in the categorization of children's speech difficulties. In the 1980s and 1990s, the term **articulation disorder** was classified as a subset of a speech disorder and **phonological disorder** was considered a subset of a language disorder. More recently, the field has appreciated the complexity of children's speech difficulties. The overarching term **SSD** has been adopted to encompass both articulation and phonology.

The term SSD has been selected to be used within this book because it is an umbrella term for the full range of speech sound difficulties; it is theoretically neutral, and accessible to an international audience. The American Speech-Language-Hearing Association has adopted the use of the term (e.g., ASHA, 2004), and Shriberg (2010a) describes the importance of this consensus:

> The American Speech-Language-Hearing Association's recent adoption of the term *speech sound disorders* (SSD) is a welcome solution to the constraints associated with the *articulation disorders versus phonological disorders* dichotomy of the past three decades. The term SSD provides a theory-neutral cover term for researchers and clinicians who may, as I do, view SSD as a complex neurodevelopmental disorder. The term *childhood* (or in medical contexts, *pediatric*) *speech sound disorders*, which parallels *childhood language disorders*, unifies the study of speech sound disorders of both known (e.g., Down syndrome, cleft palate) and presently unknown origin. (Shriberg, 2010a, p. 2)

In Chapter 2 you will learn more about different types of SSD, and how there are other ways to classify children with SSD, depending on the purpose of classification.

Prevalence and Impact

The next section of this chapter addresses the number of children with SSD, and the impact of SSD on children's lives: now when they are children, and into the future as they move through adolescence into adulthood. You will learn about the life histories of children with SSD including some research on the likely outcomes with and without intervention. This information will be useful as you talk with children and families about the possible impact of SSD on their educational, social, and occupational outcomes. This information will also be useful when you advocate to governments, departments, and managers for additional funding, staffing, and resources, since you will learn about the high prevalence of children with SSD in communities, schools, and SLP clinics. While this chapter presents information from published research, it is important to remember that every child is unique. Personal and environmental factors, including their context, background, and support structures, will influence each child's outcome. Use this information to promote optimistic futures for children with SSD.