

# Assessing Listening and Spoken Language in Children With Hearing Loss

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# Preface

Over the past few decades, we have seen medical treatments described as “miracles” become standards of care. The widespread adoption of universal newborn hearing screening (UNHS) has opened the doors for so many children with hearing loss and their families. Because of earlier identification of hearing loss, these children can receive advanced hearing technology—such as digital hearing aids—within the first days or weeks of life. Digital hearing aids allow access to environmental sounds and spoken language unlike ever before. And when digital hearing aids cannot provide enough benefit, cochlear implants can take children from a world of mostly silence to hearing laughter, music, and, most importantly, their parents’ or caregivers’ voices. All of these advances are taking place within the framework of a very complex healthcare system that can be challenging for everyone involved. However, one advantage that the management of pediatric hearing loss has over other healthcare areas is the collaborative nature that most professionals support and the range of resources available.

## THE NEED FOR THIS BOOK

Our goal in writing this book is to equip you with the knowledge, insights, strategies, and tools that will enable you to provide evidence-based practices when assessing the communication abilities of children with hearing loss. To adequately assess any child with hearing requires the cooperation of the child’s family and col-

laboration with a range of professionals. While most of healthcare practices today reside in “silos” where each discipline practices its area of expertise with little or no awareness of what others are doing, pediatric hearing loss is different. We are ahead of the curve in working collaboratively with other disciplines, but there is always room for improvement.

This book evolved out of the 2010 *OPTIONSchools, Inc.* meeting in Memphis, Tennessee in which there were teachers of the deaf and hard of hearing, speech-language pathologists, audiologists, lawyers, and psychologists present. A survey was conducted on the assessments completed by all of the schools. The survey revealed that these programs used a total of 66 measurements to assess listening, speech, language and cognition in the children they were serving. It was surprising, to say the least, that such a variety of instruments was used. This survey also raised many questions! Programs wanted to know why certain measures were being used, what the measures assess, whether the measures were valid, and so forth. From these questions, a resource guide was created. *OPTIONSchools, Inc.*, has graciously agreed to share this wonderful resource in this book (see Appendix A).

Another reason for this book is that we often hear: “Is it necessary to have all these tests, assessments, and evaluations?” “Why does my child have to be re-evaluated so frequently?” “We already have the diagnosis of hearing loss, why do we need to go to \_\_\_\_\_?” [Fill in the blank—genetics, ophthalmology, psychologist, family support group, early

intervention, etc.]. So, we answer with a question: “How do you start, or modify, intervention if you don’t have an assessment that drives the plan?”

Finally, university training programs, especially those in deaf education, speech-language pathology, and audiology, have not changed quickly enough in light of the increased complexity of hearing health care. It is nearly impossible to cover all of the topics relevant to our areas of study as evidence-based practices, service delivery models, and treatment approaches continue to evolve due to new advancements in technology, systems, and research. Our university training programs continue to be 1, 2, or 4 years—depending on the discipline. Curricula have changed but not the number of credit hours. One noted difference is that audiology changed from a 2-year master’s program to a 4-year clinical doctorate as the terminal degree. Perhaps speech-language pathology will follow and will soon—within the next decade—require a clinical doctorate prior to licensure and certification. We hope that this text will help to augment the training of new graduates who are starting their careers as well as add to the knowledge of seasoned professionals who now find themselves serving children with hearing loss who are learning to listen and use spoken language.

### TO OUR AUDIENCE

*Assessing Listening and Spoken Language in Children With Hearing Loss* is relevant to administrators, government agencies, university training programs, teachers of the deaf and hard of hearing, special needs teachers, regular education teach-

ers, audiologists, speech-language pathologists, psychologists, and physicians. The content is applicable to multiple settings, including but not limited to, community speech and hearing centers, university training programs, hospitals, outpatient practices, private practices, state agencies, and most importantly, early intervention, preschools, and elementary through high school educational programs. The wide applicability of this book’s content is in keeping with the principle that care is provided through a complex system of sites, services, and relationships, and that we must work together to ensure the best possible outcome for the child and family we are serving.

### DESCRIPTION OF CONTENTS

The book is divided into three parts: Foundations in Assessments, Assessments, and Beyond the Assessments: Components to Consider. We are grateful to the outstanding contributing authors who gave their time to share their knowledge and expertise about best practices, which are based on the research and evidence available at this time of publication. For each chapter, there are key points to guide the reader, words that are bold can be found in the glossary, and resources mentioned are listed in the back of the book.

#### ■ Chapter 1: Assessing a Child With Hearing Loss: Past, Present, and Future

The focus of this chapter sets the stage for the various evaluations that a child will have and the importance of having a multidisciplinary, interprofessional team.

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- **Chapter 2: Assessment Tools: Evaluating Our Measurements**  
This chapter covers standardized and norm referenced tests, criterion referenced tests, reliability, validity, and questionnaires. This chapter helps the reader understand how to select a test that assesses what he or she needs based on the child's functioning at the time.
  - **Chapter 3: Medical Assessment**  
This chapter provides an overview of the medical workup that a child may undergo following the diagnosis of hearing loss, including genetics, ophthalmology, and otolaryngology.
  - **Chapter 4: Auditory Assessments**  
The auditory assessments chapter covers objective and behavioral testing, understanding the audiogram, assessing functional listening, and provides suggestions for monitoring hearing status.
  - **Chapter 5: Speech Production Assessment**  
Evaluating speech production is critical to developing spoken language. This chapter discusses an effective process for evaluating vocalizations and a child's development of speech, and the chapter also includes, for the first time in print, a new tool for assessing speech production, *The Paterson-Cole Phonologic Evaluation Procedure, (PC-PEP)*.
  - **Chapter 6: Language Assessment of Children With Hearing Loss**  
This chapter provides an overview of the process of selecting receptive and expressive language assessments, how some can be modified without invalidating the results, specific adaptations that may be used—in some cases—that may be necessary. The chapter ends with a comprehensive assessment protocol that can be used to accurately evaluate the language performance of any child with hearing loss.
  - **Chapter 7: Psychoeducational Assessment**  
Understanding the psycho-educational component is essential in setting realistic expectations with the family and educational programming. This chapter provides an overview of psychoeducational assessments provided to children with hearing loss.
  - **Chapter 8: Literacy Assessment**  
Reading is an auditory task. This chapter provides the framework in which a child needs to develop literacy skills and how to assess the child with hearing loss in mastering these skills.
  - **Chapter 9: Assessment of the Listening Environment**  
Assessing the listening environment in the home, child care setting, and/or educational environment is critical to ensure that the child has auditory access to spoken language. In adverse listening environments, children exert more energy trying to listen and may be accused of being distracted and "not listening" when the environment is not conducive to auditory learning.
  - **Chapter 10: Hearing Aid Assessment**  
Assessing the functioning of the hearing aids is key to ensuring the child has access to environmental
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sounds and spoken language. This chapter focuses on how hearing aids should be programmed based on evidence-based practices and red-flags for when the hearing aids may not be performing as needed.

■ Chapter 11: Cochlear Implants Assessment

As FDA guidelines continue to change, more people are electing to receive cochlear implants to improve their hearing. This chapter addresses candidacy, assessments of the cochlear implant system, and red flags for when the cochlear implant may be not performing as expected.

■ Chapter 12: Supporting Families Through the Assessment  
Family-centered care is paramount to the success of the child learning to listen and use spoken language. This chapter discusses how professionals can provide appropriate family support through a family-centered care perspective and what that looks like in today's practice.

■ Chapter 13: Assessment Considerations for Children With Hearing Loss Who Are Culturally and Linguistically Diverse  
Although the most prominent language in the United States is English, the US is not a monolingual country. This chapter describes special considerations speech-language pathologists, audiologists, and educators should take into account when evaluating the speech and language of non-English-speaking children.

■ Chapter 14: From Assessment to Intervention  
Putting the pieces together in the

development of an intervention or treatment plan is always a difficult task. This chapter provides general guidelines for professionals to consider when interpreting their test results and formulating appropriate short and long term goals.

### EVOLVING TERMINOLOGY

How do you describe a child who has additional needs and/or diagnoses? We all have been taught that we are a person first before anything. Through the years, we have heard terms like *deaf child* or *deaf and hard of hearing child*, and more recently—a child who is deaf or hard of hearing, a child with hearing impairment, or a child with hearing loss. By taking a lesson from Dr. Karen Anderson, we chose to use the term *child with hearing loss* for this book. As Dr. Anderson has shared, the terms *deaf* and *hard of hearing* do not necessarily relate to audiometric thresholds (mild, moderate, severe, or profound). Functional hearing varies regardless of what the unaided thresholds or real ear measurements reveal. A person's identity comes from within that person and their supporting environment. Kent (2003) revealed that the majority of students with hearing loss (55.8%) did not self-identify as having a hearing disability. The choice of wording of *children with hearing loss* for this book was not a trivial matter. We acknowledge that the Deaf Community has experienced no loss, and we also do not wish to reinforce the notion that we are trying to "fix" a child with hearing loss. In light of research revealing that more children are born into a family with normal hearing (Mitchell & Karchmer, 2004), more

families are choosing listening and spoken language (Alberg, Wilson & Roush, 2006), and how children are identifying themselves only as persons with a “hearing problem” (Kent, 2003), we elected to use the term, *child with hearing loss*.

Another terminology note is that we also elected, in most cases, to use the word *family* instead of *parent* or *parents*. This is an attempt to include all the significant people who care for the child: aunts, uncles, cousins, grandparents, parents, adopted parents (i.e., forever parents), foster parents, siblings, and neighbors. There are a few places where parent is used due to the context of the sentence. Please note that we still mean to include all the people who care for and support the child with hearing loss.

In closing, we are pleased to share this incredible resource with you. While it is focused on assessment of children with hearing loss, many of the diagnostic principles and strategies discussed apply to other children with special needs or unique diagnoses. While it is impossible to provide all of the information needed on the topic of assessment of listening and spoken language in a single text, we do know that the information provided will be invaluable to those professionals who are serving children with hearing loss and their families. Assessment guides intervention, and without comprehensive

diagnostic processes, children with hearing loss may not receive the appropriate intervention, treatment, or educational support that meet their specific communicative or learning needs. Through assessment and ongoing data collection and performance tracking, professionals can ensure that each intervention or treatment session is designed to facilitate the child’s listening, speech, language, cognition, and conversational competence. Intervention tailored to individual learning needs maximizes outcomes; and, as professionals, we all want the children with hearing loss we are serving to reach their fullest potential. It all starts with assessment.

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## CHAPTER 1

# Assessing a Child With Hearing Loss: Past, Present, and Future

*Tamala S. Bradham, K. Todd Houston, and Allan O. Diefendorf*

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### KEY POINTS

- Assessments are completed based on the family's concerns, to provide a diagnosis, and to develop treatment options for the family to consider. Assessments are necessary to formulate appropriate intervention models.
- Hearing and hearing-related conditions are a healthcare priority.
- To move forward in the new era of health care, understanding the evolution of early hearing loss detection and intervention (EHDI) is essential. Learning from the past moves the profession forward in providing efficient, evidence-based care.
- Transformational changes occurring in health care today as a result of changes in reimbursement are striving to be more patient-centered, equitable, timely, safe, effective, and efficient.
- Tomorrow's healthcare system will be transparent, accessible, and innovative. If you can dream it, then it can happen.
- The assessments for children with hearing loss require an

interdisciplinary team to assess medical factors, developmental, hearing, speech, language, listening/speech perception, conversational competence/pragmatics, cognition, and literacy.

Think about the last time you took a test. Maybe it was a college final exam, a test for state licensure, or a recent medical evaluation. Recall how you felt about taking that test, or being examined: are you like Hermione Granger from *Harry Potter* who was disappointed when final exams were cancelled or do you get anxious or worry about how well you did? For most individuals, it is probably the latter. Then, on top of it, after you take the test, you have to wait for the grade or results. So, why are there tests and assessments? What is the purpose? What are we trying to achieve?

### INTRODUCTION

To effectively address the concerns a family has about their child, an assessment is the necessary first step. An **assessment** is

the act of making a judgment about something (Merriam-Webster, 2014). In this case, professionals complete assessments to determine a diagnosis and to make a prognosis. When making a diagnosis, the professional is identifying a disease, illness, or condition by examining someone (Merriam-Webster, 2014). Understanding the nature of the concerns, the signs and symptoms, and, if possible, the etiology of the condition, the professional can provide the family with information about treatments and prognosis. If an assessment is not completed, treatment options cannot be explored, concerns cannot be addressed, and hope cannot be instilled.

In March 2001, the Institute of Medicine (IOM) released “Crossing the Quality Chasm: A New Health System for the 21st Century” report. In this report, IOM describes the immense divide between current service delivery practices and what we know to be best evidence-based practices. This report states that people “should be able to count on receiving care that meets their needs and is based on the best scientific knowledge . . . ” (IOM, 2001, p. 1). While more than a decade has passed since this report was published, many would argue that this report remains true today. There is still much work to be done to ensure that all people receive the care that meets their unique needs, that is delivered efficiently, and is safe and effective. In order to deliver high quality care, it is essential to complete an assessment to obtain a baseline of performance and determine the appropriate plan of care.

This chapter provides an overview of hearing and hearing loss and the evidence of hearing loss as a national priority. The past, present, and a snapshot of the future are shared. Finally, an overview of the necessary assessments for children with

hearing loss and the importance of having an interdisciplinary team are provided.

## HEARING AND HEARING LOSS

The auditory system has two primary functions: hearing and balance. Additionally, the auditory system is made up of four parts: the outer ear, the middle ear, the inner ear, and the auditory cortex. Hearing sensitivity is measured across several speech **frequencies** (250 through 8000 Hz) and loudness is measured using a **decibel (dB) hearing level (HL)** scale ranging from -10 to 115 dB HL in 5 dB HL increments. In the United States (U.S.), a child is said to have a hearing loss if the measured thresholds are 15 dB HL or greater across the speech frequencies in at least one ear. The World Health Organization (WHO) defines disabling hearing loss in adults (15 years and older) with a pure tone average (PTA) of 41 dB HL or greater for the better ear (WHO, 2014). In children, disabling hearing loss is defined as PTA of 31 dB HL or greater for the better ear (WHO, 2014). There are different *degrees* of hearing loss ranging from slight to profound and *variations* of hearing loss that include temporary, fluctuating, permanent, or progressive hearing loss. There are many causes of hearing loss, including nongenetic factors, genetic factors, syndromes associated with hearing loss, and acquired hearing losses.

Permanent hearing loss associated with nongenetic factors can often be prevented and include: (a) anoxia; (b) atresia, stenosis, or microtia; (c) birth injuries; (d) complications associated with the Rh factor in the blood; (e) inner ear malformations (e.g., Mondini’s malformation or large vestibular aqueduct); (f) low

birth weight; (g) maternal diabetes; (h) maternal infections (e.g., rubella, cytomegalovirus, toxoplasmosis, syphilis, and herpes simplex virus); (i) prematurity; (j) toxemia during pregnancy; and/or (k) toxins (i.e., drugs and alcohol consumed by the mother during pregnancy) (American Speech-Language-Hearing Association [ASHA], 2014).

Approximately 60% of children identified with hearing loss have a genetic component that caused their hearing loss (Smith, Kochhar, & Friedman, 2009). The hearing loss may be present at birth or may develop later in life. Genetic hearing losses are described as autosomal recessive (e.g., Connexin 26), autosomal dominant, X-linked, or mitochondrial inheritance patterns. Many genetic syndromes are also associated with hearing loss: (a) Alport syndrome, (b) CHARGE syndrome, (c) Crouzon syndrome, (d) Down syndrome, (e) Goldenhar syndrome, (f) Pendred syndrome, (g) sickle cell disease, (h) Tay-Sachs disease, (i) Treacher Collins syndrome, (j) Usher syndrome, and (k) Waardenburg syndrome (ASHA, 2014).

Hearing loss can be acquired at any time. Examples of conditions that cause acquired hearing loss include: (a) chicken pox, (b) encephalitis, (c) head injury, (d) measles, (e) mumps, (f) meningitis, (g) noise exposure, (h) otitis media, (i) ototoxic medications (i.e., cancer treating agents), and (j) presbycusis (ASHA, 2014).

**DETERMINING IF HEARING LOSS IS A HEALTHCARE PRIORITY WORTH ASSESSING**

To determine if a condition is a healthcare priority, the following parameters should be considered: (1) the condition is an

important health problem, (2) adequate knowledge about the condition is available in order to establish evidence-based protocols, (3) acceptable and valid screening tools, diagnostics tests, and treatments are available, (4) resources (i.e., facilities, equipment, people) are available for screening, identification, and treatment, (5) early screening detection, and intervention result in improved outcomes, and (6) the cost-benefit ratio is appropriate (American Academy of Pediatrics, 1999; Mausner & Kramer, 1985).

**Is Hearing Loss an Important Health Issue?**

Prevalence rates vary depending on the population tested, the type and degree of hearing loss, the tests used to measure hearing, and the ages at which the hearing tests were administered (Bess & Paradise, 1994). With this in mind, there are 360 million people with hearing loss representing over 5% of the world's population (328 million adults and 32 million children) (WHO, 2014). The majority of people with hearing loss live in low- and middle-income countries (WHO, 2014). In the United States, permanent hearing loss is the most common birth defect, affecting approximately 3 newborns per 1,000 births (White, 2004). One in 1,000 (0.1%) infants are born with severe to profound hearing loss (NIH, 1993; Northern & Downs, 2002). Prevalence is higher (5% of the pediatric population) for children with milder forms of **sensorineural hearing loss** (<40 dB HL), and 11.3% for school-aged children for all types of minimal to moderate hearing losses (Bess, Dodd, & Parker, 1998).

One of the most common types of temporary hearing loss in children is caused

from **otitis media**. The WHO reported a global burden of 65 to 330 million individuals with otitis media with effusion and accounted for 28,000 deaths (Acuin et al., 2004). In the United States, between 50% and 85% of children under the age of three years experience at least one episode of acute otitis media (Klein, 1989). Otitis media with effusion can affect as many as 80% of children with approximately 2.2 million cases of otitis media identified annually in the United States (American Academy of Family Physicians & American Academy of Otolaryngology-Head & Neck Surgery, 2004; van Zon, van der Heijden, van Dongen, Burton, & Schilder, 2012). Acuin et al. (2004) estimated that chronic otitis media may contribute to more than half of the global burden of children with hearing loss.

Hearing is critical to speech and language development, communication, literacy, and learning. Children with hearing loss have increased difficulties with communication skills, increased behavioral and pragmatic problems, decreased psychosocial well-being, and lower educational accomplishments compared with children with normal hearing (Calderon & Low, 1998; Davis, 1990; Davis, Eifenbein, Schum, & Bentler, 1986; Wake, Hughes, Collins, & Poulakis, 2004). Early identification of hearing loss resulting in timely family-centered early intervention, though, can lessen the impact on a child's development (Sininger, Grimes, & Christensen, 2010; Yoshinaga-Itano, Baca, & Sedey, 2010). Several case control and cohort studies have suggested that intervention improves children's use of residual hearing and their speech-language skills, social and emotional status, and academic performance (Geers, Strube, Tobey, Pisoni, & Moog, 2011; Greenberg, Calderon, & Kusche, 1984;

Moeller, Tomblin, Yoshinaga-Itano, Connor, & Jerger, 2007; Ramkalawan & Davis, 1992). With early access to audition and intense habilitation, children with hearing loss often can be educated alongside hearing peers in their neighborhood schools instead of requiring years of expensive special education placements, which generates substantial cost benefit for society (Barton, Stacey, Fortnum, & Summerfield, 2006; Bond et al., 2009; Francis, Koch, Wyatt, & Niparko, 1999).

In 1993, the U.S. Surgeon General, Dr. C. Everett Koop, issued a challenge to the U.S. healthcare system to reduce the age congenital hearing loss was identified. He acknowledged the harmful effects of childhood hearing loss when so few people recognized this largely invisible disability. In 1995, the World Health Assembly passed a resolution on the prevention and control of major causes of hearing loss and for early detection of hearing loss in "babies, toddlers, and children, as well as in the elderly, within the framework of primary health care" (section 1, para. 1).

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### **Is Knowledge About Hearing Loss Available to Establish Evidence-Based Protocols?**

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Many important professional and advocacy groups, such as the National Institute for Health (NIH), American Academy of Pediatrics (AAP), the March of Dimes, the American Academy of Audiology (AAA), American Speech-Language-Hearing Association (ASHA), the Joint Committee on Infant Hearing (JCIH), and the Alexander Graham Bell Association for the Deaf and Hard of Hearing (AG Bell), have created position papers, held conferences, and convened working groups focused on childhood hearing loss and intervention

(Nation Center for Hearing Assessment and Management [NCHAM], 2010). As such, the U.S. Preventive Services Task Force (USPSTF) concluded “that there is moderate certainty that the net benefit of screening all newborn infants for hearing loss is moderate” (USPSTF, 2008, para. 5).

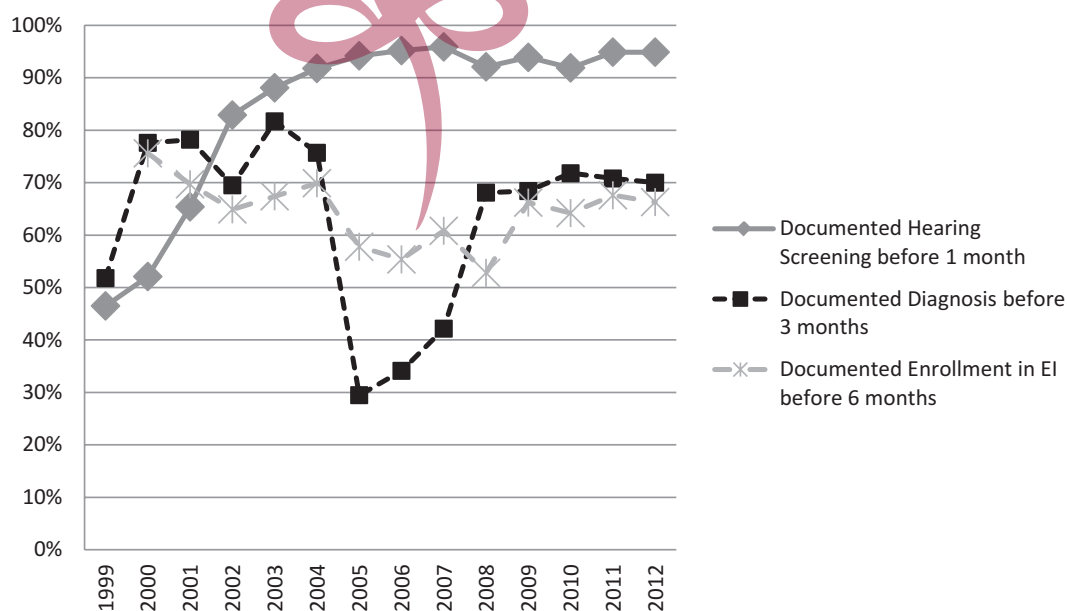
identified hearing loss should receive appropriate intervention, including hearing aids if appropriate, by a qualified professional at no later than 6 months of age (AAP, 2007). A child can be screened and tested for hearing loss at any time with valid, evidence-based protocols.

### Are Acceptable and Valid Screening Tools, Diagnostics Tests, and Treatments Available?

There are valid, safe, and cost-effective screening tools available to determine the presence or absence of hearing loss within hours of birth. The JCIH recommends the **1-3-6 model**. That is, hearing should be screened by 1 month of age, audiological evaluation should be completed no at later than 3 months of age (for those who did not pass the screening), and infants with

### Are Resources (i.e., Facilities, Equipment, People) Available for Screening, Identification, and Treatment?

During the past two decades, newborn hearing screening, diagnosis, and intervention programs have expanded dramatically (Figure 1–1). In the United States, each state and territory has an established early hearing detection and intervention (EHDI) program, typically housed within the State Department of Education or the



**Figure 1–1.** Percentage of newborns hearing screening, audiological evaluation, and enrollment in early intervention in the U.S. from 1999–2012 (CDC, 2014).