

# **SPEECH AND DIVERSE LEARNERS WHO ARE DEAF/HARD OF HEARING IN THE 21ST CENTURY**

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## **ABSTRACT**

Global expectations and outcomes for speech production of children who are deaf and hard of hearing have changed in the 21<sup>st</sup> century for several reasons: 1. identification of hearing loss in infancy due to universal newborn hearing screening; 2. availability of early intervention programs; 3. advances in hearing technologies; and, 4. access to programs and qualified professionals. Speech research and clinical feedback indicates positive impact of these advances -- that many children with hearing loss are demonstrating improved speech perception and speech production which follows typical patterns and sequences of development. However, the global reality is that not all children with hearing loss benefit from the advances cited above due to intrinsic (child-related) and extrinsic (environmental) factors. Four pathways define the different timetables and trajectories of development for this group of diverse learners. In addition, professional exchanges on speech learning and teaching have been limited. Recent Ling Consortium international surveys indicate a need for professional development and training, so that today's professional can encourage speech development in infants and have a deep level of knowledge and skills to address speech remediation for diverse learners. Core knowledge and principles required for effective speech teaching exist within the systematic Ling model. Suggestions for adaptation of functional listening and speech assessments as well as selected strategies and resources for teaching will be offered. The goal is to focus awareness and refresh professional interest in using existing knowledge and tools to improve speech outcomes for diverse children with hearing loss.

## **INTRODUCTION**

Newborn hearing screening, early and appropriate intervention, and intensive audiological management with advanced hearing technologies have created a new reality in the 21<sup>st</sup> century in which children who can take advantage of these benefits can expect higher outcomes. These infants and young children with hearing loss have the potential to follow typical trajectories of listening, speech and language development. They may learn to listen and to speak more like typically developing peers and may be educated in regular education (mainstream) settings (Cole and Flexer 2011).

Children who do not have these advantages may be 'at risk learners' with different timetables and trajectories for the development of listening, speech, spoken language and literacy (Perigoe 2013).

## **LEARNING PATHWAYS FOR DIVERSE LEARNERS**

Multiple intrinsic (child-related) or extrinsic (environmental) factors may impede the child's ability to attain intelligible speech. Intrinsic factors include; characteristics of the hearing loss; and, cognitive, sensory, behavioral, psychological, neurological or physical factors (Goldberg and Perigoe 2008). Extrinsic factors include: socio-economic status (Lenihan, Rice and Voss 2010); parental education levels (Morrison and Lew 2012); and, amount and quality of language input from caregivers (Hart and Risely 1995; Zimmerman et al. 2009). Cultural and linguistic differences, changes in family dynamics or frequent relocation may also contribute.

All these factors can create diverse learners who then have different pathways for developing speech.

Using a. age of identification and age at intervention; and, b. child-specific information on some of the factors listed above, we have outlined four potential learning pathways for the development of speech. 1. Children who are identified early and benefit from early and appropriate hearing technologies and intervention are more likely to acquire speech in a manner similar to hearing children who are typically developing. 2. Other children may be identified early, but have environmental factors (such as inappropriate or delayed use of hearing technology) or intrinsic factors (such as cognitive challenges or developmental delays) that affect learning. Depending on the impact of these additional factors, speech sound acquisition may be delayed, but some children may close the gap. 3. For children who are late identified, but otherwise developing typically, specialized teaching can assist speech acquisition, even with a delayed timetable.

4. Most challenging are those children who are late identified and have additional learning challenges. They will most likely require specialized teaching from highly trained professionals (Perigoe and Perigoe, 2004). Outcomes for these children will be even more impacted if environmental factors, such as poverty, lack of parent involvement or access to services, become complicating issues. Since it is estimated that 40% of children with hearing loss have additional challenges (Gallaudet Research Institute, 2010), professionals should be prepared to teach speech to these children using the most effective means available (Goldberg and Perigoe, 2008; Perigoe 2013).

## **RESEARCH**

Research on brain plasticity and listening development has confirmed the importance of auditory input on speech production output (Cole and Flexer, 2011; Perigoe and Paterson, 2013). For example, a child with a well-mapped cochlear implant perceives and discriminates vowels and has access to high frequency information for consonants (Warner-Czyz, Davis and Morrison, 2005). Improved early access to speech input from the parent allows the child to establish the auditory-vocal loop (Paterson and Perigoe, 2015). Improved auditory input should result in improved speech production output.

Studies of early speech output of children with hearing loss suggest that the earlier a child can access sound, the more typical their speech output might be (Paterson and Perigoe, 2015). The progression of vocalization to pre-speech development in infants with normal hearing is consistent and predictable. The vocal model proposed by Oller (1980) established the basis of research on vocalization development of children with hearing loss. Using Oller's model, Paterson reported rapid change in the types and use of vocalizations in the first fifteen days after hearing aid fitting of a severely hearing-impaired 15-month old (1990). This model was used to track vocal development of children between 16 and 30 months of age in their first year post cochlear implantation. The majority increased in the amount and maturity of vocalizations (Jaskierniak, 1994; Paterson, 1997).

Current research provides evidence to support the assumption that, with early optimal auditory access to speech input through advanced technology, young children with hearing loss demonstrate attainment of speech development milestones similar to hearing children and that the very youngest implanted children achieve milestones more typically (Eriks-Brophy, Gibson and Tucker 2013; Ertmer and Inniger 2009; Ertmer, Young and Nathani 2007; Wiggin et al. 2013).

Today, the **LENA** (**L**anguage **E**Nvironment **A**nalysis) advanced audio-recording technology allows the researcher to track the child's vocal to verbal development in the home environment. Over the course of the day, it records adult speech, child speech, conversational turn-taking and estimates noise in the home environment (Zimmerman et al. 2009). The speech analysis software is based on Oller's model. Morrison and Lew (2012) reported that sharing feedback on speech output with parents encouraged them to change the home auditory environment and increase parent-child interactions to optimize speech input to the child. Oller's stages are now included on the Cottage Acquisition Scales for Listening, Language and Speech (CASLLS) (Wilkes 2001).

In the past 15 years, there have been few professional exchanges or publications about the learning and teaching of speech. The child with the cochlear implant and excellent auditory access has drawn the focus, creating an assumption that that these children can learn speech without instruction, and no longer need trained speech professionals. Equally worrisome is the perpetuation of old models of 'isolated' speech teaching that is disconnected from spoken language and classroom content, and that teaching speech is no longer the responsibility of the teacher of the deaf, but of the speech pathologist (Perigoe and Houston 2012).

These concerns prompted the formation of the **Ling Consortium**, a group of professionals dedicated to continuing the work of Dr. Daniel Ling. A recent Ling Consortium survey, with participants from 12 countries, revealed that respondents lacked knowledge of how to teach speech or how to use available speech assessment and teaching tools (Paterson, Smith and Perigoe, in preparation). They also desired more information on how to use speech acoustics in speech teaching and how to elicit specific speech sounds. In addition, there was great inconsistency across programs on how speech is taught. The field may have forgotten some of the core knowledge and skills taught in the period prior to early cochlear implantation and it is time to refresh discussions about speech teaching.

## **PROFESSIONAL PREPARATION**

University programs in education of the deaf, speech/language pathology, and audiology have historically prepared professionals to work with children who are deaf or hard of hearing. However, fewer numbers of training programs and lack of expertise have led to national shortages of appropriately trained professionals – especially those trained in developing listening and speech. In order to prepare professionals to help children with hearing loss become 21<sup>st</sup> Century learners and spoken language communicators, training programs should provide coursework grounded in research and practicum experiences that reflect best practices (Perigoe and Houston 2012).

The core knowledge and principles needed by professionals include: anatomy and physiology of speech; the relationship between auditory and speech development; typical speech development; acoustics of speech; use of the latest hearing technologies; and, characteristics of 'deaf speech' and how these might be avoided or remediated (Cole and Paterson 1984; Ling 2002, 1989; Perigoe and Paterson 2013). Children with additional learning challenges, including those who come late to hearing or who do not benefit from hearing technologies, might produce speech more commonly seen in the past, including errors in suprasegmental patterns (e.g. monotone voice); neutralization of vowels/diphthongs; nasalization; consonant errors; and, consonant cluster reductions (Paterson and Perigoe 2015).

Professionals need core skills in technology use and in both developmental and remedial speech teaching. When infants are aided early, professionals should

encourage natural vocalizations, including speech babble through play in an auditory, language-rich environment (Perigoe 1999). Even children who are identified later, but have good auditory access with hearing technologies, can derive great benefit when provided with abundant spoken language through listening. The skilled professional can help these children to 'catch up' to hearing peers and acquire intelligible speech. For those children with additional challenges who require a systematic, remedial approach, direct intervention in a collaborative model has the best chance for success (Perigoe 2013).

## **EFFECTIVE SPEECH ASSESSMENT AND TEACHING**

The most systematic and effective model for assessment and teaching of speech to children who are deaf/hard of hearing was developed by Ling (2002, 1989). The Ling model of theory and practice is grounded in the concept that speech perception drives speech production. Both phonetic (syllable) and phonologic (words, phrases and sentences) levels are addressed.

### **Functional Assessment**

Functional assessments are on-going, diagnostic, measure child performance and are used for goal setting and for evaluating the effectiveness of intervention (Perigoe, Allen and Dodson 2012). Listening assessments might include questionnaires and parent tools, closed-set and open-set tests. Since most are criterion-referenced, the knowledgeable professional can construct teacher-made tests that provide comparable information. More detailed information on listening assessments can be found in Perigoe and Paterson (2013).

Prior to any assessment or intervention, it is essential to administer the *Ling Six Sound Test* (Ling 2006) – /u/, /m/, /a/, /i/, "sh" and /s/. This is also a daily listening check of both the child's hearing technology and his/her ability to access speech across the speech spectrum.

Speech assessments should gather information about what the child can produce in syllables, words, sentences and connected discourse. A spoken language sample should be analyzed to evaluate the child's ability to generalize speech skills to connected spoken language (Ling 2002). An overview of frequently used speech assessments can be found in Paterson and Perigoe (2015).

### **Adapting Assessment and Teaching for Diverse Learners**

Ling's model can be adapted for developmental as well as remedial work (Cole and Paterson 1984; Paterson 1994; Perigoe 1992, 2013). Assessment and teaching for children who do not follow typical trajectories of speech development need to be adapted based on: the child's hearing age; language level; cognitive abilities; learning style; and available supports, such as parent involvement. Speech teaching strategies should focus on audition first, but when audition is insufficient, visual and tactile strategies can be used (Ling 2002; Paterson 1994). For some children with greater needs, a multi-modality approach may be the most effective.

Manipulatives, such as small toy animals, can be used for both assessment and teaching. Practical suggestions for intervention include: the use of "set" to establish prerequisite behaviors (e.g. p > t > k); selecting facilitating contexts for phoneme production (e.g. establishing "sh" in the context of long "ee"); teaching continuants (such as fricatives and nasals) in the final position first; and, using functional words and language (e.g. "my baby") for carry-over of speech into spoken language (Ling 2002; Perigoe 1992, 2013; Perigoe and Ling 1986).

More in-depth information and resources (many available for free on-line) for assessment and development of listening and speech are included in Perigoe and Paterson (2013) and Paterson and Perigoe (2015)

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