

Loud & Clear!



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SETTING THE STAGE

for Literacy Development in Children with Cochlear Implants

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After a child's hearing loss is identified, parents often ask, "Will my deaf child learn to speak?" An equally important question is, "Will my child learn to read and write?" as reading and writing represent even higher-levels of communication processes. This article focuses on young children with cochlear implants and highlights the effective variables that may set the stage for future literacy development. The reader will note that the authors approach is a highly auditory

one and we are strongly committed to the auditory-verbal philosophy. While development of literacy for children who use sign language is also of great importance, it is beyond the scope of this issue.

Literature suggests that children who are deaf are clearly more at risk in adulthood for functional illiteracy in comparison to peers who hear normally. Low levels of reading achievement

among deaf and hard of hearing children have been reported consistently since the beginning of the 20th century (see, for example, Pintner & Patterson, 1916; Lane & Baker, 1974; Allen, 1986; Schildroth & Karchmer, 1986; Moog & Geers, 1985; and Geers & Moog, 1989). Educational outcomes for children with severe-to-profound hearing impairments continue to challenge parents and educators. In general, this population of children matures into adults who are vastly undereducated and underemployed (Schildroth & Karchmer, 1986; Blanchfield, Dunbar, Feldman, & Gardner, 1999).

Lack of spoken language competence is often cited as the critical factor separating achievement of adults with severe-to-profound hearing loss from that of their hearing peers. The learning of spoken language cannot be brushed aside as unimportant, or as something that can be developed later, "when the child is old enough." Rather, because it is the precursor to the demanding and related language skills of reading and writing, we view it as the primary focus of the child's educational experiences. From the beginning of spoken language development, the sequence of events leading up to literacy are initiated (Robertson, 2000), and the children who acquire spoken communicative competence experience many advantages over those who do not (Ling, 1989). As the predominant means of social interchange, spoken language provides the child with hearing impairment the ability to interact easily with the majority of people in the community at large. This critical achievement affords children with hearing impairment a wide array of educational, social, and vocational choices (Ling, 2002; Ling, 1989).



Fortunately, recent language and reading outcomes for some children with hearing impairment appear to approximate those of children with normal hearing (Goldberg & Flexer, 1993; Robertson & Flexer, 1993; Wray, Flexer, & Vaccaro, 1997). Recent data from Geers (2002) suggest that children with cochlear implants

from oral-aural programs that emphasize dependence on speech and audition exhibited higher competency in hearing, speaking, and reading. Today's technological advances make it more possible than ever before that children with cochlear implants can become independent, articulate, and literate adults.

The Connection Between Language and Reading

Learning the spoken language sets the stage for learning to read and write

This applies to both children with normal hearing and to those whose hearing is made possible technologically. Knowing the spoken language involves knowing the sounds, rhythms, patterns, and uses of the language. Such knowledge is necessary in making sense of the ink on the page. When a person reads with

fluency, he/she pays attention to whole words, word parts, letter sounds, word order, word function, meanings of words, conventional phrasings and context. The reader's attention shifts from one of these language cues to another, depending on the reading task. If the reader does not have the requisite language and

experiential background knowledge to get at the meaning of the text, then it will not make sense. When this knowledge is present, the reader reads with comprehension. When it isn't, the reader must try again with a different cue strategy or seek some help. Children, especially, need a supportive language environment so that reading does not become so frustrating that they give up. Their language abilities

allow them to begin to read, and, as time goes on, their reading begins to inform their language abilities. For an in depth review of reading theory, see Adams (1990) or Blachman (1997).

Access to spoken language through the cochlear implant must be accompanied by speech and language therapy that emphasizes listening. Only then is the

stage set for the acquisition of the various components of the spoken language: its phonology, semantics, syntax, and pragmatics. Having acquired facility with spoken language, the child is then ready to learn the orthography of the language. This is the point where formal reading instruction can begin.

Variables That Make a Difference in Literacy Development

A) Monitoring Access to the Speech Spectrum

Adequate access to the speech signal forms the essence of literacy. If one accepts the premise that hearing impairment is an invisible acoustic filter that distorts and eliminates incoming sounds, one also recognizes the detrimental effects of this acoustic filter on listening, speaking, and ultimately reading and writing (Flexer, 1999; Ling, 1989). Quite simply, "we speak because we hear, and we speak what we hear" (Flexer, 1999, p. 6). Hearing is a first-order event in the acquisition of literacy (Flexer, 1999). Consequently, it is of utmost importance that the child with a cochlear implant have adequate access to most sounds within conversational speech throughout intervention. Cochlear implant technology affords this access for deaf children to a degree that was typically not possible with hearing aids. With good hearing sensitivity via the implant, incidental learning may take place through distance hearing (Flexer, 1999). Thus, a cochlear implant permits the child to overhear much of the spoken communication in which

he/she is immersed, replicating to some degree the process by which normal-hearing children learn language.

The clinician must recognize when the cochlear implant is not providing adequate benefit. Clinicians must recognize that the signal has degraded as this can seriously compromise subsequent auditory language learning. Adjustments to the speech processor or program may be necessary by the audiologist. Accordingly, the speech-language pathologist (SLP) and

audiologist must regularly communicate any concerns regarding the status of the child's access to the speech spectrum. The close relationship between the SLP and the audiologist and their knowledge of acoustic phonetics cannot be overestimated. The efficacy of their job performance cannot occur without a respectful and open line of communication at all times. Indeed, the success of this liaison forms the cornerstone of the child's journey toward literacy. Quite simply, adequate access to the sense of hearing forms the essence of literacy.



B) Immersion in Good Speech-Language Models

Children learn the language used around them, provided they have adequate access to it and derive meaning from it. In order to learn, read and write a spoken language, the child must first learn to listen to and interpret good spoken language models. These good models enable the emerging listener and speaker to generate experimental utterances of his/her own in order to discover how language is used (Britton, 1993). In an ongoing quest to understand and create meaningful language, the child will try out all kinds of constructions until his/her utterances become like the norm in terms of word order, appropriate verb tenses, subject-verb agreement, vocabulary, and so on. Because one part of the reading process involves predicting the word or words that will come next, knowing how people use the spoken language is necessary. This involves knowing the patterns, referents, and sounds that people customarily use when speaking. Certainly it is important to know which letter makes what "sound", and that is

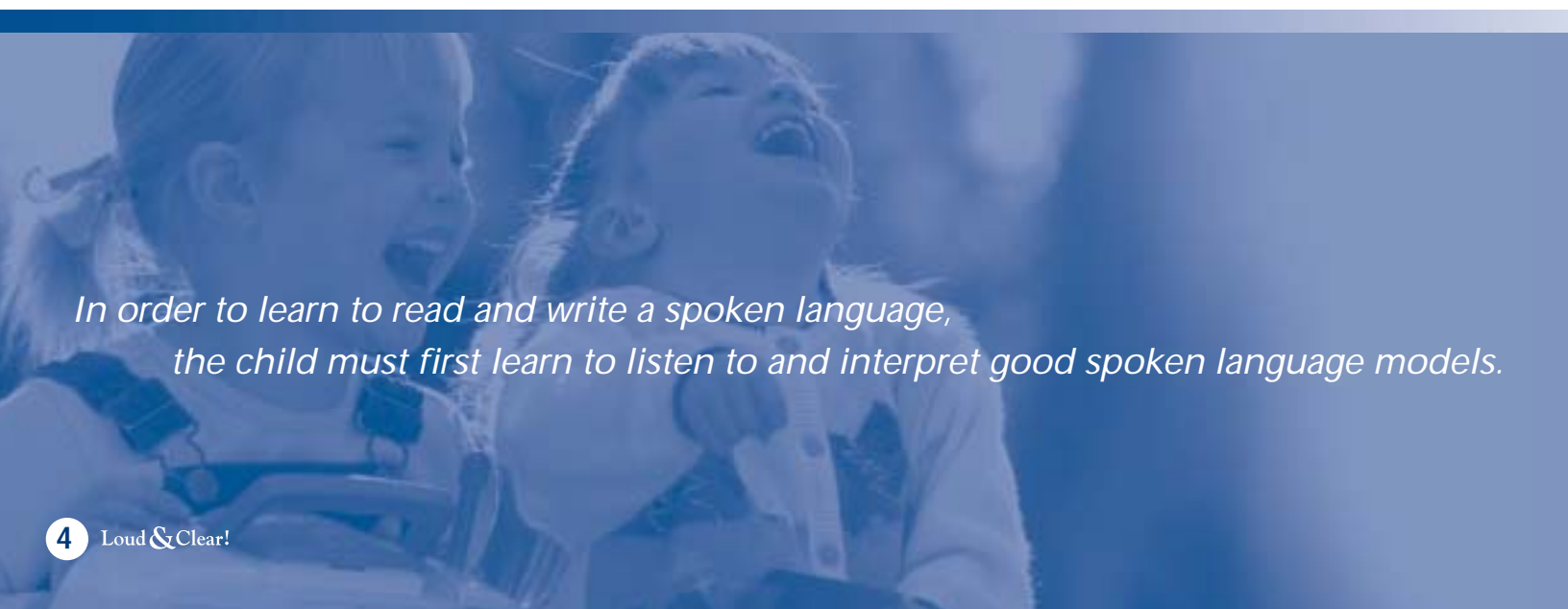
one reason to put an emphasis on phonemic awareness, but it is not sufficient. If the reader can decode letters into sounds, but has no idea what those sounds mean in the language, then comprehension does not take place. It is only by having meaningful models of the language that children can make it their own.

C) Phonologic and Phonemic Awareness

Much has been written in the last fifteen years about a concept referred to as "phonologic awareness". Phonologic awareness refers to the ability to manipulate and "play" with the sounds of a language using different linguistic units. Phonemic awareness, a type of phonological awareness, refers to a sensitivity to and control over phonemes, the smallest sound units of speech that differentiate one word from another. A strong positive correlation exists between phonological awareness and early reading abilities in hearing children. Encouragingly, these awareness skills can be explicitly taught, resulting in significantly improved reading levels (van Kleeck et al., 1998). The research

has been compelling, to the point that an "action plan" published by the Learning First Alliance (1998) identifies phonemic awareness skills as one of the most critical predictors of reading success and recommends that its training be included in every pre-kindergarten and kindergarten curriculum. Fey, Catts, and Larrivee (1995) suggest training phonological awareness skills in children with speech-language delays as early as possible. This suggestion is also highly appropriate for children who hear with the help of a cochlear implant.

Educators of children with normal hearing explain that the goal of teaching phonemic awareness is to develop a finely tuned "ear" for listening to language. This enables the child to detect and identify specific sounds and sequences and to comprehend the role sounds play in word formation (Fitzpatrick, 1997). The concept of phonemic awareness explains why "sounding out" words will be difficult for any child who is not aware that conversational speech is comprised of a sequence of small sounds. This problem is even more complicated



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because the process of understanding and producing spoken language involves more than making and receiving sounds. However, sounds are the reading foundation for children with normal hearing, just as they are for children with hearing loss.


The insight provided by phonemic awareness offers a compelling explanation of the greater literacy rates more recently reported for children with cochlear implants, especially for those taught with auditory-verbal and auditory-oral philosophies. Both philosophies actively emphasize the rhythm and intonation of spoken language, the phonemes, morpheme, structure and sequence of the language using technology to access the auditory modality. Such stimulation and exposure to a spoken language available through cochlear implants promotes expansion of the rich neural connections within the auditory cortex of the brain (Flexer in Robertson, 2000). Consistent detection and identification of the Ling's Six Sounds, fine grain discrimination training through audition, manipulation and play with sounds through rhyming, for example, all accentuate the auditory aspects of

communication. In many respects, auditory-based aural habilitation is early phonemic awareness training. As speech and language evolve, children learn to distinguish between and among all the various combinations of phonemes of the spoken language. The result is a usable foundation for processing and understanding the auditory aspects of reading (Wray & Robertson, In Press).

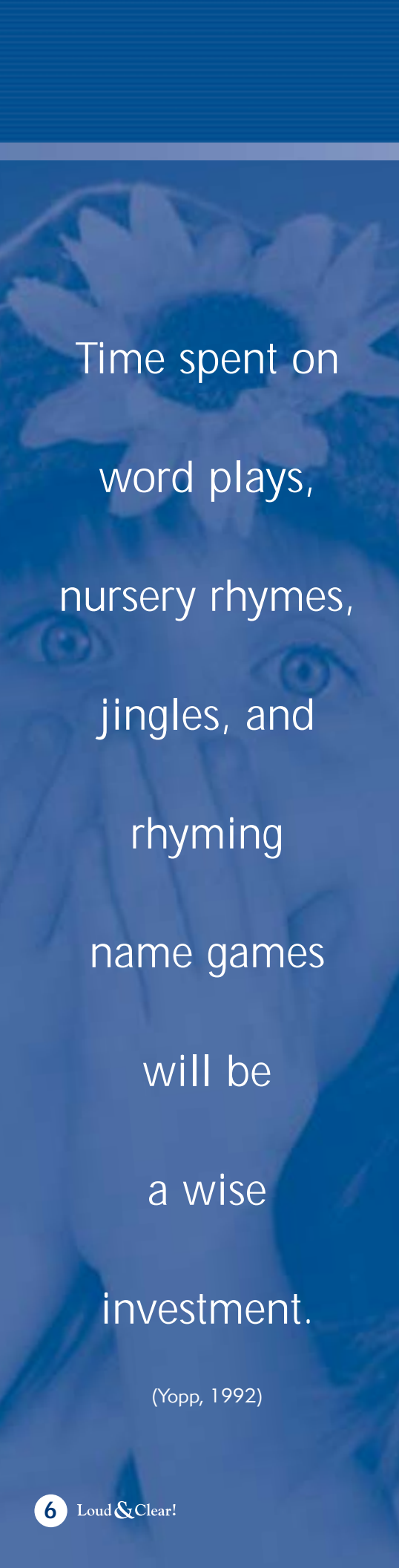
D) Reading Aloud

One of the most important predictors of reading achievement is whether the child is read to prior to the beginning of reading instruction (Durkin, 1993). Such reading aloud should begin at the earliest age possible, preferably in infancy, both for the child with normal hearing and for the child with hearing impairment. Access to the best technology for hearing is of critical importance for discrimination of subtle sound differences, developing a sense of rhyme and rhythm, and knowledge of sentence, idea, and story patterns. Furthermore, the read aloud experience enhances the child's signal-to-noise ratio because of the caregiver's natural inclination to read close to the child's

implant microphone while seated in a quiet environment. Listening to a story read aloud gives the child access to well-formed language upon which to build later predictions in listening and in reading. It appears to some adults nonsensical to read words to a child that he/she does not know, but this is one way the child will learn what people mean by those words and phrases. The human brain has the wondrous capability of making sense of sound and sight patterns, provided it has many opportunities to hear and see these patterns. Reading children's books aloud offers children rich experiences with sound and meaning. Examining the accompanying pictures together allows the adult to repeat the appropriate words in the contexts in which they are most meaningful, thus providing the child with the basics of language and meaning of the culture. Some children begin to connect sounds and words for themselves through repeated readings of particular stories and begin to read on their own. Other children need more formal instruction in order to catch on to the sound and to symbol relationships. In any case, reading aloud provides very



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important experiences that lead to the development of literacy. An additional long-lasting effect is the closeness that the adult and the child develop through interaction over stories. This closeness has obvious positive emotional value; it also fosters the trust between adult and child necessary for the child to want to learn, both at school and in the world. The child with hearing impairment has great need for closeness and trust and the self-confidence associated with them. Reading aloud should take place daily in a positive environment in which the

adult pays attention to the child's understanding of the story and to the emotional responses of the child to the story. The adult should avoid making the reading session overtly instructional. It is enough to expose the child to the sounds, patterns, and meanings of the story. Children often want to hear the same story again and again. Perhaps the child tries to figure out something new during each reading of the story, until they have exhausted all their questions about it, that is, until they feel they understand it thoroughly (Lewis & Long, 1991).

Instructional Content

Initially, young children who have little experience with manipulating the sound structure of language may have more success with larger rather than smaller units of sound. Focus on rhymes, songs, chants, and word-sound games provide playful and engaging experimentation with language during the introductory stages. Thus, time spent on word plays, nursery rhymes, jingles, and rhyming name games (Yopp, 1992) will be a wise investment. Initial activities should be interactive and social while stimulating curiosity by enticing all members of the family or friends to participate. Games with plenty of rhyme and rhythm, features often irresistible to children, may be found in commercial products and handbooks easily located in educational stores or libraries under the heading of "phonemic awareness". Therefore, accentuating the suprasegmental aspects of speech through bombardment of the "Learn to Listen Sounds"

(Pollack, Goldberg, & Caleffe-Schenck, 1997), popular children's songs, and finger plays begin the journey toward phonemic awareness. As the child matures, attention to the segmental properties of speech such as an appreciation that words rhyme or begin with the same sound segment can commence. Other operations that children can perform include matching sounds, isolating sounds, blending sounds, and segmenting sounds. Sources such as Fitzpatrick (1997) and Yopp and Yopp (2000) note that some tasks may be easier than others, and that following a hierarchy may make for more successful interactions. Two examples of commercial publications presenting a hierarchy for reference include *Phonemic Awareness* (Fitzpatrick, 1997) and *Sounds Abound* (Catts & Vartiainen, 1993). Research articles that detail programmed tasks and procedures for phonologic intervention include those by Gillon (2000), Reiner (1998), van Kleeck,

et al. (1998), and Yopp & Yopp (2000). All help students to view language independent of meaning, attend to sounds in the context of words, and manipulate component sounds in highly motivating ways.



Encouraging Research on Literacy Outcomes

Widespread need exists for continuing research on the relationships between listening and the therapies that help it develop, the emergence of phonemic/phonologic awareness, contextual knowledge acquisition, language, and literacy. In order for this to happen, professionals and parents need to be willing for their clients and children to participate in studies that can look closely at the interactions among these and other variables in their children's development.

Summary

Knowledge of spoken language and all its nuances—sounds, rhythm, rhyme, meanings, and uses is essential for literacy development to take place. Many variables factor into the process of literacy growth. This article discussed some of the most essential. While it is true that the economic and educational status of individuals with severe-to-profound hearing loss historically revealed a pessimistic picture, there is sufficient optimism in current research that suggests a turn in the tide. Parent participation, vigilant monitoring of thresholds provided by technology of the cochlear implant and the benefit the device provides, immersion with peers exhibiting good speech-language models, and exposure to literature rich in spoken language can all contribute to the goal of adult literacy. Research reveals that providing these critical components in an auditory-based early intervention program offers children with cochlear implants the same advantages for learning to read as those with normal hearing.

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