

## EMPIRICAL MANUSCRIPT

# Evaluating the Structure of Early English Literacy Skills in Deaf and Hard-of-Hearing Children

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## Abstract

Better understanding the mechanisms underlying developing literacy has promoted the development of more effective reading interventions for typically developing children. Such knowledge may facilitate effective instruction of deaf and hard-of-hearing (DHH) children. Hence, the current study examined the multivariate associations among phonological awareness, alphabetic knowledge, word reading, and vocabulary skills in DHH children who have auditory access to speech. One hundred and sixty-seven DHH children ( $M_{\text{age}} = 60.43$  months) were assessed with a battery of early literacy measures. Forty-six percent used at least 1 cochlear implant; 54% were fitted with hearing aids. About a fourth of the sample was acquiring both spoken English and sign. Scores on standardized tests of phonological awareness and vocabulary averaged at least 1 standard deviation (*SD*) below the mean of the hearing norming sample. Confirmatory factor analyses showed that DHH children's early literacy skills were best characterized by a complex 3-factor model in which phonological awareness, alphabetic knowledge, and vocabulary formed 3 separate, but highly correlated constructs, with letter-sound knowledge and word reading skills relating to both phonological awareness and alphabetic knowledge. This supports the hypothesis that early reading of DHH children with functional hearing is qualitatively similar to that of hearing children.

Hearing children learn to read an alphabetic language by acquiring the alphabetic principle—by learning to translate letters and printed words into spoken phonemes and words. Empirical and theoretical research indicates that early reading depends on children's phonological awareness (PA), alphabetic knowledge, and language abilities (Storch & Whitehurst, 2002; Wagner et al., 1997; Whitehurst & Lonigan, 1998), and this knowledge has supported the development of more effective literacy instruction (Juel & Minden-Cupp, 2000; National Early Literacy Panel, 2009). According to Ehri (2014), children's knowledge of the phonological structure of words and grapheme–phoneme correspondences provides them with the foundation that connects written words to vocabulary stored in memory.

Learning to read has long been an area of difficulty for many deaf and hard-of-hearing (DHH) children; their average literacy outcomes have remained significantly below those of hearing

children for decades (Cupples, Ching, Crowe, Day, & Seeto, 2014; Spencer & Marschark, 2010), and it is not clear why. Ineffective instruction may be a key reason. However, without a clear understanding of the underlying mechanisms and malleable sources of influence by which DHH children develop reading (which may not be the same as hearing children), developing effective instructional regimes is difficult. For example, the importance of spoken phonology for reading has been well documented (Bus & van IJzendoorn, 1999; Lonigan et al., 2009; National Early Literacy Panel, 2009). It is not surprising that DHH children, who have decreased and different access to spoken phonology, typically struggle to learn to read (Lederberg, Schick, & Spencer, 2013). However, the relative importance of spoken phonology and language in early reading for DHH children is hotly debated, with implications for how instruction is designed and implemented. There are three general theoretical perspectives about the reading processes of DHH children.

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