



Audiological and Literacy Profiles in Children with Hearing Loss and Deafness: An Interprofessional Study

Anthony D. Koutsoftas & Deborah Welling
Seton Hall University



Introduction

- Approximately 79,000 children ages 3 to 21 receive special education services under the qualifying category of Hearing Impairment (Aud et al. 2012), not inclusive of children with hearing loss or deafness who receive services under a different qualifying category.
- Research has demonstrated a general trend that children with hearing loss who use cochlear implants or hearing aids outperform children with deafness who rely on manual forms of communication on reading measures; all of whom are outperformed by normal hearing peers (Briscoe et al. 2001; Connor & Zwolan, 2004; Coppens et al. 2011; Davis et al, 1986; Easterbrooks & Beal-Alvarez, 2012; Easterbrooks et al, 2008; Harris & Marschark, 2011; James et al. 2005; Johnson & Goswami, 2010; Kyle & Harris, 2010; Luckner et al. 2005; Miller, 1997).
- Inconsistencies in the conceptualization of reading across studies poses a challenge for generalization to clinical practice. The Simple View of Reading (Hoover & Gough, 1990), the most well accepted theory of reading, was used to conceptualize reading in the current study.

$$RC = D \times LC$$

- RC = Reading Comprehension; D = Decoding; LC = Linguistic Comprehension
- Research has demonstrated that speech intelligibility scores are a good proxy variable for phonological awareness and decoding ability in children with hearing loss and deafness (Johnson & Goswami, 2010).
- Audiological profiles inclusive of types of device used, audiological history and pure tone averages for low and high frequency in addition to standard are important considerations for literacy outcomes and were accounted for in the current study.
- The **purpose** of the current study was to describe reading ability while accounting for audiological profiles in a sample of children receiving special education services under the qualifying category of Hearing Impairment.

Sample

Descriptive & Experimental Measures	[N = 23] Mean (SD)
Age in Years	11.43 (1.47)
Mothers' Years of Ed.	13.42 (2.69)
Female : Male	13 : 10
<u>Descriptive Hearing Information</u> <u>Current and/or Aided Hearing Scores</u>	
Low Frequency - Pure Tone Average	24.36 (10.78)
Standard - Pure Tone Average	27.18 (11.95)
High Frequency - Pure Tone Average	31.45 (17.81)
<u>Psychoeducational Data from Special Education File</u>	
Full Scale IQ	92.13 (12.04)
Standardized Language Composite	68.79 (11.27)
<u>Experimental Measures</u>	
BBTOP - Raw Score	46.45 (28.53)
PPVT-4 - SS	78.91 (22.56)
TOSREC - Index	75.70 (16.90)

Procedures

- Children were tested individually across 2 sessions, at their schools, by trained research assistants. Instructions for all tests were provided from videos of a certified ASL interpreter speaking and signing directions from a laptop with speakers.
- **Assessment Battery Included:**
 - Peabody Picture Vocabulary Test, Fourth Edition (Dunn & Dunn, 2007)
 - Test of Silent Reading Efficiency and Comprehension (Wagner et al. 2010)
 - Bankson-Bernthal Test of Phonology (Bankson & Bernthal, 1990)
- Researchers had access to each participant's special education file, from which psychoeducational and audiological data were obtained including current Individualized Education Plan (IEP).

Results

Table 1. Correlation matrix among cognitive, linguistic, audiological, SES, and reading variables.

Table 2. Exploratory multiple regressions predicting RC from cognitive, linguistic, audiological, and SES variables.

Mothers Years of Ed*	Mothers Years of Ed
PTA - Standard	BBTOP - RAW
Full Scale IQ	PPVT - SS*
BBTOP - RAW	
PPVT - SS	
$F(1,11) = 10.01, p < .01,$ Adjusted $R^2 = .48$	$F(1,16) = 10.37, p < .01,$ Adjusted $R^2 = .36$

Table 3. Stepwise multiple regression predicting RC from D and LC; controlling for SES.

Step 1	Step 2 +19% variance
Mothers Years of Education	PPVT - SS*
$F(1,16) = 4.25, p = .06,$ Adjusted $R^2 = .16$	$F(2,15) = 5.54, p = .01,$ Adjusted $R^2 = .35$

Discussion

- This Interprofessional study examined audiological and literacy profiles in children with hearing loss and deafness while accounting for cognitive and SES variables, housed within the simple view of reading (Hoover & Gough, 1990).
- Multiple regressions indicated that SES, as measured by Mothers' years of Education, accounted for a large amount of variance (48%) in RC when included alongside all other variables suggesting that SES is an important consideration out-weighting audiological, cognitive, and linguistic variables.
- When SES was included with only D and LC variables, LC predicted RC accounting for 36% of variance in the model suggesting that in this sample, children's receptive vocabulary accounted for reading comprehension.
- A final stepwise multiple regression predicting RC while controlling for SES indicated that LC as measured by receptive vocabulary accounted for 36% of variance over and above SES.
- Future directions for this research include:
 - Larger sample size that includes cognitive-linguistic measures validated in HI populations
 - A normal hearing, age, SES matched comparison group

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- Correspondence about this project should be directed to anthony.koutsoftas@shu.edu

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