

# The impact of social function on behavior in children who are deaf or hard of hearing.

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## Introduction

- 2-3/1,000 children in the US born with detectable level of hearing loss
- Sensorineural hearing loss (SNHL) caused by problems with inner ear
  - Causes: genetic or environmental
- Pre-lingual (before language development) HL can impair language development and is associated with impaired social function
  - Earlier age at intervention can mitigate language delays
- Poor social functioning (e.g. communication, peer & adult interaction) may impact behavior

## Objective

- To determine the relationship between social functioning and behavior in children who are deaf or hard of hearing (DHH)
- To investigate the impact of language delay on this relationship

## Methods

- Ninety children, 3 to 6 years, mild to profound bilateral hearing loss included in analysis
  - Excluded if had communication disorder (e.g. autism) or could not complete testing
- Measures included:
  - Social Functioning:** Pediatric Evaluation of Disability Inventory (PEDI)
    - Social function domain (Communication, Social Interaction, Home/Community)
  - Behavior:** Child Behavior Checklist (CBCL)
    - Internalizing (e.g. Anxiety) and externalizing (e.g. Aggression) behaviors
  - Language:** Preschool Language Scales-5th edition (PLS-5)
    - Receptive and expressive language
  - Nonverbal cognition:** Leiter International Performance Scale-Revised
- Assessments conducted by speech-language pathologist and a neuropsychologist
- Language gaps defined as a ratio of receptive language to NVIQ <80
  - (Receptive language/NVIQ)X100

Demographics of 90 children		
Characteristics		
Age at study (mo)		57.1 (13.8)
Age at HL identification (mo)		11.5 (11.9) median 6
Gender – Male		51 (56.7%)
Race		
	Caucasian	69 (76.7%)
	African American	16 (17.8%)
	Other	5 (5.5%)
Degree of hearing loss		
	Mild	9 (10%)
	Moderate	33 (36.7%)
	Severe	20 (22.2%)
	Profound	28 (31.1%)
Use of cochlear implant		41 (45.6%)
Maternal education ≥college		49 (54.4%)
At or below poverty		15 (16.7%)

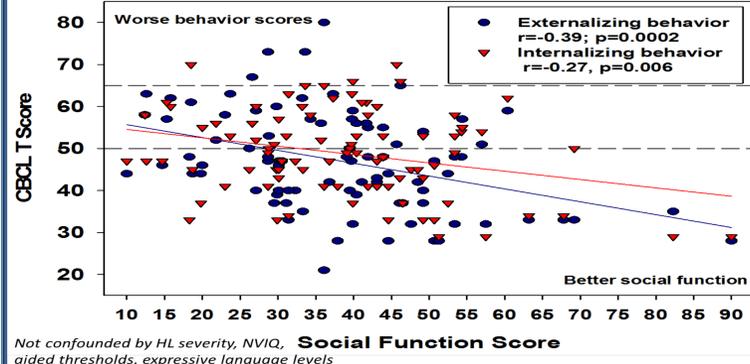
Reported as mean with SD or frequencies with percentage

Language & Cognitive Assessments		
Characteristics		
Nonverbal Intelligence Quotient (NVIQ)		94.3 (19.5)
Standard scores (mean 100±15)		
Language		
	Receptive	81.9 (18.3)
	Expressive	80.6 (18.5)
Standard scores (mean 100±15)		
Receptive:Cognitive ratio		86.2 (20.1)
	% with Ratio <85	45 (50%)
	% with Ratio<80	33 (36.7%)
PEDI social function		38.3 (15)
Standard T scores (mean 50±10)		
CBCL results T scores		
	Internalizing	48.9 (10.2)
	Externalizing	46.9 (11.6)
Standard T scores (mean 50±10)		

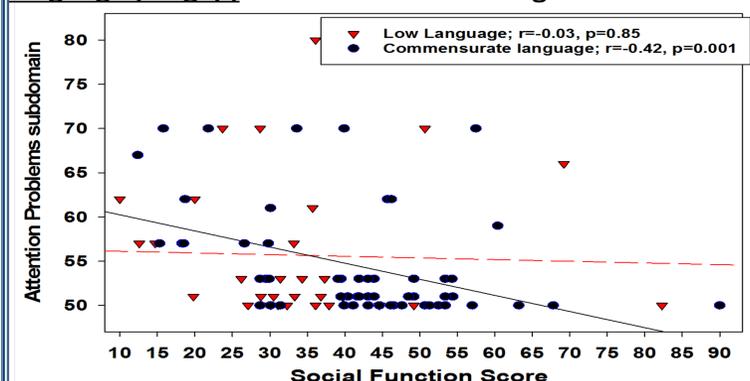
## Results

- DHH Children had social function scores ~1 standard deviation (SD) lower than population mean (p<0.0001)
  - Consistent across all NVIQ categories
- Fig 1. Poor social functioning correlated with worse externalizing and internalizing behaviors
  - Consistent across all NVIQ categories
- Fig 2. Significantly correlated with Attention Problems on CBCL
  - Relationship modified by language gap
- Specific PEDI items (shaded red in fig. 3) appear to significantly affect behaviors

**Fig 1. Scatterplot of PEDI social function T scores with CBCL behavior T scores**



**Fig 2. Better social functioning correlated with fewer attention problems only among children with commensurate language (no gap). No association among children with a gap**

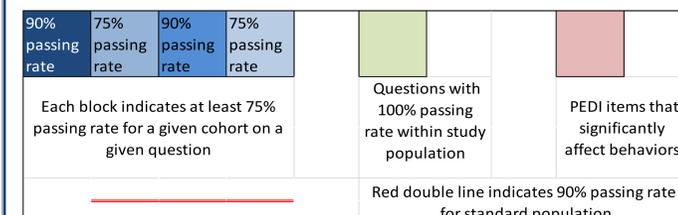


## Conclusion

- Social functioning is important for independent functioning
- DHH Children are at risk for poorer social functioning due to lower language levels
- This poor social functioning can precipitate more difficult behavior (as perceived by parents). Could be result of:
  - Difficulty communicating needs/seeking appropriate help
  - Having problems with time concepts
- Presence/absence of a language gap is more indicative of children's social function than their NVIQ alone
  - Can identify language gap in young children
- Possible long-term cascading effect of behavior problems on education and social interactions
- These findings have significant applications for language therapy that DHH children receive
  - Instead of settling for normal age-appropriate language skills, therapy should focus on bringing children to their true language potential, wherever that may be
  - Target specific trouble spots identified on the PEDI

**Figure 3. Percentage passing PEDI questions**

Communication	Comprehension of Word Meanings	Comprehension of Sentence Complexity	Functional Use of Communication	Complexity of Expressive Communication	Problem Resolution	Social Interaction	Peer Interactions	Play w/ Objects	standard pop. 3 yr old	3+ 4 yr olds	standard pop. 5 yr old	5+6 yr olds	
									no gap	gap	no gap	gap	
Communication	Comprehension of Word Meanings	Comprehension of Sentence Complexity	Functional Use of Communication	Complexity of Expressive Communication	Problem Resolution	Social Interaction	Peer Interactions	Play w/ Objects	Orients				
									Resp. to 'No'				
									10 Words				
									Und. Relationships				
	Social Interaction	Peer Interactions	Play w/ Objects	Und. Time									
				Short Sentences									
				1 Step Comm.									
				Und. Directions									
				2 Step Comm.									
				2 Sent. Forms									
Social Interaction	Peer Interactions	Play w/ Objects	Names Things										
			Requests Action										
			Asks Quest.'s										
			Descr. Objects										
			Descr. Own feel.										
			Uses Gest.'s										
			Sing. Words										
			2 Words Together										
			4/5 Word Sent.'s										
			Tells Simple Story										
Social Interaction	Peer Interactions	Play w/ Objects	Shows Problem										
			Requir. Imm. Help										
			Accepts Short Delay										
			Descr. Prob/Feel										
			Works Out Soln										
			Aware of Others										
			Init. Play										
			Takes Turns										
			Imitate Adult										
			Sugg. New Ideas										
Social Interaction	Peer Interactions	Play w/ Objects	Notifies										
			Interacts Briefly										
			Works Out Plans										
			Coop. Play										
			Plays Game w/ Rules										
			Manipulates										
			Simple Pretend Play										
			Assemble 3 Parts										
			Ext. Play Routine										
			Elab. Pretend Play										



**Fig 3**

- Compared passing percentages on each question by cohorts:
  - Age; Older group performs better
  - Language gap; Group w/o gap performs better

## Acknowledgements

- Funding from HRSA R40MC21513 and March of Dimes
- Thank you to study participants and their families

\* "deaf" indicates a physical hearing loss, whereas "Deaf" refers to people within the Deaf community