

## Impact of Language Underperformance on Communication and Social Functioning in Young Children who are Deaf or Hard of Hearing

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## Background

- Hearing loss influences all aspects of child's language acquisition  
High risk for language delays
- Early intervention provides opportunities to attain appropriate language and vocabulary development



## Persistent language delays continue

- Unfortunately, many continue to fall short of age- and cognitively appropriate levels
- Even minor lags in early language at risk  
Average and low average language not good enough  
Long term consequences
- Gaps widen with age irrespective of hearing loss levels

Tomblin, 2015; Nittrouer 2014, 2016; Meinzen-Derr, 2014  
Luckner 2005; Traxler, 2000



## Importance of social functioning

- Ability of a person to interact easily and successfully with others  
Important for independent functioning
- Plays significant role in emotional, behavioral development, and academic skills

Kaczmarek, 2002; Deater-Deckard, 2001; McElwain, 2005



## Functional impact of language delays

- Language is a primary human function  
Gateway to social functioning
- Language abilities can facilitate (or hinder) social interactions & functioning
- DHH at risk for poorer social, emotional, academic outcomes  
Language deficits magnify risk

Kaczmarek, 2002; Netten 2015; Horwitz 2003; Beitchman 1986;  
Karchmer 1999; Carney 1998; Bess 1998; Meinzen-Derr 2004; Moeller 2007

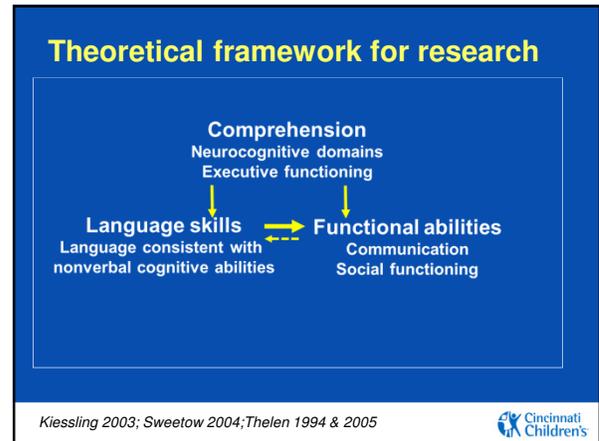
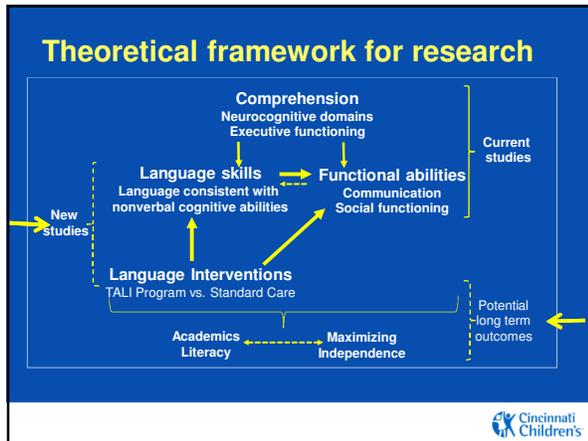


## Study Aim

- Investigate relationship between language underperformance and functional skills (in children <48 months of age who are deaf or hard of hearing (DHH))
- ***Focused on social and communication functioning***

Meinzen-Derr 2014; Wiley 2012;





Kiessling 2003; Sweetow 2004; Thelen 1994 & 2005

- ### Study Design
- **Language and Independent Functional Expectations (LIFE)**
    - Longitudinal study
    - 0 6 years at first visit
    - Annual visits for up to 3 years
  - *Current analysis focused on cross sectional data (first visit)*

- ### Study Participants
- Inclusion
    - 0 6 years
    - Permanent bilateral hearing loss (any degree)
    - Nonverbal IQ (NVIQ) >40
  - Exclusion
    - Unilateral hearing loss
    - Significant communication disorders (i.e., ASD)
  - **147 enrolled to date: 77 <48 months**

- ### Assessment Tools
- Language Assessment:
    - Preschool Language Scales 5
      - Standard scores, age equivalents
  - Cognitive Assessment (nonverbal):
    - Leiter International Performance Scale R
      - Brief IQ
    - Mullen Scales of Early Learning
      - Visual Reception Scale

- ### Assessment Tools
- Behavioral Assessments parent report
    - Behavioral Rating Inventory of Executive Function
      - Working memory
    - Child Behavior Checklist
      - Internalizing and externalizing behaviors
  - Functional Assessment
    - Vineland Adaptive Behavior Scales
    - Pediatric Evaluation of Disability Inventory

### Outcome Measure

#### Vineland Adaptive Behavior Scales

- Reflects the individual's personal and social skills as he/she interacts with environment
  - 383 items
  - Communication, Daily living skills, socialization, motor skills
  - Standard scores (mean 100±15)
- Can measure adaptive behavior in different subgroups



### Outcome Measure

#### Pediatric Evaluation of Disability Inventory

- Comprehensive standardized measure of essential daily functional activities
  - 197 discrete functional skill items
  - Self care, mobility, social function
  - Standard (mean 50±10) and Scaled Scores
- Useful in treatment planning and identifying specific areas where assistance is needed
- Aligned with the International Classification of Functioning, Disability, and Health in children and youth



### Language Performance

Quantified as language abilities relative to cognitive abilities

Receptive Language standard score  
Nonverbal IQ standard score

LANGUAGE 85

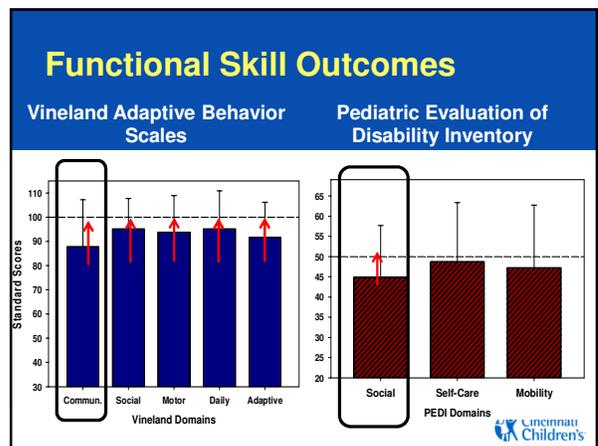
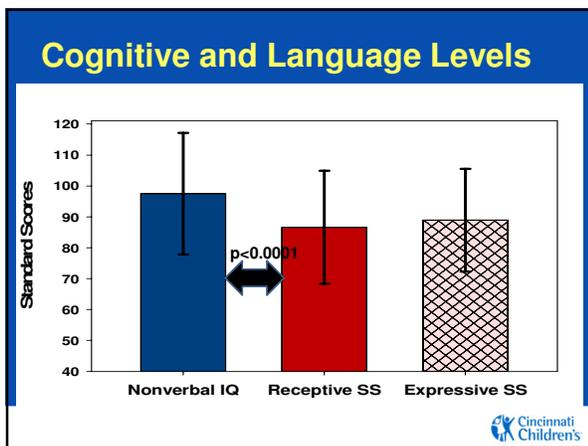
IQ 100

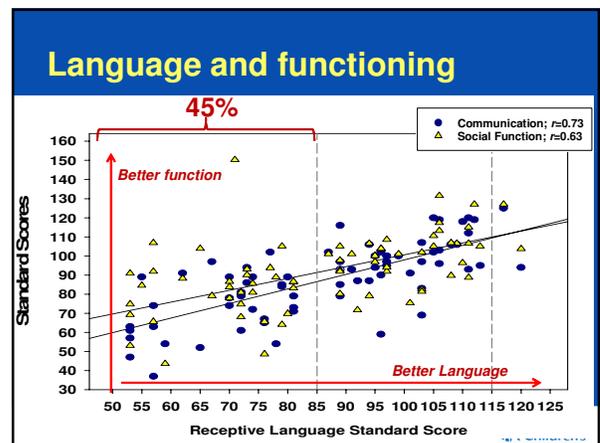
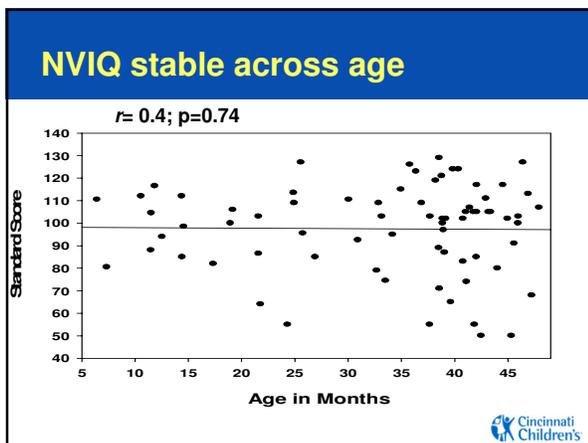
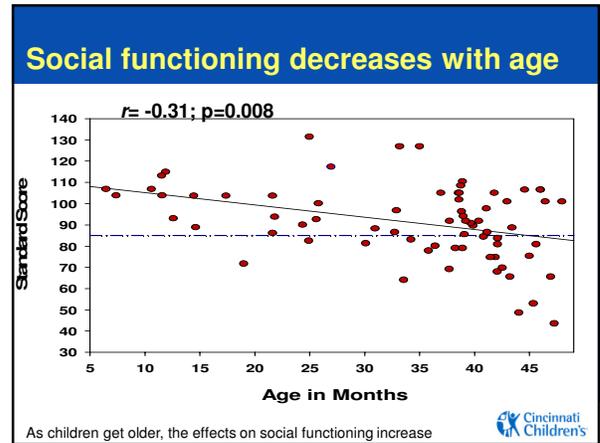
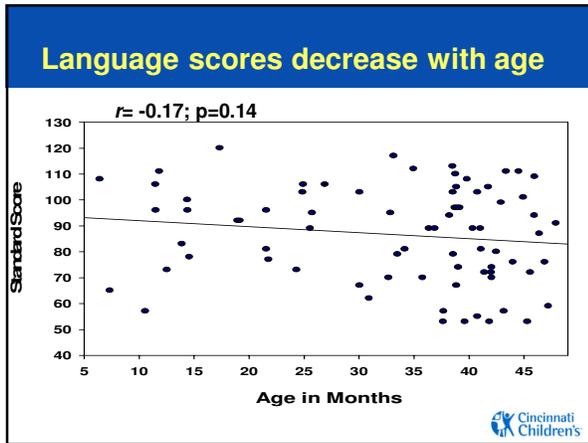
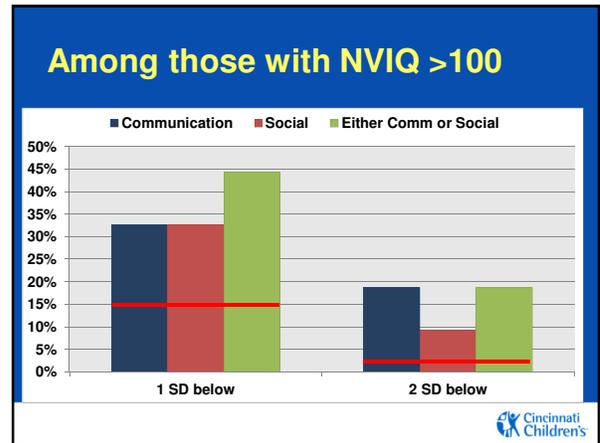
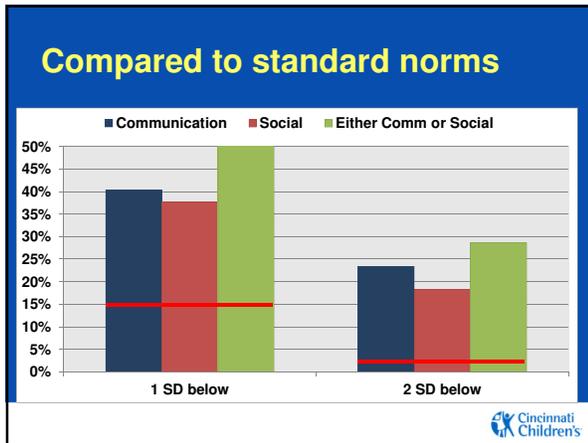
>35% have ratio <85

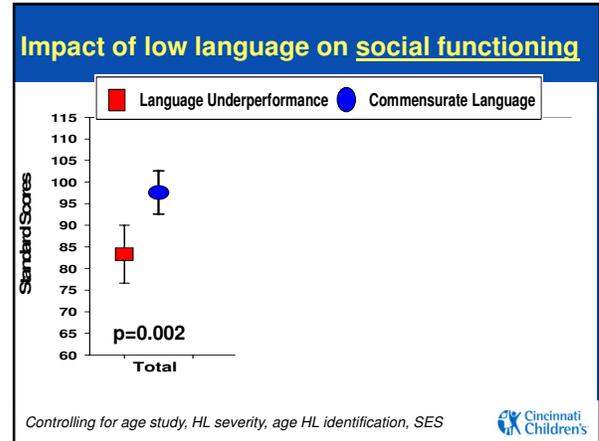
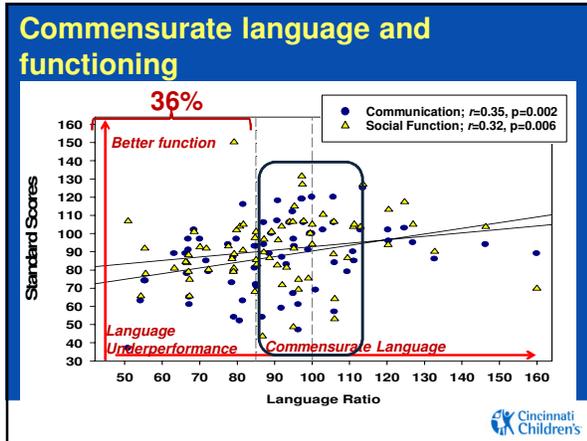
research in Developmental Disabilities 32 (2011) 757-767      (J Dev Behav Pediatr 35:197-206, 2014)



Characteristic of participants	N 77
Mean Age at study (mos)	33 (11.5)
Mean Age at HL identification (mos)	7.9 (10.6) Median 2
Male	54.6%
Caucasian	86%
Born premature	18%
Mild to moderate hearing loss	59.7%
Received a cochlear implant	27%
Maternal education	HS/GED 16% Some college 18.7% College graduate 29.3% Post college 36%
Public health insurance only	32.4%
Income at or below poverty level	19.5%







Characteristics	Low	commensurate
Age at study (mos)	34.6	32.3
Age at HL identification	Median 3.5	Median 2.0
Male	55.6%	53.1%
Caucasian	77%	91.1%
Mild to moderate HL	44.4%	67.4%
Received a cochlear implant	33.3%	24.5%
Age at CI	22.8	20.8
Maternal education* HS/GED	18.5%	14.6%
Some college	33.3%	10.4%
College graduate	22.2%	33.3%
Post college	25.9%	41.7%
Public health insurance only*	48.2%	23.4%
Income at or below poverty	29.6%	14.3%

Cincinnati Children's

Characteristics	Low	commensurate
NVIQ	106.8	91.9
NVIQ <80	0	26.5%
Receptive Language scores	75.4	92.8
Expressive Language scores	80.3	93.7
Receptive language <80	63%	24.5%

Characteristics	Low	commensurate
NVIQ	108.8	94.2
NVIQ <80	0	24.3%
Receptive Language scores	77.8	95.1
Expressive Language scores	82.4	96.2
Receptive language <80	61.1%	18.9%

Cincinnati Children's

### Summary

- Language underperformance negatively impacts social and communication skills in children who are DHH
  - language levels not commensurate with their cognitive abilities
- Occurs at very young ages, across all levels of ability and degrees of hearing loss

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### Summary

- Social functioning appears to worsen with age
  - Perhaps due to persistent or widening gaps in language
- Children with language underperformance appear to have on average higher NVIQ, but lower SES markers
- Even if language levels are in average range, if not meeting cognitive potential, impacts other outcomes

Cincinnati Children's

### Implications and future directions

- Longer term implications for behavior (see Bonfield poster) and academic outcomes
- Social functioning should be incorporated as regular assessments as early as possible  
Functional assessments take a whole child approach and can provide specific areas to target for intervention purposes



### Implications and future directions

- Consider aggressive adjustments to current EI strategies when kids perform below cognitive potential  
Early recognition of slower trajectories is critical  
Requires understanding of cognitive abilities
- Current interventions slow to introduce innovative models  
Gap in knowledge about evidence based approaches for DHH
- Novel approaches to learning language should be considered in future research



### Thank you

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