



# Outcomes for Children with Hearing Loss

Effects of age of ID, sign support,  
and auditory prosthesis

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Supported by grant R01 DC6237 from the  
National Institute of Deafness and Other Communication Disorders

# Overview of Presentation

- I. Background and Design (10 min)
- II. The BIG Picture (15 min)
- III. The Interesting Side Stuff (10 min)
- IV. Clinical Implications (10 min)
- V. Summary and Conclusions (5 min)

50 minutes

# Background and Design

# Independent Variables

Hearing loss

Age of Identification (ID) of hearing loss

Use of signs to support spoken language input –  
or not

Type of prosthesis  
hearing aid (HA)  
cochlear implant (CI)

# Characteristics of Participants

- No secondary handicaps
- English as the only language
- Children with HL
  - Greater than 50 dB HL PTA in better ear
  - Receiving intervention at least once per week before 36 months of age; increases at preschool
  - Parents want child to have spoken language as their mode of communication

# Characteristics of Samples

- This study used large, diverse samples of the populations to be tested. In this way the effects of variability in variables not of interest were minimized.
- All parents explicitly stated that their goal for their children was that they would be mainstreamed without sign language interpreters.

# Note on Sign Language

- For parents in this study sign input was used by parents as support to spoken language input.
- Stated reasons for use were to promote development of spoken language, alleviate frustration, and provide communication prior to implantation.

# What we tested

- Parenting Stress:  
Parenting Stress Index (PSI)
- Child Negative Behaviors:  
Child Behavior Check List (CBCL)
- Adaptive Behavior:  
Scale of Independent Behavior-  
Revised (SIBR)
- Nonverbal cognitive intelligence: Leiter



# What we tested

- Auditory Comprehension of Language  
PLS-4
- Expressive Vocabulary  
LDS & EOWPVT
- Language Function  
Unstructured and Elicited Samples
- Language Form  
including SALT

# What we tested

- Acoustic analysis of speech samples
- Speech intelligibility  
CSIM
- Parental Language Style

# Rigorous Test Procedures

- Examiners trained and certified
- Examiners made as few scoring decisions as possible
- Scorers at central site were blind regarding participant characteristics
- Two scorers made every measurement, entered every data point, reliability checked at each step

# Big Picture Results

## Finding #1

No group differences found for anything that does not involve language.

## Finding #2

Having a hearing loss delayed language development even for children with everything going right.

## Finding #3

No strong effects of sign language were found for language development or behavior, for children with NH or with early IDed HL.

## Finding #4

Only mild delays generally found for  
late IDed HL,  
with some more significant  
delays for children using signs.



## Finding #5

Early IDed children with CIs were delayed compared to early IDed children with HAs.

# Language Function and Form

Tested by scoring of 20-min  
samples of parent-child  
interactions.

# Child's Communication Acts

- **Function**
  - Parent-directed and child-initiated
  - Parent-directed response
  - Non-directed communication
- **Form**
  - Real word
  - Vocalization
  - Manual

# Child-Initiated Acts

- Request for object
- Request for action
- Protest
- Comment
- Inquiry
- Routine

# Directed-Response Acts

Acknowledgement

Answer

Imitation

# Non-directed Acts

Comment

Request

Object address

Talk through

# SALT

*Starting at 30 mos.*

- Mean length of utterance – word and morpheme
- Number of different words
- Number of pronouns
- One-word utterances
- Modal/auxiliary verbs
- Number/type conjunctions
- Question words

# Language Function and Form

- Children with HL use fewer utterances with real words, give fewer answers, and imitate more frequently.
- Sign support has little effect, for children IDed at birth.
- Only mild delays for children IDed late, except greater delays for those using signs.
- For early IDed children, CI users trail HA users.

# Parental Language

- Inquiry
- Directive
- Imitation
- Routine
- Visual cue
- Explanation
- Talk through
- Comment
- Verbal approval
- Nonverbal approval
- Verbal response
- Nonverbal response
- Verbal disapproval
- Nonverbal disapproval
- Nonverbal model
- No response



# Parental Language

- Parental use of verbal responses strongly correlated with child's language development.
- $r = .78$ ;  $r^2 = .61$

# The Interesting Side Stuff

# Are there Stars?

## Criteria, from SALT

Within  $\frac{1}{2}$  SD of NH  
mean on:

MLU

Total # Words

# Different Words

# 1-word utterances

## 4 Stars Found at 36 m

1 with HAs

2 with CI/HA combo

1 with CI/HA combo  
to 30 m, then  
bilateral CIs

# Interesting Stuff

- Age of implantation had no effect on outcomes.
- Two prostheses were always better than one.
- Having an HA on the unimplanted ear was better than having nothing or having two CIs.
- Socio-economic status had stronger effects for children with NH.

# Clinical Implications

# Seven Principles

#1: Identify children with HL as young as possible.

#2: No need to use sign support, unless the goal is explicitly that the child will be using ASL.

#3: Provide as much spectral input, for as long as possible.

#4: Let children see you talking.

# Seven Principles

#5: Train parents to:

- Be sensitive to children's communicative attempts.

- Provide the language the child needs at the moment.

- Encourage children to produce their own language.

# Seven Principles

#6: Train parents NOT to:

Simply label objects

Use directives to get children to talk  
("Say \_\_\_\_\_")

#7: Use complete language structures.





# Summary



- HL delays language development.... even when children have everything going for them.
- Sign support has no effect, unless HL was identified late.
- Early IDed children with CIs trail peers with HAs.
- Late ID had mild negative effect, mostly for children using signs.