Sign language and spoken language: Expressive language development in pediatric cochlear implant recipients

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Background

- 9 out of 10 children with hearing loss are born to hearing families (National Institute on Deafness and Other Communication Disorders, 2010)
- 75% of children with mild through severe hearing losses achieve intelligible speech by 60-72 months of age with use of hearing aids and appropriate intervention (Yoshinaga-Itano & Sedey, 2000)
- Those with limited residual hearing expressed by a profound hearing loss may have limited success with traditional hearing aids and instead receive cochlear implants (CI) (Peterson, Pisoni, & Miyamoto, 2010)

Current CI Outcomes

- Only one part of treatment, not a fix
- Successful, but still a portion or recipients who are unsuccessful
- No guarantee that the implant will be successful or that a child will develop intelligible spoken language
  - Factors may indicate "better" candidates, but do not necessarily predict outcomes
- Sign language is necessary to allow them access to language when auditory input is limited

Controversy

- Children with normal hearing
  - Baby sign – can act as a bridge to cognitive processes before infants can properly express themselves through spoken language (Mueller, Sepulveda, & Rodriguez, 2013)
- Children with hearing loss
  - Fear the use of bilingualism with a signed and spoken language will complicate the acquisition of spoken language
  - Desire for child to use the same language as the rest of the family

Literature

- Users of total communication had higher vocabulary scores (Connor, Hieber, Arts, & Zwolan, 2000)
- Children with spoken language only had better expressive language skills (Geers, Nicholas, & Sedey, 2003)
- Users of oral communication had significantly better expressive vocabulary (Cullington et al., 2000)
- No significant difference between groups (Niparko et al., 2010)

Need for More Evidence

- Due to limited resources, there are a lack of studies involving participants with consistent intervention and education
  - Often retrospective studies
  - Convenience samples

Purpose of the Study

- To describe expressive language outcomes between those who use sign language after cochlear implantation and those who do not
  - Uses participants enrolled in Colorado Home Intervention Program (CHIP)

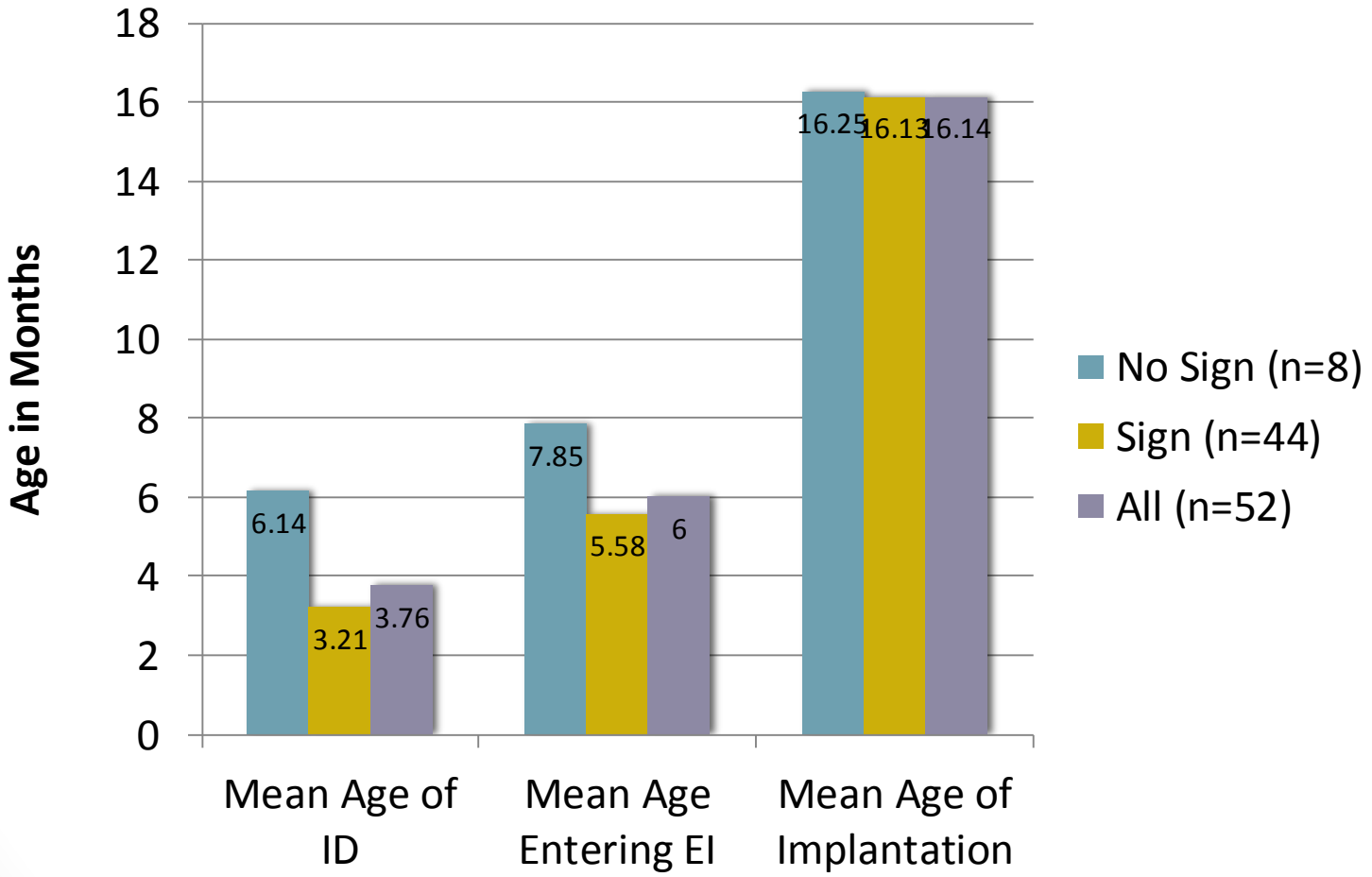
Colorado Home Intervention Program (CHIP)

- Statewide home-based early intervention program within Colorado School for the Deaf and Blind Outreach Program
- One point of entry into the system – provides 90% of all EI services for children with hearing loss, ages birth through three
- Parent Facilitator (EI Provider) - professional who specializes in kids with hearing loss; at least a masters degree
- Parents have active role
- Offered opportunity to have native signer visit for weekly in-home instruction
- Assessments every 6 months, including language sample

Participants (n=52)

- Enrolled in CHIP
- Received at least one cochlear implant before 24 months of age
- No additional disabilities that impact speech and language development per demographic forms obtained
- At least two assessments completed with at least one being administered post-implantation

Demographics



Data Collection

- Retrospective chart review from the CHIP database
- Two groups – those who used greater than 10 signs over the course of assessments (n=44) and those who used 10 signs or less (n=8)
- Variables:
  - Age at implantation
  - Minnesota Child Development Inventory (MINN CDI) scores
  - MacArthur-Bates Communicative Development Inventories (MAC CDI) expressive language scores

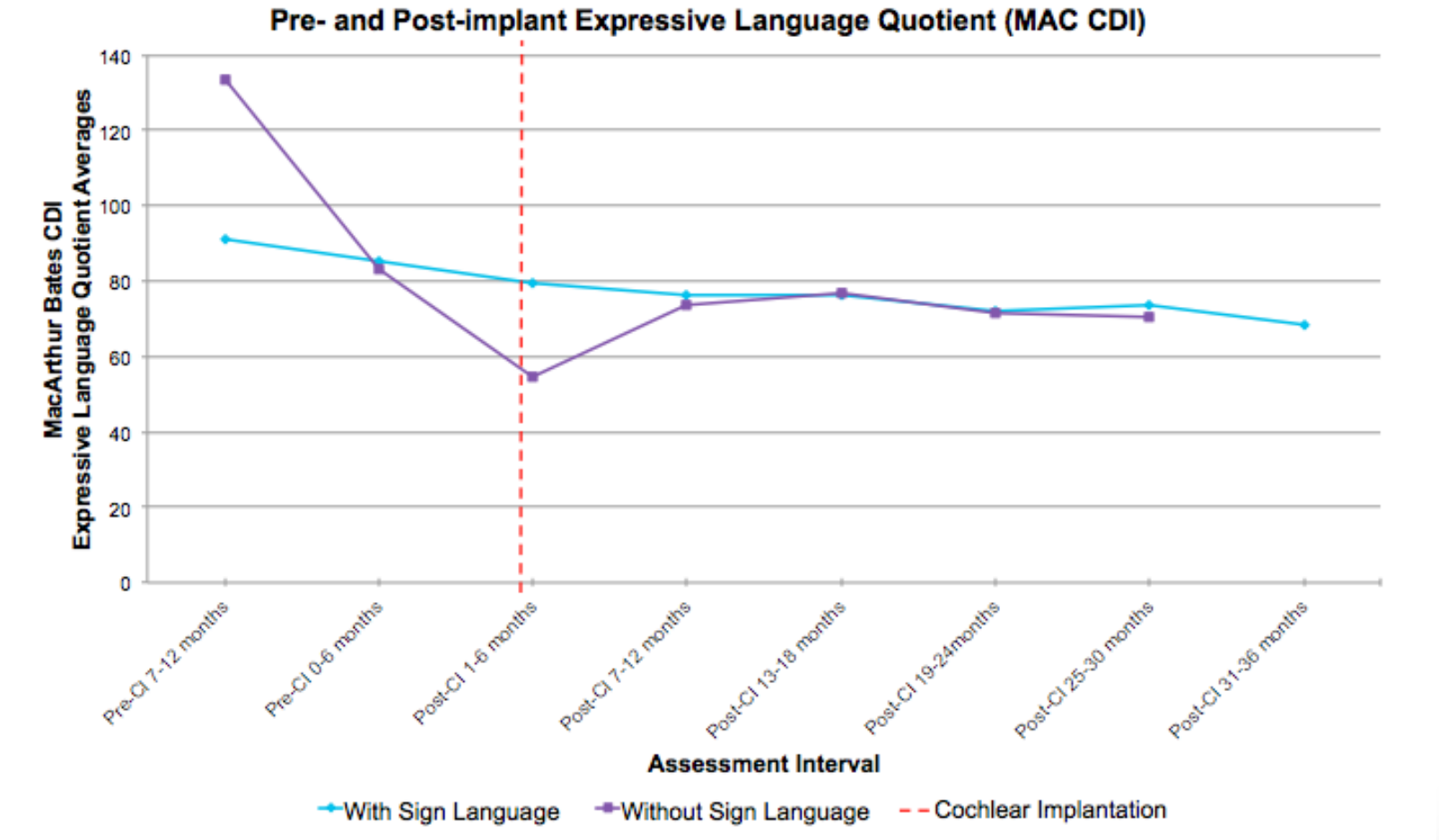
Data Analysis

- Expressive language quotient:

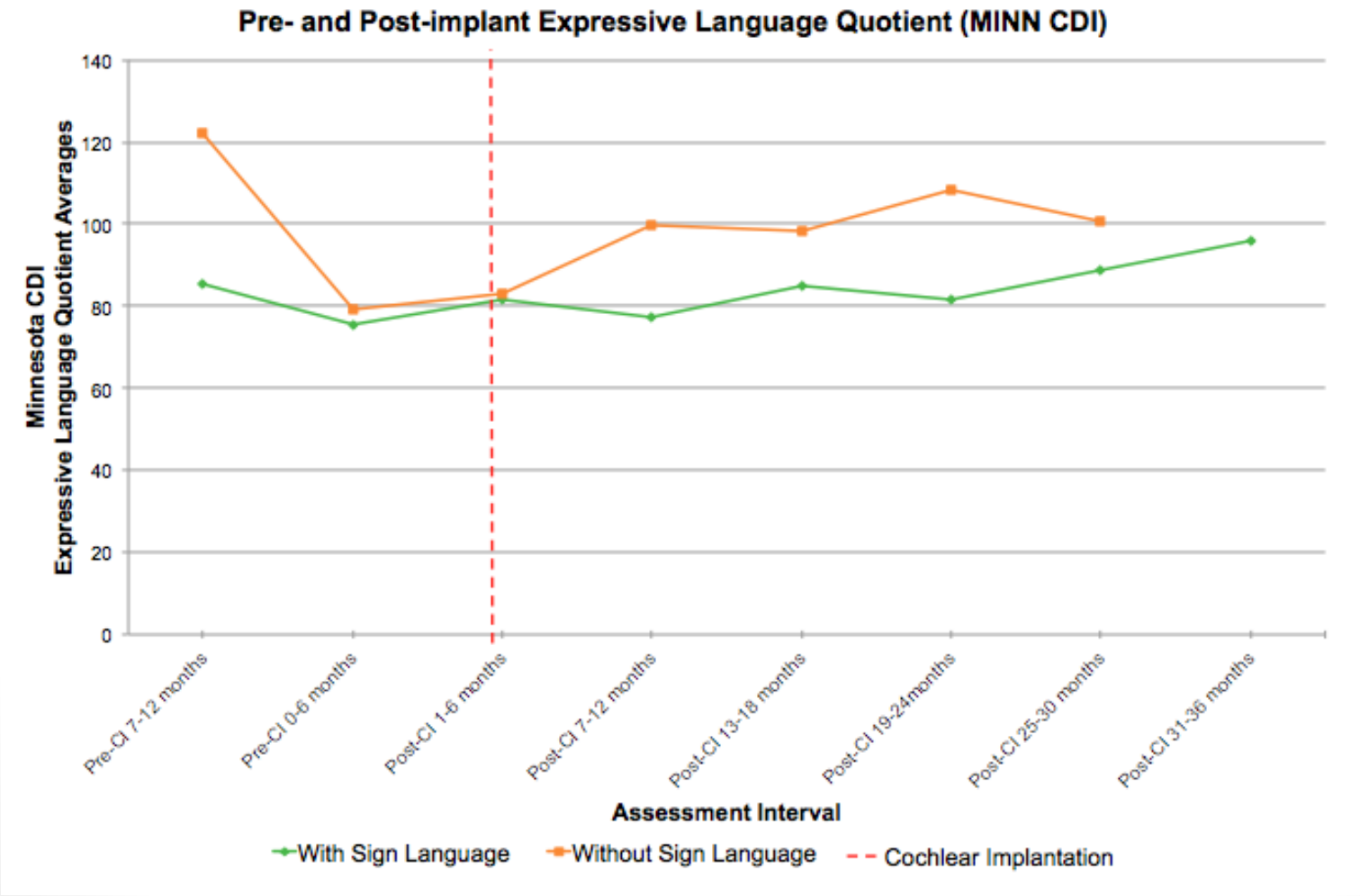
$$\frac{\text{MAC/MINN CDI Expressive Language Age}}{\text{Chronological Age}} \times 100$$

- Expressive language quotient greater than or equal to 85 considered to be average or above
- Descriptive analysis

Results


Pre- and Post-implant Expressive Language Quotient (MAC CDI)
MacArthur Bates CDI
Expressive Language Quotient Averages
140
120
100
80
60
40
20
0
Pre-CI 7-12 months
Pre-CI 0-6 months
Post-CI 1-6 months
Post-CI 7-12 months
Post-CI 13-18 months
Post-CI 19-24months
Post-CI 25-30 months
Post-CI 31-36 months
Assessment Interval
With Sign Language
Without Sign Language
Cochlear Implantation

Results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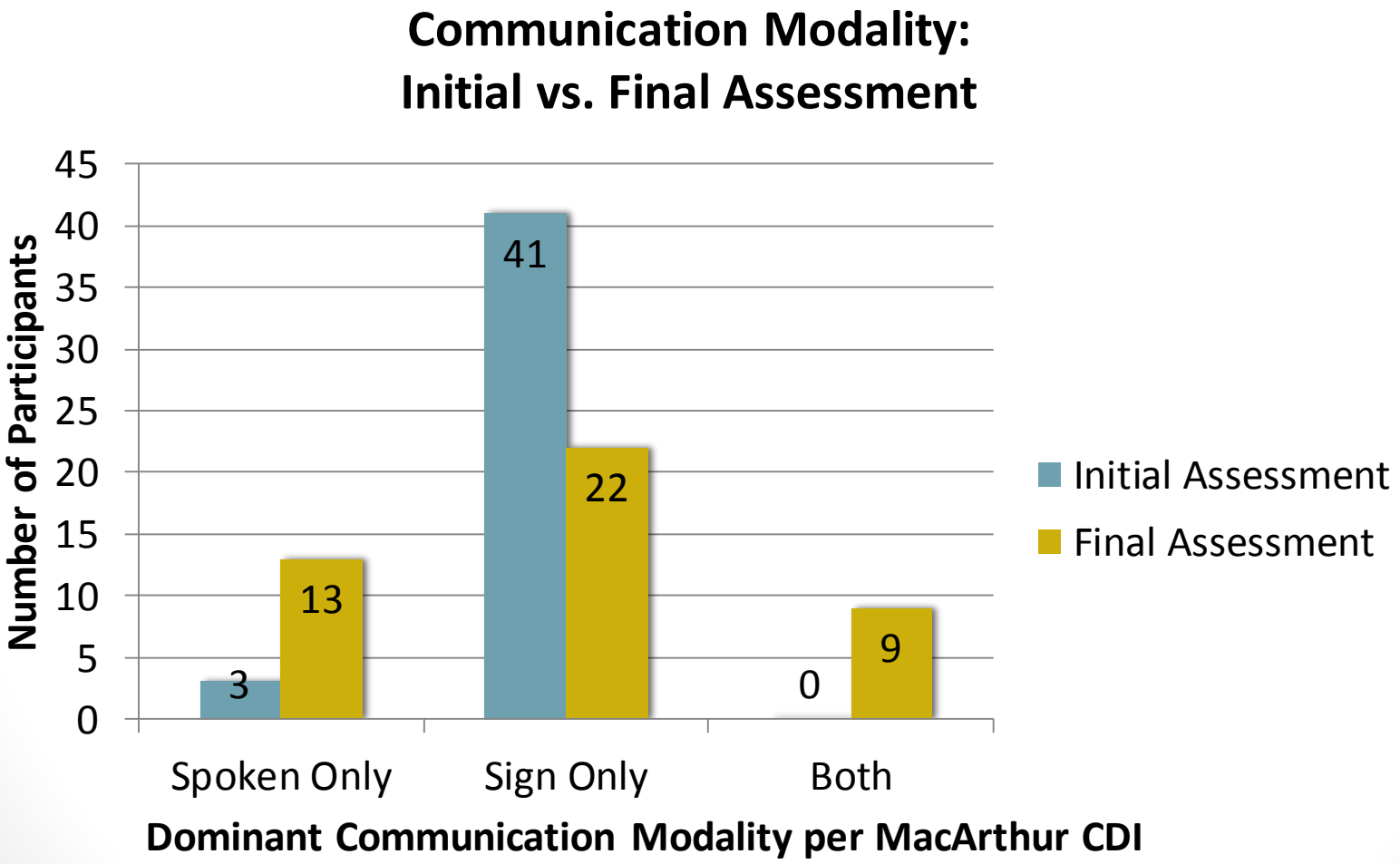
Communication Modality:
Initial vs. Final Assessment
Number of Participants
45
40
35
30
25
20
15
10
5
0
3
13
41
22
0
9
Spoken Only
Sign Only
Both
Dominant Communication Modality per MacArthur CDI
Initial Assessment
Final Assessment

Interpretations

- MacArthur Bates CDI
  - All children experienced a vocabulary delay out to 2.5 years post-implantation
- Minnesota CDI
  - All children had an expressive language quotient within the range of average by 3 years post-implantation
- Initial vs Final Assessment
  - At the initial assessment, 93% of participants had the largest vocabulary using sign language only, while 7% had the largest vocabulary using spoken language.
  - By the final assessment, 50% of participants had the largest vocabulary using sign language only and 50% used spoken language either on it's own or in conjunction with sign language

Limitations

- Group without sign language is very small
  - Amount of scores to calculate mean ranged from 2 to 7, but on average only consisted of 3 scores
- Incomplete records
  - Inconsistent assessment intervals
  - Additional private services
  - Follow-up with managing audiologist
- Recommended parent/family involvement vs. actual
- May not be indicative of functional performance

Implications

- Significantly delayed vocabulary – MacArthur
  - Is this successful?
- Expressive language skills should be back within range of average 3 years post-implantation – Minnesota
  - For many of the children this would mean at grade-level when entering kindergarten
- Need to be aware of what is being measured with assessments to have a more accurate picture of child's progress
  - Important to be using more than just one assessment tool - fuller picture

Next Steps

- Perform in depth analysis to focus on specific trends within this data set
  - Demographics
  - MAC CDI - does vocabulary eventually reach average range? When?
  - MINN CDI - rate of growth?
- Does the quality of sign language correlate with a higher expressive language quotient?
- Standardize intervals of assessment post-implantation especially once out of EI

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