Cochlear Implants for Students who are Deaf-Blind

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Why Research is Important

- State deaf-blind projects and deaf-blind research projects reported a significant increase in children being implanted
- Children with multiple disabilities were getting implants
- Limited data existed re: post-implant outcomes for children with deaf-blindness
- Limited data existed re: instructional practices for children with deaf-blindness
Objectives

- Develop a systematic data collection system specific to pre-/post-implantation status
- Identify a protocol of appropriate assessments for children who are deaf-blind
- Collaborate with state deaf-blind projects, early childhood agencies, and implant centers to identify family volunteers for participation
Objectives (cont.)

- Address four research questions targeting children between earliest age of implant through 12 years of age
- Disseminate information about the project’s activities and outcomes
- Evaluate project objectives and activities
Research Questions

- Which children between the earliest age of implant and 12 years, who are deaf-blind, receive cochlear implants?

- How does receiving a cochlear implant impact the developmental trajectories of children, who are deaf-blind, in the areas of auditory perception, receptive and expressive communication & language, and speech?
Research Questions (cont.)

- How do age of implant, severity of visual impairment, cognitive level, presence of additional disabilities, or length of time post-implant impact the outcomes?

- To what degree do the intensity, duration, and/or quality of post-habilitation services contribute to the positive or negative progress of a child, who is deaf-blind, post-implant?
For assessment purposes, participants are divided into three groups, dependent on time each child has had a cochlear implant.

Groups include:

- Pre-implant
- Post-implant
  - Implant less than seven years
  - Implant for seven years or longer
Design & Methodology

- Two groups: Pre- and Post-implant
- Quasi-experimental time-lag design
- Within subject and across subject analyses
- Case study
Measures

- Auditory perception
- Communication, including prelinguistic communication
- Receptive and expressive language
- Cognitive skills
- Speech intelligibility
Evaluation

- Formative Evaluation
  - Goal attainment scaling
  - External evaluation of project
  - Adherence to timeline
  - Cost unit analysis
Evaluation

- Summative Evaluation
  - Levels of internal and external validity
  - Extent of data across design and research questions
  - Completion of goal attainment scale
  - Timelines met, questions sufficiently answered
Outputs & Challenges

- 15 states are collaborating partners
- Over 45 children are participating in the assessment process to date
- IRB processes continue to be a challenge across the many collaborative partners
- Subcontracts also are a challenge and have impacted the identification and consent processes
Trends re: Cochlear Implants

- Eligibility age for receiving cochlear implants is decreasing
- Earlier ages are associated with more significant and rapid progress
- Bilateral implantation is dramatically increasing
- Variability in outcomes continues to exist, especially for older children
Trends (con’t.)

- Intervention with an oral focus, post-implant, is associated with more positive outcomes than is the case with total communication (HI only)
- Technology continues to advance--the number of available channels is increasing and programming is improving
Preliminary data (as of 4/17/07)

- 22 participants
- Ages from 20 months to 12 years
- 15 males, 7 females
- 3 Latino, 19 Caucasian
- All have vision less than 20/200, 13 are legally blind or totally blind
- All have severe or profound hearing loss
In addition to deafblindness…

- 14 have physical impairments
- 15 have cognitive impairments
- 6 have behavior disorders
- 13 have complex health care needs
- 8 have 3 additional impairments
- 5 have 2 additional impairments
- 4 have 1 additional impairment
- 5 have no additional impairment
Age of implantation

- Ranges from 10 months to 10 years, 7 months
- Median age = 31 months
- Younger children more likely to be implanted at earlier ages ($r_p = .621, p \leq .01$)
- Earlier the hearing loss the more likely to be implanted at earlier ages ($r_p = .724, p \leq .001$)
- Older children less likely to have additional impairments (weak negative correlation with exception of complex health care needs)
### Correlations with age of implant

<table>
<thead>
<tr>
<th>Category</th>
<th>Spearman’s $r_s$</th>
<th>Significance</th>
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<tbody>
<tr>
<td>Physical</td>
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<td>.533</td>
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<tr>
<td>Cognitive</td>
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<td>.747</td>
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<td>Behavior</td>
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<td>.799</td>
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<td>Complex health care</td>
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<td>.002*</td>
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</table>
Cochlear Implant data

Habilitation
- Mapping (7)
- Auditory/verbal (1)
- Speech therapy (5)
- TLC (1)

Communication intervention
- Auditory/verbal (2)
- Oral lip reading (1)
- Total communication (13)
- Sign (1)
Vocabulary Comprehension

- MacArthur Communicative Development Inventories (1992)
- Parent report of child language development
- Collects data on comprehension vocabulary, productive vocabulary and the use of communicative and symbolic gestures
- Assesses 396 words and 63 gestures commonly used by typically developing children
- Provides percentile scores to allow the comparison of individual children to similarly aged peers
- Milestones were calculated based on when 50% of the sample were reported to exhibit a given behavior
## Use of the MacArthur

<table>
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<tr>
<th></th>
<th>Min</th>
<th>Max</th>
<th>Mean*</th>
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<tr>
<td>Vocab Comprehension</td>
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<tr>
<td>Vocab Production</td>
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<td>17</td>
<td>5.0</td>
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<tr>
<td>Sign Comprehension</td>
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<td>15</td>
<td>3.79</td>
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<tr>
<td>Sign Production</td>
<td>0</td>
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<td>3.36</td>
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<tr>
<td>Total Gestures</td>
<td>5</td>
<td>20</td>
<td>10.5</td>
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*Data reported in months
## Correlations with Age of Implant

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<tbody>
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<td>Sign Comprehension</td>
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<tr>
<td>Sign Production</td>
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<td>Total Gestures</td>
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## Correlations with Age of Child

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<td>Sign Production</td>
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<td>Total Gestures</td>
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*p ≤ .05
A picture of Murphy

- 12 year-old girl
- Profound hearing loss since birth
- Progressive vision loss
- Nucleus 24 at 35 months
- Moderate physical impairments and mild cognitive impairments
- Total communication
- Fully included in home school
- Lives at home with parents
- Vocal comprehension age is approximately 19 months and her total gestures age is about 20 months
- Murphy has no understandable vocal or sign production
A picture of Larry

- 8 year-old boy with CHARGE syndrome
- Nucleus implant @ 4 ½ years
- Legally blind
- Total communication
- Moderate physical and cognitive impairments
- Mild complex health care needs
- Attends a public separate school
- Lives at home with parents
- Larry’s sign comprehension age is approximately 12 months and his sign production about 13 months
A picture of Charles

- 4 year-old boy with CHARGE syndrome
- Profound hearing loss since birth
- Low vision (<20/200)
- Med El implant at 12 months
- Mild physical and cognitive impairments
- Moderate complex health care needs
- Attends an early childhood special education setting
- Lives at home with parents
- Charles’ sign comprehension age is approximately 15 months, total gestures age about 18 months, and no vocal comprehension
- Charles vocal production age is approximately 16 months and his sign production about 19 months
Very preliminary findings

- Strong relationship between age of child and age of implant
- Strong relationship between age of hearing loss and age of implant
- Younger children with complex health impairments are more likely to be implanted earlier than their older counterparts
- Moderate relationship between age of child and total gestures age (older the child, older the total gestures age)
- No statistically significant relationship between primary vision and sign comprehension age or total gestures age
- Children display tremendous variation in their outcomes
Preliminary Anecdotal Data

- States report that a number of parents have discontinued the use of the cochlear implant (10-20% in some states)
- Intensity, frequency and types of available intervention vary widely across children/families
- Tremendous need for appropriate intervention strategies for children who are blind and/or low vision, especially with additional disabilities.
Contact Info

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