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?

Assessment Schedule

- 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

	Spearman's (r_s)	**Significance**
Physical	-0.157	.533
Cognitive	-0.079	.747
Behavior	-0.072	.799
Complex health care	-0.686	.002*

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

	Min	Max	Mean*
Vocab Comprehension	0	19	6.5
Vocab Production	0	17	5.0
Sign Comprehension	0	15	3.79
Sign Production	0	19	3.36
Total Gestures	5	20	10.5

*Data reported in months

Correlations with Age of Implant

	r_p	r_s
Vocab Comprehension	0.172	0.278
Vocab Production	0.054	-.049
Sign Comprehension	0.013	-0.095
Sign Production	0.030	0.035
Total Gestures	0.178	0.389

Correlations with Age of Child

	r_p	r_s
Vocab Comprehension	0.309	0.183
Vocab Production	-0.018	0.095
Sign Comprehension	0.137	0.222
Sign Production	0.271	0.370
Total Gestures	*0.537	0.446

*$p \leq .05$

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 producation 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.

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