SUMMARY OF RESEARCH ARTICLES: UTILIZATION OF "TOTAL COMMUNICATION" VERSUS "ORAL COMMUNICATION" PROGRAMS INVOLVING PROFOUNDLY DEAF CHILDREN WITH COCHLEAR IMPLANTS

SUMMARY OF RESEARCH ARTICLES CONTENTS

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Summary of Research Articles: Utilization of "Total Communication" Versus "Oral Communication" Programs Involving Profoundly Deaf Children with Cochlear Implants

Moog, Jean S., Geers, Ann E. Speech and Language Acquisition in Young Children After Cochlear Implantation. *Early Identification and Intervention of Hearing Impaired Infants* 32 (6), 1127-1141. (1999).

Purpose: This article details a study concerning deaf children with cochlear implants who have demonstrated significantly improved scores in speech production, language, and reading when were provided with intensive instruction in a high quality oral education program. The authors state that the more a deaf child can hear, the more easily that child can learn to talk.

Procedures: Twenty-two children, ranging in age from 6 years to 10 years, with cochlear implants participated in this study. All of the children had been implanted for one year or longer and had been enrolled in an oral setting since preschool. They were tested on auditory speech perception, speech intelligibility, language, and reading development, using a battery of standardized tests for each.

Analysis of Results: In speech perception, the scores ranged from 4% to 84% correct. All of the children demonstrated some open set speech perception at the time of the testing. In speech production, all of the children but 3 scored 90% or better. A score of 90% correct is described in the SPINE test manual as "Excellent Intelligibility". In language, almost half of the children demonstrated language skills in the average range when compared to normal-hearing children. In reading, all but 4 of the children scored within 80% of their normal-hearing age peers. This level of reading is considered exceptionally good for profoundly deaf children.

Conclusion: "Speech perception, speech production, language and reading levels attained by the children in this sample generally exceeded those previously observed in profoundly deaf children using hearing aids. **These levels are believed to result from a combination of improved auditory skills with a cochlear implant and intensive auditory-oral education."**

Dornan, Dimity. Let's Hear and Say: A Current Overview of Auditory-Verbal Therapy. *The Auricle* 16-23. (Fall/Winter 1999).

Purpose: This article gives an overview of the current philosophy and teaching methods of Auditory-Verbal Therapy. It provides a description and rationale for the Auditory-Verbal approach, the importance of parent participation, the development of auditory skills, and an overview of an Auditory-Verbal session.

Findings: **The Auditory-Verbal approach focuses on listening leading to the natural development of speech and language.** "The goal is for the hearing-impaired child to grow up in typical learning and living environments and to become an independent, participating citizen in mainstream society." "As speech is a series of acoustic events best learned through listening, the highlighting of a listening approach allows language and speech learning in the most natural manner." "Studies show that over 90% of parents with normal hearing do not sign language beyond a basic preschool level of competence. Auditory-Verbal practice requires that caregivers interact with a child through spoken language and create a listening environment that helps a child to learn." As verbal language develops through the auditory input of information, reading comprehension skills can also develop. Parent participation is vital to Auditory-Verbal Therapy, since this approach embraces the view that children learn language most easily when actively engaged in relaxed, meaningful interactions with supportive parents and caregivers. The development of auditory skills is critical because all of theother language skills are developed through audition. The Auditory-Verbal sessions usually cover the four areas of audition, language, speech, and cognition. Parents and caregivers always participate in the sessions.

Conclusion: One of the major differences between the various programs for hearing-impaired children is not what the child can do but what is expected for that child. The aim for hearing-impaired children taught with the Auditory-Verbal approach is for mainstream education.

Francis, Howard W., Koch, Mary E., Wyatt, J.R., Niparko, John K. Trends in Educational Placement and Cost-Benefit Considerations in Children with Cochlear Implants. *Arch Otolaryngol Head Neck Surg.* 125, 499-505. (1999).

Purpose: This article summarizes a study concerning the effect of cochlear implantation on the use of special education support services by profoundly hearing-impaired children. The authors also conducted a cost-benefit analysis on the savings associated with mainstreaming children with cochlear implants.

Procedures: The study consisted of 35 children with prelingual profound hearing loss and no other clearly defined disabilities. All were enrolled in special education programs or mainstream classrooms in regular public schools. They underwent cochlear implantation at ages ranging between 2 and 15 years, followed by a 2-year program of weekly auditory habilitation. These children were then compared to a group of 10 children without implants from "total communication" programs.

Analysis of Results: "A correlation was observed between the length of cochlear implant experience and the rate of full-time placement in mainstream classrooms." "There was also a negative correlation between the length of implant experience and the number of hours of special educational support used by fully mainstreamed children." Children with greater than two years of implant experience were mainstreamed at twice the rate of age-matched children with profound hearing loss who did not have implants. They were also placed less frequently in self-contained classrooms and used fewer hours of special education support. "A cost-benefit analysis based on conservative estimates of educational expenses shows a cost savings of cochlear implantation and appropriate auditory habilitation that ranges from $30,000 to $200,000."

Conclusion: Educational achievement by hearing-impaired children is enhanced by the use of verbal communication. "Deaf young adults not in mainstream elementary and post secondary schools are less likely to pursue secondary education and more likely to be underemployed or unemployed." "Cochlear implantation accompanied by aural habilitation increases access to acoustic information of spoken language, leading to higher rates of mainstream placement in schools and lower dependence on special education support services." The cost savings that results from a decrease in the use of support services indicates an educational cost benefit of cochlear implant habilitation for many children.

Meyer, Ted A., Svirsky, Mario A., Kirk, Karen I., Miyamoto, Richard T. Improvements in Speech Perception by Children with Profound Prelingual Hearing Loss: Effects of Device, Communication Mode, and Chronological Age. *Journal of Speech, Language and Hearing Research* 41, 846-858. (1998).

Purpose: This article details a study examining perception performance in children with prelingual profound hearing loss who use multichannel cochlear implants. The goals of this study were:

1. To estimate the amount of improvement in speech perception scores based on the degree of hearing loss and communication program (total v. oral) for the children using hearing aids; and
2. To compare the observed changes over time in speech perception by children using cochlear implants to the improvements predicted for children with profound hearing loss who use hearing aids.

Procedures: The study consisted of 58 children with prelingual profound hearing losses who use hearing aids and 74 children with prelingual profound hearing losses who received the Nucleus 22-channel cochlear implant. Within the hearing aid group, 31 children were in the oral program and 27 were in the total communication program. Within the cochlear implant group, 37 children were in the oral program and 37 children were in the total communication program. The Minimal Pairs Test and the Common Phrase Test were used to conduct the study. Comparisons for the two communication programs were made independently.

Analysis of Results: Although the study was not conducted to compare oral programs to total communication programs, the average scores for the children in oral communication programs using either hearing aids or cochlear implants were slightly higher **on the Minimal Pairs Test** than the average scores for children in total communications programs. Similarly, for the children using cochlear implants, the children in oral communication programs performed better **on the Common Phrases Test** than the children in total communication programs.

Conclusion: "Although the effect of communication mode on speech perception scores was not assessed specifically, scores from the children educated orally tended to be higher than scores for children enrolled in total communication programs."

***WARNING The author notes that "even if a test of the effect of communication mode on the test scores proved to be significant, one would have to be careful not to generalize the result in infer that a particular mode of communication is superior to another. In particular, it is possible that at least part of the difference in speech perception scores for children in oral versus total communication programs was related to factors we did not control such as socioeconomic status and cognitive skills."

Moog, J., Biedenstein, J., Davidson, L., Brenner, C. Instruction for Developing Speech Perception Skills. *The Volta Review* 96 (5), 61-73. (1994).

Purpose: This article describes the three components of the Central Institute of the Deaf (CID) auditory learning program. This program focuses on improving the speech perception skills of children using hearing aids, tactile aids, and cochlear implants. The author stresses that because children live in an auditory-rich environment, listening may

be the most important factor influencing the degree to which a deaf child develops auditory skills and spoken language skills.

Findings: The first component in the CID auditory learning program is audiologic management of the sensory aid. This entails daily equipment checks, observation of internal or external problems, and annual audiologic assessments. The second component is a skill hierarchy listing the objectives that will help a child acquire the listening skills necessary to benefit from the device being used. Objectives and activities for auditory instruction that originally were designed for children wearing hearing aids have been adapted for use with children using cochlear implants or tactile aids. All objectives listed in the hierarchy for cochlear implants describe skills to be demonstrated through listening alone. However, when the tasks are first introduced to the children, they are presented auditory-visually. Only after the child has demonstrated the ability to do the task is that task presented auditorily alone.

The third component is a set of teaching activities designed to accomplish the listed objectives. Since auditory lessons require a very high level of concentration and effort, they are scheduled for only about fifteen minutes each day. Even the most aggressive auditory programs engage the child in directed auditory lessons less than two or three hours a week. The following factors are to be considered when designing teaching activities:

1. The context in which the target stimulus is presented (the child's familiarity with the language).
2. The language and vocabulary used.
3. The age and interest of the child.

Conclusion: Regardless of which assistive listening device is used, a child must learn to listen and make use of the information available through that device. CID has developed an auditory learning program that enables a child to do so.

Tobey, E., Geers, A., Brenner, C. Speech Production Results: Speech Feature Acquisition. *The Volta Review* 96 (5), 109-129. (1994).

Purpose: This article describes a study researching the speech production skills of profoundly hearing-impaired children using multichannel cochlear implants ("CI"), tactile aids ("TA") and conventional hearing aids ("HA"). The author makes comparisons across the three sensory groups. The author also compares all three groups to a fourth group of profoundly hearing-impaired children with pure tone average thresholds between 90 and 100 dB HL ("HA+").

Procedures: The study included 13 matched groups of children with CI, TA and HA as well as 13 children with HA+. Speech production skills were examined using two types of elicitation procedures, imitation and spontaneous speech. Speech production skills in the CI, TA, and HA groups were evaluated once each year for three years in both

imitative and spontaneous contexts. Children with HA+ were tested at the end of the study for comparison with the other groups.

Analysis of Results: The CI group demonstrated significantly higher improvement than the TA or HA groups in their production of vowels and consonants in their spontaneous speech. Children who had used cochlear implants for three years demonstrated performance comparable to children with average pure tone average thresholds of 90-100 dB HL. With imitated speech, after three years the TA and HA groups improved 20% while CI group improved 36%. With spontaneous speech, after three years the TA and HA group improved 20% and 25% respectively, and CI group improved by 43%.

Conclusion: "Sensory aids for children with profound hearing impairments, when used **in conjunction with an intensive oral training program**, appear to provide valuable feedback necessary for acquiring more nearly normal speech production." Although all sensory groups improved their speech production skills, the cochlear implant group performed significantly higher in most areas than the rest of the sensory groups.

Osberger, Mary J., Robbins, Amy M., Todd, Susan L., Riley, Allyson I. Speech Intelligibility of Children with Cochlear Implants. *The Volta Review* 96 (5), 169-180. (1994).

Purpose: The purpose of this study is to explore the relationship between communication mode and speech intelligibility in children who used oral or total communication.

Procedure: The speech intelligibility of 18 children with prelingual deafness was examined after using multichannel cochlear implants for an average of three years. Half of the subjects used an oral communication program and the other half used a total communication program. The children were matched as closely as possible on variables of age at onset of deafness, age at implantation, and duration of implant use. In addition, only children who were implanted at a young age were included in the study because it was predicted that they would demonstrate the greatest potential to improve their speech. The children were administered *The Beginner's Intelligibility Test (BIT),* which was developed specifically for use with young children with profound hearing impairments who are delayed in their speech and language development.

Analysis of Results: The mean score for children who used oral communication was 48% (SD=31) and the mean score for children who used total communication was 21% (SD=21). These results reveal that the average speech intelligibility score of the children who used oral communication was 27% higher than that of the children who used total communication. The intelligibility of the oral children's speech was roughly twice as intelligible as the speech of the children who used total communication. Four factors may have contributed to this advantage:

1. More time may have been devoted to the direct teaching of speech in both structured and unstructured settings in programs that use oral rather than total communication.

2. **Teachers in total communication programs might not be adequately trained to teach speech to profoundly hearing-impaired children.**
3. There may be higher expectations set by parents and teachers of children who use oral rather than total communication.
4. A child in a classroom with other children who use oral communication is surrounded by peers who use speech as their primary means of communication.

Conclusion: The findings suggest a weakness in the way total communication has been implemented in many programs. Thus, it might be that children who use total communication do not reach their potential in terms of speech development because of problems inherent in their method of communication. **This is an excellent article to cite when advocating for an oral program.**

Moog, J., Geers, A. Educational Management of Children with Cochlear Implants. *American Annals of the Deaf* 136 (2), 69-76. (1991).

Purpose: This article outlines some procedures for maximizing the benefits that profoundly deaf children can achieve with cochlear implants. It discusses the Central Institute of the Deaf (CID) and their involvement in the educational planning, using an oral communication program, for children with cochlear implants.

Findings: Although most programs use "total communication" approaches, CID believes that the more speech the child hears, the easier it is for the child to learn to understand and produce it. When in oral programs, very profoundly deaf children rely exclusively on lipreading and skilled teachers to learn to talk. Those in total communication programs, however, rely primarily on sign language to communicate. The author emphasizes "the need for children to receive direct, intensive training in developing auditory and speech skills." In most oral programs, this training is an integral part of the entire school day. However, in total communication programs, it is necessary to plan for periods of each day when children will work on auditory skills and no signs will be used. In developing an auditory training program for children with implants, there should be a balance between discrete training in listening alone and listening in the context of regular classroom activities.

***WARNING The author notes that the cochlear implant provides no advantage to the development of sign skills. Sign language skills, however, can be used to capitalize on the benefits of cochlear implants if teachers use the language developed through signs as stimuli to develop the listening and speaking skills of the child.

Conclusion: Because spoken language is now audible to almost all deaf children, the number of deaf children who learn to speak as well as improve the intelligibility of their speech should increase. However, this potential for listening and speaking is likely to be realized only if appropriate and intensive instruction in listening and speaking is provided on a daily basis.

Robbins, Amy M. Developing Meaningful Auditory Integration in Children with Cochlear Implants. *The Volta Review* 92 (7), 361-370. (1990).

Purpose: The article presents a framework for modifying traditional auditory therapy techniques to address the needs of children with cochlear implants. The need for appropriate auditory training procedures is particularly important for children who use cochlear implants because of the profound nature of their hearing loss, the number of years they have been without auditory stimulation, and the long learning period required with these devices. The author emphasizes activities which encourage carry-over of skills from structured to unstructured settings, thereby creating situations that resemble listening in a natural environment.

Findings: Many auditory programs focus heavily on the traditional drill-type procedures which occur in a highly structured therapy setting. However, there are disadvantages to using this approach exclusively because children learn to respond only when they have been prompted to so do and there is a lack of relevance to real-world experiences. A less structured approach to auditory learning, which more closely approximates what happens during everyday communication than does the traditional drill-type, facilitates carry-over of learned skills to natural contexts. Structured listening skills are viewed as a necessary starting point to a later-developing and more relevant level of listening which is referred to as *meaningful auditory integration*. This refers to the child's ability to make meaningful use of sound within natural contexts. The two major components of meaningful auditory integration which are addressed in this article are:

1. Alerting to auditory input without being in a listening set, and
2. Using auditory stimuli as cues to meaning within the environment.

The author lists four suggested activities for developing meaningful auditory integration:

1. Use of child's name
2. "Sound of the Day" game
3. Classroom Auditory Signals
4. Presentation of Commands with Auditory Cues Only

The lack of confidence in responding to auditory-only input is a critical variable in a hearing-impaired child's performance. Unless children are provided with frequent opportunities to handle auditory-only stimuli, they will not have success with this task and may lack the confidence to attempt this sort of listening.

Conclusion: Although the implant provides the raw material for hearing, it is through learning and experience that the child begins to make sense of what he or she hears and begins using audition as one means of decoding his or her world. The problem of facilitating the carry-over of learned skills to natural contexts is an issue for all hearing-impaired children, but it is particularly acute for those with a cochlear implant. The activities suggested in this article serve as a general guide to clinicians seeking to develop meaningful auditory integration in children with cochlear implants.

THIS IS A STUDY THAT THE SCHOOL DISTRICT'S ATTORNEY USED IN THE DARA MALLORY CASE. THIS ARTICLE DOES NOT FAVOR ORAL COMMUNICATION OVER TOTAL COMMUNICATION PROGRAMS.

Conner, Carol M., Zwolan, Teresa, Heiber, Sara, Arts, H.A., M.D. Michigan Study Compares Speech, Vocabulary, and Reading Outcomes of Children Using Cochlear Implants in Oral and Total Communication Settings. *NECCI Newsletter* (July 1997).

Purpose: This study was conducted "to determine whether the communication method employed by the child's school resulted in differing levels of performance between oral communication and total communication groups after three or more years of implant use."

Procedure: Forty-nine children who had used their implant for three or more years and who had an onset of profound deafness prior to the age of two were used. Children were assigned to either the total communication or oral communication group based on the communication method employed by the child's school during the first three years of implant use. Total communication programs were defined as "programs that utilized some form of manual sign language in addition to spoken language." The oral communication program "utilized spoken language alone." The children were tested preoperatively and at 6 month intervals after implantation to monitor performance with their device.

Analysis of Results: **Preoperatively**, there existed no significant difference between the total communication and oral communication groups on measures of speech intelligibility and expressive vocabulary. However, the total communication group demonstrated better receptive vocabulary skills. **Postoperatively**, there were still no significant changes in the two groups speech intelligibility, receptive vocabulary, or reading comprehension scores. However, the total communication group did demonstrate significantly greater scores on the expressive vocabulary measure three to four years postoperatively.

Conclusion: School communication method does not appear to significantly affect performance with the implant users. Therefore, **parents may choose "the school program and communication method that will work best for each individual child."** "The quality and flexibility of the educational setting and its ability to optimize each child's individual strengths may be key factors to optimizing success with the implant."

**Although the study itself finds no significant differences in two programs, the conclusion suggests that parents should ultimately decide what is best suited for their child which is a good argument in retaliation to this study.