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ABSTRACT

Cochlear implants have tremendous potential to aid profoundly deaf students in achieving competency in using spoken communication. Children with cochlear implants do not perceive sound in the same way as normal hearing individuals do, and realizing their potential requires long-term intensive instruction and the utilization of a multidisciplinary team approach. With the current trend towards inclusion of students with disabilities in the regular classroom environment and with the number of children receiving cochlear implants expected to increase in the coming years, the schools and regular and special educators alike will be challenged to take on new roles. Some of the roles educators may be expected to assume are: providing guidance to parents of deaf children who are considering the cochlear implant device, assisting in the pre-implant screening, incorporating auditory training and speech teaching into the regular classroom environment, and monitoring and maintaining the cochlear implant device when the child is in school. Educators of children with cochlear implants are in a prime position to generate much needed data concerning the impact of the cochlear implant device upon the profoundly deaf child's educational development. (Contains 20 references.) (Author/JDD)

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Educational Implications of Cochlear Implants in Deaf Children

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Abstract

Cochlear implants have tremendous potential to aid profoundly deaf students in achieving competency in using spoken communication. However, realizing that potential requires long-term intensive instruction and the utilization of a multidisciplinary team approach. With the current trend towards inclusion of students with disabilities in the regular classroom environment and with the number of children receiving cochlear implants expected to increase in the coming years, the schools and regular and special educators alike will be challenged to take on new roles. Some of the roles educators are expected to assume are: providing guidance to parents of deaf children who are considering the cochlear implant device, assisting in the pre-implant screening, incorporating auditory training and speech teaching into the regular classroom environment, and monitoring and maintaining the cochlear implant device when the child is in school. Educators of children with cochlear implants are in a prime position to generate much needed data concerning the impact of the cochlear implant device upon the profoundly deaf child's educational development.

Educational Implications of Cochlear Implants in Deaf Children

In a recent newspaper article, Siegel (1993) reports that cochlear implants have helped approximately 10,000 deaf people acquire basic hearing capabilities. Initially, these prosthetic devices were only implanted in adults. Since 1980, cochlear implants were being implanted as an investigative procedure in select profoundly deaf children. In June of 1990, the Nucleus 22 Channel Cochlear Implant device received the full approval of the Food and Drug Administration for children 2-17 years of age. With the current trend towards inclusion of students with disabilities in the regular classroom environment and with the number of children receiving cochlear implants expected to increase in the coming years, educators of such children will need a working knowledge of what a cochlear implant prosthetic is and what to expect in the way of auditory stimulation in order to effectively plan and implement educational strategies.

A principle objective of the cochlear implant, according to Schein (1984), "has been to restore the deafened individual's ability to hear and understand speech" (p. 326). This goal has yet to be fully realized. For the most part, the cochlear implant serves the function of facilitating speechreading (Tyler, Tye-Murray, and Lansing, 1988). The cochlear implant provides profoundly deaf children the benefit of increased speech perception which gives them a heightened advantage in producing

speech (Moog and Gustus, 1991). Schein (1984) notes "three potential contributions [of the cochlear implant] to the hearing-impaired patient's welfare: restore, or provide for the first time, the ability to understand connected discourse; improve lipreading; and increase auditory contact with the environment, including awareness of one's own voice" (p. 329). "Implant recipients are able to detect medium-to-loud environmental sounds and conversational speech at comfortable listening levels" (Cochlear Implant Club International Ad-Hoc Committee, 1993, p. 27). Berliner (1990) found that some children are able to understand speech without the benefit of visual clues. Schein (1984) recognizes the added potential of the cochlear implant in enabling children to recognize when someone is speaking, and recognizing the emotional connotations of speech.

Cochlear implants can provide social and emotional benefits to the child and improve behavioral management (Schein, 1984). By increasing the amount of auditory contact with the environment, cochlear implants may serve to diminish the feeling of isolation that people who are deaf frequently feel. It also seems possible that cochlear implants may allow these profoundly deaf individuals to function in a broader range of social settings and increase employment options. Staller, Beiter, Brimacombe, and Mecklenburg (1989) remark that "the parents and teachers report that the children are more in contact with their environment, vocalize more frequently and are, in general,

more responsive" (p. 23-24).

A cochlear implant is a surgically implanted prosthetic device. Presently, they are only being implanted in profoundly deaf children who do not benefit from hearing aids. Although there are a variety of cochlear implant models, all have some basic features in common. The cochlear implant electronically stimulates the surviving nerve fibers by way of the cochlea. "The system of a cochlear implant consists of a microphone, a signal-processing unit, external and internal coils, and active and ground electrodes" (Schein, 1984, p. 325). The surgery involves "implanting an electrode array into the cochlea of the inner ear" (Cochlear Implant Club International Ad-Hoc Committee, 1993, p. 28). Approximately four to six weeks after the surgery, when the surgical incisions have had time to heal, the external components of the device are attached and the child is "hooked up." A body-worn signal processing unit, which consists of a highly specialized mini computer chip, gathers critical information from environmental and speech sounds. The microphone converts this information into electrical signals "which are transmitted to the surgically implanted components and electrical array which stimulate the nerve endings in the inner ear. The resulting signal is perceived as sound by the brain." (Cochlear Implant Club International Ad-Hoc Committee, 1993, p. 28).

Children with cochlear implants do not perceive sound in

the same manner that we associate with normal hearing. The sensation of sound produced by a cochlear implant has a buzzing, mechanical quality. What we perceive as music or speech sounds quite different to an individual with a cochlear implant. Tyler (1993) states that "some adults have described speech as sounding like Donald Duck or squawking parrots" (p. 95). Schein (1984) found no evidence that "patients have gained or regained the ability to understand speech perception without visual clues" (p. 329). However, Tyler, Tye-Murray, and Lansing (1988) found that "some cochlear implant recipients can recognize words in sentences without visual clues in an open-set response format. This is very important given that in many situations audiovisual communication is difficult (e.g., group situations and watching television) if not impossible (e.g., communicating on the telephone and listening to the radio) for profoundly hearing-impaired listeners" (p. 120).

Even though a cochlear implant does not provide a normal hearing environment, it can be a valuable tool in the child's psychoeducational development. Intensive and long-term instruction is necessary in order for children with cochlear implants to be able to utilize the device to the maximum potential. School personnel need to be aware that cochlear implantation will not reduce the child's need for speech therapy. Rather, the child will require more intensive and long-term therapy following cochlear implantation. Research conducted

at the University of Melbourne (1990) has shown that in cogenitally or early-deafened young children "the time required to attain good speech perception performance has varied from 9 months to 3 years. There has not been evidence of open-set speech performance in any of these children immediately after implantation" (Dowell et al., 1990, p. 9-10). McConkey Robbins, Osberger, Miyamoto, and Renshaw's (1988) findings highlight the need for "long-term training and experience [with the cochlear implant]" (p. 26). This training will most likely be provided in the child's home and school.

Educators will be an integral part in the cochlear implant child's educational process. It is likely that educators may be sought to provide guidance for the parents of deaf children who are considering the device. "To respond to parent's request for assistance in making decisions about the cochlear implant, educators will need to remain alert to changing philosophies and to the new evidence that is becoming available almost daily" (Schein, 1984, p. 330).

Educators will also play an important role in the screening and selection process of cochlear implant candidates. "In most cases, school personnel will be responsible for providing the child with much of the rehabilitation" (Domico, E. H., 1988, p. 2). One important aspect of the cochlear implant center's pre-implant screening involves assessing the child's school environment to determine whether the necessary educational

resources are in place. Because cochlear implant children will need long-term educational intervention, the school's willingness and ability to provide these resources are influential factors in determining the child's degree of success with the implant. Educators that work with the child can provide valuable information that can help determine the child's eligibility for receiving the cochlear implant device. They are often interviewed during the pre-implant evaluation process to determine "the child's current academic, audiological, cognitive, linguistic, and social functioning in the school program" (Nevins, Kretschmer, Chute, Hellman, Parisier, 1991, p. 200). An important part of the preoperative evaluation concerns assessing whether or not the child's expectations of the cochlear implant device are realistic. "In order to evaluate the child's own expectations, teacher input may be sought" (Nevins et al., 1991, p. 200).

As in the case of other children with disabilities, educators working with cochlear implant children will be called on to help plan and evaluate individualized educational programs for the child as an integral part of a multidisciplinary team. "A minimum of 20-30 minutes daily of individual auditory training in addition to the time spent in speech therapy and lipreading practice is recommended to the child's special education supervisor" (Domico, E. H., 1988, p. 2). Domico (1988) suggests that this training be written into the child's individualized

educational program prior to implant surgery.

Although well over 1,000 children have been implanted with the cochlear implant device, "the length of implantation has not been long" (Mecklenburg, 1988, p. 167). Very little specifics are given in how to go about planning and implementing effective educational strategies for such children. Presently, we are in just the beginning stages of research concerning issues pertaining to cochlear implants and the education of young deaf children. Specialized training materials, curriculum, and evaluation tools are still in the early stages of development. In this respect, it seems that educators will need to take a creative and experimental approach to the teaching of these children.

However, in many ways, the planning of the cochlear implant child's individualized education program continues in much the same way as it did prior to implant surgery, tailored to the specific needs of the hearing-impaired child. Many of the same methods and strategies conventionally employed in the educational management of children who are hearing-impaired are applicable for students with cochlear implants. "There are considerable variations in performance [of children with cochlear implants] and this may be due to the following factors: whether they have had some hearing after birth, the method of education used, the motivation of the [child] and age at implantation" (Clark et al., 1987, p. 1). These and other factors such as the

age of the child, the type of educational setting, the educational approach (oral, cued speech, total communication, American Sign Language), and the extent of auditory stimulation a particular child is receiving also need to be taken into consideration when planning the cochlear implant child's individualized educational program. This highlights an even greater need than before to incorporate a multidisciplinary approach toward educational planning which involves the child, the parents, the cochlear implant clinician, speech/language pathologist, and educators.

Cochlear implant children will need rather intensive instruction with a speech therapist in order to obtain the goal of using spoken language effectively as a means of communication. However, this goal will not be realized if the child is not provided with substantial opportunity to practice using speech in the home and school environments. Dawson (1991) states:

> In many, perhaps most, educational programs today, teaching speech to deaf children has become the responsibility of the speech therapist. Speech instruction is provided outside the regular classroom setting and the classroom teacher is rarely involved. As a result, there is little carry-over of speech skills acquired in therapy to communicative use in the classroom or in the child's day-to-day communicative interactions. (p. 2)

In order for the cochlear implant child to gain proficiency

in using spoken language, it is essential that auditory training procedures and speech teaching be incorporated throughout the child's daily activities.

Cochlear implant teams, such as the ones at the House Ear Institute, Shea Clinic, and the Cochlear Implant Center of the Manhattan Eye, Ear & Throat Hospital, conduct the pre-implant assessment and generally provide ongoing educational support. By maintaining contact with school personnel, the cochlear implant team is able to receive important feedback regarding the functioning of the cochlear implant device and deal with questions and problems as they arise. Many cochlear implant centers conduct training sessions with the c... l's educators. They provide school personnel with information about the cochlear implant and it's implications for the child. A consideration that may be addressed, depending on the age of the child, is the teacher's role in maintaining the cochlear implant. Particularly with younger children, teachers may need to monitor the equipment to assure that it is working properly and may need to perform minor adjustments and repairs, such as replacing a cord, when necessary. Often, cochlear implant clinicians will be involved in troubleshooting transition problems and assisting the child's teacher and speech pathologist in planning and implementing aural rehabilitation strategies. At present, the majority of local school districts have not had experience in dealing with children who have cochlear implants. Nevins

et al. (1991) note, however, that "as the numbers of children obtaining cochlear implants increase with time, the nature and scope of the local educational agencies' responsibilities may change" (p. 198).

"The classroom environment can provide varied situations for developing auditory skills and provide opportunities for the child to develop full use of his/her auditory potential" (Vidas, Hassan, Parnes, 1992, p. 387). The real life situations encountered in the classroom provide the cochlear implant child with an opportunity to practice what is learned in speech therapy. As Hasenstab (1993) states, "the real 'test' of the use of spoken language is determined by how it serves the cochlear implant child in responding to external social demands and the child's personal internal cognitive requirements" (p. 28). Incorporating reasonable and effective strategies for teaching informal auditory and speech skills in the classroom necessitates a cooperative relationship between the child's speech therapist and teacher.

Auditory training involves helping the cochlear implant child to develop a recognition of speech sounds using the electrical signal. The child's aural rehabilitation specialist and speech pathologist are in the best position to provide classroom teachers with information about what the child is currently working on in therapy and suggestions as to how teachers can implement such training informally in the course

of their regular classroom activities. The nature of this informal training will depend upon factors such as the child's age, listening skills, audiological test results, and educational environment. Informal auditory training procedures can generally be provided by teachers as the opportunity arises in the course of the regular academic work. "For instance, a classroom teacher may encourage the child to identify words beginning with [p] and [b] during an art activity such as making a puppet or speak from behind the child and ask him or her to circle one of three numbers on the chalkboard" (Tyler, 1993, p. 119).

Moog and Gustus (1991) believe it is important for the classroom teacher to be involved in the speech teaching process. The speech pathologist may involve the child's teacher by having him/her reinforce the skills the child is learning in therapy as the opportunity arises in class. Teachers can incorporate speech teaching in regular classroom activities by making simple corrections in the child's spoken language. These corrections should not disrupt the flow of the lesson. In making these corrections, communication is the first priority, language the second, and speech is not worked on until these first two priorities have been satisfied (Moog and Gustus, 1991). "Expressive language skills develop more slowly than receptive skills" (Dawson et al., 1989, p. 5). It is important to note that "the objective in these speech corrections is for improvement, not accuracy in the absolute sense. We want the

child to get a closer approximation on the targeted aspects" (Moog and Gustus, 1991, p. 5). Teachers can also assist the speech therapist by noting the problem areas in the child's communication skills they observe in the classroom.

It seems feasible that cochlear implantation may open up educational options for profoundly deaf children, particularly as they gain experience using the device. Selmi's (1985) research indicates that, "at least for some children, the cochlear implant may allow a greater range of choices for school placement and method of communication" (p. 57S). Traditionally, the majority of severely and profoundly deaf children attended special schools for the deaf (Conrad, 1979). Hearing-impaired children attending programs in regular schools typically have mild to moderate hearing losses. Cochlear implantation combined with a specially designed educational program will allow many of these previously totally deaf children to function at the moderately hearing-impaired level (Ling and Milne, 1981).

According to Tyler (1993), the amount of mainstreaming of the child in academic courses and the child's primary mode of communication is not likely to change much following implantation. Although there is an increased emphasis on aural integration, if the child communicated primarily via total communication or sign language prior to implantation, the child will likely continue using it post-implant, especially during the first year.

Dawson's (1991) research presents some interesting highlights regarding the education and speech production of a sample of cochlear implant children. By surveying the parents and teachers of twenty-two cochlear implant children, ranging in age from two to ten years old, she found that most of these children were in special contained classrooms for the hearing-impaired. Cochlear implant children were also found attending mainstream programs as well as some who were enrolled in residential facilities. Before the cochlear implants, the majority of the children in this sample used sign language as their primary means of communication. After the implant, most of the children used oral methods of communication, supplemented with sign language and cued speech, with good effectiveness. None of the children in this sample had language skills and vocabulary comparable to their age level peers prior to receiving the implant. After the implant, twenty-six percent of the children had achieved age level competency in this area. Dawson (1991) reports that "in Math and related areas, 2/3 of the children were performing on level with their peers, and 1/3 were slightly below their peers. In reading and related areas, 1/3 were on level with their peers, 1/3 slightly below, and 1/3 significantly below" (p. 3).

Despite the ability of the cochlear implant to provide improved speech perception, it is important to realize that children with cochlear implants are, as are other hearing-

impaired children, severely disadvantaged in acquiring language and spoken communication effectiveness compared to children of normal hearing. Deficits in language and spoken communication have a significant negative impact on learning. By the time deaf children reach the age of five, they only have a vocabulary of approximately 200 spoken words whereas children of normal hearing may have acquired a vocabulary of 5,000-26,000 words and can use these words in grammatically correct sentences (Schwab, 1977). "A child's reading level is the primary determinant of achievement in all academic areas" (Selmi, 1985, p. 59S). Because cochlear implants enable profoundly deaf children to have access to a wider range of auditory information, Selmi (1985) reasoned that it is likely that "academic improvement should result" (p. 59S).

Educators working with cochlear implant children are in a prime position to generate important and much needed data concerning the educational implications of this device. As Vidas et al. (1992) found, data on cochlear implant children obtained in the laboratory often do not adequately reflect how these children perform in real-life settings such as the classroom. Schein (1984) reports that "if the full value of cochlear implants is to be realized, educators must become involved in research--contributing to the philosophical and scientific deliberations pre-implant and to the curricular and evaluational procedures that must be undertaken post-implant.

They should not disregard their role in decisions about the cochlear implant: Determining what it contributes to the well-being of the student" (p. 331).

Cochlear implants have tremendous potential to aid profoundly deaf students in achieving competency in using spoken communication. However, achieving that potential involves intensive instruction and utilizing a multidisciplinary approach. The number of children with cochlear implants is expected to increase in the coming years which will challenge the schools and regular and special educators alike to take on new roles.

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