

# **CURRENT TRENDS AND IMPLICATIONS FOR EDUCATION AND HABILITATION OF DEAF LEARNERS USING COCHLEAR IMPLANTS**

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## **ABSTRACT**

This publication reports on several reviews on the speech, language, reading and social emotional development and on current trends in education and habilitation of deaf children using cochlear implants. It is a summary of the conclusions of 14 international publication by the author and his colleagues during the last five years.

Following the implementation of neonatal hearing screening in many countries, cochlear implantation of deaf born children under the age of two has become a major trend. In Western Europe 50% to 95% of the deaf children are using cochlear implants. This shift in policy and practice has changed the demographic of the deaf population entering the educational system and continue to do so into the future. It has not only influenced the early intervention approach, the language and communication approach and the habilitation, but also the school curriculum, school placement and a lot of other educational attainments.

Deaf children using cochlear implants are a particularly heterogeneous population with many variables to account for and cochlear implantation has added even more variables, which results in diversity of outcomes and many different avenues to success.

## **CHANGING TRENDS**

### **Universal neonatal hearing screening and cochlear implantation**

During the last two decades the population of deaf children has changed tremendously due to the combination of universal newborn hearing screening (UNHS), early intervention, and cochlear implants (CI).

The American Food and Drug Administration (FDA) started to approve cochlear implants for adults in 1985. At the end of 1985 worldwide only 750 deaf adults had received a cochlear implant. The number of deaf people wearing a cochlear implant increased continuously to approximately 300000 in September 2013, of which more than half of them are children. (O'Donoghue, 2013). Following the implementation of UNHS and the earlier identification and diagnosis of deafness, cochlear implantation in the very early years of life has become a reality.

### **Current outcomes**

Separate to the importance of early screening and early implantation, the heterogeneity of the population of deaf children is another major factor emphasized in the research literature. In addition to factors associated with the cause of the hearing loss (maternal illness, child infections, toxins, syndromes, ...) itself influencing the outcomes, there is also huge variability in early auditory, linguistic, family and educational environment. In recent literature, 30 to 40% of deaf children are reported to have additional disabilities (Fortnum, Marshall, & Summerfield, 2002; Nikolopoulos, Archbold, & Gregory, 2005).

During the last decade several papers have been published on the auditory, speech and

early language outcomes of deaf children using cochlear implants (Schauwers et al., 2004; Tait et al., 2007, 2010; Geers et al., 2008; Archbold, 2010; Baudonck et al., 2010; Boons et al., 2012, 2013; Sparreboom et al., 2010). All these studies reported significant mutually related improvements in auditory, speech and language performance measures. Several studies reported vocabulary outcomes within normal range of typical hearing children (Svirsky et al., 2004; Sparreboom et al., 2010), while others indicated that complicated language components, such as morpho-syntax and pragmatic aspects, remained more difficult to acquire (Geers et al., 2008; Boons et al., 2013). Published studies for literacy outcomes for deaf children who receive CIs are rare. Moog and Geers (2003) used standardized reading tests and the results after 4 years of implant use revealed a reading quotient range of 71-124, meaning that the students' scores ranged from below average to above average. In a more recent publication of Vermeulen et al. (2007) they found that even late implanted deaf children (mean age of implantation was 74 months) obtain higher mean reading comprehension scores than deaf children with conventional hearing aids, but the average outcomes are still more than 3 standard deviations below the hearing norm. The improved auditory experience provided by cochlear implants over hearing aids has facilitated the acquisition of spoken language in children with profound deafness from a wide range of educational settings, including oral, Total Communication (TC), or bilingual classrooms (Geers, 2006).

Limited research has also been done in the area of cochlear implants and the use of supported signs and sign language. Chin and Kaiser (2002) found that children educated through oral communication had better articulation than did those educated through TC. In contrast with the above study, some studies suggest that when signs support spoken words, they do not hinder the auditory speech perception in children with cochlear implants. In both the perception of perceptually confusable words (Giezen, 2011; Giezen, Baker & Escudero, 2014) and in reading comprehension (Spencer, Gantz, & Knutson, 2004) children using cochlear implants appear to benefit from the availability of bimodal input.

The positive effect of binaural hearing is demonstrated by Tait and co-authors (2010) who showed significantly more use of vocalization to communicate, and more use of audition when interacting vocally with an adult in bilaterally implanted infants compared to the unilateral ones, and by a recent study of De Raeve, Vermeulen and Snik (2015) which shows that these binaural 'hearing' deaf children can acquire complex spoken language and verbal cognition skills age equivalent to their hearing peers at 5 years post CI.

### **Impact on deaf education**

Early hearing screening and early implantation also created a changing trend towards family centered early intervention. Because of the very young age of the children involved, it is clear that the general principles of working in partnership with parents have particular relevance. Another consequence of early screening and implantation is the increased demand for early developmental stimulation, especially in the areas of audition and spoken language, in order to catch up with their normal hearing peers as soon as possible. That's one of the reasons why the demand for auditory verbal therapists (AVT) has increased worldwide.

An increasing number of deaf students using cochlear implants have developed good spoken language skills, attend mainstream schools and fewer chose for an interpreter (De Raeve & Lichtert, 2012). The reality of attendance of mainstream education however can be rather complex in a noisy classroom environment, where speech perception is very poor. Good classroom acoustics are also essential for deaf children using cochlear implants, but also teachers' attitudes toward students with hearing loss have to be adapted.

The deaf child in the mainstream is often the only one with a hearing loss in the classroom or even in the school, which increases the risk for problems in their social-emotional development. For that reason there is an increased demand by these students to meet and socialize with other deaf peers.

Although the outcomes of young implanted children are very promising, we also have to take care of those who have (for one reason or the other) poor auditory perception skills, who are not able to engage in incidental learning from an auditory only input, who have additional needs or who are not wearing cochlear implants (because there was no cochlea or auditory nerve, because they don't like the implants or because their parents decided not to go for a cochlear implant).

Another trend in the education of deaf children using cochlear implants is the increased demand for training for teachers of the deaf and other staff members to become experienced in optimal education and rehabilitation of CI children. Even the teachers of the regular schools need some basic knowledge on deaf children using cochlear implants (De Raeve, 2014).

Because the deaf population is a very heterogeneous population, there is not a one-size-fits-all approach which meets the needs of all children with cochlear implants and their families. A combination of communication approaches may be used and modified over time depending on the needs of the child and his family.

## **IMPLICATIONS FOR THE EDUCATION OF EARLY SCREENED DEAF CHILDREN USING COCHLEAR IMPLANTS**

Universal neonatal hearing screening (UNHS) and cochlear implantation have changed the choices for parents and educators for their deaf children. Archbold (2010) even calls it an educational impact in ways that no changes in pedagogy or communication approach have previously achieved.

After UNHS detection of a baby's hearing loss, hearing parents of young deaf children are confronted with the need to make choices about issues that they seldom may have thought about before learning of their child's hearing loss. UNHS programs should be organized in a way that parents receive complete and unbiased information about all aspects of deafness, about the medical but also about the cultural-linguistic approach to support their decisions about.

Deaf children also are a particularly heterogeneous population with many variables to account for and cochlear implantation has added even more variables, which results in a diversity of outcomes. Therefore cochlear implantation requires documentation of the child's progress in order to monitor device functioning, to inform the tuning process, or to identify additional problems or areas of difficulty as well as specific abilities and skills.

Children with CIs are now in a variety of educational settings using a variety of communication approaches. Some are in special schools, others start in a special school or in a unit before moving to a regular school, and others start immediately in a regular school. Many parents hope their child will be able to attend a regular school in their home environment to be part of their community, with siblings, neighbors and classmates.

However, we do not know whether the expectations of parents and professionals are always realistic, knowing the amount of children (and also families) with special needs.

The reality of attendance of mainstream education, in contrary to many parents' expectations, is that speech perception can be poor, hindered by a noisy classroom environment. In addition to this, there are often little visual cues in regular schools. As Wiefferink et al. (2013) mentioned, for effective inclusion of children with hearing loss in a mainstream setting, more attention must be given to the number of children in a class and the classrooms' acoustics as well as to the social-emotional development of these children. Additionally to further improve the listening conditions in the classroom, the use of assistive listening devices such as an FM-system, can be considered.

An increasing number of deaf students using cochlear implants attend mainstream schools and they often are the only child with a hearing loss in the classroom or even in the school, which increases the risk for problems in their social-emotional development. For that reason there is an increased demand by these students to meet and socialize with other deaf peers.

Spoken language has become the first language for the majority of mainstreamed deaf students but it doesn't mean that these deaf children are not interested in sign language. On the contrary, there is an increasing demand to learn sign language, not as their first but as their second, third or fourth language (Knors & Marschark, 2012). The fact that less mainstreamed deaf students using cochlear implants request for an interpreter, and that those who request an interpreter prefer a note taker, results in an increased demand for note takers.

As the education of deaf learners has become increasingly complex, there is currently more knowledge and skill required from educators than at any time in the history of the field. This has implications for teachers and teacher education programs (Leigh, 2008).

## **Conclusion**

Newborn hearing screening and cochlear implantation have provided new opportunities for profoundly deaf children, created new challenges for teachers of the deaf, and have changed educational choices and options. All this is a big change for the educational services. They have to adapt their way of working and they must ensure that their staff have the skills to meet the challenges: to be flexible, continually updated with the technology and changing expectations, to provide an environment which will utilize any useful hearing while meeting the linguistic and curricular needs of the children, to meet the psycho-social needs of this group as they grow through adolescence and to work with other professionals.

The challenge for the field is to embrace the diversity of this population and to appropriately address the specific needs of each child in his/her family in a specific country. Just as the population of deaf children has changed very rapidly in locations with access to advanced technology, and as more children attend mainstream schools, the demand for professional development opportunities and for specialized staff training increases.

The potential of cochlear implants is still not fully realised given that all current research is based on children implanted a number of years previously. In addition, future additional gains are anticipated because of innovative new technologies and better understanding of central nervous system plasticity and cognitive and neurobiological factors. All health professionals and educators of deaf children have to be aware of this current change, so that they can provide appropriate support and advice for the diverse group of children, many of whom have additional needs and whose families share complex expectations (Powell & Wilson, 2011).

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