

The Positive Impact of Cochlear Implants on Literacy Outcomes for Deaf Children

A Summary of Recent Research

Introduction

At no time in the history of Deaf Education have age-appropriate literacy outcomes been possible for most children with severe to profound hearing loss. Cochlear implantation has had a positive impact on literacy outcomes that no other changes in communication policies or educational approaches have achieved.

Cochlear implants provide deaf children with levels of hearing that allow most to acquire spoken language. For the 95% of deaf children who are born to hearing parents (CDCP, 2018; Mitchell & Karchmer, 2004), the language of the home is a spoken one. The written word is the spoken word on the page and children rely on their knowledge of spoken language as the bridge for developing literacy skills, the life-long tool for inclusion, education, employment, and communication.

Cochlear implants, surgically implanted devices, with an externally worn speech processor, provide useful hearing for those unable to benefit from hearing aids. Cochlear implantation for children began in the 1980's and is now the accepted intervention for children with profound hearing loss. It is estimated that there are now 1 million users of CI globally of whom circa 580,000 are estimated to be implanted as children.

As the technology of cochlear implantation has developed and early implantation, including in the first year of life, has provided earlier access to hearing, literacy outcomes in children with CIs have dramatically improved.

This document provides a summary of some current research reporting these improvements in literacy outcomes to share with parents, health and education professionals, policy makers and funders of CI services.

Background and context

There has been a long history of attempts to overcome the challenges of childhood deafness in developing spoken language and literacy:

- ❑ The literacy achievement of deaf students has been an area of educational concern for more than a century when Pintner and Patterson (1916) reported that, “very few deaf children reach scores above fourth-grade ability” (9-year-old level) (p. 436)
- ❑ The median literacy rates of deaf high school graduates have remained consistently around the level of an 8/9-year-old since then. (Conrad, 1977, Allen, 1986; Qi & Mitchell, 2012; Traxler, 2000).

- ❑ Despite changes in educational approaches and communication philosophies, these low reading levels have persisted (see Mayer, 2007; Paul, 2009; Trezek et al., 2010), with a consequent negative impact on educational attainment, the transition to higher education and success in the workplace for many deaf individuals (Marschark et al., 2007; Moores, 2001).
- ❑ Recent technological developments since the 1980's including newborn hearing screening programmes, digital hearing aids and cochlear implants have enabled most deaf children to have useful hearing early in life, to acquire spoken language and changed the opportunities for them and their families.
- ❑ Children with CIs have the most profound hearing losses and do not benefit significantly from even the latest hearing aids. This was the group that in the past faced the most substantial challenges learning to read and write (Archbold & Mayer, 2012)

Why is literacy important?

- ❑ Literacy empowers and liberates people. Acquiring and improving literacy skills throughout life is an intrinsic part of education. Literacy drives sustainable development, enables greater participation in education and the work place, improves child and family health and nutrition, reduces poverty and expands life opportunities. (<https://www.unesco.org/en/literacy>) ([https://www.right-to-education.org/sites/right-to-education.org/files/resource-attachments/UNESCO Literacy from a right to education perspective 2013 En.pdf](https://www.right-to-education.org/sites/right-to-education.org/files/resource-attachments/UNESCO_Literacy_from_a_right_to_education_perspective_2013_En.pdf))
- ❑ The ability to read and write represents the difference between inclusion in and exclusion from society (<https://www.literacyworldwide.org/docs/default-source/resource-documents/the-case-for-childrens-rights-to-read.pdf>)
- ❑ The majority of vocations require reading levels of 6th grade (10 years of age) or higher, and anyone with a reading level below this is likely to struggle with the literacy demands of the workplace.

What does recent research tell us about the literacy levels of deaf children with CIs?

The available evidence is consistent and demonstrates that deaf students with cochlear implants are reading and writing at levels that far surpass those historically reported for the deaf population. This summary provides a description of a recent Canadian investigation (Mayer et al., 2021; Mayer & Trezek, 2023) and a synopsis of two comprehensive systematic research reviews.

Mayer & Trezek investigated the literacy achievement of deaf students aged 9 to 18 years, educated in mainstream settings in a large Canadian city. The participants showed performance within the average range on standardized assessments of both reading and writing indicating achievement far surpassing outcomes of the past. Spoken language was the primary means of communication of the

children reported in this research (see also Bharadwaj & Barlow, 2020) with 40 percent having a home language other than English.

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Two major systematic research reviews

Mayer & Trezek Review of Literacy Outcomes (2018)

The review included 21 empirical studies from 1997 to 2016 which reported findings from over 1000 students with CIs. It was found that even when literacy outcomes reported were lower than those of the hearing comparison group, children with CIs in these studies **are still performing within the average range**. <https://apps.asha.org/EvidenceMaps/Articles/ArticleSummary/e74e8f5a-1504-4e88-a537-8b2bf1225601>

Wang et al. (2021) reported similar findings:

This meta-analysis of 47 articles of group differences in reading skills between children with cochlear implants and hearing peers (900 CI users, nearly 2,500 hearing peers), and aged between 3 and 18 years. Although as a group, children with CIs scored lower than their hearing peers, **they still achieved within the normal range on standardised reading tests**. Wang et al. noted that their findings align with those reported by Mayer and Trezek (2018) **confirming a positive shift in literacy outcomes for deaf students with CIs**, exceeding the historically reported ceiling with the majority performing in the average range.

Two major factors supporting improved literacy outcomes for CI users revealed in the research reviews:

- Earlier implantation is associated with better literacy outcomes
- Bilateral implantation has more benefits for reading skills than unilateral implantation

Conclusion

The evidence indicates that cochlear implantation has **enabled profoundly deaf children for the first time to achieve literacy outcomes within the normal range for their hearing peers**. It is important for both parents and professionals to be aware of the crucial link between hearing and literacy acquisition. As children are now implanted earlier in life and with two implants, it is vital that we continue to monitor this positive change in outcomes and consider what rehabilitation and educational support will maximise this major benefit which follows from CIs.

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