Exploring and enjoying non-speech sounds through a cochlear implant: the therapy of music

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ABSTRACT Cochlear implant (CI) technology was designed to promote reception of speech sounds, and sound enjoyment remains a challenge. Music plays an important role in our cognitive, physical and social development. For many CI recipients it is not feasible to communicate how sounds are perceived, and consequently the benefits of music may be reduced. Non-speech sounds may also be important to persons with multiple functional deficits that rely on information additional to verbatim for participating in communication. Deaf-born children with multiple functional deficits constitute a special vulnerable group, as lack of reaction to sound often is discouraging to caregivers. Individually adapted tools for sound awareness may promote exploration and appreciation of the information mediated by the implant. Two current studies involving habilitation through sound production and music listening are presented.

1) PLAYING WITH SOUND The Soundscaper (Ljudskrapan) is software and hardware for providing i) a sound toy, ii) a sound exploration tool, and iii) a new diagnostic method for charting qualitative aspects of auditory function based on a non-linguistic approach. The software simplifies mapping of different types of hardware controllers to sound parameters and allows expressive interaction with engaging sounds, even with very restricted physical movement capabilities.

Sound thus provides an immediate sensory feedback to the body movements, and non-speech sounds constitute an alternative channel for emotional communication. The target users are children with CI/HA and possibly additional functional deficits, which is a heterogeneous group in all respects.

A proof-of-concept study was conducted with the Latvian Children’s Hearing Centre in Riga. 10 children participated in the study: 5 males/5 females, 4 CI/6 HA, ages 2-7 years (mean age 4.7 yrs), varying hearing functions, varying physical and mental development.

In situ and video observations confirmed that the Soundscaper engaged all the users, caregivers and trainers: 8 kids showed clear positive reactions to sound. These children were more inclined to use the auditory channel for expression and play than the caregivers anticipated. Further long-scale tests are planned.

2) EXPOSURE TO MUSIC A questionnaire was developed by a multidisciplinary team at the South of England Cochlear Implant Centre to determine preschool children’s exposure and responses to music. The questionnaire was distributed to the parents of preschool children with normal hearing (NH) and to the parents of preschool children who had been implanted at least one year prior. The groups were gender and age matched.

NIH Group
23 Children (13 females, 10 males) Mean age 44.9 mths. (±9.2 SD)

CI Group
23 Children (13 females, 10 males) Mean age 44.8 mths. (±9.4 SD) Mean duration CI use 20.8 mths. (±8.4 SD) Mean age implantation 24.1 mths. (±7.4 SD) 1 x Nucleus 24 Contour, 22 x Nucleus Freedom 15 x Unilateral, 8 x Bilateral, 17 x Congenitally deaf, 6 x Prelingually deaf

Young CI users appears to receive less exposure to children’s music without visual stimuli (exposure to adult music is likely to reflect listening habits of parents). Parents of young CI users may decide not to use media where there is no visual stimulus; however, there was no observed increase in exposure to audio-visual media for this group. Parents also reported less sophisticated responses for the CI users, which may be due to difficulties comprehending music, resulting in a lack of interest in music. The provision and supported use of materials which encourage interaction with music might therefore be beneficial.

Video examples from the study:
Clip 1: 2 yrs. HA, Edwards syndrome. Some reactions to sound, but no goal-oriented play.
Clip 2: 5 yrs. CI, 6 mths post implant, plays with the sound, understands that movements influence sound.
Clip 3: 7 yrs. CI 1 mth, development delay. Little reaction to everyday sounds, clear appreciation of manipulating sounds.

SUMMARY The present studies focus on the importance of broadening the listening experience for children using CI technology. Children’s subjective appreciation of non-linguistic sounds are likely to stimulate their listening skills. Children with multiple functional disabilities sometimes show little or no response to auditory stimuli. In these instances, parents may be discouraged from ensuring optimal use of the CI. It is thus important that the child is provided with opportunities to explore and play with sound. This clearly shows caregivers that the child is hearing.

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