Predicting Speech Perception Results for Children Using Multichannel Cochlear Implants

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It is most helpful in counselling families considering cochlear implants to be able to predict outcomes for individual hearing-impaired children. Speech perception results for open-set words and sentences have been collected for all children implanted with the Nucleus device in Melbourne. Assessments are available at approximately six month intervals following implantation. Data was collected for each child regarding type of hearing loss, duration and age at onset of profound hearing loss, age at implantation, pre and post-implant communication mode, developmental delay, speech coding scheme and implant experience. These data were used as predictor variables in step-wise multiple linear regression analyses with the speech perception scores as the dependent variables. Shorter duration of profound hearing loss, later onset of profound hearing loss, exclusively oral communication mode following implantation, and longer implant experience were associated with significantly ($p < 0.001$) improved open-set speech perception. The use of the SPEAK signal coding scheme was shown to provide significantly better speech perception performance for children ($p < 0.001$). Developmental delay was associated with poorer speech perception outcomes ($p < 0.01$). Over 50% of the variance in speech perception scores was accounted for by these variables. The study suggests that younger implantation for congenitally deaf children leads to improved speech perception results. On the other hand, the development of auditory language skills in implanted children may be as important as age at implantation in enhancing long term outcomes. Regression equations derived from these results can be used to predict outcomes for cochlear implant candidates with a reasonable accuracy.

Improving and Preserving Speech Perception in Noise Using Advanced Digital Directional Technology

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Poor performance in noise is a leading user complaint about hearing instruments. The use of amplification alone does not solve this problem. Enhancement of the signal-to-noise ratio is needed (Killion, 1997), and the most successful method until now seems to be the use of directional microphones and especially multi-microphone technology (Valente, 1998). Recently this technology has been further improved with the introduction of adaptive directional systems. The purpose of these systems is to automatically optimise the directional characteristics to reduce the interference from the most intense noise sources in the environment. Another important issue is amplitude and phase mismatch between the two microphones. This can be corrected for in the manufacturing process, but drift over time and influence from user specific physical factors such as head shape and hairstyle can only be eliminated employing an automatic microphone.
It is most helpful in counselling families considering cochlear implantation to have some ability to predict outcomes for individual hearing-impaired children. Speech perception results for open-set words and sentences have been collected for all children implanted with the Nucleus device in Melbourne. Assessments are available at approximately six month intervals following implantation. Data was collected for each child regarding type of hearing loss, duration and age at onset of profound hearing loss, age at implantation, pre and post-implant communication mode, developmental delay, speech coding scheme and implant experience. These data were used as predictor variables in step-wise multiple linear regression analyses with the speech perception scores as the dependent variables. Shorter duration of profound hearing loss, later onset of profound hearing loss, exclusively oral communication mode following implantation, and longer implant experience were associated with significantly \( p < 0.001 \) improved open-set speech perception. The use of the SPEAK signal coding scheme was shown to provide significantly better speech perception performance for children \( p < 0.001 \). Developmental delay was associated with poorer speech perception outcomes \( p < 0.01 \). Over 50% of the variance in speech perception scores was accounted for by these variables. The study suggests that younger implantation for congenitally deaf children leads to improved speech perception results. On the other hand, the development of auditory language skills in implanted children may be as important as age at implantation in enhancing long term outcomes. Regression equations derived from these results can be used to predict outcomes for cochlear implant candidates with a reasonable accuracy.

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