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ELECTROPHYSIOLOGICAL AND BEHAVIOURAL MEASURES OF CENTRAL AUDITORY PROCESSING IN ADULT COCHLEAR IMPLANT USERS.

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A thesis submitted in partial fulfilment of the requirements for the degree of

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ABSTRACT

This study aimed to determine the relationship between auditory evoked potential measures, speech perception and frequency discrimination in 12 experienced adult cochlear implant (CI) users and to compare the evoked potential results in the CI subjects to those of a group of age- and gender-matched control subjects with normal hearing. The CI subjects all used the Nucleus CI-22 implant with the SPEAK processing strategy. Subject age range was 27-74 years (mean 50.9 years). All had used their implant for a minimum of one year (range 13-76 months, mean duration of implant use 37.5 months). Duration of profound deafness prior to implantation ranged from 1 - 40 years (mean 15.6 years). Middle latency response (MLR), obligatory N1-P2 cortical potentials, mismatch negativity and P3a auditory evoked potential were recorded. Speech perception was evaluated using tests from “The Minimum Speech Test Battery for Adult Cochlear Implant Users”. Frequency discrimination was measured using a two-alternative forced choice procedure, to record difference limens (DL) for a 1000 Hz tone. Duration of deafness correlated strongly with speech perception scores with poor scores reflecting greater years of deafness. The most sensitive of all the evoked potential measures was P2 latency, with strong relationships found between P2 and duration of deafness and speech perception scores. Earlier P2 latencies were associated with shorter durations of deafness and higher speech perception scores. In general, mismatch negativity was absent or degraded in CI subjects with poor speech scores. In better implant users mismatch negativity was typically present to both large and small frequency differences and demonstrated characteristic changes of increased latency and decreased area and amplitude for the more difficult discrimination task (as seen in the normal hearing group). Na amplitude of the MLR correlated negatively with duration of deafness, with small amplitudes reflecting greater duration of deafness. Frequency DLs were very variable, and no strong relationships were found between these and the evoked potential or speech perception measures.
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