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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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## TABLE OF CONTENTS

ABSTRACT .....	ii
ACKNOWLEDGEMENTS.....	iii
LIST OF FIGURES.....	IX
LIST OF TABLES .....	XIV
INTRODUCTION .....	1
REVIEW OF LITERATURE .....	4
PHYSIOLOGY OF THE HUMAN AUDITORY SYSTEM.....	4
The Peripheral Auditory System.....	4
Outer Hair Cells.....	7
Inner Hair Cells .....	7
Frequency Resolution .....	8
The Central Auditory System.....	9
Auditory Nerve.....	9
Electrical Stimulation of the Auditory nerve .....	10
The Auditory Structures of the Brainstem.....	12
The Cochlear Nucleus .....	13
Superior Olivary Complex.....	14
The Lateral Lemniscus .....	14
The Inferior Colliculus .....	15
The Auditory Cortex.....	15
CHARACTERISATION OF COCHLEAR IMPLANTS.....	16
Hardware Developments.....	16
Hardware Specifications .....	19
Stimulus Characteristics.....	20
Modes of Stimulation.....	21
Bipolar Stimulation.....	21
Common Ground Stimulation .....	21
Loudness Coding .....	22
Frequency Coding .....	22
History of Cochlear Ltd Nucleus CI-22 Speech Processing Strategies .....	22

F0/F2 WSP II 1982.....	23
F0/F1/F2 WSP III 1985.....	23
Multipeak MSP 1989.....	23
SPEAK SPECTRA 22 1994.....	24
AUDITORY EVOKED POTENTIALS .....	26
Electrocochleogram.....	29
Auditory Brainstem Response.....	29
Middle Latency Response.....	30
Cortical P1-N1-P2 Responses .....	32
P1.....	34
N1.....	36
Cortical Tonotopicity and Ipsilateral/Contralateral Asymmetry .....	38
Habituation of Cortical Evoked Potentials.....	42
P2.....	43
Exogenous and Endogenous Responses.....	45
MMN .....	46
MMN to Frequency Contrasts.....	48
Measurement and Interpretation Issues .....	49
N2b.....	50
P3.....	51
Central Auditory Processing In Cochlear Implant Subjects.....	55
Tone Decay in CI users.....	55
Pitch Discrimination .....	56
Auditory Evoked Potentials in Cochlear Implant Subjects.....	57
Auditory Brainstem Responses in CI users.....	57
Middle Latency Responses in CI Users.....	58
Cortical Responses in CI Users.....	59
MMN and P3 in Cochlear Implant Subjects .....	62
Frequency Discrimination in Normal Hearing and Hearing Impaired Subjects.....	66
Pre-operative Predictors of Success.....	68
AIMS.....	70
METHOD.....	71
EXPERIMENTAL SUBJECTS .....	71
NORMAL HEARING SUBJECTS .....	72

Sound Field Audiogram.....	73
TEST PROCEDURE.....	75
TEST ENVIRONMENT .....	76
BEHAVIOURAL TESTS .....	76
Frequency Discrimination.....	76
SPEECH PERCEPTION .....	77
AUDITORY EVOKED POTENTIAL RECORDINGS.....	78
Test Ear.....	78
AEP Instrumentation .....	78
AEP Procedure.....	80
Response Identification.....	81
Middle Latency Response - Stimulus and Recording Parameters.....	82
Cortical P1-N1-P2 Responses - Stimulus and Recording Parameters .....	82
Mismatch Negativity and P3a - Stimulus and Recording Parameters .....	83
STATISTICAL METHODS.....	85
RESULTS.....	86
BEHAVIOURAL RESULTS.....	86
Speech Perception .....	86
SOUND FIELD AUDIOGRAM .....	88
Frequency Discrimination.....	89
AUDITORY EVOKED POTENTIALS .....	91
Middle Latency Response.....	93
Na Amplitude.....	97
Pa Amplitude.....	100
Pb Latency.....	103
Summary of electrode montage effects on the MLR:.....	103
MLR Two-Group Analysis .....	104
MLR Three-Group Analysis.....	106
Summary of Group Effects on the MLR .....	110
Cortical results.....	111
Summary of Significant Main Effects and Interactions for the Cortical Results.....	122
Cortical Two-Group Analysis.....	124
Cortical Three-Group Analysis.....	129

Summary of the Significant Findings from the Two-Group and Three-Group Analyses of the Cortical Data:.....	138
Mismatch Negativity (MMN) and P3 .....	139
P3a.....	150
RELATIONSHIP BETWEEN OBJECTIVE AND SUBJECTIVE MEASURES OF IMPLANT PERFORMANCE.....	153
Correlations Between Behavioural Data and Subject Characteristics .....	153
Correlations with MLR Electrophysiological Findings.....	154
Correlations With Cortical Electrophysiological Findings .....	157
250 Hz Stimulus .....	157
1 kHz Stimulus .....	158
4 kHz Stimulus .....	159
Correlations with the Large Deviant (1500 Hz) Stimulus, MMN and P3a Electrophysiological Results .....	159
MMN .....	159
P3a.....	161
Correlations with the Small Deviant (1250 Hz) Stimulus, MMN and P3a Electrophysiological Results .....	162
MMN .....	162
P3a.....	163
DISCUSSION.....	164
BEHAVIOURAL RESULTS .....	165
Speech Perception .....	165
Frequency Discrimination .....	165
ELECTROPHYSIOLOGICAL RESULTS .....	167
General Characteristics of Evoked Potentials in CI versus NH Groups .....	167
MLR Group Differences .....	167
MLR Paradigm .....	168
Cortical Group Differences .....	170
MMN Group Differences .....	173
P3a Group Differences .....	173
Recording Electrode Effects.....	175
Choice of reference electrode for MLR recordings .....	175
MLR Hemispheric Asymmetry .....	176
Cortical Ipsilateral/Contralateral Asymmetry .....	177



MMN Lateralisation .....	180
P3a Lateralisation .....	181
Stimulus Effects .....	182
Frequency Effects on Cortical EPs .....	182
Habituation of Cortical Evoked Potentials .....	184
Deviant Stimulus Effects on MMN.....	186
Deviant Stimulus Effects on P3a .....	186
ELECTROPHYSIOLOGICAL VERSUS BEHAVIOURAL RESULTS .....	187
CONCLUSIONS.....	190
FUTURE DIRECTIONS .....	191
APPENDIX I: RADIO FREQUENCY FILTER.....	194
APPENDIX II: AVERAGED ELECTRODE VOLTAGES .....	195
METHOD.....	195
RESULTS.....	196
CONCLUSIONS.....	196
APPENDIX III: INDIVIDUAL IMPLANT ELECTRODE THRESHOLD, COMFORT AND FREQUENCY ALLOCATION VALUES .....	198
REFERENCES .....	210

## LIST OF FIGURES

Figure 1.	Illustration of the human ear (Figure 6-4 from Coren and Ward, 1989). .....	5
Figure 2.	The organ of Corti (Figure 6-7 from Coren and Ward, 1989). .....	6
Figure 3.	The central auditory pathways, through brain stem cross sections (Figure 11-17 from Bear, Connors and Paradiso, 1996). .....	13
Figure 4.	The Nucleus <sup>®</sup> Cochlear Implant System, A) Cochlear implant, comprising a magnet, receiver/stimulator and a 22 band electrode array, B) Speech processor, C) Directional microphone and D) Transmitter coil and cable (from Nucleus <sup>®</sup> Cochlear Implant System “Issues and Answers” Cochlear Pty Ltd, product brochure). .....	19
Figure 5.	Diagram illustrating the current flow in the cochlear implant electrode array for bipolar (BP) and common ground (CG) stimulation modes (Figure 9-4 adapted from Rance and Dowell, 1997). .....	21
Figure 6.	Illustration of the SPEAK strategy. The speech waveform is filtered by twenty band-pass filters. The 6 – 10 maximum outputs are selected to stimulate appropriate electrodes according to a frequency place coding representation (Figure 8-3 from Patrick, Seligman and Clark, 1997). .....	25
Figure 7.	Examples of waveforms for major auditory evoked potentials. Latency and amplitude scales for each figure are noted in the right portion of the figure: A, Electrocochleogram; B, Auditory Brainstem Response; C, Middle Latency Response; D, Cortical Response; E, P3 Response. (AP = action potential; SP = summing potential; $\mu$ V = microvolts; I, II, III and V = ABR waves numbered sequentially; N and P are negative and Positive voltage indicators with respect to the vertex, respectively). (Figure 1-1 adapted from Hall, 1992). .....	28
Figure 8.	(a) Range of sound field pure tone thresholds (dBHL) as a function of frequency (Hz) for the CI subjects, and (b) range of pure tone thresholds for the test ear of the NH subjects. The average speech spectrum (solid shaded area) is displayed on both audiograms. ....	75
Figure 9.	Individual speech recognition scores (% correct) for HINT sentences and CNC words (word and phoneme scores) rank ordered from best to worst sentence score for the 12 CI subjects. The subjects can be divided into 8 “better” (> 85%) users (subjects 1 – 8) and 4 “poorer” (< 40%) users (subjects 9 – 12) based on their HINT sentence scores. ....	87
Figure 10.	Duration of profound deafness and duration of cochlear implant use for the 12 CI subjects rank ordered on the basis of their HINT sentence scores from best (subject 1) to worst (subject 12) scores. ....	88

Figure 11. Frequency difference limens (DL) for the 12 CI subjects rank ordered on the basis of their HINT sentence scores from best (subject 1) to worst (subject 12) scores. ....	90
Figure 12. Grand mean MLR waveforms (n = 12 per group) for the CI (green) and NH (black) groups for the eight electrode montages. ....	94
Figure 13. Na amplitudes for the NH (striped) and CI (solid) groups as a function of electrode montage. Error bars show standard errors of the mean. ....	99
Figure 14. Pa amplitudes for the NH (striped) and CI (solid) groups as a function of electrode montage. Error bars show standard errors of the mean. ....	102
Figure 15. Grand mean waveforms for the NH (black) and CI (green) at the C3-A1 electrode site. Scale bar is in $\mu$ Volts.....	104
Figure 16. Mean amplitude values for the NH group (striped) and CI group (solid) for the MLR peaks Na, Pa, Nb and Pb at the C3-A1 electrode montage. The significant group difference ( $p = 0.01$ ) is indicated by the asterisk. Error bars show standard errors of the mean. ....	105
Figure 17. Grand mean waveforms for the NH (black), better CI (red), and poorer CI (blue) groups at the C3-A1 electrode site. Scale bar is in microvolts.....	106
Figure 18. Mean MLR peak amplitudes for the C3-A1 electrode montage for the three subject groups. Group 1 = NH (striped), group 2 = "better" CI (grey), and group 3 = "poorer" CI (black). The significant group differences ( $p \leq 0.01$ ) are indicated by the asterisk. Error bars indicate standard errors of the mean. ....	110
Figure 19. (previous page). Cortical grand mean waveforms for the 250 Hz stimulus (a), 1 kHz stimulus (b) and 4 kHz stimulus (c) for the NH (black) and CI (green) groups at the Cz-contra electrode montage. Scale bars are in $\mu$ Volts.....	113
Figure 20. Mean latencies (ms) of the cortical peaks P1, N1 and P2 as a function of stimulus frequency, 250 Hz (pale grey bars), 1 kHz (striped bars) and 4 kHz (dark bars). Latencies were significantly earlier for the 1 kHz stimulus than for the 250 Hz and 4 kHz stimuli. Error bars show standard errors of the mean. ....	118
Figure 21. Mean N1 latency values (ms) for the NH group (striped) and CI group (solid) for the four electrode montages Fz-contra, Cz-contra, C3-A1 and C4-A2. Error bars show standard errors of the means. This figure illustrates the significant montage by group interaction for N1 latency. Fz was significantly different from Cz and C3 and Cz was significantly different from C3.....	119
Figure 22. Mean N1 amplitude ( $\mu$ V) values for the NH group (striped bars) and CI group (solid bars) for the four electrode montages, Fz-contra, Cz-contra, C3-A1 and C4-A1. Error bars show standard errors of the mean.....	120

- Figure 23. Mean P1 latency values for the NH group (striped) and CI group (solid) for the three stimulus frequencies 250 Hz (red), 1 kHz (blue), and 4 kHz (black) and the four electrode montages (Fz, Cz C3 and C4). This figure illustrates the significant three-way montage by frequency by group interaction. There were significant P1 latency group differences between the Cz and C4 electrode montages (for 1 kHz and 4 kHz) and between the Fz and Cz electrode montages (for 250 Hz and 1 kHz) with the CI group having longer latencies for the 250 Hz and 1 kHz stimuli. Error bars show standard errors of the mean. .... 122
- Figure 24. Mean cortical P1, N1 and P2 amplitude values ( $\mu$ V) for the NH group (striped) and CI group (solid) for the three stimulus frequencies (250 Hz, 1 kHz, and 4 kHz) at the Cz electrode montage. This figure illustrates the significant three way frequency by wave by group interaction. There were significant group differences between 250 Hz and 1 kHz and between 250 Hz and 4 kHz stimulus frequencies for the group amplitudes. The NH group had significantly greater amplitudes for N1 to the 1 kHz and 4 kHz stimuli compared to the 250 Hz stimulus. The CI group had similar N1 amplitudes across frequencies. Compared to the NH group, the CI group had significantly greater P1 amplitudes to the 250 Hz stimulus, similar P1 amplitudes for the 1 kHz stimulus and smaller P1 amplitudes to the 4 kHz stimulus. Error bars show standard errors of the mean. .... 126
- Figure 25. Mean cortical P1, N1 and P2 latency values for the NH group (striped) and CI group (solid) for the three stimulus frequencies (250 Hz, 1 kHz, and 4 kHz) for the Fz electrode montage. This figure illustrates the significant three-way frequency by wave by group interaction. There were significant differences between the 1 kHz and 4 kHz stimulus frequencies for the group latencies, with the NH group having significantly shorter P2 latencies to the 1 kHz stimulus and longer N1 latencies to the 4 kHz stimulus. At 1 kHz the CI and NH groups had similar N1 latencies. Error bars show standard errors of the mean. .... 128
- Figure 26. (previous page). Cortical grand mean waveforms for the 250 Hz stimuli (a), 1 kHz stimulus (b) and 4 kHz stimulus (c) for the NH (black), better CI (red) and poorer CI (blue) groups. Scale bars are in  $\mu$ Volts. .... 131
- Figure 27. Mean cortical P1, N1 and P2 amplitude values for the NH group (striped), better CI group (grey) and poorer CI group (black) for the three stimulus frequencies (250 Hz, 1 kHz, and 4 kHz) at the Fz electrode montage. This figure illustrates the significant group effect for N1 amplitude. The NH group had significantly greater N1 amplitude

	to the 4 kHz stimulus than both the poorer and better CI groups. Error bars show standard errors of the mean.....	136
Figure 28.	Mean cortical P1, N1 and P2 latency values for the NH group (striped bars), better CI group (grey bars) and poorer CI group (black bars) for the three stimulus frequencies (250 Hz, 1 kHz, and 4 kHz) at the Fz electrode montage. This figure illustrates the group trends in the latency data. The poorer CI group had longer P1 latencies for all three frequencies (250 Hz, 1 kHz and 4 kHz) and the shortest P2 latency for the 4 kHz stimulus. The NH group had the shortest N1 latency to the 1 kHz stimulus. Error bars show standard errors of the mean.....	137
Figure 29.	MMN grand mean waveforms for the NH group (n = 12) at the Fz electrode site. The frequent waveform (1000 Hz, black), small deviant waveform (1250 Hz, red) and large deviant waveform (1500 Hz, blue) are shown. Scale bar is in $\mu$ Volts.....	140
Figure 30.	MMN grand mean subtracted waveforms for the NH group (n = 12) at the Fz electrode site for the small deviant (red) and large deviant (blue) stimuli. Scale bar is in $\mu$ Volts.....	140
Figure 31.	MMN grand mean waveforms for the CI group (n = 9) at the Fz electrode site. The frequent waveform (1000 Hz, black), small deviant waveform (1250 Hz, red) and large deviant waveform (1500 Hz, blue) are shown. Scale bar is in $\mu$ Volts.....	141
Figure 32.	MMN grand mean subtracted waveforms for the CI group (n = 9) at the Fz-contra electrode site for the small deviant (red) and large deviant (blue) stimuli. Scale bar is in $\mu$ Volts.....	141
Figure 33.	MMN grand mean waveforms for the better CI group (n = 8) at the Fz electrode site. The frequent waveform (1000 Hz, black), small deviant waveform (1250 Hz, red) and large deviant waveform (1500 Hz, blue) are shown. Scale bar is in $\mu$ Volts.....	142
Figure 34.	MMN grand mean subtracted waveforms for the better CI group (n = 8) at the Fz-contra electrode site for the small deviant (red) and large deviant (blue) stimuli. Scale bar is in $\mu$ Volts.....	142
Figure 35.	MMN grand mean waveforms for the poorer CI group (n = 4) at the Fz electrode site. The frequent waveform (1000 Hz, black), small deviant waveform (1250 Hz, red) and large deviant waveform (1500 Hz, blue) are shown. Scale bar is in $\mu$ Volts.....	143
Figure 36.	MMN grand mean subtracted waveforms for the poorer CI group (n = 4) at the Fz-contra electrode site for the small deviant (red) and large deviant (blue) stimuli. Scale bar is in $\mu$ Volts.....	143
Figure 37.	Mean MMN duration values for the NH group (striped) and CI group (solid) at the three electrode sites (Fz, F3 and C4) that yielded significant group differences. Error bars show standard errors of the mean.....	149

Figure 38. Mean P3a amplitude values for the NH group (striped bars) and CI group (solid bars) for the three electrode montages (Fz, F4 and C4) yielding significant group differences to the small deviant stimulus (1250 Hz). This figure illustrates the significant amplitude differences for the P3a response. The NH group had similar P3a amplitudes across the three electrode sites whereas the CI group had the greatest amplitudes for the right-sided electrode montages (F4 and C4). Error bars show standard errors of the mean.....	152
Figure 39. Cortical responses from CI subject 10 to the 250 Hz stimulus for the C4 electrode montage. This waveform represents the average of 100 stimulus presentations. Note the prominent positive response and small N1. The amplitude scale differs from that used in the Results section because of the large amplitude of the response. ....	179
Figure 40. Frequency response of the radio frequency filter modified from Game and Sanli, 1997.....	194
Figure 41. Averaged electrodes voltages ( $\mu V$ ) in the BP + 1 mode from the individual CI-22 implant electrodes of the 12 CI subjects. ....	197
Figure 42. Averaged electrodes voltages ( $\mu V$ ) in the CG mode from the individual CI-22 implant electrodes of the 12 CI subjects.....	197

## LIST OF TABLES

Table 1.	Details of the CI subjects showing age (years), duration of profound deafness (years), duration of implantation (years), durage (duration of profound deafness/age), number of active electrodes (# Elect), stimulation mode (Mode) (Bipolar + 1 or Common Ground) and ear of implantation. ....	72
Table 2.	Details of the normal hearing (NH) group showing their ear of stimulation, sex, age (years) and pure tone thresholds (dB HL) in the test ear at audiometric frequencies from 250 Hz to 6 kHz. ....	73
Table 3.	Individual sound field pure tone thresholds (dB HL), and mean and standard deviations (sd) for the cochlear implant (CI) subjects (n = 12) at audiometric frequencies 250 Hz to 6 kHz. ....	74
Table 4.	Details of the stimuli used for the AEP (auditory evoked potential recordings), showing their duration (ms), rise and fall / ramp times (ms), frequency (Hz) and rate (ms) or ISI (inter-stimulus interval, ms). ....	79
Table 5.	Presentation levels (dBppeSPL) of the stimuli used for the CAEP and MMN recordings (250 Hz, 1 kHz and 4 kHz) and for the MLR recordings (MLR 500 Hz) for the CI (CI subjects 1 - 12) and NH (NH subjects 1 -12) subjects. ....	81
Table 6.	Mean sound field pure-tone thresholds (dB HL) of the better (n = 8) and poorer (n = 4) CI groups at the audiometric frequencies 250 Hz, 500 Hz, 1, 2, 4, and 6 kHz. Standard deviations are in parentheses. ....	89
Table 7.	Individual dB ppeSPL levels for the AEP stimuli for the CI subjects (n = 12) and the means and standard deviations (sd). ....	92
Table 8.	Individual dB ppeSPL levels for the AEP stimuli for the NH subjects (n = 12) and means and standard deviations (sd). ....	93
Table 9.	Mean MLR latencies (ms) for waves Na, Pa, Nb and Pb for the NH and CI groups at the eight MLR electrode montages. Standard deviations are in parentheses. ....	95
Table 10.	Mean MLR amplitudes ( $\mu$ V) for waves Na, Pa, Nb and Pb for the NH and CI groups at the eight MLR electrode montages. Standard deviations are in parentheses. ....	96
Table 11.	Mean MLR latency (ms) and amplitude ( $\mu$ V) values from the significant repeated measures ANOVA showing a main effect of montage. Standard deviations are in parentheses. ....	97
Table 12.	Significant electrode montage post hoc contrasts for Na amplitude. ....	98
Table 13.	Significant electrode montage by group contrasts for Na amplitude. ....	100
Table 14.	Significant electrode montage contrasts for Pa amplitude. ....	101

Table 15.	Significant electrode montage by group post hoc contrasts for Pa amplitude. ....	102
Table 16.	Significant electrode montage contrasts for Pb latency. ....	103
Table 17.	Mean MLR latencies (ms) for waves Na, Pa, Nb and Pb for the NH, better CI and poorer CI groups at the eight MLR electrode montages. Standard deviations are in parentheses. ....	107
Table 18.	Mean MLR amplitudes ( $\mu$ V) for waves Na, Pa, Nb and Pb for the NH, better CI and poorer CI groups at the eight MLR electrode montages. Standard deviations are in parentheses. ....	108
Table 19.	Significant dependent variables for the C3 electrode montages for the three-group ANOVA (the two left-hand columns) and the significant post hoc contrasts (the two right-hand columns). ....	109
Table 20 (a).	Cortical latency (ms) and amplitude ( $\mu$ V) values for the NH and CI groups for the 250 Hz stimulus frequency at the Fz, Cz, C3 and C4 electrode montages. Standard deviations are in parentheses. ....	113
Table 20 (b).	Cortical latency (ms) and amplitude ( $\mu$ V) values for the NH and CI groups for the 1 kHz stimulus frequency at the Fz, Cz, C3 and C4 electrode montages. Standard deviations are in parentheses. ....	114
Table 20 (c).	Cortical latency (ms) and amplitude ( $\mu$ V) values for the NH and CI groups for the 4 kHz stimulus frequency at the Fz, Cz, C3 and C4 electrode montages. Standard deviations are in parentheses. ....	115
Table 21.	Mean cortical amplitudes ( $\mu$ V) from the significant repeated ANOVA for the main effect of montage. Standard deviations are in parentheses. ....	116
Table 22.	Significant post hoc contrasts for the main effect of electrode montage. ....	117
Table 23.	Significant post hoc contrasts for the main effect of frequency on the cortical data. ....	118
Table 24.	Mean group N1 amplitudes ( $\mu$ V) for the 250 Hz, 1 kHz and 4 kHz stimulus frequencies. Standard deviations are in parentheses. ....	121
Table 25.	Significant post hoc contrasts for the montage by group and frequency by group interactions. ....	121
Table 26.	Significant post hoc contrasts for the frequency by wave interaction for the amplitude data from the individual montage analysis of the two-group cortical data. ....	125
Table 27.	Significant frequency by wave by group interactions and post hoc contrasts for the amplitude data from the individual montage analysis of the two-group cortical data. ....	127
Table 28.	The significant frequency by wave by group interaction and post hoc contrasts for the latency data at the Fz electrode site from the individual montage analysis of the two-group cortical data. ....	128



Table 29 (a).	Cortical latency (ms) and amplitude ( $\mu$ V) data for the NH (n=12) and better (n=8) and poorer (n=4) CI groups for the 250 Hz, stimulus frequency at the Fz, Cz, C3 and C4 electrode montages. Standard deviations are shown in parentheses. ....	132
Table 29 (b).	Cortical latency (ms) and amplitude ( $\mu$ V) data for the NH (n=12) and better (n=8) and poorer (n=4) CI groups for the 1 kHz stimulus frequency at the Fz, Cz, C3 and C4 electrode montages. Standard deviations are shown in parentheses.....	133
Table 29 (c).	Cortical latency (ms) and amplitude ( $\mu$ V) data for the NH (n=12) and better (n=8) and poorer (n=4) CI groups for the 4 kHz stimulus frequency at the Fz, Cz, C3 and C4 electrode montages. Standard deviations are shown in parentheses.....	134
Table 30.	Significant post hoc contrasts at the three electrode sites (Fz, Cz, and C3) that had significant group effects for the three-group cortical amplitude data. ....	135
Table 31.	Mean MMN onset, offset and peak latencies (ms) and onset, offset and peak amplitudes ( $\mu$ V), MMN area (ms/ $\mu$ V) and duration (ms), for the large (1500 Hz) deviant stimulus. Standard deviations are shown in parentheses. ....	144
Table 32.	Mean MMN onset, offset and peak latencies (ms) and onset, offset and peak amplitudes ( $\mu$ V), MMN area (ms/ $\mu$ V) and duration (ms) for the small (1250 Hz) deviant stimulus. Standard deviations are shown in parentheses. ....	145
Table 33.	Mean P3a latency (ms) and amplitude ( $\mu$ V) values for the large (1500 Hz) deviant stimulus. Standard deviations are shown in parentheses. ....	146
Table 34.	Mean P3a latency (ms) and amplitude ( $\mu$ V) values for the small (1250 Hz) deviant stimulus. Standard deviations are shown in parentheses. ....	146
Table 35.	The number of subjects in the NH and CI groups (NH,CI) that had MMN or P3a responses to the large (1500 Hz) and small (1250 Hz) deviant stimuli for the seven electrode montages. The montages that produced statistically significant group differences ( $p \leq 0.027$ ) are marked with an asterisk (*). ....	147
Table 36.	Significant group and dependent variable results for the large deviant MMN stimulus at the electrode sites Fz, F3 and C4. Subject numbers (n) for the two groups (NH,CI) are shown for each result.....	150
Table 37.	Significant group and dependent variable P3a results for the small deviant stimulus at the electrode sites Fz, F4 and C4. Subject numbers (n) for the two groups (NH,CI) are shown for each result. ....	151
Table 38.	Statistically significant ( $p \leq 0.05$ ) correlations between the MLR measures and the behavioural performance (speech perception scores) and subject factors at the eight electrode sites. Strong correlations ( $p \leq 0.01$ ) are in bold type. The electrode sites	

that produced significant group differences in the two- and three-group analyses of variance are marked with an asterisk (\*). ..... 156

Table 39. Statistically significant ( $p \leq 0.05$ ) correlations between the cortical results (250 Hz stimulus) and the behavioural performance (speech perception scores) and subject factors, duration of CI use (D of CI), and duration of deafness (D of deaf). Asterisks (\*) indicate the electrode sites that showed significant group differences in the cortical two- and three-group analyses of variance. Strong correlations ( $p \leq 0.01$ ) are in bold type. .... 158

Table 40. Statistically significant ( $p \leq 0.05$ ) correlations for the large deviant stimulus (1500 Hz) between the dependent variables MMN area (Area), MMN onset latency (Onset L), MMN onset amplitude (Onset A), MMN duration at the electrode montages (Fz, F3, F4, Pz and C4) and the subject factors, duration of CI use (D of CI), duration of deafness (D of deaf), age, duration, and the behavioural performance factors, difference limen (DL), and speech perception scores. Strong correlations ( $p \leq 0.01$ ) are in bold type. The asterisk (\*) indicates the electrode sites that showed significant group differences in the analyses of variance. .... 161

Table 41. Statistically significant ( $p \leq 0.05$ ) correlations for the large deviant stimulus (1500 Hz) between the dependent variable P3a amplitude (P3a A) at the electrode montages (Fz, F3, F4, and C4) and the subject factors, duration of CI use (D of CI) and duration of deafness (D of deaf), and the behavioural performance factor, difference limen (DL). Strong correlations ( $p \leq 0.01$ ) are in bold type. .... 162