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PROGRAM & ABSTRACTS

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#6

N400: Objective measure of speech Understanding in Noise

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Background

In a regular clinical set up, audiologists encounter adults who report of difficulty understanding speech in the presence of background noise despite having clinically normal audiograms. The exact reason to why they report difficulty understanding speech in the presence of noise is still unclear. Therefore, the aim of the current study was to explore the neural processing involved in speech understanding task in individuals with and without listening in noise concerns using N400.

Method

22 adults with normal hearing, control group, (19-50 years, 7 males) and 20 with reported listening in noise concerns, listening concern group (21-62 years, 8 males) were recruited. Electroencephalography (EEG) was carried out on all the participants using semantically congruent and incongruent sentences. Three types of analysis was carried out; 1) the onset responses i.e., P1-N1-P2 were identified for both types of sentences; 2) N400 magnitude was estimated as the area under the curve on the difference waveform in the time frame [0.4-0.8] seconds following the onset of the critical word; 3) Time frequency analysis of the recorded EEG.

Results

Analysis of variance of the onset of the sentence and area under the curve for N400 showed no significant difference across the groups. Within group analysis showed significant differences between responses elicited for incongruent versus congruent sentences only for the control group. Significant clusters were observed only in control group, on cluster permutation analysis in the frontal electrodes. Furthermore, the time frequency analysis showed stronger synchronised alpha oscillations for the control group when compared to the listening concern group.

Considering there were no differences in the onset response, the obtained result may indicate that both groups perform similarly on simple perception tasks. In contrast, N400 elicitation, requires additional cognitive skills such as attention and the ability to predict the occurrence of the incoming sentences. Increased alpha oscillations have been reportedly associated with increased focussed attention. It could be that individuals with listening concerns have difficulty maintaining their attention during complex tasks such as speech understanding as observed in the presence of stronger alpha oscillations in the control groups relative to listening concern group.