

An Event-Related Potential Investigation of Speech-in-Noise Recognition in Native and Nonnative Speakers of English

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Abstract : Speech communication often occurs in environments where noise conceals part of a message. Listeners should compensate for the lack of auditory information by picking up distinct acoustic cues and using semantic and sentential context to recreate the speaker's intended message. This situation seems to be more challenging in a nonnative than native language. On the other hand, early bilinguals are expected to show an advantage over the late bilingual and monolingual speakers of a language due to their better executive functioning components. In this study, English monolingual speakers were compared with early and late nonnative speakers of English to understand speech in noise processing (SIN) and the underlying neurobiological features of this phenomenon. Auditory mismatch negativities (MMNs) were recorded using a double-oddball paradigm in response to a minimal pair that differed in their middle vowel (beat/bit) at Wilfrid Laurier University in Ontario, Canada. The results did not show any significant structural and electroneural differences across groups. However, vocabulary knowledge correlated positively with performance on tests that measured SIN processing in participants who learned English after age 6. Moreover, their performance on the test negatively correlated with the integral area amplitudes in the left superior temporal gyrus (STG). In addition, the STG was engaged before the inferior frontal gyrus (IFG) in noise-free and low-noise test conditions in all groups. We infer that the pre-attentive processing of words engages temporal lobes earlier than the fronto-central areas and that vocabulary knowledge helps the nonnative perception of degraded speech.

Keywords : degraded speech perception, event-related brain potentials, mismatch negativities, brain regions

Conference Title : ICPLP 2022 : International Conference on Psycholinguistics and Language Production

Conference Location : San Francisco, United States

Conference Dates : November 03-04, 2022