NEUROCOGNITIVE EFFECTS OF LISTENING EFFORT ON SPEECH PERCEPTION IN OLDER ADULTS: EVIDENCE FROM EVENT-RELATED BRAIN POTENTIALS
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Purpose: In older adults, there is a clear relationship between hearing loss and cognitive disruptions, including negative effects on speech comprehension. This leads adults to distancing themselves from participating in daily communicative activities. The goal of the current study is to use cognitive event-related brain potentials (ERPs) to understand higher-level cognitive and brain functions as adults listen to perceptually demanding speech (e.g., in background noise).

Method: We measured ERPs as older adults ($N = 48$, mean age $= 71$; range $= 60 - 85$) listened to sentences with expected and unexpected sentence-final words either in quiet or with background noise. We measured two cognitive ERPs time-locked to the sentence-final word: the N400 and the frontal negativity.

Results: We found that the N400 response, which indexes semantic processing, is delayed in background noise. This indicates that the early retrieval of words from long-term memory is hindered when listening effort is high. In addition, we observed a frontal negativity to expected words in quiet, which has been linked to high-level working memory related comprehension processes. This frontal negativity was eliminated in background noise. Thus, high-level comprehension processes are diminished when increased listening effort is required to overcome perceptual limitations.

Conclusion: This study demonstrates underlying differences in brain activity in older adults when processing auditory input in quiet compared to noise. Our findings demonstrate that older adults experience delays in word retrieval and reductions in high-level comprehension processes when the listening environment is more perceptually demanding. Such findings may be clinically useful with respect to assessing hearing loss in parallel with cognitive functioning to improve the communicative experience of those who endure age-related hearing loss.