Neurophysiological biomarkers for tracking auditory selective attention

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Topic: Speech perception/discrimination

Background: Selective attention enables speech comprehension in noisy environments by enhancing relevant sounds while suppressing distractions. Traditional auditory evoked potential (AEP) tests use artificial stimuli, limiting ecological validity. This study explores the feasibility of using natural speech stimuli to objectively assess selective attention.

Methods: EEG recordings were collected from 10 normal-hearing adults (4 females, 21–42 years) while they listened to an audiobook, either alone or competing with another audiobook at 0 dB SNR. Neural responses were analysed to compare *attended* versus *unattended* speech conditions. Cortical responses to words onset were obtained using deconvolution, and amplitude differences in the P1-N1-P2 complex were evaluated to identify objective markers of selective attention.

Results: The study successfully recorded cortical responses to natural speech at both group and individual levels, even under competing speech conditions. A key finding was the significant reduction in N1-P2 amplitude for unattended speech compared to attended speech, while P1-N1 amplitudes remained similar. This suggests that N1-P2 amplitude reflects speech comprehension rather than mere detection, as indicated by the stable P1-N1 component, making it a strong candidate for an objective biomarker of selective attention.

Conclusion: This novel AEP-based approach demonstrates the feasibility of an objective measure for selective attention using natural speech. Future research may explore brainstem-level responses, investigate the association of this biomarker with standardised cognitive tests of selective attention, and evaluate its sensitivity to hearing-in-noise problems reported by individuals with or without hearing loss.