Speech in noise testing relies on a number of factors beyond the functionality of the auditory system, including cognitive function, motivation, compliance, and motor function. It may be possible to avoid these limitations by measuring comprehension passively, using electroencephalography (EEG). The present study investigated the feasibility of this approach using the N400, a response that reflects the detection of semantic anomalies.

Eleven normal hearing adults heard high-constraint sentences with congruent and incongruent terminal words in the presence of speech-shaped noise. The signal to noise ratio (SNR) of the speech in noise was varied around each participant's behavioural threshold during EEG The amplitude of the N400 effect exhibited a nonlinear relationship with SNR. In the presence of background noise, amplitude decreased from high (+4 dB) to low SNR (+1 dB), but increased dramatically at threshold before decreasing again at subthreshold SNR (-2 dB).

The SNR of speech in noise modulates the amplitude of the N400 effect to semantic anomalies in a nonlinear fashion. This suggests that the N400 may be viable for future development of an electrophysiological speech in noise test, but further research is needed to understand the source and replicability of amplitude changes at threshold and to optimize the testing procedure.