Objective Quantification of Large–Scale Neural Correlates of Auditory Selective Attention

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Our concern is to quantify objectively large–scale neural correlates of auditory selective attention by using electroencephalographic data. To circumvent problems inherited from simple averaging techniques, a phase coherence measure called wavelet–phase stability (WPS) has been proposed. This method focuses on the phasic information of single sweep event related potentials (ERPs) in extracting and quantifying neural correlates of selective attention. A performance study of the WPS using the auditory late response (ALR) sequences has been demonstrated. Particularly, it is shown that the number of ALR sweeps that are needed to discriminate attended and unattended conditions is greatly reduced by using the WPS compared to wavelet coherence and correlation coefficient.

The presented approach can be used to quantify neural correlates of auditory selective attention. Due to the analysis of single sweeps, it provides a direct monitoring and thus, might be used in neurofeedback–based control systems for clinical (diagnosis and treatment for tinnitus patients and other attentional–related disorders) as well as non-clinical (human performance monitoring and improvement) applications.

Research Interest: Biomedical (Neural) Signal Processing, Brain-Computer Interface (BCI), Neurofeedback, Artificial Intelligence in Cognitive Engineering & Science.