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EEG Correlates of Trait and Mathematical Anxiety during Lexical and Numerical Error-Recognition Tasks

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Abstract : EEG correlates of mathematical and trait anxiety level were studied in 52 healthy Russian-speakers during execution of error-recognition tasks with lexical, arithmetic and algebraic conditions. Event-related spectral perturbations were used as a measure of brain activity. The ERSP plots revealed alpha/beta desynchronizations within a 500-3000 ms interval after task onset and slow-wave synchronization within an interval of 150-350 ms. Amplitudes of these intervals reflected the accuracy of error recognition, and were differently associated with the three conditions. The correlates of anxiety were found in theta (4-8 Hz) and beta2 (16-20 Hz) frequency bands. In theta band the effects of mathematical anxiety were stronger expressed in lexical, than in arithmetic and algebraic condition. The mathematical anxiety effects in theta band were associated with differences between anterior and posterior cortical areas, whereas the effects of trait anxiety were associated with inter-hemispherical differences. In beta1 and beta2 bands effects of trait and mathematical anxiety were directed oppositely. The trait anxiety was associated with increase of amplitude of desynchronization, whereas the mathematical anxiety was associated with decrease of this amplitude. The effect of mathematical anxiety in beta2 band was insignificant for lexical condition but was the strongest in algebraic condition. EEG correlates of anxiety in theta band could be interpreted as indexes of task emotionality, whereas the reaction in beta2 band is related to tension of intellectual resources.

Keywords : EEG, brain activity, lexical and numerical error-recognition tasks, mathematical and trait anxiety
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