Different cortical source activation patterns in children with attention deficit hyperactivity disorder during a time reproduction task.

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Abstract

Several neurocognitive studies have indicated that children with attention-deficit/hyperactivity disorder (ADHD) exhibit cognitive deficits in perceptual timing functions; however, only a few electroencephalographic studies have investigated their time reproduction abilities. In the present research, 15 children with ADHD were studied along with 19 age-matched control subjects (aged 7-11 years) as they attempted to reproduce shorter (1000 ms) and longer (2200 ms) time intervals. Trial-mean event-related potential (ERP) and event-related spectral perturbation measures were used to compare the electroencephalography (EEG) source-level activity patterns of the ADHD and control subjects during the time-encoding and reproduction phases. For both short and long intervals, the performance of subjects with ADHD was significantly less accurate and more variable than that of the age-matched controls. During the encoding phase, the ADHD and control ERPs differed significantly for the midfrontal source cluster. The midfrontal P300 amplitude evoked by the onset of the encoding phase was significantly higher for the ADHD group. Similarly, the amplitude of contingent negative variation for the ADHD group was lower for the midfrontal independent component (IC) cluster during long-interval encoding. Theta event-related synchronization in the right occipital cluster also differed between groups during both the encoding and reproduction phases. Moreover, children with ADHD failed to show a frontal selection positivity component in the reproduction phase. Significant differences were found in the mean alpha power for the prefrontal source cluster during the time reproduction phase. These results suggest electrophysiological evidence for time perception deficiencies, selective visual processing disturbances, and working memory impairment in children with ADHD.