Attention-related EEG markers in adult ADHD

Roland Hasler, Nader Perroud, Hadj Boumediene Meziane, François Herrmann, Paco Prada, Panteleimon Giannakopoulos, Marie-Pierre Deiber

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Abstract

ADHD status affects both bottom-up sensory processing and top-down attentional selection, impairing professional and social functioning. The objective of the study was to investigate the functional mechanisms of attention deficits in adult ADHD by examining the electrophysiological activities associated with bottom-up attentional cueing (temporal and spatial orienting of attention) and top-down control (conflict resolution). Continuous EEG was recorded in 21 adult ADHD patients (40.05 ± 9.5 years) and 20 healthy adults (25.5 ± 4 years) during performance of the Attention Network Test (ANT). We examined the cue and target-related P1, N1 and P3 components as well as the contingent negative variation (CNV) developing between cue and target. Oscillatory responses were analyzed in the alpha (8-13 Hz) and beta (14-19 Hz) frequency bands. ADHD patients performed similarly to controls but showed reduced P3 amplitude, larger early CNV decrementation over time, reduced preparatory activation in both alpha and beta bands, as well as flattened target-related posterior alpha and beta responses. As compared to controls, the inverted CNV pattern suggested peculiar preparatory processing in ADHD patients. The singular pattern of target-related beta response indicated increased inhibitory processes in the case of easier task resolution and more generally, the lack of association between conflict resolution speed and beta activity supported alternative executive processing in ADHD patients. Overall, the reduced activation of the functional networks devoted to bottom-up and top-down attention suggests that adult ADHD patients engage reduced cortical resources in this composite task, compatible with the cortical hypoarousal model.