Performance monitoring and post-error adjustments in adults with attention-deficit/hyperactivity disorder: an EEG analysis

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Abstract

BACKGROUND:
Recently, research into attention-deficit/hyperactivity disorder (ADHD) has focused increasingly on its neurobiological underpinnings, revealing (among other things) frontal lobe alterations. Specifically, action-monitoring deficits have been described, including impaired behavioural adjustments following errors. Our aim was to examine the neurophysiological background of post-error behavioural alterations in an adult ADHD sample for the first time, hypothesizing that people with ADHD would differ from controls in neurophysiological markers of cognitive preparation and stimulus processing, specifically following errors.

METHODS:
In total, 34 people with ADHD and 34 controls participated in an electroencephalography measurement while performing a flanker task. The final number of electroencephalography samples included in the analyses ranged from 23 to 28. We recorded event-related potentials for the erroneous response itself (error-related negativity) and for events following errors (intertrial interval: contingent negative variation; next flanker stimulus: P300).

RESULTS:
Over frontal electrode sites, error-related negativity amplitudes were significantly reduced in people with ADHD across response conditions. Both groups showed reduced P300 amplitudes on flanker stimuli following errors. Moreover, during the intertrial interval, patients exhibited significantly reduced contingent negative variation, specifically following errors. At the behavioural level, we observed no significant group differences in post-error data.

LIMITATIONS:
Only adults were examined (no longitudinal data).

CONCLUSION:
Based on previous reports of post-error behavioural alterations in childhood samples, we conclude that people with ADHD develop compensatory strategies across the lifespan that lead to inconspicuous post-error behaviour in adulthood. Neurophysiologically, however, subtle alterations remain, indicating a perseverance of at least some frontal lobe deficits in people with ADHD who are partially medicated, particularly with respect to action-monitoring and post-error adaptation.