Diminished modulation of preparatory sensorimotor mu rhythm predicts attention-deficit/hyperactivity disorder severity.

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doi: 10.1017/S0033291717000332. [Epub ahead of print]

Abstract

BACKGROUND:
Attention-deficit/hyperactivity disorder (ADHD) is characterised by problems in regulating attention and in suppressing disruptive motor activity, i.e. hyperactivity and impulsivity. We recently found evidence that aberrant distribution of posterior α band oscillations (8-12 Hz) is associated with attentional problems in ADHD. The sensorimotor cortex also produces strong 8-12 Hz band oscillations, namely the μ rhythm, and is thought to have a similar inhibitory function. Here, we now investigate whether problems in distributing α band oscillations in ADHD generalise to the μ rhythm in the sensorimotor domain.

METHOD:
In a group of adult ADHD (n = 17) and healthy control subjects (n = 18; aged 21-40 years) oscillatory brain activity was recorded using magnetoencephalography during a visuospatial attention task. Subjects had to anticipate a target with unpredictable timing and respond by pressing a button.

RESULTS:
Preparing a motor response, the ADHD group failed to increase hemispheric μ lateralization with relatively higher μ power in sensorimotor regions not engaged in the task, as the controls did (F 1,33 = 8.70, p = 0.006). Moreover, the ADHD group pre-response μ lateralization not only correlated positively with accuracy (r s = 0.64, p = 0.0052) and negatively with intra-individual reaction time variability (r s = -0.52, p = 0.033), but it also correlated negatively with the score on an ADHD rating scale (r s = -0.53, p = 0.028).

CONCLUSIONS:
We suggest that ADHD is associated with an inability to sufficiently inhibit task-irrelevant sensorimotor areas by means of modulating μ oscillatory activity. This could explain disruptive motor activity in ADHD. These results provide further evidence that impaired modulation of α band oscillations is involved in the pathogenesis of ADHD.