Identifying ADHD children using hemodynamic responses during a working memory task measured by functional near-infrared spectroscopy.

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Abstract

Attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental disorder affecting children and adults. Previous studies found that functional near-infrared spectroscopy (fNIRS) can reveal significant group differences in several brain regions between ADHD children and healthy controls during working memory tasks. This study aimed to use fNIRS activation patterns to identify ADHD children from healthy controls.

Approach. FNIRS signals from 25 ADHD children and 25 healthy controls performing the n-back task were recorded; then, multivariate pattern analysis (MVPA) was used to discriminate ADHD individuals from healthy controls, and classification performance was evaluated for significance by the permutation test.

Main results. The results showed that 86.0% (p<0.001) of participants can be correctly classified in leave-one-out cross-validation. The most discriminative brain regions included the bilateral dorsolateral prefrontal cortex, inferior medial prefrontal cortex, right posterior prefrontal cortex, and right temporal cortex.

Significance. This study demonstrated that, in a small sample, MVPA can effectively identify ADHD children from healthy controls based on fNIRS signals, which argues for the potential utility of fNIRS in future assessments.