Verbal working memory-related functional connectivity alterations in boys with attention-deficit/hyperactivity disorder and the effects of methylphenidate.


Abstract

OBJECTIVE: Few studies have investigated verbal working memory-related functional connectivity patterns in participants with attention-deficit/hyperactivity disorder (ADHD). Thus, we aimed to compare working memory-related functional connectivity patterns in healthy children and those with ADHD, and study effects of methylphenidate (MPH).

METHOD: Twenty-two boys with ADHD were scanned twice, under either MPH (single dose, 10 mg) or placebo, in a randomized, cross-over, counterbalanced placebo-controlled design. Thirty healthy boys were scanned once. We used fMRI during a numerical n-back task to examine functional connectivity patterns in case-control and MPH-placebo comparisons, using independent component analysis.

RESULTS: There was no significant difference in behavioral performance between children with ADHD, treated with MPH or placebo, and healthy controls. Compared with controls, participants with ADHD under placebo showed increased functional connectivity within frontoparietal and auditory networks and decreased functional connectivity within the executive control network. MPH normalized the altered functional connectivity pattern and significantly enhanced functional connectivity within the executive control network, though in non-overlapping areas.

CONCLUSION: Our study contributes to the identification of the neural substrates of working memory. A single dose of MPH normalized the altered brain functional connectivity network but had no enhancing effect on (non-impaired) behavioral performance.