Children with ADHD symptoms show decreased activity in ventral striatum during the anticipation of reward, irrespective of ADHD diagnosis

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Abstract

Background
Changes in reward processing are thought to be involved in the etiology of attention-deficit/hyperactivity disorder (ADHD), as well as other developmental disorders. In addition, different forms of therapy for ADHD rely on reinforcement principles. As such, improved understanding of reward processing in ADHD could eventually lead to more effective treatment options. However, differences in reward processing may not be specific to ADHD, but may be a trans-diagnostic feature of disorders that involve ADHD-like symptoms.

Methods
In this event-related fMRI study, we used a child-friendly version of the monetary incentive delay task to assess performance and brain activity during reward anticipation. Also, we collected questionnaire data to assess reward sensitivity in daily life. For final analyses, data were available for 27 typically developing children, 24 children with ADHD, and 25 children with an autism spectrum disorder (ASD) and ADHD symptoms.

Results
We found decreased activity in ventral striatum during anticipation of reward in children with ADHD symptoms, both for children with ADHD as their primary diagnosis and in children with autism spectrum disorder and ADHD symptoms. We found that higher parent-rated sensitivity to reward was associated with greater anticipatory activity in ventral striatum for children with ADHD symptoms. In contrast, there was no relationship between the degree of ADHD symptoms and activity in ventral striatum.

Conclusions
We provide evidence of biological and behavioral differences in reward sensitivity in children with ADHD symptoms, regardless of their primary diagnosis. Ultimately, a dimensional brain-behavior model of reward sensitivity in children with symptoms of ADHD may be useful to refine treatment options dependent on reward processing.