Attention-Deficit/hyperactivity disorder symptoms coincide with altered striatal connectivity


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Abstract

Background
Cortico-striatal network dysfunction in attention-deficit/hyperactivity disorder (ADHD) is generally investigated by comparing functional connectivity of the main striatal sub-regions (i.e., putamen, caudate, and nucleus accumbens) between an ADHD and a control group. However, dimensional analyses based on continuous symptom measures might help to parse the high phenotypic heterogeneity in ADHD. Here, we focus on functional segregation of regions in the striatum and investigate cortico-striatal networks using both categorical and dimensional measures of ADHD.

Methods
We computed whole-brain functional connectivity for six striatal sub-regions that resulted from a novel functional parcellation technique. We compared functional connectivity maps between adolescents with ADHD (N=169) and healthy controls (N=122), and investigated dimensional ADHD-related measures by relating striatal connectivity to ADHD symptom scores (N=444). Finally, we examined whether altered connectivity of striatal sub-regions related to motor and cognitive performance.

Results
We observed no case-control differences in functional connectivity patterns of the six striatal networks. In contrast, inattention and hyperactivity/impulsivity symptom scores were associated with increases in functional connectivity in the networks of posterior putamen and ventral caudate. Increased connectivity of posterior putamen with motor cortex and cerebellum was associated with decreased motor performance.

Conclusions
Our findings support hypotheses of cortico-striatal network dysfunction in ADHD by demonstrating that dimensional symptom measures are associated with changes in functional connectivity. These changes were not detected by categorical ADHD versus control group analyses, highlighting the important contribution of dimensional analyses to investigating the neurobiology of ADHD.