Fronto-striatal dysfunction during decision-making in Attention-Deficit/Hyperactivity Disorder and Obsessive-Compulsive Disorder

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Abstract

Background
The aim of the current paper was to provide the first comparison of computational mechanisms and neurofunctional substrates in adolescents with Attention-Deficit/Hyperactivity Disorder (ADHD) and adolescents with Obsessive-Compulsive Disorder (OCD) during decision-making under ambiguity.

Methods
Sixteen boys with ADHD, 20 boys with OCD and 20 matched controls (aged 12-18) completed a functional magnetic resonance imaging (fMRI) version of the Iowa gambling task. Brain activation was compared between groups using three-way ANCOVA. Hierarchical Bayesian analysis was used to compare computational modelling parameters between groups.

Results
Patient groups shared reduced choice consistency and relied less on reinforcement learning during decision-making relative to controls, while adolescents with ADHD alone demonstrated increased reward sensitivity. During advantageous choices, both disorders shared underactivation in ventral striatum, while OCD patients showed disorder-specific underactivation in ventromedial orbitofrontal cortex (vmOFC). During outcome evaluation, shared underactivation to losses in patients relative to controls was found in medial prefrontal cortex (MPFC) and shared underactivation to wins was found in left putamen/caudate. ADHD boys showed disorder-specific dysfunction in right putamen/caudate, which was activated more to losses in patients with ADHD, but activated more to wins in controls.

Conclusions
The findings suggest shared deficits in using learned reward expectancies to guide decision-making, as well as shared dysfunction in medial-fronto-striato-limbic brain regions. However, findings of unique dysfunction in vmOFC in OCD and in right putamen in ADHD indicate ad