Shared and disorder-specific task-positive and default mode network dysfunctions during sustained attention in paediatric Attention-Deficit/Hyperactivity Disorder and obsessive/compulsive disorder

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NeuroImage: Clinical, 2017

Abstract

Patients with Attention-Deficit/Hyperactivity Disorder (ADHD) and obsessive/compulsive disorder (OCD) share problems with sustained attention, and are proposed to share deficits in switching between default mode and task-positive networks. The aim of this study was to investigate shared and disorder-specific brain activation abnormalities during sustained attention in the two disorders. Twenty boys with ADHD, 20 boys with OCD and 20 age-matched healthy controls aged between 12 and 18 years completed a functional magnetic resonance imaging (fMRI) version of a parametrically modulated sustained attention task with a progressively increasing sustained attention load. Performance and brain activation were compared between groups. Only ADHD patients were impaired in performance. Group by sustained attention load interaction effects showed that OCD patients had disorder-specific middle anterior cingulate underactivation relative to controls and ADHD patients, while ADHD patients showed disorder-specific underactivation in left dorsolateral prefrontal cortex/dorsal inferior frontal gyrus (IFG). ADHD and OCD patients shared left insula/ventral IFG underactivation and increased activation in posterior default mode network relative to controls, but had disorder-specific overactivation in anterior default mode regions, in dorsal anterior cingulate for ADHD and in the anterior ventromedial prefrontal cortex for OCD. In sum, ADHD and OCD patients showed mostly disorder-specific patterns of brain abnormalities in both tasks positive salience/ventral attention networks with lateral frontal deficits in ADHD and middle ACC deficits in OCD, as well as in their deactivation patterns in medial frontal DMN regions. The findings suggest that attention performance in the two disorders is underpinned by disorder-specific activation patterns.