Altered salience processing in attention deficit hyperactivity disorder

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Abstract
Attentional problems in patients with attention deficit hyperactivity disorder (ADHD) have often been linked with deficits in cognitive control. Whether these deficits are associated with increased sensitivity to external salient stimuli remains unclear. To address this issue, we acquired functional brain images (fMRI) in 38 boys with and without ADHD (age: 11–16 years). To differentiate the effects of item novelty, contextual rareness and task relevance, participants performed a visual oddball task including four stimulus categories: a frequent standard picture (62.5%), unique novel pictures (12.5%), one repeated rare picture (12.5%), and a target picture (12.5%) that required a specific motor response. As a main finding, we can show considerable overlap in novelty-related BOLD responses between both groups, but only healthy participants showed neural deactivation in temporal as well as frontal regions in response to novel pictures. Furthermore, only ADHD patients, but not healthy controls, engaged wide parts of the novelty network when processing the rare but familiar picture. Our results provide first evidence that ADHD patients show enhanced neural activity in response to novel but behaviorally irrelevant stimuli as well as reduced habituation to familiar items. These findings suggest an inefficient use of neuronal resources in children with ADHD that could be closely linked to increased distractibility.