

Out of focus - brain attention control deficits in adult ADHD.

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Abstract

Modern environments are full of information, and place high demands on the attention control mechanisms that allow the selection of information from one (focused attention) or multiple (divided attention) sources, react to changes in a given situation (stimulus-driven attention), and allocate effort according to demands (task-positive and task-negative activity). We aimed to reveal how attention deficit hyperactivity disorder (ADHD) affects the brain functions associated with these attention control processes in constantly demanding tasks. Sixteen adults with ADHD and 17 controls performed adaptive visual and auditory discrimination tasks during functional magnetic resonance imaging (fMRI). Overlapping brain activity in frontoparietal saliency and default-mode networks, as well as in the somato-motor, cerebellar, and striatal areas were observed in all participants. In the ADHD participants, we observed exclusive activity enhancement in the brain areas typically considered to be primarily involved in other attention control functions: During auditory-focused attention, we observed higher activation in the sensory cortical areas of irrelevant modality and the default-mode network (DMN). DMN activity also increased during divided attention in the ADHD group, in turn decreasing during a simple button-press task. Adding irrelevant stimulation resulted in enhanced activity in the salience network. Finally, the irrelevant distractors that capture attention in a stimulus-driven manner activated dorsal attention networks and the cerebellum. Our findings suggest that attention control deficits involve the activation of irrelevant sensory modality, problems in regulating the level of attention on demand, and may encumber top-down processing in cases of irrelevant information.