

# Local functional connectivity suggests functional immaturity in children with attention-deficit/hyperactivity disorder.

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## Abstract

Previous studies have associated Attention-Deficit/Hyperactivity Disorder (ADHD) with a maturational lag of brain functional networks. Functional connectivity of the human brain changes from primarily local to more distant connectivity patterns during typical development. Under the maturational lag hypothesis, we expect children with ADHD to exhibit increased local connectivity and decreased distant connectivity compared with neurotypically developing (ND) children. We applied a graph-theory method to compute local and distant connectivity levels and cross-sectionally compared them in a sample of 120 children with ADHD and 120 age-matched ND children (age range = 7-17 years). In addition, we measured if potential group differences in local and distant connectivity were stable across the age range considered. Finally, we assessed the clinical relevance of observed group differences by correlating the connectivity levels and ADHD symptoms severity separately for each group. Children with ADHD exhibited more local connectivity than age-matched ND children in multiple brain regions, mainly overlapping with default mode, fronto-parietal and ventral attentional functional networks ( $p < .05$ - threshold free-cluster enhancement-family-wise error). We detected an atypical developmental pattern of local connectivity in somatomotor regions, that is, decreases with age in ND children, and increases with age in children with ADHD. Furthermore, local connectivity within somatomotor areas correlated positively with clinical severity of ADHD symptoms, both in ADHD and ND children. Results suggest an immature functional state of multiple brain networks in children with ADHD. Whereas the ADHD diagnosis is associated with the integrity of the system comprising the fronto-parietal, default mode and ventral attentional networks, the severity of clinical symptoms is related to atypical functional connectivity within somatomotor areas. Additionally, our findings are in line with the view of ADHD as a disorder of deviated maturational trajectories, mainly affecting somatomotor areas, rather than delays that normalize with age.