

Preschool Executive Function Predicts Childhood Resting-State Functional Connectivity and Attention-Deficit/Hyperactivity Disorder and Depression

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Abstract

BACKGROUND:

Measures of executive function (EF), such as the Behavior Rating Inventory of Executive Function, distinguish children with attention-deficit/hyperactivity disorder (ADHD) from control subjects, but less work has examined relationships to depression or brain network organization. This study examined whether early childhood EF predicted new onset or worsening of ADHD and/or depression and examined how early childhood EF related to functional connectivity of brain networks at school age.

METHODS:

Participants included 247 children who were enrolled at 3 to 6 years of age from a prospective study of emotion development. The Behavior Rating Inventory of Executive Function Global Executive Composite score was used as the measure of EF in early childhood to predict ADHD and depression diagnoses and symptoms across school age. Resting-state functional magnetic resonance imaging network analyses examined global efficiency in the frontoparietal, cingulo-opercular, salience, and default mode networks and six "hub" seed regions selected to examine between-network connectivity.

RESULTS:

Early childhood EF predicted new onset and worsening of ADHD and depression symptoms across school age. Greater EF deficits in preschool predicted increased global efficiency in the salience network and altered connectivity with four regions for the dorsal anterior cingulate cortex hub and one region with the insula hub at school age. This altered connectivity was related to increasing ADHD and depression symptoms.

CONCLUSIONS:

Early executive deficits may be an early common liability for risk of developing ADHD and/or depression and were associated with altered functional connectivity in networks and hub regions relevant to executive processes. Future work could help clarify whether specific EF deficits are implicated in the development of both disorders.