

# Study of preschoolers with ADHD detects brain differences linked to symptoms

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In a study published today in the *Clinical Neuropsychologist* (e-publication ahead of print), researchers from the Kennedy Krieger Institute found differences in the brain development of preschool children with symptoms of Attention-deficit/Hyperactivity Disorder (ADHD). Results showed the region of the brain important for cognitive and motor control was smaller in these children than in typically developing children. Novel for its use of neuroimaging in very young, preschool age children with early symptoms of ADHD, this study's examination of brain differences may offer new insights into potential early interventions for the disorder.

ADHD is the single most common child behavioral diagnosis, affecting approximately 2 million children. This highly prevalent developmental disorder is characterized by inattentiveness, hyperactivity and impulsivity. By age 4, as many as 40 percent of children have sufficient problems with attention to be of concern to parents and preschool teachers. This observation is important, as children whose [symptoms](#) begin in early childhood are at high risk for academic failure and grade repetition.

Since preschool children with symptoms of ADHD are at significant risk for social and academic difficulties compared to typically developing children, researchers set out to determine how to identify the disorder as early as possible in order to begin intervention earlier and facilitate better outcomes. Previous [magnetic resonance imaging](#) (MRI) studies have provided some insights into [brain](#) differences associated with

ADHD, but these have almost exclusively focused on children ages 7 and older.

In the current study, researchers examined brain images in preschoolers (ages 4 and 5) both with and without symptoms of ADHD, specifically looking at cortical and basal ganglia volumes and the size of these particular areas of the brain. Researchers analyzed high resolution MRI brain images in 26 preschoolers, 13 presenting with ADHD symptoms and 13 without, and found differences in the caudate nucleus. The caudate nucleus is a small structure in the subcortical region of the brain and is associated with cognitive and motor control. Results showed that children with ADHD symptoms had significantly reduced caudate volumes compared to the children who did not present with ADHD symptoms. Additionally, these caudate volumes were significantly correlated with parent ratings of hyperactive/impulsive symptoms. Cortical volumes, however, were not associated with symptom severity. Researchers concluded that differences in basal ganglia development, particularly the caudate nucleus, appear to play an important role among children presenting with early onset symptoms of ADHD.

"Clinically, this abnormal brain development sets the stage for the symptoms of ADHD that contribute to cognitive challenges and problems in school," said Dr. Mark Mahone, lead author and Director of Neuropsychology at the Kennedy Krieger Institute in Baltimore, MD. "Earlier identification and treatment of children presenting with attention problems in the preschool years may minimize the impact of ADHD in the long-term."

As part of this longitudinal study, researchers will continue to follow the [brain development](#) of these [children](#) to determine if abnormalities persist or regress with age.

Provided by Kennedy Krieger Institute

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