Reduced subcortical volumes among preschool-age girls and boys with ADHD

Keri S. Rosch, Deana Crocetti, Kathryn Hirabayashi, Martha B. Denckla, Stewart H. Mostofsky, E. Mark Mahone

Psychiatry Research: Neuroimaging, 2017
DOI: https://doi.org/10.1016/j.pscychresns.2017.10.013

Abstract

Anomalous brain structure and function are implicated in children with attention-deficit/hyperactivity disorder (ADHD). Most neuroimaging research, however, has examined school-aged children, despite the typical onset of symptoms in early childhood. This study compared the volumes of subcortical structures (caudate nucleus, putamen, globus pallidus, and thalamus) among preschoolers with ADHD and typically developing (TD) children. High resolution T1-weighted 3D MPRAGE images covering the whole brain were acquired on a 3 T scanner and subcortical volumes were automatically extracted. Analyses were conducted in a total of 87 medication-naïve preschoolers, ages 4–5 years (47 with ADHD, 40 controls; 63% boys). ADHD was diagnosed using modified DSM-IV criteria based on review of developmental history, structured psychiatric interview and caregiver ratings. Compared to typically developing children, subcortical volumes were reduced among preschoolers with ADHD, with largest reductions in the caudate, globus pallidus, and thalamus. Among girls (but not boys) with ADHD, putamen and thalamus volumes were associated with ADHD symptom severity. The observed patterns of subcortical differences in preschoolers with ADHD (larger reductions in girls), contrasted with differences observed among school-aged children, (larger reductions in boys) suggests that children with ADHD show sexual dimorphism in neuroanatomical development that parallels early trajectory of symptom onset and attenuation.