Anomalous subcortical morphology in boys, but not girls, with ADHD compared to typically developing controls and correlates with emotion dysregulation

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Abstract

There has been limited investigation of volume and shape difference in subcortical structures in children with ADHD and a paucity of examination of the influence of sex on these findings. The objective of this study was to examine morphology (volume and shape) of subcortical structures and their association with emotion dysregulation (ED) in girls and boys with ADHD as compared to their typically-developing (TD) counterparts. Participants included 218 children ages 8–12 years old with and without DSM-IV ADHD. Structural magnetic resonance images were obtained, and shape analyses were conducted using large deformation diffeomorphic metric mapping (LDDMM). Compared to TD boys, boys with ADHD showed reduced volumes in the bilateral globus pallidus and amygdala. There were no volumetric differences in any structure between ADHD and TD girls. Shape analysis revealed localized compressions within the globus pallidus, putamen and amygdala in ADHD boys relative to TD boys, as well as significant correlations between increased ED and unique sub region expansion in right globus pallidus, putamen, and right amygdala. Our findings suggest a sexually dimorphic pattern of differences in subcortical structures in children with ADHD compared to TD children, and a possible neurobiological mechanism by which boys with ADHD demonstrate increased difficulties with ED.