Cortical morphometry in attention deficit/hyperactivity disorder: Contribution of thickness and surface area to volume

Timothy J. Silk, Richard Beare, Charles Malpas, Chris Adamson, Veronika Vilgis, Alasdair Vance, Mark A. Bellgrove

Cortex (May 2016)
DOI: [http://dx.doi.org/10.1016/j.cortex.2016.05.012](http://dx.doi.org/10.1016/j.cortex.2016.05.012)

Abstract

Although lower brain volume is a consistent neuroimaging finding in attention deficit hyperactivity disorder (ADHD), we lack an understanding of whether this effect is driven by changes in cortical thickness or surface area, which are governed by distinct neurodevelopmental processes. This study examined ADHD-control differences in cortical thickness, surface area and volume, and tests whether thickness and surface area mediates any observed volume differences. Magnetic resonance imaging (MRI) data was collected from 35 males with ADHD-combined type and 35 typically developing control participants aged 9–17 years. Morphometric measures were examined for between group differences and the specific contribution of surface area and thickness to group differences in volume tested using mediation analysis. Individuals with ADHD had smaller total cortical volume (7.3%), surface area (4.3%), and mean cortical thickness (2.8%) compared to controls. Differences were pronounced in frontal and parietal lobes. Variance in volume as a function of ADHD diagnosis was accounted for at least in part by the relationship between diagnosis and each of cortical thickness and surface area, with regional variation in the relative contributions of these measures. The surface area of the precuneus was a major driver of volume differences, attesting to the potential relevance of this region for neurodevelopment in ADHD. Both surface area and cortical thickness play a significant mediating role in determining diagnostic differences in volume, with regional variation in the contribution of thickness and surface area to those volume differences, highlighting the importance of examining both cortical thickness and surface area in examining ADHD.