Cortical morphology as a shared neurobiological substrate of attention-deficit/hyperactivity symptoms and executive functioning: a population-based pediatric neuroimaging study.

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Abstract

BACKGROUND:
Attention-deficit/hyperactivity symptoms have repeatedly been associated with poor cognitive functioning. Genetic studies have demonstrated a shared etiology of attention-deficit/hyperactivity disorder (ADHD) and cognitive ability, suggesting a common underlying neurobiology of ADHD and cognition. Further, neuroimaging studies suggest that altered cortical development is related to ADHD. In a large population-based sample we investigated whether cortical morphology, as a potential neurobiological substrate, underlies the association between attention-deficit/hyperactivity symptoms and cognitive problems.

METHODS:
The sample consisted of school-aged children with data on attention-deficit/hyperactivity symptoms, cognitive functioning and structural imaging. First, we investigated the association between attention-deficit/hyperactivity symptoms and different domains of cognition. Next, we identified cortical correlates of attention-deficit/hyperactivity symptoms and related cognitive domains. Finally, we studied the role of cortical thickness and gyrification in the behaviour-cognition associations.

RESULTS:
We included 776 children in our analyses. We found that attention-deficit/hyperactivity symptoms were associated specifically with problems in attention and executive functioning (EF; b = -0.041, 95% confidence interval [CI] -0.07 to -0.01, p = 0.004). Cortical thickness and gyrification were associated with both attention-deficit/hyperactivity symptoms and EF in brain regions that have been previously implicated in ADHD. This partly explained the association between attention-deficit/hyperactivity symptoms and EF (bindirect = -0.008, bias-corrected 95% CI -0.018 to -0.001).

LIMITATIONS:
The nature of our study did not allow us to draw inferences regarding temporal associations; longitudinal studies are needed for clarification.

CONCLUSION:
In a large, population-based sample of children, we identified a shared cortical morphology underlying attention-deficit/hyperactivity symptoms and EF.