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Rationale/Statement of the Problem: Increasing evidence suggests exposure to adverse conditions in intrauterine life may increase the risk of developing attention-deficit/hyperactivity disorder (ADHD) in childhood. High maternal pre-pregnancy body mass index (BMI) has been shown to predict child ADHD symptoms; however, the neurocognitive processes underlying this relationship are not known. The aim of the present study was to test the hypothesis that this association is mediated by alterations in child executive function and cortical development.

Methods: A population-based cohort of 174 children (mean age = 7.3 ± 0.9 (SD) years, 55% girls) was evaluated for ADHD symptoms, using the Child Behavior Checklist, and for neurocognitive function, using the Go/No-go Task. This cohort had been followed prospectively from early gestation and birth through infancy and childhood with serial measures of maternal and child prenatal and postnatal factors. In 108 children, a structural MRI scan was acquired and the association between maternal obesity and child cortical thickness was investigated using FreeSurfer software.

Results: Maternal pre-pregnancy BMI was a significant predictor of child ADHD symptoms ($F_{1,158} = 4.80, p = 0.03$) and of child performance on the Go/No-go Task ($F_{1,157} = 8.37, p = 0.004$) after controlling for key potential confounding variables. A test of the mediation model revealed that the association between higher maternal pre-pregnancy BMI and child ADHD symptoms was mediated by impaired executive function (inefficient/less attentive processing; Sobel test: $t = 2.39 (± 0.002, SEM); p = 0.02$). Interestingly, after controlling for key potential confounding variables pre-pregnancy obesity was furthermore associated with region-specific thinner cortices, including regions previously reported to be thinner in children with ADHD, like the prefrontal cortex.

Conclusion: To the best of our knowledge, this is the first study to report the neurocognitive underpinnings of maternal pre-pregnancy BMI-related effects on child ADHD risk. These results add further evidence to the growing awareness that neurodevelopmental disorders such as ADHD may have their foundations very early in life.

Keywords: obesity; pregnancy; ADHD; BMI; executive function; cortical thickness

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