Altered White Matter Connectivity in Children with Prenatal Marijuana Exposure

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Background:

The potential health outcomes of cannabis use during pregnancy are currently not well-known. Several studies have shown an association between prenatal marijuana exposure (PME) and adverse neonatal outcomes. Specifically, cannabis use has been associated with an increased risk of cognitive deficits and neuropsychiatric disease. The aim of this project is to examine alterations in cerebral white matter connectivity of children with PME compared to unexposed controls based on diffusion tensor imaging (DTI). Identifying such microstructural alterations may help us better understand neurodevelopmental and cognitive effects of PME.

Hypothesis:

We hypothesize that there will be differences in white matter connectivity in children with PME compared to controls.

Methods:

DTI images for children with (n=88) and without (n=90) PME were obtained from the Adolescent Brain Cognitive Development (ABCD) Study database. Image quality assurance, preprocessing, and tractography were completed using DSI Studio. Fiber counts between 94 regions of interest were assessed. A groupwise comparison was performed to assess differences in structural connectivity in children with and without PME.

Results:

The PME group and control group had 35 and 37 males, respectively. The mean age for both groups was 9.9 years. First level comparative analysis revealed alterations in microstructural connectivity between PME and control groups. Increased connectivity was found in the PME group compared to the control group in 51 tracts, while decreased connectivity was indicated in 22 tracts. However, significance was not maintained when corrected for multiple comparisons.

Conclusion/Impact:

Although there were small alterations in brain structural connectivity in children with PME, these were not significant after correcting for multiple comparisons. It is possible that microstructural neuroplasticity in the developing brain lowers the impact of potential long-term adverse effects of marijuana exposure in utero. Further studies are required to understand longitudinal brain development and adverse neurodevelopmental and cognitive outcomes associated with PME.