Distinct effects of childhood ADHD and cannabis use on brain functional architecture in young adults


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Abstract

One of the most salient long-term implications of a childhood diagnosis of ADHD is an increased risk for substance use, abuse, or dependence in adolescence and adulthood. The extent to which cannabis use affects ADHD-related alterations in brain functional organization is unknown, however. To address this research gap, we recruited a sample of 75 individuals aged 21–25 years with and without a childhood diagnosis of ADHD Combined Type, who were either frequent users or non-users of cannabis. These participants have been followed longitudinally since age 7–9.9 years as part of a large multi-site longitudinal study of ADHD, the Multimodal Treatment Study of Children with ADHD (MTA). We examined task-independent intrinsic functional connectivity (iFC) within 9 functional networks using a 2 × 2 design, which compared four groups of participants: (1) individuals with a childhood diagnosis of ADHD who currently use cannabis (n = 23); (2) individuals with ADHD who do not currently use cannabis (n = 22); (3) comparisons who currently use cannabis (n = 15); and (4) comparisons who do not currently use cannabis (n = 15). The main effects of childhood ADHD were primarily weakened iFC in networks supporting executive function and somatomotor control. Contrary to expectations, effects of cannabis use were distinct from those of diagnostic group and no interactions were observed. Exploratory brain-behavior analyses suggested that ADHD-related effects were primarily linked with poorer neurocognitive performance. Deficits in the integrity of functional networks supporting executive function and somatomotor control are consistent with the phenotypic and neurocognitive features of ADHD. Our data suggest that cannabis use does not exacerbate ADHD-related alterations, but this finding awaits replication in a larger sample. Longitudinal neuroimaging studies are urgently required to delineate the neurodevelopmental cascade that culminates in positive and negative outcomes for those diagnosed with ADHD in childhood.