

The Kaplan Lab

Specializing in the developmental consequences and therapeutic benefits of cannabis

Cannabis and ADHD

Cannabis and Attention Deficit Hyperactivity Disorder

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Attention Deficit-Hyperactivity Disorder (ADHD) is characterized by symptoms of inattention and hyperactivity/impulsivity which begin before age 12, are present in multiple settings, and interfere with daily functioning. ADHD can be classified as predominately inattentive presentation (previously known as Attention Deficit Disorder), predominantly hyperactive-impulsive presentation, or combined presentation (1). Extensive research has demonstrated the role of abnormal dopamine transmission and dopamine deficiency in ADHD, which may implicate the endocannabinoid system. As previously described, the endocannabinoid system is comprised of CB1 and CB2 receptors which are activated by endogenous cannabinoids 2-AG and anandamide. Dopamine and the endocannabinoid system have a bidirectional relationship, in which dopamine affects the endocannabinoid system, and cannabinoids affect the dopamine system. Animal models have demonstrated the role of dopamine in modulating the endocannabinoid system, resulting in reduced sensitivity of CB1 receptors and increased anandamide levels in people with ADHD (2). This suggests drugs which restore CB1 function may be effective in treating ADHD (3). However, any associations between cannabinoids and ADHD are only speculative at this point.

While CBD has been shown to significantly improve hyperactivity in children with Autism Spectrum Disorder (ASD; 4), there is no evidence from randomized controlled studies to support cannabis as treatment for ADHD. Conventional ADHD medications, including amphetamine and methylphenidate (Ritalin), work by increasing dopamine and norepinephrine activity (5). Acute THC ingestion may similarly increase dopamine release (6). One study found nominally significant improvement in symptoms of hyperactivity/impulsivity in 30 adults with ADHD who used a cannabinoid medication (1:1 THC:CBD; 7). However, in chronic use, THC actually blunts the dopamine system, which could worsen ADHD (6). Additionally, CBD increases anandamide levels, already high in people with ADHD (this is opposite of ASD). The lack of research on cannabis use in ADHD makes it difficult to know the

potential long-term effects. Presently, the majority of research surrounding ADHD and cannabis focuses on the co-occurrence of ADHD and cannabis use disorders.

People with ADHD are more likely to engage in cannabis use earlier, become a heavy user, and develop a cannabis use disorder (8). It is unclear whether early cannabis use causes ADHD symptoms, or whether the heavier cannabis use is caused by self-medication of ADHD symptoms. The self-medication theory is supported by findings that daily cannabis users were more likely to experience hyperactive-impulsive symptoms when not using cannabis (9). However, until there is more research on the association between ADHD symptoms and the endocannabinoid system and cannabis use, it is not advisable to use cannabis to treat hyperactivity associated with ADHD.

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