Self-Medication or Self-Sabotage?

Marijuana and ADHD: An Investigation in Long-Term Outcomes on Symptom Severity and Cognitive Functioning

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Attention-Deficit/Hyperactivity Disorder (ADHD) is a multifaceted neurodevelopmental disorder characterized by patterns of inattention, impulsivity, and hyperactivity that significantly interferes with daily functioning and development (Banna & Saad, 2019; Pliszka, 2022, National Institute of Mental Health, n.d.). Neurophysiologically, ADHD is associated with disruptions in dopamine and norepinephrine signaling pathways, affecting critical brain areas such as the prefrontal cortex and basal ganglia, which are involved in regulating attention, emotional control, executive functioning, and behavioral inhibition (Barkley, 2022; Volkow et al., 2009) These symptoms typically emerge in early childhood and can continue into adolescence and adulthood,

impacting academic performance, interpersonal relationships, professional success and overall quality of life (Banna & Saad, 2019; Belanger et al., 2018; Pliszka, 2022). Beyond these core symptoms, individuals with ADHD often experience secondary challenges such as mood instability, poor planning and organizational skills, increased tendency for risk-taking, and heightened emotional reactivity (Banna & Saad, 2019; Pliszka, 2022; National Institute of Mental Health, n.d.). These challenges contribute to higher rates of impulsivity-driven behaviours, including substance use, as individuals may seek stimulation to enhance focus and regulate emotions (Francisco et al., 2023; Wallace et al., 2019).

The prevalence of ADHD varies across age groups, with estimates ranging from 5–9% in children and adolescents to 3–5% in adults (Salari et al., 2023; National Institute of Mental health, n.d.). This widespread occurrence highlights the need to find and implement strategies that improve daily functioning and quality of life for those with ADHD. Current treatments primarily involve stimulant medications, such as methylphenidate (e.g., Ritalin) and amphetamine-based medication (Adderall), which effectively enhances dopamine availability and improves symptom management (Kawabe et al., 2024; Spencer et al., 2022). Non-stimulant alternatives, including atomoxetine (e.g., Strattera) and guanfacine (e.g., Intuniv), and behavioural interventions, such as Cognitive-Behavioral Therapy (CBT) help ADHD individuals develop coping strategies, manage emotional dysregulation, and improve executive functioning (Kawabe et al., 2024; Spencer et al., 2022). While stimulant medications have been widely studied and remain the first line of treatment for ADHD individuals, it does have some limitations (Kawabe et al., 2024; Spencer et al., 2022). Potential side effects include decreased appetite, sleep disturbances, increased heart rate, and mood fluctuations, raising concerns regarding their long-term efficacy and tolerability (Kawabe et al., 2024; Spencer et al., 2022).

Additionally, consistency to medication treatment can be challenging, particularly among adolescents and young adults, leading to discontinuation and the exploration of alternative treatments (Kawabe et al., 2024; Spencer et al., 2022).

One alternative treatment that has gained attention is marijuana, with some subjective reports suggesting that individuals with ADHD believe cannabis may help relieve their symptoms (Cooper et al., 2017; Dhamija et al., 2023). Cannabis contains active cannabinoids including tetrahydrocannabinol (THC) and cannabidiol (CBD) and exerts its effects primarily through interactions with the endocannabinoid system, a complex neural network involved in regulating attention, impulse control, cognitive functions, emotional responses, and reward pathways – areas directly related to ADHD symptoms (Cooper et al., 2017; Dhamija et al., 2023; Ryan et al., 2024). Given these neurophysiological interactions, cannabis is theorized to relieve symptoms of ADHD by affecting the dopaminergic signaling and neural connectivity in brain areas responsible for executive control, emotional stability, and impulse regulation (Cooper et al., 2017; Ryan et al., 2024).Subjective reports suggest that marijuana use may help some individuals with ADHD improve focus, decrease anxiety-related symptoms, and reduce hyperactivity (KindHealth Florida, n.d.; Neurolaunch, 2024). However, empirical research on the long-term impact of cannabis use in ADHD and examining its neurophysiological effects remains limited and inconclusive (Cooper et al., 2017; Dhamija et al., 2023). Some studies indicate that cannabis use may provide short-term relief from ADHD symptoms, while others suggest that chronic use could worsen cognitive deficits, contribute to dependency, and increase emotional instability (Francisco et al., 2023; Ryan et al., 2024). Furthermore, a scoping review highlighted the limited number of clinical trials examining the efficacy of cannabis in treating ADHD symptoms (Cohen & Weinstein, 2018), highlighting the need for more comprehensive research in this area.

Due to the given tension between perceived short-term benefits and documented longterm risks, the present study aims to critically examine whether cannabis use provides effective long-term symptom management of ADHD or increases existing neurophysiological vulnerabilities, leading to worsened cognitive, emotional, and behavioural outcomes over time. Specifically, it will examine the impact of prolonged marijuana use on impulsivity, executive functioning, attention regulation, and overall daily functioning in adults with ADHD. The primary theory is that while marijuana may offer temporary symptom relief through alterations of neurophysiological processes, prolonged use is likely to worsen ADHD symptoms, increase cognitive impairments, and negatively affect overall well-being. Understanding the neurophysiological, emotional, and behavioral consequences of marijuana use for ADHD management is crucial for developing evidence-based recommendations and informing both clinical practice and public health policies.

This study addresses the research question: Does prolonged cannabis use improve or worsen long-term symptom management and cognitive functioning in youth and adults with ADHD? Guided by the Self-Medication Hypothesis (SMH) (Hall & Queener, 2007), this study investigates whether cannabis use in ADHD functions as an adaptive coping mechanism or as a behaviour that exacerbates impairment over time. SMH suggests that individuals use substances to relieve distressing symptoms; however, this relief may be temporary and could worsen underlying vulnerabilities (Hall & Queener, 2007). This framework informs both variable selection (e.g., perceived benefits, motivations, long-term symptom changes) and the decision to include both subjective and objective outcome measures. By integrating SMH with concepts from cognitive-behavioral theory, the study can explore not only “why” behind cannabis use but also the behavioural and cognitive consequences. The literature review will first examine

standard ADHD treatments and their limitations, then evaluate cannabis as an alternative therapy, including perceived benefits and clinical findings, followed by a review of potential risks and adverse outcomes. Lastly, existing research gaps will be identified to establish the clinical and empirical context for the proposed study.

Literature Review

A comprehensive literature search was conducted using databases including PubMed, PsycINFO, Google Scholar, City University Database, and Science Direct. Search terms and the combinations included “ADHD and cannabis”, “attention-deficit hyperactivity disorder and marijuana”, “longitudinal effects of cannabis use on ADHD symptoms”, “therapeutic use of marijuana use in ADHD”, cognitive effects and cannabis and ADHD”, and “adult ADHD symptom management and cannabis”.

Inclusion criteria included peer-reviewed journal articles, clinical trials, systematic reviews, empirical studies, and meta-analysis that have been published within the last ten years (2014-2024) to ensure relevance. Exclusion criteria included non-peer reviewed journal articles, editorials, commentaries, and studies that exclusively focus on adolescent populations to maintain the study focus on adults with ADHD. Initial searches meeting inclusion criteria required further refinement through manual screening based on abstract relevance and research quality. Challenges that were encountered through the literature review included variability in research quality among studies, limited longitudinal research that specifically addresses cannabis use in ADHD individuals, and the prevalence of short-term benefits with subjective evidence. To address these limitations, key articles will be reviewed for additional sources and reliable grey literature such as the government reports and documents from trusted ADHD research organizations.

The literature review will first examine and discuss standard ADHD treatments, highlighting their effectiveness and significant limitations, in order to provide a critical context for why practitioners and individuals with ADHD might consider alternative therapies for symptom relief. Furthermore, a detailed examination of cannabis as an alternative treatment for ADHD will be provided, presenting empirical research that is connected to the neurophysiological and behavioral alterations hypothesized to highlight cannabis's short-term therapeutic benefits and potential long-term risks. Detailed examinations will be given to empirical research including clinical trials, observational research, and neuroimaging findings to clearly demonstrate the evidence base from which conclusions regarding cannabis's efficacy and safety are explored. For example, studies such as Cooper et al.'s (2017) double-blind controlled trial, Mansell et al.'s (2022) clinical case reports, and Francisco et al.'s (2023) comprehensive scoping review will be discussed thoroughly, providing methodological details, primary outcomes, and conclusions to allow readers to examine the empirical methods of this study's hypothesis. Through this approach, the review will establish how existing research directly informs and validates the hypothesis regarding cannabis's potential neurophysiological benefits and risks in ADHD symptom management. Lastly, the literature review will identify critical gaps in current research, emphasizing the urgent need for longitudinal studies and standardized measurements. These gaps are addressed through the formulation of a proposed study and explored further in the concluding discussion.

Overview of ADHD and Its Challenges

As previously discussed, attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental condition that consists of persistent patterns of hyperactivity, inattention, and impulsivity that significantly impairs daily functioning (Banna & Saad, 2019; National

Institute of Mental Health, 2024; Pliszka, 2022). Neurophysiologically, ADHD involves disruptions in key neurotransmitter systems, particularly dopamine and norepinephrine, affecting brain areas, such as the basal ganglia and prefrontal cortex, important for executive functioning, emotional regulation, and impulse control (Barkley, 2022; Volkow et al., 2009). ADHD symptoms typically emerge in childhood and persist into adulthood, significantly hindering academic success, interpersonal relationships, and overall quality of life (Belanger et al., 2018; Pliszka, 2022). Individuals with ADHD frequently encounter secondary difficulties such as increased risk-taking behaviours, emotional instability, and executive functioning difficulties (Francisco et al., 2023; Wallace et al., 2019). Executive functioning is a set of cognitive skills that includes planning, working memory, organization, emotional regulation, and response inhibition, and deficits in this area for ADHD individuals include difficulties in initiating and completing tasks, maintaining attention and organization, and regulating emotions effectively (Barkley, 2022). Ultimately, substantially increasing daily stressors and overall functional impairment.

These secondary challenges increase the risk for impulsivity-driven behaviours, including substance abuse, as ADHD individuals may seek alternative methods of symptom relief, emotional regulation, and methods of stimulation (Francisco et al., 2023; Wallace et al., 2019). For example, Francisco et al.'s (2023) research indicates that adolescents and adults with ADHD have higher rates of substance use, including cannabis, which individuals with ADHD often reported using cannabis for symptom management like restlessness, attentional difficulties, and emotional dysregulation. Given these considerable impacts, addressing both the primary and secondary symptoms of ADHD through effective, thorough treatment strategies remains critical.

This need highlights the importance of ongoing research to identify the most beneficial, sustainable, safe therapeutic options to increase long-term outcomes for ADHD individuals.

Effectiveness and Limitations of Standard ADHD Treatment

The standard treatments for ADHD pre-dominantly include stimulant medications such as methylphenidate, (e.g., Ritalin or Concerta), and amphetamine-based medications (e.g., Adderall or Vyvanse) (Cortese, 2020; Cortese et al., 2018). Non -stimulant pharmacological medications for ADHD include atomoxetine (e.g., Strattera) and guanfacine (e.g., Intuniv) (Cortese, 2020; Cortese et al., 2018). These options for ADHD treatment significantly improve symptoms by enhancing neurotransmitter availability, specifically dopamine and norepinephrine, which improves attention regulation, reduces hyperactive behaviours, and decreases impulsivity (Cortese, 2020; Cortese et al., 2018). With these medications treatments, psychosocial interventions like Cognitive Behavioral Therapy (CBT) are also recommended due to the therapy's ability to address core deficits in emotional regulation, executive functioning, and social skills (Antshel et al., 2012; Liu et al., 2023).

Cognitive Behavioral Therapy (CBT) specifically targets maladaptive thought patterns and behavioral responses, which is helpful for individuals with ADHD so that they can learn practical skills in improving their self-regulation, organizational capacities, and goal setting, ultimately resulting in continuous improvements in overall daily functioning and emotional stability (Antshel et al., 2012; Liu et al., 2023). For example, Liu et al.'s (2023) meta-analysis of randomized controlled trials demonstrated that CBT significantly improved not only core symptoms of ADHD but also broader functional outcomes such as emotional stability, organizational skills, and overall daily functioning.

However, despite the standard ADHD treatments significant effectiveness, its treatments present several limitations. Stimulant medications provide substantial short-term symptom relief for ADHD individuals, and studies have found that stimulants also frequently lead to adverse side effects. For instance, Farhat et al (2025) conducted a systematic review of 19 randomized controlled trials with a combined sample of over 3,500 children, adolescents, and adults diagnosed with ADHD. Using standardized cardiovascular assessments — including continuous heart rate monitoring, electrocardiograms (ECG's), and blood pressure measurements, researchers found significant cardiovascular effects like elevated heart rate and high blood pressure in ADHD individuals using stimulant medications (Farhat et al., 2025).

Likewise, Storebo et al. (2018), conducted a comprehensive review involving a systematic analysis of 260 non-randomized studies, including observational cohorts and controlled trials, and utilized standardized reporting methods and meta-analytic techniques to assess adverse events associated with the stimulant medication methylphenidate (e.g. Ritalin). Results reported that approximately 30% of participants consistently indicated experiencing significant side effects, with sleep disruptions and appetite suppression being observed frequently (Storebo et al., 2018). Specifically, 29% of participants reported sleep disturbances and 31% reported a decrease in appetite (Storebo et al., 2018). These side effects pose considerable difficulties for adherence, specifically among adolescents and young adults, who often discontinue medication due to discomfort or concerns about long-term health outcomes (Farhat et al., 2025; Ferrin et al., 2024). Furthermore, there are concerns that have been raised about the potential long-term cardiovascular risks and growth suppression in children and adolescents, which were found in individuals who have been using the stimulants consistently (Cortese et al., 2018). Cortese at al. (2018) conducted a network meta-analysis of 133 doubleblind randomized

controlled trials using a combination of clinical measurements such as height and weight tracking, as well as cardiovascular parameters including heart rate and blood pressure over time. Their findings showed that long-term stimulant use was associated with moderate but statistically significant growth suppression with an average reduction of 1.4cm in height over a 12-month period (Cortese et al., 2018).

The non-stimulant medications used for ADHD like Strattera, are beneficial in reducing some adverse side effects caused by stimulant medications but typically have a slower onset rate of action and may be less effective in managing core hyperactivity and impulsivity behaviours (Cortese et al., 2018; Vilus & Engelhard, 2025). Additionally, the effectiveness of both medications and psychosocial interventions rely heavily on consistent patient engagement and structured therapeutic environments, which can be challenging for ADHD individuals who already struggle with attention and organizational deficits, as well as potential dissatisfaction due to side effects and/or lack of symptom relief (Franke et al., 2018; Katzman et al., 2017). Due to this, individuals with ADHD, specifically adolescents and young adults, often explore alternative treatment options such as dietary modifications, supplements, or cannabis-based products to seek symptom relief and improve overall functional outcomes (Cohen et al., 2018; Franke et al., 2018). This highlights a critical need for continued research on the long-term effectiveness of standard ADHD treatments and the potential risks of using alternative treatments for ADHD symptom relief.

Cannabis as an Alternative ADHD Treatment

As discussed in the previous section, while standard ADHD treatments are often effective, they present significant limitations such as adverse side effects, long-term health risks, and issues with treatment adherence, specifically among adolescents and young adults. Due to

these limitations, attention has turned to alternative treatments, such as cannabis. Marijuana is not an evidence-based treatment for ADHD; however, it has gained popularity for ADHD individuals, especially among adolescents and young adults, due to the growing subjective and clinical discussions regarding its potential therapeutic effects (Cooper et al., 2017; Dhamija et al., 2023; Ryan et al., 2024). Cannabis contains psychoactive compounds such as tetrahydrocannabinol (THC) and cannabidiol (CBD), which acts on the endocannabinoid system when used (Cooper et al., 2017; Dhamija et al., 2023; Ryan et al., 2024). The endocannabinoid system is involved in regulating attention, impulse control, and emotional reactivity and due to these overlaps in the neurocognitive domains and core ADHD symptoms, cannabis has been theorized to offer symptom relief for ADHD individuals through neurophysiological modulations, particularly in the dopaminergic system (Cooper et al., 2017; Dhamija et al., 2023; Ryan et al., 2024). These mechanisms have contributed to a growing interest in cannabis as a potential alternative treatment for ADHD individuals, despite limited clinical validation and emerging concerns about its long-term effects.

Unfortunately, subjective reports form a significant portion of the current knowledge base surrounding cannabis use and its effects on ADHD symptoms. In a large cross-sectional study, Stueber and Cuttler (2022) studied 1,738 cannabis-using individuals with ADHD. More than 90% of respondents reported that cannabis use improved impulsivity, hyperactivity, and restlessness, while fewer than 5% reported a worsening of symptoms (Stueber & Cuttler, 2022). Participants in this study also reported an enhanced calmness and improved ability to concentrate when using cannabis, highlighting the perceived alignment between symptom relief and cannabis use (Stueber & Cuttler, 2022). Furthermore, Mitchell et al. (2016) conducted a qualitative analysis of online forum discussions to explore the perceptions of cannabis use among ADHD

individuals. The study evaluated 268 forum threads and researchers found that 25% of the posts described cannabis as therapeutic for ADHD symptoms, while 8% indicated it was harmful, 5% reported both harmful and therapeutic effects, and 2% indicated no effect (Mitchell et al., 2016). The forums that identified cannabis as beneficial for ADHD symptom relief also reported that cannabis helped to reduce racing thoughts, enhance focus, and improve emotional regulation (Mitchell et al., 2016). Interestingly, some of the forums claimed that cannabis was recommended by healthcare providers, promoting medical approval of cannabis use for ADHD symptoms (Mitchell et al., 2016). However, these sources are limited by their reliance on subjective evidence and lack of clinical oversight.

The clinical research that has been emerging on this topic supports some of these perceived benefits, although the evidence is still new and developing. For example, Cooper et al. (2017) performed a double-blind, placebo-controlled trial involving 30 adults diagnosed with ADHD that investigated their use of cannabinoid medications — cannabinoid medications are prescribed by a small number of psychiatrists in the USA. Participants in the treatment group, demonstrated significant improvements in hyperactivity/impulsivity symptoms, however researchers emphasized a need for larger, long-term trials due to the small sample size and limited generalizability as they used only 30 participants (Cooper et al., 2017). In a more recent study by Ayyash et al. (2024) researchers explored 12 studies — including five observational/cross-sectional studies, one case-control study, one randomized controlled trial, three case reports, one literature review, and one neuroimaging study — and found that while some individuals experienced perceived symptom relief like improved sleep and reduced impulsivity, a majority of the studies lacked consistent outcome measures and used small, heterogenous samples.

One of Ayyash et al.'s (2024) findings discuss a series of clinical cases with 30 treatment resistant ADHD patients who found medical cannabis helpful for many symptoms including improved sleep and concentration as well as a decrease in impulsive behaviours (Ayyash et al., 2024). 73% of these participants discontinued their stimulant medications for cannabinoids as they believe the cannabinoids are more effective than the stimulant medications (Ayyash et al., 2024). Ayyash et al. (2024) highlighted that across the case series, participants consistently described medical cannabis as beneficial for ADHD symptom relief and management, particularly when standard ADHD treatments were non-effective. Furthermore, majority of the cases in this study reported increased focus, emotional control, and clarity, reinforcing the perception that cannabis may be helpful for ADHD symptom relief (Ayyash et al., 2024).

Another case study, provided by Mansell et al. (2022), presented three clinical cases involving young adult males aged 18-23 who utilized cannabis as their ADHD treatment. Each participant in this study was assessed using a blend of clinical interviews and validated symptom rating scales, such as the PHQ-9 (for depression) SCARED (for anxiety), SNAP (for ADHD symptoms), and CEER-9 (for emotional regulation) (Mansell et al., 2022). After cannabis use, patients showed significant reductions in depressive symptoms (30-81% improvement), inattention (7-30% improvement), emotional dysregulation (up to 78% improvement), and anxiety (up to 33% reduction) (Mansell et al., 2022). Subjectively, all three participants reported enhanced attention, improved quality of life, and better emotional control (Mansell et al., 2022). While these short-term benefits may seem promising for ADHD symptom relief, authors noted that these outcomes are based on self-reports from a very small sample size, and it is not sufficient to define a definite conclusion (Mansell et al., 2022). Furthermore, mild side effects such as short-term memory impairment and drowsiness were observed, raising concerns about

the potential cognitive effects long-term (Mansell et al., 2022). This report by Mansell et al. (2022) provides beneficial insight into the perceived short-term benefits of cannabis use for ADHD symptoms but does not provide evidence for long-term safety and efficacy of cannabis use.

While case reports such as those by Ayyash et al. (2024) and Mansell et al. (2022) suggest that cannabis may offer short-term relief for some ADHD individuals, specifically those who are treatment-resistant, the findings remain limited by small sample sizes, self-reporting biases, and lack of long-term follow up. These methodological weaknesses highlight the need for more larger, controlled, and longitudinal studies to assess both short-term and long-term effects. To critically assess the broader effects of cannabis use for ADHD individuals, Francisco et al. (2023) conducted a comprehensive review analyzing 39 studies on this topic, using both experimental and observational designs to assess the effects of cannabis use on ADHD symptoms and cognitive outcomes. Most of their studies were cross-sectional to evaluate the associations between ADHD severity and cannabis use, using 15 studies to specifically address the cognitive effects of cannabis use on ADHD through cognitive tests and neuroimaging techniques (Francisco et al., 2023). A significant limitation was identified across these studies, and it was found that there was a lack of precise measurement regarding the amount and concentration of THC and CBD consumed, creating challenges in standardizing results, comparing outcomes across samples, or defining firm conclusions about efficacy (Francisco et al., 2023).

Furthermore, their findings challenge the idea that cannabis may be a helpful therapeutic alternative for ADHD individuals (Francisco et al., 2023). Francisco et al. (2023) found that a minority of studies indicated short-term symptom improvement, while the majority either reported no significant benefit or a worsening of ADHD-related outcomes while sustaining

cannabis use. Furthermore, the review highlighted potential cognitive risks including impairments in memory, attention, and executive functioning- areas that are already vulnerable in ADHD individuals (Franciso et al., 2023). This review also raised concerns about increased risk for developing Cannabis Use Disorder (CUD) among ADHD individuals, particularly adolescents, due to the shared vulnerabilities including emotional dysregulation, impulsivity, and impaired self-regulation (Francisco et al., 2023) The limitations around the lack of standardized dosing, cannabinoid concentration, and study design highlights the importance for caution and further emphasize that cannabis should not be currently considered as an evidence-based or longterm intervention for ADHD treatment (Francisco et al., 2023). Building on these findings, further concerns have been raised regarding the broader risks associated with cannabis use in individuals with ADHD. ADHD itself has been identified as a significant risk factor for developing cannabis use disorder (CUD), particularly when cannabis use begins in adolescence (Dhamija et al., 2023). Early use of cannabis has been linked to long-term cognitive impairments, diminished motivation, decreased memory and attention span, and poorer longterm outcomes (Dhamija et al., 2023). These risks are particularly concerning given the overlap between the cognitive vulnerabilities already present in ADHD individuals and to those potentially worsened by chronic cannabis use.

In alignment with these findings, the Canadian ADHD Resource Alliance (CADDRA, 2024) released a formal position statement affirming that there is currently no clinical evidence supporting the use of cannabis for ADHD treatment. The statement cautions against replacing empirically supported pharmacological and psychosocial interventions with cannabis-based alternatives, specifically for youth, highlights the importance of clinician-led decision making and the need for caution in the lack of standardized, large-scale trails (CADDRA, 2024). While

individual case reports and some observational studies point to the perceived short-term benefits of cannabis use for ADHD symptoms such as reduced impulsivity, improved mood regulation, and enhanced concentration, these reports are not sufficient enough as the current literature is limited by small sample sizes, reliance on self-reports, and lack of control groups and standardized dosing (Dhamija et al., 2023; Francisco et al., 2023). Furthermore, the potential for negative long-term cognitive and psychiatric consequences, as well as increased risk for developing CUD among ADHD individuals further raises significant ethical and clinical concerns about endorsing cannabis as a long-term therapeutic strategy. Continued research is needed, particularly longitudinal studies, to fully evaluate and assess the efficacy, safety, and long-term impact of cannabis use for ADHD treatment.

Concerns and Potential Risks of Cannabis Use

Despite these short-term benefits of cannabis use on ADHD symptom relief, considerable concerns exist regarding cannabis's long term cognitive and psychological impact for ADHD individuals, specifically adolescents and young adults using cannabis as a form of ADHD treatment. Current research has indicated that chronic cannabis use can impair cognitive functions such as working memory, attention, and executive functioning- areas that are already vulnerable in ADHD individuals (Dhamija et al., 2023; Gujska et al., 2023). These cognitive disruptions are particularly concerning for ADHD individuals given that cannabis use may worsen the same symptoms it is used to self-medicate.

Supporting these findings, Tamm et al (2013) conducted a comparative, cross-sectional study involving 128 young adults with a diagnosis of childhood ADHD, dividing the participants into cannabis users and cannabis non-users. Validated neuropsychological assessments were utilized including tests for working memory, decision making, and response inhibition (Tamm et

al., 2013). Tamm et al.'s (2013) study found that cannabis users displayed significantly poorer executive functioning skills, and these impairments were observed independent of baseline ADHD symptom severity, indicating that cannabis use contributes independently to cognitive decline. Similarly, Wallace et al. (2019) investigated the impact of cannabis use on attentional performance in adolescence and young adults, regardless of subclinical ADHD symptoms. The study involved 72 participants, including 34 cannabis users and 38 cannabis non-users, who completed neuropsychological tasks assessing inhibition and attention (Wallace et al., 2019). The findings showed that cannabis use was significantly associated with a slower response rate on a Continuous Performance Task (CPT), suggesting impaired attentional processing speed (Wallace et al., 2019). Particularly, subclinical ADHD symptoms, as reported by the parents on the Child Behaviours Checklist, did not independently predict or moderate the effects of cannabis use on cognitive outcomes (Wallace et al., 2019). This suggests that attention deficits observed in cannabis users are primarily attributable to the effects of substance use rather than underlying symptomology (Wallace et al., 2019) and may increase cognitive vulnerabilities in ADHD individuals, rather than relieve them.

Furthermore, meta-analytic evidence from Scott et al.'s (2018) further reinforces this concern. Analyzing 69 studies on adolescent cannabis use, researchers found significant deficits in memory, executive functioning, and processing speed among frequent cannabis users (Scott et al., 2018). These cognitive impairments were further hindered if cannabis use began before age 16 as it is a developmental period that overlaps with both the typical onset of ADHD symptoms and critical stages of brain development (Scott et al., 2018). These cognitive disruptions are concerning as they can worsen the same attention and behavioral problems that cannabis is used to self-medicate for, potentially creating a cycle of worsening impairment. Additional insight has

been found into how cannabis may interact with neurodevelopment in ADHD individuals using neuroimaging studies. For example, Cawkwell et al. (2020) conducted a systematic review of 11 studies investigating the neurobiological impacts of cannabis use in adolescents and young adults diagnosed with ADHD. Out of the 11 studies, 7 of these utilized neuroimaging techniques such as functional MRI (fMRI), structural MRI, and Single Photon Emission Computed Tomography (SPECT) to assess brain structure and function (Cawkwell et al., 2020). Their review identified distinct patterns of activation and structural variation between cannabis-using and cannabis nonusing ADHD individuals (Cawkwell et al., 2020). These differences were noted in regions including the right hippocampus, right superior frontal gyrus, cerebellar vermis, and bilateral temporal lobes, areas that are associated with memory, executive control, and motor processing (Cawkwell et al., 2020).

Structural alterations were also observed in the nucleus accumbens and pre/postcentral gyri, areas that are involved in attention regulation and reward processing. Although none of the studies found a statistically significant interaction between cannabis use and ADHD diagnosis on standard neuropsychological tasks, two of the studies reported adverse effects when cannabis exposure was before age 16 (Cawkwell et al., 2020). These effects included altered patterns of neural activation and reduced cortical volume in brain regions important for cognitive and emotional regulation (Cawkwell et al., 2020). However, the researchers emphasized that the available evidence remains limited and potentially inadequate, highlighting the need for larger, longitudinal studies to clarify the long-term impacts of cannabis on brain development in youth with ADHD (Cawkwell et al., 2020). Even though this review did not find strong support for the theory that cannabis use significantly impairs executive functioning in ADHD individuals over time, it did raise concerns about the neurodevelopmental implications of early and frequent use,

specifically during adolescence, a period of sensitivity for brain maturation (Cawkwell et al., 2020).

Similarly, Kelly et al. (2017) conducted a cross-sectional neuroimaging study using task independent functional MRI to investigate how cannabis use affects intrinsic functional connectivity (iFC) in young adults with and without a diagnosis of ADHD. The study included 75 participants ages 21-25 who had been followed longitudinally since early childhood as part of the Multimodel Treatment Study of Children with ADHD (MTA) (Kelly et al., 2017). Participants were divided into four groups: ADHD cannabis-users, ADHD cannabis non-users, non-ADHD cannabis-users, and non-ADHD cannabis non-users (Kelly et al., 2017). Kelly et al.'s (2017) study assessed nine large-scale functional brain networks related to executive functioning and somatomtor control and found that individuals with a childhood ADHD diagnosis had weakened connectivity in networks supporting executive function, which is consistent with the disorders neurocognitive profile. However, cannabis use did not appear to change brain activity patterns in people with ADHD as this study found no connection between having ADHD and using cannabis in terms of how the brain's network functioned (Kelly et al., 2017). Although the researchers noticed that weaker brain connections were linked to lower cognitive performance, they did not find proof that cannabis made ADHD-related brain issues worse (Kelly et al., 2017). Researchers noted that these findings should be interpreted cautiously due to the small sample size and called for larger longitudinal studies to assess the long-term neurodevelopmental effects of cannabis in ADHD individuals (Kelly et al., 2017).

Even though this research did not find definitive results, the research found that timing of cannabis exposure plays a critical role in shaping cognitive outcomes for ADHD individuals, with research suggesting that early-onset cannabis use (specifically before the age of 16) may

lead to worsened executive functioning deficits than cannabis exposure in adulthood (Tamm et al., 2013; Wallace et al., 2019). Tamm et al.'s (2013) comparative, cross-sectional study examined the effects of cannabis use exposure on cognitive functioning in a sample of 128 individuals diagnosed with ADHD during childhood. Participants were observed into young adulthood and divided into groups based on their age of cannabis exposure: early onset (before age 16) and late onset (after age 16) (Tamm et al., 2013). Standardized neurocognitive assessments were utilized such as the Continuous Performance Test (CPT) and the n-back working memory task, and researchers found that the group of individuals with early cannabis exposure showed significantly weaker working memory, poorer inhibitory control, and slower reaction times compared to both the late exposure group and non-users (Tamm et al., 2013). These cognitive impairments were particularly noticeable in tasks requiring sustained attention and impulse regulation, suggesting that early cannabis exposure may interfere with developmental trajectories that are already vulnerable in ADHD individuals (Tamm et al., 2013).

Similarly, Lisdahl et al (2016) conducted a narrative review summarizing research on the neurocognitive, structural, and functional brain effects of regular cannabis use (defined in the review as at least weekly use) during adolescence and young adulthood. Drawing from a wide range of neuroimaging and cognitive studies, the researchers highlighted that cannabis exposure before the age of 16 is consistently associated with greater alterations in brain structure and function compared to later-onset users (Lisdahl et al., 2016). Specifically, the review references findings from structural MRI studies showing reduced cortical thickness in areas such as the dorsolateral prefrontal cortex and anterior cingulate cortex, brain areas that are critical for executive functioning, decision-making, brain inhibition (Lisdahl et al., 2016). Additionally, early cannabis use was linked to poorer performance on neuropsychological tasks and greater

self-reported executive dysfunction, measured by tools such as the Behaviour Rating Inventory of Executive Function (BRIEF). The authors emphasised that adolescence represents a period of heightened neuroplasticity and ongoing brain maturation, making early cannabis exposure particularly disruptive (Lisdahl et al., 2016). These disruptions may interact with existing neurodevelopmental conditions like ADHD, potentially worsening impairments in emotional regulation, academic achievement, and occupational functioning (Lisdahl et al., 2016). Researchers concluded that public health efforts should address the specific risks of adolescent cannabis use and its long-term impact on cognitive and neural development (Lisdahl et al., 2016).

In addition to the cognitive risks, cannabis use in ADHD individuals increases risk emotionally and psychologically. As stated previously, many individuals with ADHD use cannabis to self-medicate mood symptoms and/or anxiety, yet in contrast long-term use is linked to increased emotional dysregulation and anxiety/depression (Cawkwell et al, 2020; Dhamija et al., 2023). In Cawkwell et al.'s (2020) systematic review of 11 studies on cannabis use in adolescence and young adults diagnosed with ADHD, the review noted a limited evidence base, but identified emerging patterns indicating that regular cannabis use in ADHD individuals may be associated with adverse emotional outcomes, including higher rates of mood and anxiety disorders (Cawkwell et al., 2020). While direct causality could not be established due to the study design limitations, the review highlighted the need for further research into emotional regulation impairments among ADHD individuals using cannabis (Cawkwell et al., 2020).

Chronic cannabis use can dysregulate emotional processing, while providing short term relief like euphoria, and as tolerance develops users can experience increased anxiety, irritability, and depressive symptoms during withdrawal or between uses (Cawkwell et al., 2020; Hosseini &

Oremus, 2019). Furthermore, cannabis's impact on the developing endocannabinoid system may interfere with neural circuits involved in the stress response and emotional regulation, potentially worsening emotional dysregulation in ADHD (Hosseini & Oremus, 2019). For example, Hosseini & Oremus (2019) conducted a systematic review of 23 studies examining the relationship between cannabis use before the age of 25 and symptoms of psychosis, depression, and anxiety. 11 studies focused on just depression and anxiety, and over half reported that early exposure to cannabis was linked to higher levels of these symptoms (Hosseini & Oremus, 2019). Researchers concluded that youth with existing vulnerabilities, such as ADHD individuals, may be particularly suspectable to the emotional risks associated with early cannabis exposure (Hosseini & Oremus, 2019). Together, these findings, highlight that while cannabis may offer temporary relief from emotional distress, chronic use (especially when initiated before age 16) may increase vulnerability to mood instability, anxiety, and long-term emotional dysregulation in individuals with ADHD.

Alongside mood disturbances, motivational deficits have also been associated with longterm, heavy cannabis use — a pattern often referred to in the literature as "amotivational syndrome" (Lisdahl et al., 2016). Although not formally recognized as a psychiatric diagnosis, individuals with this condition experience a change in cognitive functions such as a lack of concentration and activeness, apathy, and poor memory (Lisdahl et al., 2016). In their review, Lisdahl et al. (2016) noted that regular adolescent cannabis users often demonstrate lower academic motivation, poorer cognitive performance in areas related to memory and attention, and decreased engagement in goal-orientated activities (Lisdahl et al., 2016). In ADHD, this condition is concerning as ADHD is linked to reward-processing deficits and low dopamine tone (Volkow et al., 2009), and chronic cannabis use can further decrease dopaminergic signaling in

mesolimbic pathways (Bloomfield et al., 2014). Users often report lack of interest, reduced initiative, and diminished reward sensitivity, which can increase ADHD-related motivational impairments (Lisdahl et al., 2016). Furthermore, early and heavy cannabis use in ADHD youth has been linked to decreased motivation and goal directed behaviour, contributing to worse academic and occupational engagement (Francisco et al., 2023; Gujska et al., 2023). Research by Dhamija et al. (2023) emphasises that early cannabis exposure in ADHD individuals associates with diminished motivation and attentional drive, intensifying attentional fatigue and disorganization in school and/or work settings.

Another critical risk involved with cannabis use as a form of ADHD treatment is the increased risk of developing Cannabis Use Disorder (CUD) (Dhamija et al., 2023; Gujska et al., 2023). Individuals with ADHD are significantly at more of a risk for developing substance use disorders, especially if substances, like cannabis, are being used as a form of symptom management/reduction (Dhamija et al., 2023; Gujska et al., 2023). The impulsive and noveltyseeking behaviours involved in ADHD can facilitate an increase from casual use to a dependence, increasing risk for substance use disorders (Dhamija et al., 2023; Gujska et al., 2023). Epidemiological research has reported ADHD as a risk factor for CUD, especially when cannabis use begins in adolescents, identifying that the odds of developing CUD are higher for ADHD youth versus non-ADHD youth (Dhamija et al., 2023; Gujska et al., 2023). These causes may be due to a shared dysfunction in executive control and reward circuits as ADHD-related poor self-regulation and impulsiveness make it difficult to moderate use, and over time cannabis further impairs control mechanisms, creating a destructive cycle of abuse for ADHD individuals (Dhamija et al., 2023; Gujska et al., 2023). Further research shows that ADHD cannabis users tend to have more severe use patterns including high THC consumption, more frequent use, and

stronger cravings (Dhamija et al., 2023; Gujska et al., 2023), possibly due to ADHD-related vulnerabilities in the endocannabinoid-dopamine reward system (Hosseini & Oremus, 2019). In a non-clinical sample of 376 young adults, Bidwell et al. (2014) found that both current and childhood inattention symptoms were significantly associated with more severe cannabis outcomes such as greater cravings, earlier exposure, and more cannabis-related problems. Childhood hyperactivity-impulsivity symptoms were specifically linked to earlier cannabis exposure (Bidwell et al., 2014). These associations remained significant even after controlling for comorbid psychopathology, suggesting that ADHD symptoms may independently contribute to vulnerability to cannabis misuse (Bidwell et al., 2014). Over the long term, the development of CUD can lead to worsening overall functioning as persistent cannabis use has been tied to social difficulties, poorer educational attainment, and employment problems in ADHD individuals (Bidwell et al., 2014; Gujska et al., 2023).

For example, adolescents with ADHD who engage in regular cannabis use often have higher declines in academic performance like low grades, high drop-out rates, and are less likely to pursue higher education due to the combination of the negative symptoms of ADHD and cannabis-induced cognitive/motivational impairments in school and/or the workplace (Francisco et al., 2023; Gujska et al., 2023). Furthermore, adults with ADHD and chronic cannabis use report weaker work motivation, productivity losses, and interpersonal conflicts than those with ADHD who do not use cannabis, as continuous use of cannabis increases memory problems, attention deficits, and emotional dysregulation, affecting professional and social relationships in these individuals' lives (Francisco et al., 2023; Wallace et al., 2019). While some case studies have reported perceived short-term benefits of cannabis use including improved focus and mood,

comprehensive reviews caution that cannabis use should be limited due to the potential longterm harms (Francisco et al., 2023; Wallace et al., 2023).

Joining evidence from recent research highlights that there is significant neurobiological and behavioral risks of long-term cannabis use in ADHD individuals including noticeable declines in executive cognitive abilities, heightened anxiety/depression, alterations in brain development (especially if cannabis use occurred in adolescence), emotional dysregulation, motivational impairments that affect academic, social, and occupational success, and increased risk for developing a cannabis addiction (Cawkwell et al., 2020; Kelly et al., 2017; Scott et al., 2017; Tamm et al., 2013; Wallace et al., 2019). Due to these effects, clinicians have emphasized caution with cannabis use as a form of ADHD treatment given that ADHD itself has cognitive and emotional challenges and adding cannabis use to the mix, specifically chronic cannabis use, often worsen the very symptoms and life outcomes for ADHD individuals that self-medicate with cannabis (Francisco et al., 2023). Longitudinal research is still necessary to find definitive conclusions and results, however, the current literature at this time strongly recommends that cannabis use is not a healthy and long-term coping strategy for ADHD and may actually increase long-term neurodevelopmental and psychosocial difficulties (Francisco et al., 2023).

While small-scale case reports and pilot trials (Ayyash et al., 2024; Mansell et al., 2022) highlighted perceived short-term benefits of cannabis use in ADHD, these findings are weakened by small samples, non-standardized dosing, and reliance on self-reported outcomes. In contrast, broader reviews such as Francisco's et al., (2023) study, point to cognitive risks, emotional instability, and heightened cannabis use disorder prevalence—yet often fail to account for THC/CBD concentration, comorbidities, or longitudinal patterns. This inconsistency across the literature presents a major gap that the proposed study aims to address.

Existing Gaps and the Need for Further Research

While foundational studies have researched short-term effects and long-term risks of cannabis use for ADHD individuals, there remains a serious lack of longitudinal and experimental research specifically assessing cannabis as a healthy therapeutic option for ADHD individuals. Most of the current literature is cross-sectional and relies on self-report data which limits conclusions about symptoms long-term and cognitive outcomes over time (Francisco et al., 2023; Stueber & Cuttler, 2022). Although small studies and case reports suggest that cannabinoids may offer symptom relief for emotional dysregulation, hyperactivity, and impulsivity in treatment resistant ADHD individuals (Ayyash et al., 2024; Mansell et al., 2022), these studies do not have strong enough evidence or careful methods to reliably inform clinical practice. It is very important to note that there are very few thorough studies exploring how safe and effective cannabis is for long-term treatment for ADHD individuals. Cohen & Weinstein (2018) highlighted this gap in their research, recommending thorough clinical trials to assess both therapeutic potential and cognitive-emotional risks associated with cannabis use in ADHD individuals. Recent reviews have also highlighted this recommendation, noting inconsistent measurement of cannabis strains like THC/CBD ratios, age of exposure, dosing frequency, and comorbid psychiatric conditions (Francisco et al., 2023). The lack of these consistent measures makes it difficult to compare results between studies and is unclear whether cannabis is therapeutic or not therapeutic.

Additionally, neuroimaging studies suggested that cannabis use in ADHD individuals alters brain structure and function, particularly in reward-processing and executive functions (Cawkwell et al., 2020; Kelly et al., 2017), but clinical improvements or declines remain unclear with these neural changes. Even fewer studies have researched adolescent-specific

vulnerabilities, gender differences, or the impact of cannabis use on co-occurring disorders like depression, anxiety, and substance use in ADHD individuals. These gaps reflect a growing urgency for carefully designed, longitudinal research. There is a particular need for larger scale studies that explore cannabis's role in ADHD treatment across diverse populations, and that measure functional outcomes such as occupational performance, academic achievement, and emotional well-being. Without this data, clinicians and psychologists remain unable to determine whether cannabis serves as a healthy treatment option or alternative to standard ADHD treatments, and whether it increases long-term impairments.

Conclusion of Literature Review

The current literature highlights that standard ADHD treatments like stimulant medications and cognitive-behavioral therapy (CBT), effectively manage many core symptoms of ADHD, however, has significant limitations such as negative side effects from stimulant medications and inconsistent adherence (Antshel et al., 2012; Cortese et al., 2018; Farhat et al., 2025; Liu et al., 2023; Storebo et al., 2018). These limitations have driven increased interest in alternative treatments, such as cannabis for system management/treatment. While subjective reports and small sample studies suggest that cannabis may temporarily relieve certain ADHD symptoms like hyperactivity, impulsivity, and emotional dysregulation, clinical empirical studies remain minimal (Ayyash et al., 2024; Mansell et al., 2022; Mitchell et al., 2016; Stueber & Cuttler, 2022). Significant concerns persist regarding cannabis's long-term effects, such as an increase of cognitive impairments, risk of developing cannabis use disorder, increased emotional dysregulation, and harmful effects on occupational, social, and academic functioning (Cawkwell et al., 2020; Dhamija et al., 2023; Francisco et al., 2023; Gujska et al., 2023; Hosseini & Oremus,

2019; Kelley et al., 2017; Lisdahl et al., 2016; Scott et al., 2018; Tamm et al., 2013; Wallace et al., 2019).

Furthermore, the methodological limitations across existing studies such as a reliance on self-reports, lack of longitudinal studies, and inconsistence dosing measures, highlights crucial gaps in clinical evidence (Cohen & Weinstein, 2018; Francisco et al., 2023). Therefore, there is an urgent need for more carefully designed, long-term studies with standardized measures to clearly determine cannabis's efficacy, safety, and overall impact on ADHD individuals. Until this evidence is available, clinicians and psychologists should remain cautious in recommending cannabis use as a form of ADHD treatment. To investigate the potential impact of cannabis use on ADHD symptoms, the following proposed study employs a structured research design that integrates both quantitative and qualitative approaches. The following section outlines the proposed methodological framework, including participant recruitment, group categorization, data collection tools, and procedures used to assess symptom patterns and cognitive functioning over time.

Proposed Study

This study will involve a longitudinal and mixed methods design to carefully evaluate the effects of cannabis use on ADHD symptoms over time. This longitudinal, mixed-methods study will recruit approximately 60 participants (30 cannabis users, 30 non-users) to provide sufficient statistical power for detecting medium effect sizes in repeated measures ANOVA (Field, 2018). Participants will be enlisted from clinical settings, community support groups, and social media advertisement, and will involve adults clinically diagnosed with ADHD. The participants will be divided into two groups: cannabis users and cannabis non-users. Cannabis users will be categorized based on their clearly defined doses and frequency of cannabis use such as daily use,

weekly use, or monthly use and the duration of use such as months or years of cannabis consumption. Participation will require informed consent, with assurance of confidentiality and voluntary withdrawal. A distress protocol will be implemented, for example, if a participant exhibits signs of significant emotional discomfort, the session will pause, grounding strategies will be offered, and referrals to counselling services provided. Interviews will follow traumainformed principles, including sensitivity to triggers, collaborative pacing, and non-judgmental listening.

Quantitative data collection will include standardized measurement instruments such as the Adult ADHD Self-Report Scale (ASRS) to accurately assess the severity of ADHD symptoms at multiple times throughout the study. Cannabis use will be measured through validated tools including the Cannabis Abuse Screening Test (CAST) and Severity of Dependence Scale (SDS), to accurately capture the intensity, duration, and potential dependency characteristics of substance use. Additionally, participants will undergo cognitive performance tests targeting core ADHD-affected areas including memory, executive functioning, impulsivity, and attention. These tests will be administered periodically to track longitudinal cognitive changes.

Qualitative data will be collected through semi-structured interviews and open-ended surveys that are designed to prompt detailed narratives about the individuals subjective experience with cannabis use on ADHD management/treatment. Participants will be asked to discuss their perceived benefits, potential adverse effects from cannabis use, the motivations for their use, and their perspectives on the effectiveness and potential challenges associated with cannabis use. Statistical analysis will include repeated measures ANOVA and mixed-effects models to determine differences in severity of ADHD symptoms and cognitive performance

outcomes between the cannabis users and cannabis non-users over multiple assessment points. Repeated measures ANOVA is appropriate for this study because it allows the comparison of the same individuals at different times, controlling for inter-individual variability and increasing the ability to detect significant changes within participants over the longitudinal timeframe (Field, 2018). Mixed-effects models provide additional advantages by accommodating varying intervals between assessments, missing data, and random effects, in turn enabling a more accurate representation of real-world patterns and individual differences (Singer & Willett, 2003). For qualitative data, thematic analysis following Braun and Clarke's (2006) guidelines will be done to thoroughly identify, analyse, and report patterns (themes) within the qualitative dataset. Results of the thematic analysis will provide researchers with insights into the lived experiences of individuals using cannabis for ADHD, including the emotional, psychological, and functional impacts of use. This will help highlight the motivations behind cannabis use, perceived efficacy in symptom relief, and the personal and contextual factors influencing treatment choices (Braun & Clarke, 2006).

Understanding the longitudinal impact of cannabis use on ADHD symptoms is critically important as ADHD significantly impairs daily functioning, academic performance, emotional regulation, and professional successes (Banna & Saad, 2019; Pliszka, 2022). While current standard treatments offer benefits, they have many negative limitations, such as adverse side effects and inconsistent adherence to medications (Farhat et al., 2025; Storebo et al., 2018). As cannabis has gained popularity as a potential therapeutic alternative for ADHD symptom management (Cooper et al., 2017; Francisco et al., 2023; Mansell et al., 2022), it is essential to clearly define its therapeutic efficacy, potential risks, and long-term cognitive and emotional impacts for ADHD individuals. This comprehensive understanding is crucial for informing

clinical practice, guiding public health policies, and empowering individuals with ADHD to make evidence-based decisions about their treatment strategies, especially if cannabis is already a form for ADHD treatment.

Conclusion

This research directly addresses the question of whether cannabis use in ADHD is beneficial or detrimental over the long-term. Given the substantial impairments associated with ADHD, along with the limitations of current treatments, exploring alternative treatments like cannabis is both relevant and necessary. While subjective reports suggest marijuana may provide symptom relief, existing evidence highlights significant concerns related to cognitive impairment, dependency, and emotional dysregulation. A longitudinal, mixed-methods empirical study was formulated and proposed to provide thorough empirical data and detailed qualitative insights into how cannabis impacts ADHD symptoms over time. Findings from this research could guide clinicians in distinguishing between adaptive coping and harmful self-medication among individuals with ADHD. For example, outpatient ADHD clinics may integrate cannabis use screening into intake procedures and adopt harm-reduction counselling where appropriate. At the policy level, results could inform public health campaigns tailored to ADHD populations, balancing education on perceived benefits with evidence of long-term risks. Ultimately, this study aims to provide clarity on the long-term consequences of cannabis use in ADHD. By directly connecting subjective experiences with measurable outcomes, the findings will support evidence-based clinical practice, inform policy, and set a foundation for future research exploring alternative and integrative treatment options.

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