



BEFORE THE IOWA MEDICAL CANNABIDIOL BOARD

[Redacted]

Petition by *Your Name*

for the (addition or removal) of

ADHD - Attention  
Deficit - Hyperactivity  
Disorder



PETITION FOR  
ADDITION or REMOVAL  
(Circle one)

(medical condition, medical treatment or debilitating disease) to the list of debilitating medical conditions for which the medical use of cannabidiol would be medically beneficial.

Petitioner's Information			
Name (First, Middle, Last or Name of Organization):			
Home Address (including Apartment or Suite #):			
City:		State: <u>IA</u>	Zip Code:
Telephone Number:		Email Address:	
Is this the person/ organization to whom information about the petition should be directed?			Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>

Representative's Information (If applicable)			
Name (First, Middle, Last):			
Mailing Address (including Apartment or Suite #):			
City:		State:	Zip Code:
Is this the person/ organization to whom information about the petition should be directed?			Yes <input type="checkbox"/> No <input type="checkbox"/>



Telephone Number:		Email Address:	
1. Please provide the name of the specific medical condition, medical treatment, or debilitating disease you are seeking to add to or remove from the list of debilitating medical conditions for which patients would be eligible to receive a medical cannabis registration card. <i>Please limit to ONE condition, treatment, or debilitating disease per petition.</i>			
Recommended Action		Condition or Disease	
<input checked="" type="checkbox"/> Add <input type="checkbox"/> Remove		ADHD	

2. Please provide a brief summary statement that supports the action urged in the petition. *Attach additional pages as needed.*

Please see attached documentation supporting benefits of adding ADHD as a condition.

I am a Licensed Mental Health Counselor as well as an individual with ADHD and take medication to treat symptoms. ADHD medications are helpful however. It is believed medical marijuana may be a much safer option. Significant research has recently been done regarding. Please see attached documentation regarding.



3. Please provide a brief summary of any data or scientific evidence supporting the action urged in this petition. *Attach additional pages as needed*

PLEASE SEE ATTACHED DOCUMENTS

4. Please provide a list of any reference material that supports your petition.

PLEASE SEE ATTACHED DOCUMENTATION



5. Please provide a list of subject matter experts who are willing to testify in support of this petition (if any). The list of subject matter experts must contain names, background, email addresses, telephone numbers, and mailing addresses. *Attach additional pages if needed.*

Name	(1)	(2)	(3)
Background			
Email address			
Telephone number			
Mailing address			

6. Please provide the names and addresses of other persons, or a description of any class of person, known by you to be affected by or interested in the proposed action which is the subject of this petition. *Attach additional pages if needed.*

ADULTS WITH ADHD



7. Please indicate whether you have attached a brief in support of the action urged in the petition.	Yes ✓	No -
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8. Please indicate whether you are asking to make an oral presentation of the contents of the petition at a board meeting following submission of the petition.	Yes □	No ✓
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9. Acknowledgement and Signature

By signing this document I certify that the information provided in this petition is true and accurate to the best of my knowledge.

12/07/2019  
Date (mm-dd-yyyy)

- Please fill out each section that is applicable to your petition. Failure to conform to what is required in this petition may result in a denial of consideration by the board.
  - You do not need to fill out sections asking for your representative's information if you do not have one.
  - For section 2, please provide a short, essay-like summary of your argument.
  - For section 3, please provide a short, essay-like summary of the articles and evidence that supports your position (if any).
  - For section 4, please provide a list of articles that are in support of your position (if any).
  - For section 5, please provide a list of experts that would be willing to testify in support of your position (if any). In the background section, please provide the reasons why they should be considered experts in the area: education, credentials, field of study, occupation, etc. This section is optional but will greatly aid in helping the board consider your petition.
  - For section 6, please provide information about groups of people that will be affected if the petition were approved. This could include people suffering from a specific disease, advocacy groups, local government officials, etc.
  - Sections 7 and 8 are optional but may aid the board in considering this petition.
- Please be aware:
  - The board may request that you submit additional information concerning this petition. The board will notify you of the requested materials in the event that more information is needed.
  - The board may also solicit comments from any person on the substance of this petition. The board may also submit this petition for a public comment period where any interested person may comment.
  - The board has six months after you submit this form to either deny or grant the petition. If approved, you will be notified in writing that the board has recommended the addition or removal of the medical condition, treatment, or debilitating disease to the board of medicine. If denied, the board will notify you in writing the reasons for denial.



- If the board denies your petition for failure to conform to the required form, you will be allowed to correct the errors and resubmit for consideration.
- **After you have completed this petition, please make sure that you sign, date it, and email, mail, or hand deliver to:**

**Iowa Department of Public Health  
Office of Medical Cannabidiol  
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## Medical marijuana

POSTED JANUARY 15, 2018, 10:30 AM | UPDATED JUNE 25, 2019, 9:36 AM



[Peter Grinspoon, MD](#)

Contributor

There are few subjects that can stir up stronger emotions among doctors, scientists, researchers, policy makers, and the public than medical marijuana. [Is it safe?](#) Should it be legal? Decriminalized? Has its effectiveness been proven? What conditions is it useful for? Is it addictive? How do we keep it out of the hands of teenagers? Is it really the “wonder drug” that people claim it is? Is medical marijuana just a ploy to legalize marijuana in general?

These are just a [few of the excellent questions](#) around this subject, questions that I am going to studiously avoid so we can focus on two specific areas: why do patients find it useful, and how can they discuss it with their doctor?

Marijuana is currently legal, on the state level, in 29 states, and in Washington, DC. It is still illegal from the federal government’s perspective. The Obama administration did not make prosecuting medical marijuana even a minor priority. President Donald Trump promised not to interfere with people who use medical marijuana, though his administration is currently threatening to reverse this policy. About 85% of Americans support legalizing medical marijuana, and it is estimated that at least several million Americans currently use it.

### Marijuana without the high

Least controversial is the extract from the hemp plant known as [CBD](#) (which stands for cannabidiol) because this component of marijuana has little, if any, intoxicating properties. Marijuana itself has more than 100 active components. THC (which stands for tetrahydrocannabinol) is the chemical that causes the “high” that goes along with marijuana consumption. CBD-dominant strains have little or no THC, so patients report very little if any alteration in consciousness.

Patients do, however, report many benefits of CBD, from relieving insomnia, anxiety, spasticity, and pain to treating potentially life-threatening conditions such as epilepsy. One particular form of childhood epilepsy called Dravet syndrome is almost impossible to control, but responds dramatically to a CBD-dominant strain of marijuana called Charlotte’s Web. The videos of this are dramatic.

### Uses of medical marijuana

The most common use for [medical marijuana](#) in the United States is for pain control. While marijuana isn’t strong enough for severe pain (for example, post-surgical pain or a broken bone), it is quite effective for the chronic pain that plagues millions of Americans, especially as they age. Part of its allure is that it is clearly safer than opiates (it is impossible to overdose on and far less addictive) and it can take the place of NSAIDs such as Advil or Aleve, if people can’t take them due to problems with their kidneys or ulcers or GERD.

In particular, marijuana appears to ease the pain of multiple sclerosis, and nerve pain in general. This is an area where few other options exist, and those that do, such as Neurontin, Lyrica, or opiates are highly sedating. Patients claim that marijuana allows them to resume their previous activities without feeling completely out of it and disengaged.

Along these lines, marijuana is said to be a fantastic muscle relaxant, and people swear by its ability to lessen tremors in Parkinson’s disease. I have also heard of its use quite successfully for fibromyalgia, endometriosis, interstitial cystitis, and most other conditions where the final common pathway is chronic pain.



Marijuana is also used to manage nausea and weight loss, and can be used to treat glaucoma. A highly promising area of research is its use for PTSD in veterans who are returning from combat zones. Many veterans and their therapists report drastic improvement and clamor for more studies, and for a loosening of governmental restrictions on its study. Medical marijuana is also reported to help patients suffering from pain and wasting syndrome associated with HIV, as well as irritable bowel syndrome and Crohn's disease.

This is not intended to be an inclusive list, but rather to give a brief survey of the types of conditions for which medical marijuana can provide relief. As with all remedies, claims of effectiveness should be critically evaluated and treated with caution.

### Talking with your doctor

Many patients find themselves in the situation of wanting to learn more about medical marijuana, but feel embarrassed to bring this up with their doctor. This is in part because the medical community has been, as a whole, overly dismissive of this issue. Doctors are now playing catch-up, and trying to keep ahead of their patients' knowledge on this issue. Other patients are already using medical marijuana, but don't know how to tell their doctors about this for fear of being chided or criticized.

My advice for patients is to be entirely open and honest with your physicians and to have high expectations of them. Tell them that you consider this to be part of your care and that you expect them to be educated about it, and to be able to at least point you in the direction of the information you need.

My advice for doctors is that whether you are pro, neutral, or against medical marijuana, patients are embracing it, and although we don't have rigorous studies and "gold standard" proof of the benefits and risks of medical marijuana, we need to learn about it, be open-minded, and above all, be non-judgmental. Otherwise, our patients will seek out other, less reliable sources of information; they will continue to use it, they just won't tell us, and there will be that much less trust and strength in our doctor-patient relationship. I often hear complaints from other doctors that there isn't adequate evidence to recommend medical marijuana, but there is even less scientific evidence for sticking our heads in the sand.

### Related Information: [Harvard Health Letter](#)

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### Comments:

POSTED MARCH 13TH, 2018 AT 6:32 AM

**Brian Harrison**

Very interesting post, may be worth noting that there is no real need for the THC element within the medical products, studies have shown that THC and CBD combined at a 1:1 ratio is beneficial towards pain, however it has also been discovered that THC can modify our brains functions, making it hard for some people to continue with specific jobs.

Cbd Has been discovered to be effective for pain without the use of THC, this is one of many reasons why it hit the world market with a storm, it allowed a person to relieve themselves (at a financial cost) from pain but without the psychedelic side effects of the THC.

There is a big study happening in the UK at the moment, its still relatively new but its full supported by a big company the [CBD Medical and Health Research](#) is a very good read also, based on real human subjects.

The study linked above shows that THC is not needed for the effects that people look for when using CBD, it is THC that is truly illegal in most places around the world, and it is THC that is used to get a high, remove this element and the drug is far less likely to be abused, CBD is also known for helping with drug addictions and hold zero addictive properties.



*Updated on February 5, 2019. Medical content reviewed by Dr. [REDACTED], MD, M.B.A.,  
Chief Medical Officer*

Attention Deficit Hyperactivity Disorder (ADHD), also referred to as ADD, is a chronic disorder affecting [10-15% of children](#) and [3-5% of adults](#) worldwide. From impulses and hyperactivity to inattentiveness, this condition commonly affects children, but it can continue throughout their adult years.

While no cure exists for ADHD, it can be treated. For many people, however, current treatment options have been either ineffective or produced adverse side effects. But there could be a new answer for ADHD patients that are seeking better treatment — medical marijuana.

## How Is Medical Marijuana an Effective Treatment?

A 2015 published German study [conducted](#) on [patients](#) who weren't responding to Ritalin or Adderall. Most of the subjects following treatment experience reduced impulsivity, improved sleep and better performance.

The effects of ADHD are [different](#). Women seem to receive fewer diagnoses and suffer more with [anxiety](#), [depression](#), obesity and eating disorders than do men. Men, however, are more likely to experience anger, car accidents and behavioral issues.

The most common ADHD treatments are methylphenidate and amphetamine stimulants like Ritalin and Adderall. These medications help improve cognitive functioning and increase concentration and focus.

But, what these medications don't do is help you relax. They've also been known to cause nausea, suppress your appetite and give you abdominal cramping and diarrhea. They even can reduce your sleep. It's here that marijuana comes into play.

Many studies have proved marijuana use is beneficial for individuals who have ADD and ADHD. While there have been many preconceptions that marijuana exacerbates ADHD, many cannabologists believe cannabis has been significantly responsible for improving the lives of people living with ADHD.

Researchers believe one of the leading factors contributing to ADHD is a shortage of dopamine in the brain. Dopamine is a neurotransmitter important in regulating attention, memory and other cognitive processes. Ritalin, Adderall and other medications are designed to stimulate the production of dopamine, thereby helping to increase a patient's ability to concentrate. These drugs, however, result in a wide range of severe side effects and can also result in potentially severe withdrawal symptoms.

One area in which medical cannabis for ADHD has shown promise is the way it ~~interacts~~ interacts with the brain's ability to manage dopamine. Research is still in its early stages but shows marijuana may increase dopamine production. It seems to work in a similar way to Ritalin as it binds to dopamine and helps slow the metabolic breakdown of the substance.

Cannabis may be able to correct an ADHD sufferer's deficiency of dopamine, but it has to be administered in the correct dose. When used correctly, it can aid in concentration and make arduous, routine tasks more manageable for patients. It can also help level out mood swings.

## What Symptoms of Attention Deficit Hyperactivity Disorder Can Medical Marijuana Treat?

A well-known effect of marijuana is relaxation. But you may wonder how medical cannabis works for managing your ADHD symptoms.

As you know, when you have ADHD, you often find it hard to stay focused, and you're hyperactive. Because of this, many physicians believe medical cannabis can help decrease impulsivity in ADHD patients.

Medical weed can also treat effects of stimulant drugs such as sleep problems, nervousness and loss of appetite.

## ADHD Symptoms Treated by Medical Marijuana

Methylphenidate and amphetamine can be harmful to your body, particularly when you increase your dose or first begin treatment. They might make you agitated, excessively nervous and

amped up. Medical pot helps relieve some of these medications' uncomfortable side effects.

Weed can:

- Stimulate appetite
- Improve sleep
- Relax and calm you
- Reduce nausea

Since cannabis for attention deficit hyperactivity disorder reduces stress, calms you down and helps you pay attention, it's a favorite treatment choice for many people living with ADHD. It can exhaust you mentally when you're feeling agitated and wired all day, so it makes sense that people are turning to the herb to find some peace.

Additionally, it can be hard to "turn off" after using stimulant medications all day. A soothing dose of marijuana can calm your anxious body and provide you with peace of mind.

## How to Get Medical Marijuana for ADHD

If you're a patient with ADHD who is interested in exploring a medical marijuana treatment plan, your first step will be verifying the current cannabis laws practiced in your state. Currently, medical marijuana is not legal in every U.S. state. In the states where cannabis is permitted for medicinal purposes, ADHD may not be a qualifying condition.

Is medical marijuana permitted for ADHD patients in your region? If so, connect with a marijuana-trained physician who will provide you with the necessary diagnosis. While under the care of a certified cannabis doctor, you'll find it easy to enroll as a patient with the state.

Typically, patients are required to sign up for a medical marijuana I.D. card. Because marijuana isn't distributed in a manner akin to normal prescriptions, you must visit a state-authorized dispensary to obtain your cannabis supply instead. Your medical I.D. card will serve as proof of your patient status and will play a vital role in your ability to access your medical marijuana supply.

## Ways to Use Medical Marijuana for ADHD

Modern day medical professionals have proven marijuana to be an effective treatment option for patients living with ADHD. But unlike traditional medications, cannabis offers [multiple dosing options](#) — making it a preferred option due to its versatility. How you decide to consume your cannabis will play an influential role in your ability to find relief.

Since many ADHD patients are children, smoking medical cannabis can be problematic. Therefore, below lists some kid-friendly alternative methods of getting your medical weed treatment that is just as effective with adults.

## 1. Tinctures and Sub-Lingual Sprays

Micro-dosing is a valid alternative method. Extracted cannabinoids are combined with a [carrier oil](#), alcohol or Medium-Chain Triglyceride oil, which is typically palm or coconut oil. With sublingual sprays, you simply spray or squirt your dose under your tongue and allow it to absorb through your mouth's tissue.

## 2. Edibles

[Edibles](#) are a simple yet discreet way for many patients to enjoy their necessary cannabis medications. The effect of ingested medical marijuana is often longer lasting, too. Some edible cannabis treats may include:

- Popcorn
- Chocolate Bars
- Cookies
- Ice cream
- Nut mixes
- Gummy bears
- Lollipops

In most cases, the treats are yummy, and you can't tell they contain weed.

## 3. Suppositories

With [suppositories](#), you insert a cannabis extract inside a small cone-shaped mass into your rectum. It then absorbs through your colon. Two sizes of suppositories are available — 1g for children and 2g for adults. For children, you can cut doses in half to make them even smaller. Because ADHD can impact a patient's daily sense of wellbeing, it's crucial to find a delivery method that offers quick yet effective relief. For many, the intake methods outlined above allow users to safely control their symptoms with little to no adverse effects.

# Best Strains of Marijuana for ADHD

Since there needs to be more research to show exactly how and if medical marijuana can help people with ADHD, information and evidence is limited to mainly personal anecdotes. You may want to do a little experimenting yourself with different strains to see what's most useful for your ADHD symptoms. Below is a small list of strains people have found helpful in treating their symptoms.

In general, sativa strains are known to uplift the user due to its higher THC content, while indica strains will make the user feel more tired and relaxed because of its high CBD content. The same goes for sativa-dominant and indica-dominant hybrids, respectively.

## 1. Strains for Mental Energy and Engagement

These sativa strains help decrease inattentiveness:

- Cinex
- Sour Diesel
- Green Crack

## 2. Strains for Calming Focus

These calm the mind, reducing anxiety and impulsivity:

- True OG
- Blueberry Headband

## 3. Strains for ADD/ADHD Medication Side Effects

These indica strains are sleep-inducing, appetite-boosting strains:

- Goo
- Jupiter OG

Again, try some different strains out for yourself so you can find your ideal ADHD treatment.

## Side Effects of Marijuana for ADHD

Marijuana is highly esteemed in the medical community for its ability to successfully treat problematic symptoms without inducing any unwanted effects in the process. However, you may

notice some side effects when using cannabis. Several symptoms you can anticipate experiencing include:

- Increased appetite
- Tiredness
- Feelings of relaxation

As is the case with any new treatment plan, it's best to discuss your prospective medical marijuana treatment with a doctor before you begin to use this substance.

## ADHD

Many patients are beginning to learn about the positive effect of cannabis — especially for individuals living with ADHD. Below, we'll delve into the important details about this condition that are necessary to know before deciding on a treatment plan.

### What Is ADHD?

ADHD is a disorder that causes trouble focusing on tasks and paying attention without a wandering mind. Patients might also have difficulty sitting still. The condition often starts early in childhood. If left untreated, ADHD can cause trouble at work, at school, at home and with relationships.

ADHD is typically diagnosed in the early stages, according to the Centers for Disease Control and Prevention (CDC). Boys are diagnosed with the disorder twice as much as girls. Adults can receive a diagnosis of the disorder as well.

### Types of ADHD

ADHD shows three typical patterns including:

1. **Inattention:** When you struggle with inattention, you have difficulty sustaining focus, lack persistence and are disorganized, but these issues aren't due to lack of comprehension or defiance. Inattentive ADHD is what is typically referred to as *ADD*.
2. **Hyperactivity:** This type of ADHD is characterized by moving about regularly, even in circumstances where it's not appropriate. You fidget, talk or tap excessively. You may be restless and wear others out with continuous activity, especially in adult cases.
3. **Impulsivity:** You make hasty, thoughtless actions that could potentially harm yourself or others. You're always seeking instant gratification. Impulsive people may also interrupt others

excessively, be socially intrusive or be unable to consider the consequences of important decisions.

Your symptoms determine the type of ADHD you're struggling with, and both may change over time. It's a lifelong challenge for many, but therapy and medication can help improve your symptoms and quality of life.

## What Causes ADHD?

ADHD impacts a patient's ability to think without disruption — an inconvenience which can greatly alter their ability to perform daily activities with ease. Because this condition can have such a negative impact on patients, it's vital to know the risk factors and causes associated with ADHD to reduce the likelihood of its occurrence.

One of the leading causes of ADHD is genetics. Many researchers label ADHD a genetic disorder due to the large percentage of patients who inherit this condition.

However, there are some external factors which play a role in the formation of ADHD, too.

Several causes to take into consideration include:

- Smoking or drinking during pregnancy
- Sugar intake levels
- Lead exposure
- Brain trauma

While environmental factors may not always be the root cause of ADHD in a patient, they can aggravate the condition and make symptoms worse.

## ADHD History

Sir Alexander Crichton gave the first example of a condition appearing similar to ADHD in 1798.

In 1902, [ADDYANIS \(The Journal of Psychiatry, 1902\)](#), a British pediatrician, as "*an abnormal defect of moral control in children.*" His findings revealed that with some children affected, they couldn't control their behavior in the same manner of ordinary children; however, they were still intelligent.

The FDA approved Benzedrine in 1936 and [Ritalin \(1971\)](#) as a potential medication for treating ADHD. As diagnoses increased and physicians better understood the disorder, Ritalin became more popular, and it's still a commonly prescribed treatment today.

Many people have mixed symptoms of ADHD, and they continue to change over time. Younger children have more tendency of showing hyperactivity, whereas older children and adults often show more signs of inattention.

Today, ADHD is recognized as one of the most diagnosed childhood disorders continuing into adulthood. According to the Attention Deficit Disorder Association (ADDA):

- Around 6.4 percent of people age 11+ struggle with ADHD — that's more than 11 million.
- ADHD isn't limited to children and may persist throughout an individual's lifetime. Around two-thirds or more of kids with the disorder have challenges and symptoms that continue into adulthood and require treatment.

The advocacy group Children and Adults with Attention-Deficit/Hyperactivity Disorder (CHADD) says:

- Approximately 5.4 percent of people age 18 years old or under have ADHD, according to a meta-analysis of 175 worldwide research studies.
- Worldwide, the average prevalence in adults is 3.4 percent.

## Symptoms and Side Effects of ADHD

Key behaviors in ADHD are hyperactivity, impulsivity and inattention. Some individuals will wrestle with only one of these indicative behaviors, while others grapple with more or even all of them. Children often struggle with the combined form of ADHD. Hyperactivity is the most common symptom of ADHD in preschool.

While all people from time to time will have some unfocused motor activity, impulsivity and inattention, in those with the disorder, these behaviors:

- Occur more often
- Are more severe
- Reduce or interfere with the ability to function at work, school or socially

Recognizing an increase in these behaviors is your first step toward receiving a diagnosis.

### 1. Inattention

When living with the symptoms of inattention, you may often:



- Have troubles maintaining attention in tasks such as conversations, lengthy reading or lectures
- Miss or overlook details or make careless errors during activities like at your job
- Not listen or follow through on directions or instructions, start tasks but get easily sidetracked or lose focus rapidly
- Fail to finish tasks at home or in the workplace
- Not seem to be listening when others are speaking to you directly
- Have difficulties organizing activities and tasks such as keeping belongings and materials in order, failing to meet deadlines and having poor time management and sloppy work
- Dislike or avoid tasks requiring you to sustain a mental effort like completing forms, preparing reports or reviewing lengthy papers
- Lose things like pencils, tools, books, keys, wallets and cell phones necessary for activities and tasks
- Be forgetful in day-to-day activities like errands, chores, keeping appointments and returning calls
- Be distracted easily by unrelated stimuli or thoughts

## 2. Hyperactivity-Impulsivity

Symptoms of hyperactivity-impulsivity, mostly in children, may include:

- Squirming and fidgeting in your seat
- Dashing, running or climbing when it's expected you stay seated, such as in the office or classroom
- Having the inability to engage quietly in hobbies
- Talking nonstop
- Being in motion constantly or acting as if you're driven by a motor or on the go
- Blurting out an answer before the person finished the question, speaking before your turn or finishing the sentences of others
- Intruding or interrupting others in activities, conversations or games
- Having difficulty waiting your turn

Children need to have ~~symptoms~~ falling under this specific category type to receive an ADHD diagnosis.

Since ADHD symptoms can impact your relationships and your performance at work, you may also struggle with psychological issues through childhood and later.

- **Low Self-Esteem:** When living with ADHD, you may struggle with low self-esteem caused by the symptoms of the disorder. Low self-esteem may stem from difficulties you're experiencing at work and may occur with any of these ADHD symptoms. These challenges can lead to poor performance and underachievement which adds to your low self-esteem.
- **Anxiety:** You may develop anxiety along with your ADHD. The condition can cause intense worry regarding performance or organizational issues. These issues can trigger anxiety and, when untreated, can affect your ability to think clearly and lead to physical symptoms like sweating, racing heart and tremors.
- **Depression:** Depression is another possibility where you could experience a change in your mood such as helplessness and persistent sadness. You may feel an overwhelming sense of guilt, making your depression worse. Depression may also affect your behavior causing things like problems with sleeping and concentrating.

## Current Treatments Available and Their Side Effects

ADHD treatment relies on a combination of medications and behavior therapy. If treating the disorder in children, the prescribed dosage used will depend on how old the child is. Adults may benefit from these treatments as well.

### 1. Medications

Your doctor may prescribe the following medications for your or your child's ADHD:

- Methylphenidates, such as Concerta, Ritalin or Metadate CD
- Amphetamines, such as Dexedrine or Adderall

If you're experiencing bothersome side effects from these stimulant medications or they aren't working, your doctor may prescribe a non-stimulant medication such as:

- Kapvay (Clonidine)

- Strattera (Atomoxetine)
- Intuniv (Guanfacine)

The doctor may use these medications alone or combine them with other medications. Side effects of ADHD medications include:

- Decreased appetite
- Irritability and moodiness
- Sleep problems
- Stomachaches and headaches
- Tics
- Delayed growth
- Rebound or feeling irritable after your drugs wear off

The doctor may either change the dosage of your medication, the type of medication or the release formula of the medication if the side effects are becoming a problem. The aim is to determine what will provide you with the most benefit with minimal side effects.

## 2. Behavior Therapy

Behavior therapy helps teach parents strategies to improve their child's behaviors, such as positive reinforcement. Children will learn skills in communication, problem solving and self-advocacy. For the most success, doctors may prescribe behavior therapy combined with medication, rather than by itself.

Counseling helps you to recognize any problem behaviors you have and learn strategies to deal with them. Counseling can also benefit family members, allowing them to deal with the second-hand effects of ADHD.

## Discover How Easy It Is to Find a Dispensary or Medical Marijuana Doctor Near You

Obtaining medical cannabis isn't as difficult as you may think. It's easy to start your search online, but make sure to select a location that's in strict compliance with state laws. It's also convenient if the location is a one-stop resource including both a [dispensary](#) and



## Medical Cannabis for Adult Attention Deficit Hyperactivity Disorder: Sociological Patient Case Report of Cannabinoid Therapeutics in Finland

Aleksi Mikael Markunpoika Hupli

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### Keywords

Cannabinoid therapy · Attention deficit hyperactivity disorder · Case report · Finland · Qualitative research

### Abstract

This paper presents a detailed patient case report of a male patient who was diagnosed in adulthood (aged 33) with attention deficit hyperactivity disorder (ADHD) and treated initially with immediate-release methylphenidate (Ritalin<sup>®</sup>, 10 mg twice daily). After experiencing adverse effects from prolonged use of this medication and afterwards other medications that were prescribed as alternatives, the patient discovered that cannabinoid therapeutics (CT) had been experimented inside the EU area to treat patients with ADHD. Subsequently, he was evaluated by a physician in Germany (June 2010) who prescribed CT (Bedrocan<sup>®</sup>, Bediol<sup>®</sup>). A Finnish neurologist later confirmed the two prescribed medicines (Bedrocan<sup>®</sup>, October 2010; Bediol<sup>®</sup>, May 2011) in the patient's own country of permanent residence (Finland). During a 5-year period of access, Bedrocan<sup>®</sup>, which mainly contains  $\Delta^9$ -tetrahydrocannabinol ( $\Delta^9$ -THC), was found to be helpful in alleviating the patient's ADHD symptoms, in particular poor tolerance to frustration, outbursts of anger, boredom, and problems related to concentration. The second CT medication, Bediol<sup>®</sup>, which contains both  $\Delta^9$ -THC and the phytocannabinoid cannabidiol, was found to neu-

tralize the excessive dronabinol effects of Bedrocan<sup>®</sup> as well as to offer other medical benefits (e.g., improved sleep). In addition to the case report, this paper also offers a brief review of the literature surrounding the medical benefits of CT for AD(H)D, which includes observational studies, clinical case reports, and one randomized clinical experiment. This paper also briefly discusses the endocannabinoid system in relation to ADHD, although more preclinical and clinical research is warranted to establish the optimal levels of cannabinoids, terpenes, and dosing regimens, which vary between different ADHD patients.

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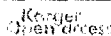
### Introduction

There are numerous qualitative and quantitative studies as well as a recent online study [1] reporting an association between attention deficit hyperactivity disorder (ADHD) and cannabis use [2–4]. Many studies, however, often interpret cannabis use as nonmedical, “recreational,” and/or drug abuse, not as a potential, albeit often illegal, form of (self-)medication. As with all medicines, the potential harms – and the risk of developing a substance abuse disorder – should be considered, especially for this patient group [5]. Nonetheless, it has been demonstrated that use of (non)medical cannabis can also help to keep

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adult individuals with ADHD away from other more harmful substances, like cocaine [6]. Observational studies have shown that medical cannabis patients in general use cannabinoids as a substitution for alcohol, illicit drugs, and/or commonly used prescription drugs for better symptom management, as well as to experience fewer side effects [7, 8].

This paper offers a medical sociological case study of a Finnish resident adult male diagnosed with combined-type ADHD. He was treated with standardized cannabinoids in botanical (whole-plant) form between 2010 and 2016, after experiencing adverse effects from immediate-release methylphenidate. The patient was prescribed cannabinoid therapeutics (CT) initially by a physician practicing in Germany, and the prescriptions were later confirmed by a Finnish neurologist. In December 2010 and in May 2011 the Finnish Medicines Agency (Fimea) authorized the patient's access to Bedrocan<sup>®</sup> and Bediol<sup>®</sup>, respectively, which he used on a daily basis until 2016.

A single detailed case study, although not generalizable to wider patient populations, brings important insights to further develop clinical practice and research around CT for adult ADHD patients. For a comprehensive review of cannabinoids in other neurological and mental health conditions see Fattore [9]. Before presenting the case report, this paper offers a brief review of the literature surrounding the medical benefits of CT for ADHD, which include observational research, clinical case reports, and one randomized clinical trial. This paper also briefly discusses the endocannabinoid system (ECS) in relation to ADHD. For a more comprehensive review of the ECS and impulsive behavior, see Wiskerke and Pat-  
tj [10].

#### *Surveys and Qualitative Studies*

In the author's previous study, an online survey with a convenience sample of university students in Amsterdam ( $n = 113$ ), the following qualitative answer was given by a respondent who identified himself as having ADHD in an open-ended question [11]:

Ritalin made me very slow and unable to concentrate. Cannabis on the other hand creates a state of hyperconcentration (which is more common amongst ADHDers). So it helps me sit still and read and helps me when writing essays. When in a state of hyperconcentration I write 2,000 words in an afternoon easily.

In *Marihuana, the Forbidden Medicine*, Grinspoon and Bakalar [12] offer a similar type of report from a California State University student using cannabis for his attention deficit disorder. Also, in a demographic survey of

4,117 cannabis users in California who applied to access medical cannabis between 2001 and 2007, the researchers state that "a significant percentage of male applicants under 30 had been treated or evaluated for treatment with Ritalin or other stimulants for attention deficit hyperactivity disorder (ADHD) as children and their histories of a preference for morning use of minimal amounts (*ofcannabis*) strongly suggest that inhaled cannabis enhances their ability to concentrate" (italics added by the author for clarity) [13].

In a six-country survey of (illegal) cannabis cultivators, ADHD was the fifth (15.3%,  $n = 2,070$ ) most commonly reported medical reason to grow and use cannabis, the most common ones being depression/anxiety and chronic pain [14]. According to the study, "Scandinavian growers seem to use cannabis for the treatment of ADHD more often than growers in other countries" [14, p. 253]. In a qualitative interview study of 100 (illegal) cannabis users in Norway, alleviating ADHD symptoms was the most common medical motive reported by the users [15].

#### *Clinical Studies and Case Reports*

In Germany, there was a detailed clinical case report in 2008 that depicted the medical benefits of cannabinoids, especially  $\Delta 9$ -tetrahydrocannabinol ( $\Delta 9$ -THC), for an adult male ADHD patient who had previously been unsuccessfully treated with methylphenidate [16]. In a larger series of clinical cases, also done in Germany with 30 treatment-resistant adults with ADHD, it was found that medical cannabis was helpful for a variety of symptoms, including improved concentration and sleep as well as reduced impulsivity [17]. Seventy-three percent ( $n = 22$ ) preferred to use only cannabinoids after the study, while 27% ( $n = 8$ ) continued to combine cannabinoids with other stimulant medications. The researchers also noted that "Many patients were diagnosed before with cannabis use disorders by psychiatrists in hospitals or medical practices due to misinterpretation of effective illegal self-medication. Patients reported that their therapeutic experiences were not taken seriously by most physicians and that they were not listening to them due to strong prejudices." The researchers conclude that "for adult patients with ADHD, who experience side effects or do not profit from standard medication, cannabis may be an effective and well-tolerated alternative."

So far, there is only one controlled study on cannabis-based medication in ADHD [18]. A formal clinical trial in the UK treating adult ADHD patients with the Sativex Oromucosal Spray<sup>®</sup>, a cannabinoid medication containing a 1:1 ratio of  $\Delta 9$ -THC to cannabidiol (CBD), found

that despite there being no statistically significant difference in the primary outcome of cognitive performance and activity level (measured by QbTest), the overall trend was that the active group ( $n = 15$ ) achieved better results than the placebo group ( $n = 15$ ) and reported reduced hyperactivity/impulsivity symptoms as well as improved emotional lability [18]. Further studies with other CT are warranted, as at least in Finland, the price of Sativex Oromucosal Spray<sup>®</sup> is a barrier for many patients.

#### *The ECS and ADHD*

ADHD is a multifaceted disorder involving multiple genes as well as neurobiological and environmental factors [19] in its age-related development and treatment. Recently increased attention has been given to the role of the ECS in ADHD. For instance, children with ADHD have been suggested to have impaired anandamide degradation compared to healthy control subjects [20]. In addition, genetic studies have found a correlation between the cannabinoid receptor gene and ADHD [21]. However, the link between endocannabinoids and ADHD comes often from preclinical models [22–25], which require further translation into clinical practice. This section does not seek to offer a complete picture of the ECS and the complex neurobiological and metabolic interactions involved, but rather seeks to offer some potential research directions and mechanisms of action for exogenous cannabinoids research as a potential pharmacological treatment for some of the main symptoms of ADHD.

The ECS, which includes the cannabinoid receptors (e.g., CB1, CB2) and the endocannabinoids anandamide and 2-arachidonoylglycerol, has also been found to interact with the central nervous system and the neuroimmune system [26, 27]. Traditionally, ADHD pathology has been associated with the dopaminergic system [19]. Cannabinoid 1 (CB1) receptors, which interact with the dopaminergic system [24, 28, 29], have been suggested as possible pharmacological targets to reduce hyperimpulsivity [10, 25, 30] and distractibility [16, 31, 32]. Therefore, exocannabinoids, such as  $\Delta^9$ -THC, hold potential as a pharmacological therapy, as they have been demonstrated to induce dopamine release in the human striatum [33]. It has been suggested that the brain regions where the modulation of endocannabinoids might lead to action restraint and to the regulation of impulsive action are the medial prefrontal cortex and the ventral tegmental area [10].

In addition to dopamine, the role of for instance glutamate, GABA, and other neurotransmitter systems need consideration, as well as *N*-methyl-D-aspartate and can-

nabinoid 2 (CB2) receptors, which have been suggested to modulate, for instance, impulsivity in interaction with endocannabinoids [10, 22, 23, 34, 35]. Therefore, further preclinical and clinical studies are warranted to map the complex interactions involved with the ECS in various pathophysiological [35]. The case report presented below offers potential directions for future research and clinical practice. As the studies above and the following case study show, CT seem to provide a valuable treatment option for a treatment-resistant adult AD/ID patient [31].

#### **Case Report**

The patient was contacted via the Finnish Medical Cannabis User Organization (Lääkekannabiksen käyttäjien yhdistys ry). The case report is based on a combination of interviews with the patient at his home, doctors' statements, medical records, and other documents relevant to the case provided by the patient and analyzed by the author since early 2016 with the full consent of the patient.

#### *Results*

The patient is an EU citizen, educated to Master's Degree level, and who has been permanently resident in Finland since 1995. In September 2003, at the age of 33 years, he was diagnosed with combined-type ADHD by a Finnish psychiatrist and prescribed immediate-release methylphenidate (Ritalin<sup>®</sup>, 10 mg twice daily). In particular, the patient's low frustration tolerance required pharmacological intervention to manage demanding work tasks that required sustained concentration and higher cognitive functioning, to reduce chronic distractibility, and to remain concentrated on tasks until completion.

From 2003 up until 2009, the patient consumed immediate-release methylphenidate on a regular basis, taking breaks from time to time to ease the negative impact of the medication upon his digestive system. During that 6-year period of use, methylphenidate clearly demonstrated efficacy, helping the patient to remain concentrated on work matters, particularly during work situations when he must remain seated for extended periods of time. Additionally, the patient received psychotherapy and guidance on alcohol dependency and on the management of the anger and violent outbursts that resulted from his low tolerance to frustration.

In 2009, however, under increasing work stress, the patient began noticing a lack of efficacy and an increase in the severity of the adverse effects (stomach problems, sweating, irritability, insomnia) from the immediate-release methylphenidate. These adverse effects forced him to make major changes to his diet to manage the worsening adverse effects of this stimulant medication, the most severe effects typically being stomach and lower bowel convulsions and pains. Upon further investigation, varicose veins were detected in the patient's left testicle, which became progressively more aggravated by the orally ingested methylphenidate. The patient's worsening stomach condition meant that he used methylphenidate less frequently, and he was offered a number of substitute prescriptions (e.g., Pramipexole<sup>®</sup>, Bupropion<sup>®</sup>, Buspirone<sup>®</sup>, Lorazepam<sup>®</sup>, Temazepam<sup>®</sup>, Alprazolam<sup>®</sup>) between January 2009 and August 2010. These medications, however, offered poor efficacy for the primary indication and only further exacerbated the

adverse effects suffered by the patient. The substitute prescribed to the patient that gave the worst adverse effects was the Pramipexole<sup>®</sup>/Bupropion<sup>®</sup> combination prescribed in July 2010, which rendered him unable to sleep for 4 whole days and nights, gave suicidal thoughts, pounding head pains, and excessive heart palpitations. Later, in October 2014, examination finally revealed a 2-cm hernia on the left side of the patient's lower bowel region.

Earlier in 2010, the patient became aware that there was a small European study where standardized medicinal cannabis products (manufactured by Bedrocan B.V. of the Netherlands), Bedrocan<sup>®</sup> and Bediol<sup>®</sup>, were prescribed to 2 European ADHD patients in Germany. The patient also became aware of recent amendments made to the Finnish Medicines Act, formally allowing the prescription of medicinal cannabis by Finnish doctors under special authorization by Fimea. The patient contacted the former Director of Fimea seeking clarification over the prescription of Bedrocan<sup>®</sup>. The Director informed the patient in a personal e-mail that Fimea has "no requirement regarding the prescriber which would not allow a psychiatrist to prescribe this product. Our criteria (coming from the Medicines Act) for the decision are that (1) other available treatments of the patient's condition have not given a favorable result or have been poorly tolerated and that (2) the indication applied for is medically justified."

After receiving this confirmation that the legal framework supported his right to access cannabinoids, the patient began to formally seek Bedrocan<sup>®</sup> as a substitute medication for methylphenidate. It was hoped that cannabinoids would offer equivalent or better efficacy with more tolerable adverse effects. After failing to find a Finnish psychiatrist or neurologist with sufficient medical knowledge of CT, the patient exercised his right to patient self-determination and finally, in June 2010, visited the prescribing physician behind the small European ADHD study in Germany. Afterwards, the patient returned to Finland with prescriptions for standardized Bedrocan<sup>®</sup> and Bediol<sup>®</sup> medicinal cannabis products.

Upon arrival to Finland, the next challenge for the patient was to find a suitable Finnish physician to validate the prescriptions for the cannabinoid treatment model. It took him until October 2010 – a period of almost 4 months – to find a suitably qualified neurologist who was prepared to endorse the treatment model. At that time, the patient presented the prescribing neurologist with a challenge: no Finnish neurologist or psychiatrist had previously substituted Bedrocan<sup>®</sup> for short-acting methylphenidate as a pharmacological intervention for a neuropsychiatric medical condition. Clinical guidelines for adult ADHD were only introduced in Finland in 2017, updating pediatric treatment guidelines published in 2007, which were updated for adolescents in 2013 [36]. These guidelines mention no possibility of CT for either adult, adolescent, or pediatric ADHD. However, the Bedrocan<sup>®</sup> application was submitted to Fimea in late November 2010 and approved by the end of December 2010.

As described in the statement made to Fimea by the prescribing physician, the use of Bedrocan<sup>®</sup> had a positive impact on the patient's ADHD symptoms, reducing hyperactivity, improving focus and impulse control, and giving better tolerance to frustration. However, during a period of increased stress due to the sudden and unexpected termination of the patient's full-time employment, in spring 2011, the use of Bedrocan<sup>®</sup> began to induce sleeping problems and agitation. The patient who participated in the small European study had highlighted Bediol<sup>®</sup>, the medicinal cannabis preparation rich in CBD, as being of value to reduce the potential

adverse dronabinol effects of Bedrocan<sup>®</sup>, such as sleeplessness and anxiety [31]. After an urgent consultation with his neurologist, the patient's second cannabinoid medication, Bediol<sup>®</sup>, was prescribed as an evening medication to address these adverse dronabinol symptoms. The authorization to access Bediol<sup>®</sup> was processed by Fimea in May 2011. Bediol<sup>®</sup> did indeed give the desired anxiety-reducing effects, and the patient's sleeping pattern improved significantly; he was now able to fall asleep quickly and sleep through the night with only the need to get up to urinate one or two times. To our knowledge, no single patient in Finland prior to that time had ever been prescribed two separate medicinal cannabis preparations concomitantly.

It was at this time in May 2011 that the patient also noticed the beneficial effects of Bediol<sup>®</sup> for secondary medical indications. Inflammation, resulting from an anterior cruciate ligament knee injury in November 2010, was reduced, as well as the patient's chronic pain in his left ankle and lower back. In addition to the pharmacological intervention, the patient also practiced supplementary physical therapies to build up the supporting muscles around the knee, including water therapy, hyperthermia treatments, cycling, walking, and gardening. The rehabilitation of the patient's knee was accomplished without the need for surgery or the consumption of any other pain or muscle relaxant medication. Since 2010, on two occasions only, has there been any knee instability. While further studies are warranted to confirm these secondary therapeutic benefits, the synergy between the two primary cannabinoid components, THC and CBD, has been reported earlier [37, 38].

The average daily dosage for the patient ranged between 1 and 2 g, usually with a 2:1 ratio of Bedrocan<sup>®</sup> to Bediol<sup>®</sup>. For fast absorption and convenient titration, the cannabinoids were administered via a Volcano vaporizer. The patient reported that when vaporizing, this method of administration delivered the full therapeutic effects rapidly (within 10–15 min). The botanical form gave the patient the ability to control dosage more flexibly, including the possibility to produce his own cost-effective extracts and tinctures. According to the patient, Bediol<sup>®</sup> was ideal for evening use, but also during activities that required prolonged sitting. In the patient's view, this was the key therapeutic value of Bediol<sup>®</sup> in combination with the Bedrocan<sup>®</sup> stimulant. Bedrocan<sup>®</sup> aided concentration and reduced distractibility; Bediol<sup>®</sup>, on the other hand, reduced feelings of anxiety and restlessness and the need to be on the go all the time, as well as reducing the patient's chronic pain indications.

Despite these therapeutic benefits, there remain barriers to successful CT in Finland. As seen above, finding a physician willing to prescribe medical cannabis, despite being legally able to do so, is one of the barriers. The high price of the medication as well as inconsistencies with regards to reimbursement of cannabinoid medications remain other key barriers for a successful cannabinoid therapy. These topics, however, will be explored in more detail in another publication.

## Discussion and Conclusions

The current study provides the first detailed investigation of CT for a male combined-type adult ADHD patient in Finland who accessed Bedrocan<sup>®</sup> and Bediol<sup>®</sup> for



more than 5 years. The patient found relief for his ADHD symptoms, the cannabinoids offering reduced hyperactivity as well as improved focus, impulse control, and better frustration tolerance. This is in line with clinical studies on medical cannabis for ADHD [16–18]. In addition, the patient experienced other medical benefits that contributed to his overall wellbeing, especially with the combination of the high-dronabinol product Bedrocan® and the moderate-dronabinol/high-CBD product Bediol® [31]. Russo and Guy [37, p. 242] have also concluded that “the data herein presented strongly support the therapeutic rationale for combining THC and CBD for therapeutic usage.”

Endocannabinoid signaling modulation through the dopaminergic system offers a promising target for pharmacological interventions, not only for ADHD [31] as shown above, but also for other neuropsychiatric disorders [9, 39], such as Tourette syndrome tics [40], fears [41, 42], anxiety [43, 44], as well as improving synaptic plasticity for emotional learning [45]. Although many questions remain, this paper argues that there is a plethora of supporting evidence that, for individuals who obtain no relief for their ADHD symptoms from prescription stimulants like methylphenidate and/or experience adverse effects from other pharmacological therapies, CT can offer a safe and efficient mode of treatment, potentially in conjunction with other forms of psychotherapy [31]. This was noted already 15 years ago by Ethan Russo [46, pp. 170–171], who “in his practice of child and adult neurology, has heard dozens of unsolicited testimonials to the benefits of cannabis in attention-deficit hyperactivity disorder (ADHD),” and also stated that “although the idea of using cannabis-based medicines for this indication may seem surprising to most experts, controlled trials of cannabis medicines for children (*and adults*) with ADHD seem clearly indicated, particularly in view of the controversies and side effects of existing psychotropic medications” (italics added by the author for clarity).

However, further longitudinal studies are needed to quantify the quality of life changes of ADHD patients who use CT. Also, what are the most efficient modes of administration and dosages [47] and what kind of (phyto)cannabinoid and terpenoid combinations [38] are effective for different ADHD patient profiles [3, 10] remain open research questions. For instance, Loflin et al. [3, p. 428] hypothesized that “cannabis might compensate for low frontal alpha relative and absolute power, which potentially underlies hyperactive symptoms.” Thus, therapeutic uses of cannabinoids could be more effective

among hyperactive-impulsive subtypes compared to the inattentive type of ADHD [3].

Before well-designed clinical trials have established the detailed mechanisms of action and potential positive patient outcomes for using CT, especially for individuals with ADHD, but also for other patient groups, clinical practice should take seriously the experiences of patients who find relief from cannabinoids. The amount of medical conditions reported to be alleviated with CT is vast [12, 48], and while the “evidence” is not always based on the golden standard of double-blind randomized placebo-controlled clinical trials, the well-established historical use of cannabinoids across the globe to treat human ailments [49, 50] gives reason to patients and medical professional alike to consider this treatment option. More medical sociological investigation of the general attitudes and knowledge of policymakers, patients, and treating physicians is warranted to identify possible barriers for CT, as lack of training for medical professionals, the high cost of the medication, and lack of government reimbursement remain the main barriers to continued therapeutic use of cannabinoids in Finland.

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#### Statement of Ethics

The author has no ethical conflicts to disclose. This case report was conducted in accordance with the ethical guidelines provided by the University of Tampere and the National Advisory Board on Research Ethics [51] with the fully informed consent and cooperation of the patient.

#### Disclosure Statement

The author has no conflicts of interest to declare.

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Your ADD symptoms can range from mild to severe, depending on your environment and physiology. You may be mildly hyperactive and inattentive when performing a task you don't like but can maintain focus on those you enjoy. Or you may struggle with more severe symptoms that can impact your work and social situations.

Furthermore, if you have another condition like anxiety or depression, it can worsen your symptoms.

Symptoms in adults can manifest differently than those in children. You may find trouble with executive functioning which is another prominent characteristic of ADD. Executive functioning is brain activity that manages your ability to monitor behavior by organizing and planning. Other symptoms you may experience include impulsivity and inattention and restlessness.

You may also experience learning, behavioral and emotional problems.

When dealing with hyperactive-impulsive symptoms, you may continuously feel "on the go" and restless as you attempt various tasks at once. You often speak and act before you think.

## Current Treatments Available for Attention Deficit Disorder and Their Side Effects

ADD currently has no cure. However, some treatments can help to improve functioning and reduce your symptoms. Common ADD treatments include medication, therapy or a combination of both.

### Medication

For many patients with ADD, medications reduce impulsivity and hyperactivity. Medications may also improve your ability to learn, focus and work. Stimulants are typically the first line of treatment for ADD.

#### 1. Stimulants

Although stimulants may sound a little unusual for treating ADD, they are effective. Researchers believe they're useful because they increase brain levels of dopamine, which plays a significant role in attention and thinking. Examples of stimulants include methylphenidate or amphetamine.

Side effects of stimulants may include:

- Decreased appetite
- Sleep problems
- Stomachaches and headaches
- Delayed growth
- Tics
- Irritability after medicine wears off
- Moodiness

## 2. Non-Stimulants

Non-stimulants take longer than stimulants to begin working, but they still help to improve impulsivity, focus and attention in patients with ADD. Your doctor may prescribe a non-stimulant if you've been experiencing troubling stimulant side effects or if stimulant medication hasn't been effective. Examples of non-stimulants include guanfacine and atomoxetine.

Depending on the non-stimulant medication, side effects may include:

- Loss of appetite
- Upset stomach
- Nausea
- Weight loss (due to less appetite)
- Sedation
- Fatigue
- Dizziness
- Mood swings
- Low blood pressure
- Heart rhythm changes

### 3. Antidepressants

Although the FDA hasn't necessarily approved antidepressants for the use of treating ADD specifically, doctors sometimes prescribe them to adult ADD patients. Tricyclics are the common antidepressants prescribed. They work similarly to stimulants by affecting the brain chemicals dopamine and norepinephrine.

Some side effects of antidepressants may include:

- Sleeplessness
- Loss of appetite
- Rebound
- Tics
- Emotional problems
- Headaches
- Stomachaches

Various brands of antidepressants have their potential side effects and benefits. Your doctor may have to try out a few different types or dosages before finding the one best suited for your symptoms.

### 4. Therapy

Therapy is another ADD treatment, but it may not treat ADD symptoms effectively. Nonetheless, when your doctor adds therapy to medication or another ADD treatment plan, it may help you and your family cope with the everyday challenges of ADD better.

In children and teens, teachers and parents can help with following directions and staying organized with tools like keeping a schedule and routine, giving rewards and praise for good behavior and using notebook and homework organizers.

In adults, a therapist or mental health provider can help manage ADD with tools like breaking large tasks into smaller tasks and keeping routines.

# Book Your Appointment to Start Your Medical Marijuana for Attention Deficit Disorder

If you're looking to treat your ADD symptoms but don't want to suffer with the harsh side effects of the medications for it, medical cannabis may be a better alternative.

As with all forms of medicinal marijuana, you need to have an extended talk with your or your child's doctor to determine the best way to administer medical cannabis for ADD. If your doctor believes that marijuana would be beneficial, talk to an expert at your local dispensary to find out the strains that are typically most effective for treating the condition.

If you've been on the fence about trying cannabis for attention deficit disorder, you may want to talk with others who have had success in using it for treatment. When you're ready to give it a try, search for a medical marijuana



## Resources:

1. <https://adaa.org/understanding-anxiety/related-illnesses/other-related-conditions/adult-adhd>
2. <https://add.org/adhd-facts/>
3. <https://www.cdc.gov/ncbddd/adhd/data.html>
4. <https://www.ncbi.nlm.nih.gov/pubmed/24093525>
5. <http://www.u.arizona.edu/~jkimbro/history.html>

Many people use ADHD and ADD interchangeably. The official name for ADD is Attention Deficit Hyperactivity Disorder. However, even some professionals continue to call the disorder by the ~~name ADD~~: ADD. Scientific field trial findings and advances changed the name to what it is currently. Today, researchers have supportive evidence that reveals ADD isn't a single specific disorder. Rather, it has several variations.

## Types of Attention Deficit Disorder

Based on the primary features associated with the condition, there are now three subtypes of ADD. Behavior symptoms are divided into impulsivity, inattentiveness and hyperactivity. The three subtypes for ADD are:

- Predominantly Combined Type
- Predominantly Inattentive Type
- Predominantly Hyperactive-Impulsive Type

These subtypes acknowledge that some ADD patients have little or no trouble sitting still, but they will show inattentiveness leading to great difficulty staying focused on activities or tasks.

Other ADD patients might have no issues paying attention to an activity or task. However, they end up losing focus because they're predominantly hyperactive-impulsive, which results in them having difficulty controlling movement and impulse.

The combined type is the most prevalent subtype. With this type, your symptoms are indicative of three of these characteristics:

- Inattention
- Hyperactivity
- Impulsivity

## What Causes Attention Deficit Disorder?

Although the exact cause at Attention Deficit Disorder isn't known, genetics and heredity seem to be a significant factor in the development of ADD. Lead exposure, certain illnesses like encephalitis or meningitis and exposure to substances like cigarette smoking and alcohol in-utero also increase the risk of developing ADD.



# Attention Deficit Disorder Statistics

According to the California Institute of Medical Research:

- 1 percent of adults in the U.S. population has ADD.
- 7 percent of these cases are severe.
- The lifetime prevalence of adult ADD in the U.S. is 8.1 percent.

## Attention Deficit Disorder History

ADD has been named by many names through history since its first medical research recording in the late 1700's. In 1968, it was included in health professionals' diagnostic manuals. And, for a while, ADD was called "Minimal Brain Dysfunction." As understanding and research of this disorder continued to grow over the decades, the description and diagnosis name of the disorder evolved.

Tests on lab rats in the 1940s showed that Ritalin could increase neurotransmitter levels in those with the ADD, which didn't become officially recognized as a disorder until the 1980s. Adderall was the next drug released in 1996.

ADD diagnoses have been increasing in children, too — rising from 6.1 percent in 2003 to 11.6 percent in 2007 and then again to 11 percent in 2011-12.

## Symptoms and Side Effects of Attention Deficit Disorder

ADD isn't a disorder that affects only children. Even though symptoms may develop in your childhood years, the condition can continue into adulthood. While hyperactivity seems to improve as a teenager, you may experience ongoing struggles with issues like disorganization, inattention and poor impulse control.

The benefits of medical cannabis for ADD are undeniable — as acceptance of this form of medicine continues to increase nationwide, hopefully, more patients will one day be able to take advantage of it.

A 2009 study explained the [link between the chemical compound 'anandamide' and dopamine](#) in ADD patients and dopamine. An ADD diagnosis means you have more anandamide, which is a neurotransmitter that binds to the THC receptor. In ADD patients, the fatty acid amide hydrolase (FAAH), the enzyme needed to break down anandamide, is insufficient. When this type of imbalance occurs in your body, you run out of your dopamine supply too quickly, making it hard to focus. Taking marijuana, however, regulates this dopamine supply and your mood.

## Attention Deficit Disorder Symptoms Treated by Medical Marijuana

Some symptoms of ADD treatable with marijuana include:

- **Hyper-impulsivity:** You have CB1 receptors that decrease and modulate neuronal activity and produce a calming effect.
- **Loss of focus:** THC, the chemical compound in marijuana, deconditions CB1 receptors.
- **Anxiety:** CBD works as an anti-anxiety agent and binds to your CB2 receptors.
- **Lack of attention:** THC will slow down the overactivity of your ADD brain, so you can stay focused on the task at hand.
- **Hyper-sensitivity to situations that are stressful:** CBD and THC help to relieve fear and anxiety.
- **Insomnia:** Since THC slows your brain down, it helps promote sleepiness.
- **Depressive tendencies:** When THC binds to your CB1 receptors, it enables the release of serotonin.

Here are some other ways marijuana can act beneficially:

- **Stimulates Appetite.** When on Adderall and some other medications, your appetite may decrease, making it difficult to eat it. If you don't eat enough, it can impact your

health negatively. Cannabis for attention deficit disorder treatment can help stimulate your appetite.

- **Treats Nausea.** Some medications for ADD can also leave you nauseous for extended periods of time, which is why many patients turn to marijuana instead. In fact, there have been numerous studies proving how [functional medical weed](#) [works](#).
- **Releases Dopamine.** As mentioned, weed also helps your body release dopamine, and this helps regulate mood. It can be especially useful for ADD patients who also struggle with mood disorders. Dopamine release is also [linked with reward](#), which is associated with other essential body processes that control appetite, attention, sleep and learning.

Patients also experienced improved sleep in other cases. All of the participants used a medical flower and dronabinol, a THC drug used for treating nausea and vomiting. Even though it was a small case study, researchers were still confident that marijuana is an effective treatment option for ADD patients, particularly those who don't respond well to typical treatment methods.

## How to Get Medical Marijuana for Attention Deficit Disorder

For you to qualify for medical cannabis, you need to have a diagnosed condition (in this case ADD) that's on your state's list of conditions that qualify for medical weed. With a doctor's recommendation, you can obtain your medical cannabis card and visit dispensaries to buy your cannabis products.

## Ways to Use Medical Marijuana for Attention Deficit Disorder

A lot of patients who have ADD are children, making smoking medical marijuana problematic. [One effective alternative method](#) is a tincture. It is a liquid, such as oil, that is an extract of cannabis. This extract sometimes consists of the leaves of the plant, but more often, it consists of the buds or flowers.

You take tinctures in the form of drops administered to the gums. Tinctures are extracted from a particular strain, or they can be a hybrid of multiple strains. These liquids tend to be highly concentrated, meaning patients don't need to take a lot to get the amount of medication they need to find relief. Much like smoking, tinctures will usually take effect very quickly — in as little as a few seconds, in some instances. Patients often report feelings of calm almost immediately after administering a dose. But it can take a while to determine exactly how much to take. Some people find they may need to take a bit more to achieve the effects they're looking for.

Many tinctures, however, have a somewhat bitter taste when taken in their concentrated form. Some patients find that mixing a tincture with their favorite morning beverage or in a mild tea at night will produce beneficial effects without the unpleasant taste.

## Best Strains of Marijuana for Attention Deficit Disorder

When receiving an ADD diagnosis, you'll need help concentrating. Certain cannabis strains can help you stay productive and focused while others provide a calming effect.

Mental engagement and energy strains may include:

- Sour Diesel (Sativa)
- Cinex (Sativa)
- Green Crack (Sativa)

Calming focus strains include:

- Blueberry Headband (Hybrid)
- True OG (Indica)

There are also strains that help you through the side effects of ADD medication like lack of appetite and insomnia. These include:

- Goo (Indica)
- Jupiter OG (Indica)

# Side Effects of Marijuana for Attention Deficit Disorder

When using medical pot for medical purposes, remember that like with any medication, there could be side effects. However, the side effects of this herb tend to be less harsh as those of traditional medicine. Some side effects may include:

- **Hunger:** Cannabis can make you hungry or give you “the munchies.” Just be sure to stock up on healthy food if you experience this side effect.
- **Red Eyes:** This side effect isn’t harmful, but it can be embarrassing since many people know what causes “bloodshot” eyes. Use some OTC eye drops to clear the redness up.
- **Respiratory Issues:** You only need to worry about this side effect if you smoke or vape the herb —although vaping isn’t as harmful as smoking.
- **Drowsiness:** If you use an indica strain, it could make you sleepy during the day, interfering with your daily functions. You may wish to use a sativa or hybrid strain during the day and save the indica for nighttime.

## More Information About Marijuana and Attention Deficit Disorder

Both anecdotal and clinical evidence suggest cannabis as a therapeutic treatment for ADHD is on the rise. This includes reports through online resources. Out of 268 forum threads found online, [25 percent of 401 posts](#) in the threads indicated marijuana is therapeutic for ADHD.

## Attention Deficit Disorder

Now that you’ve learned how effective medical marijuana for Attention Deficit Disorder can be, let’s take a closer look at what ADD is, its symptoms, treatments and other essential information.

## What Is Attention Deficit Disorder?

ADD is a developmental, neurobiological-based disability that affects around [three to five percent of the population on average](#).

## Medical Marijuana for ADHD??

Updated on January 31, 2019. Medical content reviewed by [Dr. Joseph Russo, MD, M.B.A.](#), Chief Medical Officer

A developmental condition like attention deficit disorder (ADD) is a condition with symptoms that medical marijuana may be able to treat. Because ADD can cause symptoms like impulsivity, restlessness and inattention that can interfere with work or school, it's important to manage the condition with a treatment like cannabis. Let's explore more about ADD, its symptoms and how marijuana and attention deficit disorder treatment can help you.

### How Is Medical Marijuana an Effective Treatment for Attention Deficit Disorder?

Having to live with ADD can be paralyzing and stressful. However, many ADD patients have found relief and control using medical marijuana. In fact, a 2014 study suggests that people who are impulsive and hyperactive tend to be more likely to turn to weed.

Cannabis can help sufferers of this condition with being able to pay attention, focus their attention on a specific subject, and formulate ideas in their head that they could not before. Cannabis truly helps ADD sufferers stay on task and help them keep their lives on track. Marijuana, in its most natural form, is one of the safest and therapeutically active substances known to man.

# Effects of Marijuana on Mental Health: Attention Deficit-Hyperactivity Disorder (ADHD)

**ADAI** | ALCOHOL &  
DRUG ABUSE  
INSTITUTE

*Susan A. Stoner, PhD, Research Consultant*

## Highlights

- Both ADHD and marijuana use are associated with impaired attention, inhibition, and executive function.
- Expectations that marijuana would make symptoms of ADHD worse are not borne out by the scant research available on this topic.
- Evidence suggests that those with ADHD are at increased risk for developing cannabis use disorders.
- Despite widespread belief that marijuana has medicinal benefits for ADHD, there is virtually no research evidence to support this belief.
- Marijuana cannot be safely recommended for the treatment of ADHD at this time; at best, it might be considered as a last-line therapy when all other conventional therapies have failed.<sup>26</sup>

## Introduction

Marijuana is the most commonly used drug of abuse in the United States.<sup>1</sup> As found in the 2015 National Survey on Drug Use and Health, 22.2 million people aged 12 and older had used marijuana in the past month.<sup>1</sup> Research suggests that marijuana use has increased over the past decade<sup>2-4</sup> as perceptions of risk of harm from using marijuana among adults in the general population have steadily declined.<sup>4</sup> As of June 2017, 26 states and the District of Columbia have enacted laws that have legalized marijuana use in some form, and 3 additional states have recently passed measures permitting use of medical marijuana.<sup>5</sup> Mental health conditions figure prominently among the reasons given for medical marijuana use<sup>6</sup>, yet there is a dearth of rigorous, experimentally controlled studies examining the effects of marijuana on mental health conditions.<sup>7</sup> This research brief will summarize what is known about the effects of marijuana on attention deficit-hyperactivity disorder (ADHD).

## Overview of Complexities in Specifying Marijuana Effects

Any summarization of the effects of marijuana on mental health would be lacking without a brief overview of complexities in specifying marijuana effects. Unlike, say, methamphetamine, marijuana is not a single chemical compound. As a plant, marijuana is composed of more than 500 chemical substances.<sup>8</sup> Only a fraction of these have been studied. It is generally understood that the psychotropic substance in marijuana that is primarily responsible for its intoxicating effects is delta-9-tetrahydrocannabinol (THC).<sup>9</sup> More than 100 other compounds have been identified in marijuana that are chemically related to THC, called cannabinoids.<sup>8</sup> Cannabinoids exert their effects through the relatively recently discovered endocannabinoid system; only since the late 1980s has it been recognized that humans and other mammals have cannabinoid receptors throughout the body and endogenous cannabinoids that modulate the effects of neurotransmitters and other cellular mechanisms in ways that are not yet fully understood but that have generated intense interest as potential targets for therapeutic drug development, including drugs for mental health.<sup>9</sup> Of the two known cannabinoid receptors, CB1 and CB2, CB1 is expressed

Table 1. CNS and cardiovascular effects of THC and CBD.

	THC	CBD
Anticonvulsant	+	++
Muscle relaxant	++	+
Analgesic	++	+
Anxiolytic	±	++
Antipsychotic	-	++
Neuroprotective	+	++
Antiemetic	++	+
Sedation	+	-
Bradycardia	-	+
Tachycardia	+	-
Hypertension	+	-
Hypotension	-	+

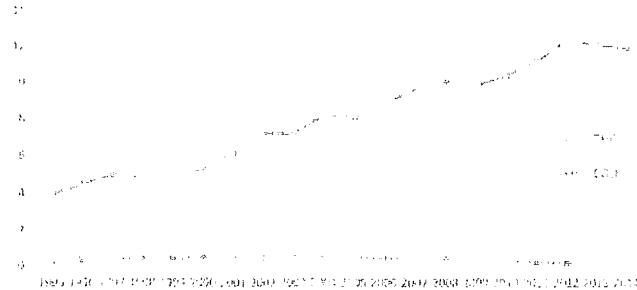
Adapted from Russo E, Guy GW. A tale of two cannabinoids: the therapeutic rationale for combining tetrahydrocannabinol and cannabidiol. *Medical Hypotheses*. 2006 Dec 31;66(2):234-46.

abundantly in the brain and central nervous system (CNS) while CB2 expression is low in the CNS but high in peripheral immune cells and tissues.<sup>10</sup> Psychoactive effects of marijuana are attributed to CB1 receptors whereas CB2 receptors are non-psychoactive.<sup>9, 10</sup>

Aside from THC, the most studied phytocannabinoid is cannabidiol (CBD).<sup>11</sup> CBD has been described as nonpsychotropic due to the fact that it appears to be non-intoxicating and non-reinforcing, but it does appear to be psychotropic insofar as it appears to have pharmacological benefits with regard to anxiety, schizophrenia, addiction, and depression.<sup>12</sup> Table 1 summarizes the major CNS and cardiovascular effects of THC and CBD.<sup>11</sup> CBD has been demonstrated to attenuate certain effects of THC, including intoxication, sedation, and tachycardia.<sup>11</sup> In modern clinical trials, this has permitted the administration of higher doses of THC in an effort to maximize therapeutic effects while minimizing side effects.<sup>11</sup> It is largely unknown how the interaction of THC and CBD plays out in practical use of marijuana by medicinal and recreational marijuana users.

Research on cannabis products seized by the US Drug Enforcement Agency (DEA) shows that the potency of marijuana in common use has increased dramatically in the last 2 decades, at least in terms of THC content.<sup>8</sup> As shown in Figure 1, from 1995 to 2014, the average THC content of seized cannabis products virtually tripled from approximately 4% to approximately 12%.<sup>8</sup> On the other hand, average CBD content fell from approximately 0.28% in 2001 to < 0.15% in 2014, resulting in a change in the THC:CBD ratio of 14:1 in 1995 to approximately 80:1 in 2014.<sup>8</sup> This means that, on average, the cannabis products seized in 2014 were presumably far more

Figure 1. Average Concentration (%) of THC and CBD in Cannabis Samples Seized by DEA, 1995-2014



Source: ElSohly MA, Mehmedic Z, Foster S, Gan C, Chandra S, Church JC. Changes in cannabis potency over the last 2 decades (1995-2014): analysis of current data in the United States. *Biological Psychiatry*. 2016 Apr; 1:79(7):613-9.

intoxicating and than those seized in 1995 – and marijuana and cannabis products that are in common use may bear little resemblance to marijuana supplied by the federal government for marijuana research.<sup>13</sup> In terms of strength, the National Institute on Drug Abuse considers less than 1% to be low, 1-5% to be medium, 5-10% to be high, and over 10% to be very high.<sup>14</sup> An examination of the online menu of one of Seattle's most popular recreational marijuana stores in June 2017 listed over 100 varieties of marijuana "flowers" that were labeled as 20% THC or higher, with THC content going as high as 30%. For many of these, CBD content was not listed. By comparison, there were only 20 varieties with listed THC content under 10%. Marijuana concentrates were labeled as having THC content as high as 97%. From a scientific standpoint, the effects of cannabis products with such levels of THC on mental health have largely not been studied.

Individual differences in objective and subjective effects of marijuana vary by individual, variety/strain, dosage, route of administration, personality, degree of tolerance, and other factors.<sup>9</sup> Many of the psychological effects of cannabis and THC are biphasic and bidirectional.<sup>9</sup> Acute marijuana intoxication is generally associated with euphoria, subjective quickening of associations, relaxation, decreased motor activity, a sense of calm, increased awareness of sensory experience and internal sensations of the body, transient sensory experiences, synesthesia, craving sweet and salty foods, enhanced perception of current activities, increased salience of stimuli, simultaneous focus on multiple things, impaired shifting of focus, fantasies of power, and belief of having arrived at a transcendent insight.<sup>15</sup> With regard to neurocognition, marijuana intoxication is associated with deficits in processing speed, attention, working memory, decision-making, motivation, time-perception, and reality testing.<sup>15</sup> Considering the broad range of effects, one can begin to imagine how marijuana could have beneficial or harmful effects with regard to mental health.

Tolerance to certain effects of marijuana develops with regular use, within several days in some cases,<sup>9</sup> as a function of CB1 receptor expression downregulation.<sup>10</sup> Research suggests that after tolerance develops it can take several



weeks of THC-free recovery for CB1 receptor expression to return to baseline levels.<sup>10</sup> Because of tolerance, the eventual downregulation of CB1 receptors with chronic use means that any benefit derived from THC with regard to mental health could result in symptom exacerbation when users are not under the influence of THC.<sup>10</sup>

### **The Role of the Endocannabinoid System in ADHD**

It is unknown precisely how the endocannabinoid system (ECS) may be involved in ADHD. A small preliminary study found that degradation of the endocannabinoid anandamide (AEA) was impaired in a small sample of drug-free boys with ADHD.<sup>16</sup> AEA impairs memory and attention by reducing the activity of the dopamine transporter system. The ECS may also be involved in ADHD through its involvement in reward circuits in the brain.<sup>10</sup>

### **Effects of Marijuana on Cognition**

Marijuana intoxication has well-documented deleterious effects on cognition, including impairments in attention and inhibition, verbal learning and memory, working memory, executive function, and psychomotor function.<sup>17</sup> Adults who use marijuana chronically have demonstrated poorer performance on tests of attention, executive functions, learning and memory, visuospatial skills, and processing speed. Adolescent marijuana users show attention, working memory, and learning abnormalities that persist at least 6 weeks following cessation of use, but that these deficits may resolve with longer term abstinence.<sup>18</sup>

Most relevant to ADHD, impaired attention is generally considered a hallmark of being under the influence of marijuana. Numerous studies have demonstrated dose-dependent impairments in focused, divided, and sustained attention tasks that may be attenuated with tolerance among daily users. Active adolescent and adult marijuana users as well as those abstinent for several weeks show impairments on measures of sustained and divided attention, processing speed, rapid visual information processing, visual search, tracking, trail making, and paced serial addition. Increasing abstinence is generally associated with improvements in performance.<sup>17</sup>

Executive functions are differentially affected by acute and chronic exposure to marijuana. Several studies have demonstrated impairments in planning, reasoning, interference control, and problem solving tasks with administration of THC. With regard to the chronic effects of marijuana, findings on executive function are less consistent. Studies in which executive dysfunction was detected tended to have older samples than the studies in which no impairments were observed, which included predominantly adolescent and young adult users.<sup>17</sup>

### **Effects of Marijuana on Cognition in ADHD**

Few studies have investigated the neurocognitive performance of individuals with both a history of ADHD and regular marijuana use. Tamm et al.<sup>19</sup> compared young adults with a childhood ADHD diagnosis who did (n=42) and did not (n=45) report marijuana use at least monthly in the past year to a normative comparison group (controls) who did (n=20) and did not (n=21) report past year regular marijuana use on neuropsychological measures. Findings indicated that ADHD group performed worse than controls on measures of verbal memory, processing speed, cognitive interference, decision-making, working memory, and response inhibition. There were no significant effects for marijuana use in either group, and no interactions between ADHD and marijuana use were found. A small study of the effects of ADHD and marijuana use on brain functional architecture in young adults with a similar experimental design produced similar findings that marijuana use does not exacerbate ADHD-related functional alterations in brain architecture.<sup>20</sup>

### **Opinions on Therapeutic Use of Marijuana by those with ADHD**

Clinical and anecdotal evidence suggest an increasingly popular perception that marijuana use is therapeutic for ADHD. A qualitative study of online forum threads regarding ADHD and marijuana found a disproportionate number of comments favoring the therapeutic over harmful effects of marijuana for ADHD that was specific to ADHD and not observed when mood, non-ADHD psychiatric conditions, or general quality of life were considered.<sup>21</sup> Comments extolling the therapeutic effects of marijuana for ADHD predominantly pointed to improvement in inattentive symptoms rather than symptoms of hyperactivity or impulsivity. A number of comments indicated that marijuana was

perceived as being "medicinal" or sanctioned by healthcare providers. Findings suggest that patients seeking information regarding effects of marijuana on ADHD will find information on Internet forums biased toward marijuana improving ADHD that is not reflective of what is found in the medical and research literature.

Interestingly, a qualitative study of marijuana users in Norway (where marijuana use is illegal) found that a considerable proportion of participants reported that they used marijuana for what they perceived as medical reasons, and self-diagnosed ADHD was most prevalent. Traditional ADHD medication was described as having many more negative effects than marijuana. Marijuana use was perceived as reducing symptoms associated with self-diagnosed ADHD, and these effects were taken as evidence for the validity of the self-diagnosis. Using marijuana medicinally for self-diagnosed ADHD was considered less stigmatizing than using it for intoxication and recreation.<sup>22</sup>

As of June 2017, ADHD is not specifically listed as a qualifying condition for a medical marijuana card in any of the states that allow for medicinal use of marijuana.<sup>23</sup> Physicians point out that marijuana can have neurocognitive effects that are, in many cases, the opposite of what patients and parents are trying to achieve, e.g., decreased concentration, irritability, and anxiety. It has been noted that even where there is some good quality evidence beneficial effects of medical marijuana or cannabinoids for certain conditions in adult patients, caution should be used in generalizing the evidence to children and adolescents due to the vulnerability of the developing brain to environmental toxins and substances, wide variation in forms of medical marijuana, and evidence of an association between adolescent marijuana use and later adverse psychosocial outcomes.<sup>24</sup>

### **Evidence on Therapeutic Use of Marijuana in ADHD**

A case report of a 28 year old man with ADHD purported to show improvements in behavior, motor function, mood, and driving skills while under the influence of dronabinol, a synthetic THC analog, compared to when he had abstained from the drug.<sup>25</sup> However, his poorer performance while abstinent may have been reflective of combined ADHD and cannabinoid withdrawal rather than ADHD alone.<sup>26</sup>

A survey of 76 adults (56 men, 20 women) with ADHD examined the relationship between marijuana use and ADHD symptoms and sleep quality. Frequency of marijuana use was positively associated with number of inattentive symptoms among men but women and negatively associated with sleep quality among women but not men. Although intent was not assessed, findings suggest men and women with ADHD may be using marijuana for different reasons, which include an attempt to self-medicate ADHD symptoms.<sup>27</sup>

A large national survey of 2811 marijuana users examined the relationship between subtypes of ADHD and marijuana use.<sup>28</sup> The researchers examined how proportions of daily and nondaily users differ in terms of meeting symptom criteria for specific subtypes of ADHD when not using marijuana. Findings revealed that, overall, daily users met more symptom criteria than non-daily users. A higher proportion of daily users met criteria for the hyperactive-impulsive or combined subtypes than the inattentive subtype. Non-daily users did not show a difference in proportions between subtypes. Casual and moderate users showed no significant difference in the likelihood of meeting symptom criteria for an ADHD diagnosis, which the researchers interpreted as lending further support to the self-medication hypothesis of cannabis use for those affected by the hyperactive-impulsive or combined subtypes of ADHD.

Cooper et al.<sup>29</sup> conducted a recently published pilot randomized double-blind, placebo-controlled trial of Sativex, an oromucosal spray consisting of THC and CBD in a 1:1 ratio, in 30 adults with ADHD in the United Kingdom, investigating effects on cognitive performance, activity level, and behavioral symptoms of ADHD and emotional lability. For ADHD symptoms, in the active group, marginally significant improvements were found for hyperactivity/impulsivity and trends towards improvements were found for inattention and emotional lability. Effect sizes were comparable to those previously reported for treatment of ADHD with stimulant medications. While there was no change in functional impairment, the study period may have been too short to assess functional outcomes. Although participants were intended to be blind to the medication that they received, the investigators noted that the correct guess rate was high, indicating that participants noticed the presence or absence of expected effects, which may have affected their self-reported outcomes. The investigators concluded that the findings provide preliminary support for further investigations of Sativex and other compounds targeting the endocannabinoid system in ADHD.

## ADHD and Marijuana Use and Use Disorders

One of the most common problems associated with ADHD is co-occurring substance abuse. In a meta-analytic study childhood ADHD was found predict later development of use disorders for nicotine, alcohol, marijuana, cocaine, and other substances.<sup>30</sup> Conversely, a 25-year prospective longitudinal study found that the extent of marijuana use by age 25 positively predicted the extent of adult ADHD symptoms at age 25, and this association was not explained by social, family, cognitive, or behavioral factors.<sup>31</sup> Current and childhood ADHD symptoms predicted cannabis-related outcomes in a non-clinical sample of young adults.<sup>32</sup> Specifically, current and childhood inattention predicted more severe cannabis outcomes in young adulthood, including higher levels of current use and/or dependence, craving, and use-related problems. Childhood hyperactivity-impulsivity predicted earlier initiation of marijuana use. Individuals with childhood ADHD that persisted into early young adulthood had a greater likelihood of marijuana dependence throughout the young adulthood years (18-22 years old) compared to those without ADHD and those with childhood-limited ADHD.<sup>33</sup>

A representative, population survey of adults in Ontario, Canada, found that hyperactive and impulsive symptoms were associated with problematic cannabis use in men but not women. By contrast, inattentive symptoms predicted problems with cannabis in women but not men.<sup>34</sup> Notzon et al.<sup>35</sup> estimated the prevalence of ADHD in a population of 99 adults seeking treatment for marijuana use disorders using a combination of well-validated questionnaires. Findings yielded an estimated prevalence of adult ADHD in this population of between 34% and 46%, which the authors noted is consistent with estimates of prevalence in two prior studies of marijuana use disorders but higher than those from most studies of substance use disorders as a whole. Similarly, a review of electronic health records of 483 adolescents presenting for treatment for substance use disorders found that 33%, 35%, and 38% of adolescents with marijuana dependence, abuse, and problem use, respectively, were diagnosed with ADHD.<sup>36</sup> It was noted that, because regular use of marijuana produces neurocognitive changes in executive functioning similar to ADHD, making a diagnosis of ADHD in a person actively using or recently abstinent from marijuana is fraught with difficulty. Thus, high apparent comorbidity between marijuana use disorder and ADHD may reflect marijuana-induced neurocognitive disorder rather than true ADHD, or a combination of both.<sup>37</sup>

## Conclusions

In summary, both marijuana and ADHD are associated with deficits in cognition. ADHD is associated with impaired attention, inhibition, and executive function. Marijuana use is also known to cause impairments in attention and inhibition, and executive function among other cognitive impairments. Thus, one would expect the effects of marijuana to exacerbate symptoms of ADHD rather than improve them. Surprisingly, the research thus far has not demonstrated this although only a few small studies have been conducted. On the other hand, despite widespread belief that marijuana has medicinal benefits for ADHD, there exists virtually no research evidence to support this belief. Evidence does suggest that those with ADHD are at increased risk for developing cannabis use disorders. Given the current scarcity of data, marijuana cannot be safely recommended for the treatment of ADHD at this time. At best, it might be considered as a last-line therapy when all other conventional therapies have failed.<sup>26</sup>

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