Today's Cannabis & The Adolescent Brain

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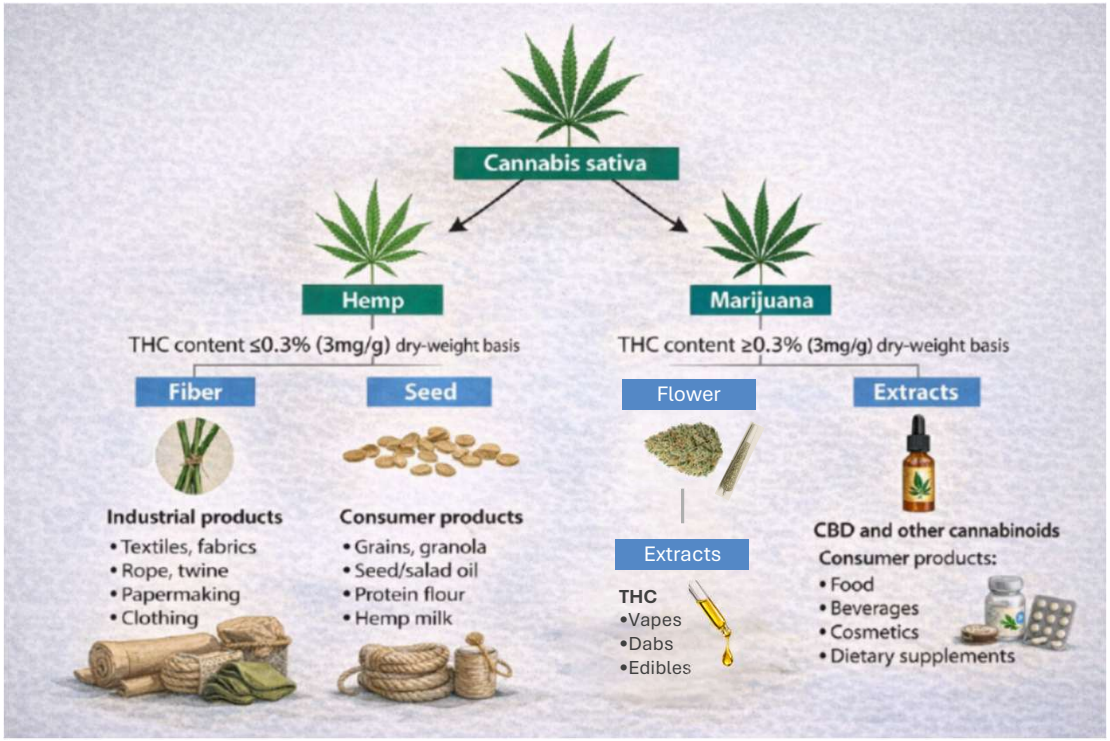
Key Points

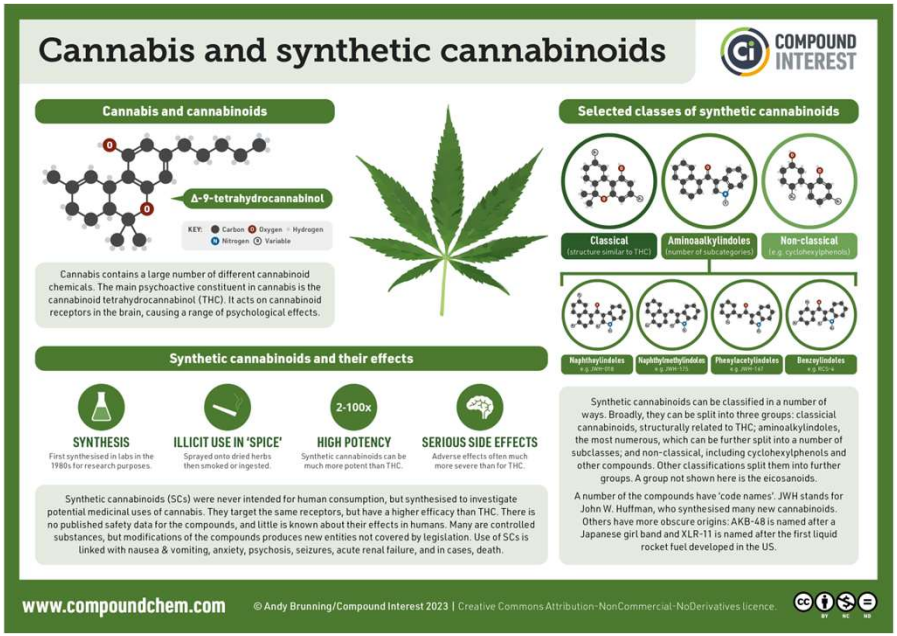
- **The Cannabis of Today**
  - Rising THC content in commercial products increases harm
  - The landscape of hemp-derived intoxicating cannabinoid products
- **Adolescent Brain Development**
  - Adolescent Brain Development Teens (<19yrs) and Young Adults (19-25yrs)
    - New data shows adolescence until 32yo
  - The role of the endocannabinoid system in brain development
- **Adolescent Cannabis Use is Particularly Risky**
  - The adolescent brain is especially vulnerable to cannabis/THC use.
  - Cannabis use can affect a young person's health and development.
  - The negative mental health effects linked to cannabis use, are especially concerning for young people.

The Cannabis Plant

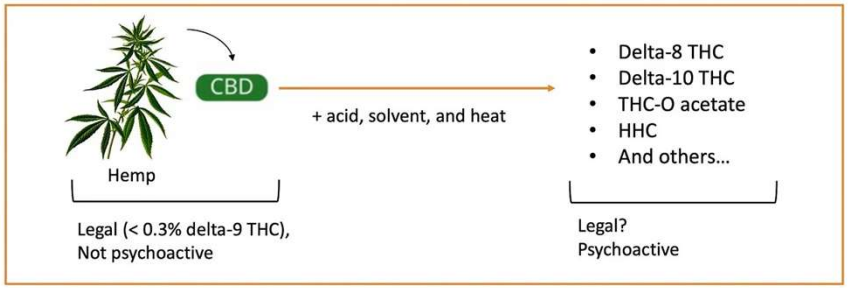


Adapted from: https://www.everycrsreport.com/reports/R46189.html

- The Cannabis Plant contains ~550 chemical components
- Delta 9 **T**etra**h**ydro**c**annabinol (d9THC) and **C**anna**bid**iol (CBD) are the two most studied cannabinoid components
- d9THC is a partial agonist at CB1 receptors in the brain, and is psychoactive (producing a high)
- CBD produces more of a calming effect, with limited activity at CB1 receptors



Hemp-derived Intoxicating Cannabinoids

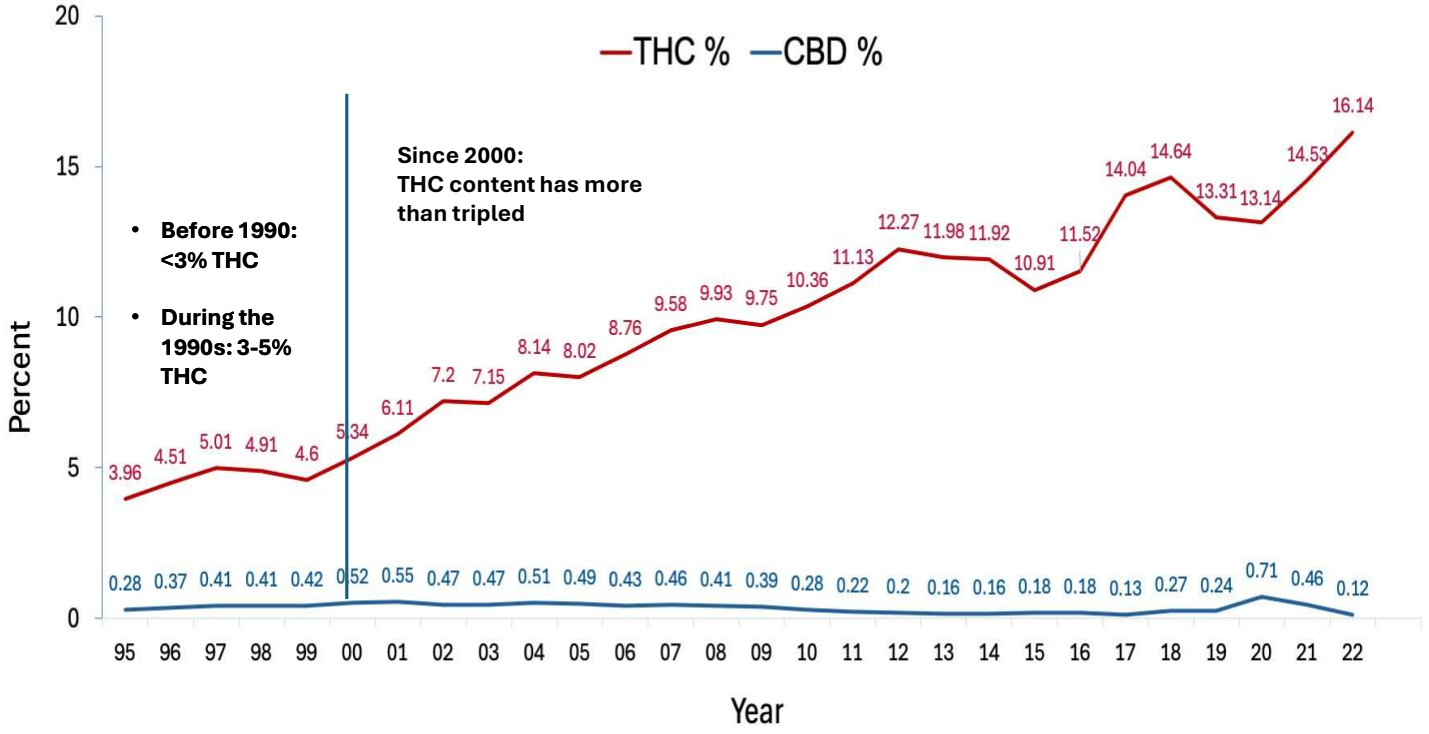


Potency: Today's High THC Products Are Driving Cannabis-related Harm

- **Potency** as a term in pharmacology, reflects the drug's biological activity which is distinct from efficacy (the maximum effect a drug can produce) and strength (the amount in a dosage form).

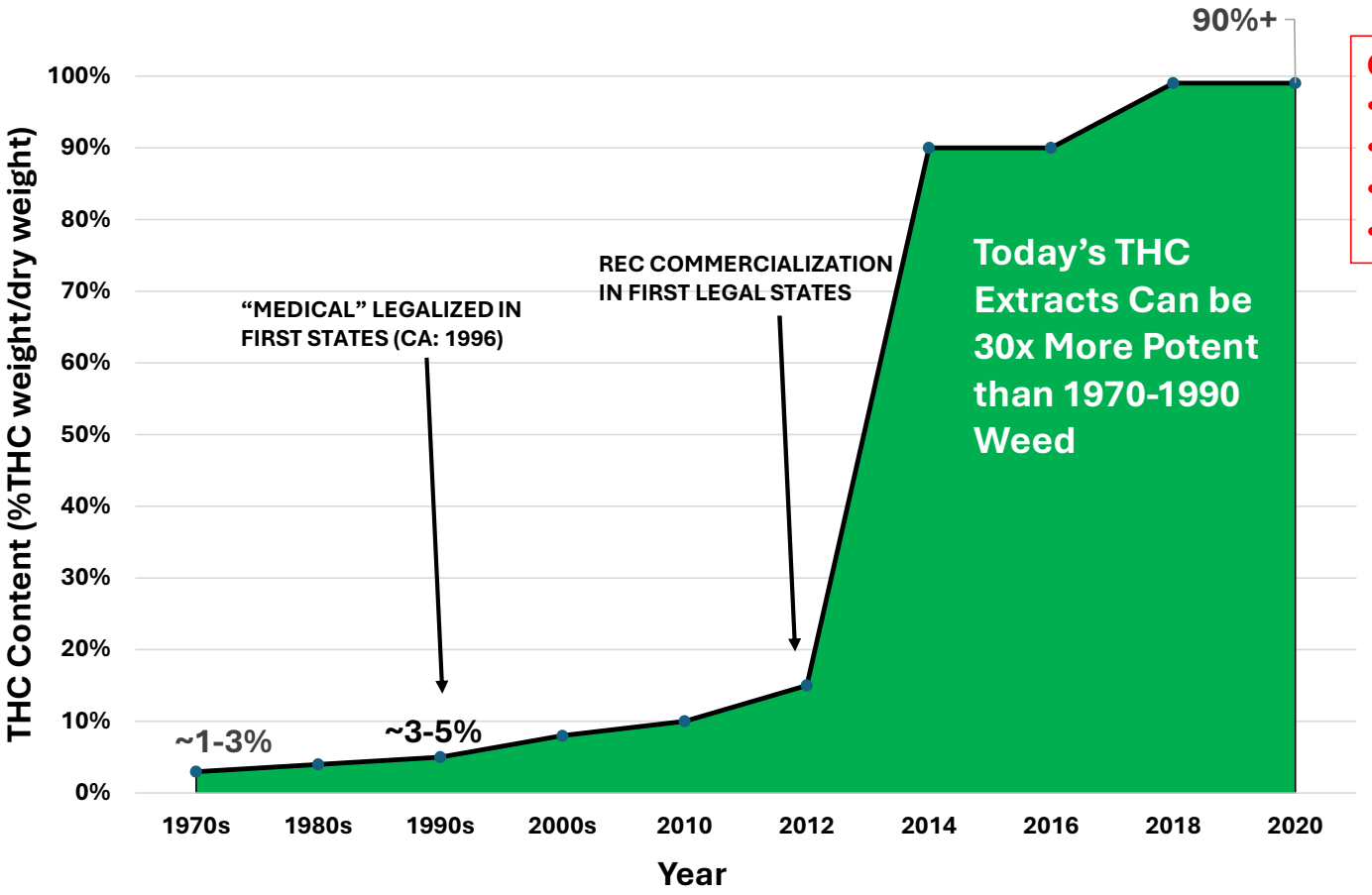
- **d9THC Potency:** most often this is referring to the strength of a cannabis product, THC content, amount of THC in a cannabis product.
  - Often given as **%THC**, meaning %d9THC weight/dry weight of product.
  - **Generally, products containing >10% THC (100mg/gram) are considered high potency**
  - A 10mg dose can be considered a high single dose.

Percentage of THC and CBD in Cannabis Samples Seized by the DEA, 1995-2022



SOURCE: U Miss, Potency Monitoring Project

Estimated THC Content Over Time



Commercialization=

- Greater high
- More tolerance
- More people use
- More addiction

1 joint today

100mg THC in 0.333g joint (30%THC)

Could be as powerful as

≥10 joints in 1970-1990

10x 10mg THC in 0.333g joint (3%THC)

- Then (1970-1990): There used to be ~0.333g (333mg) 3% THC flower in a standard joint = ~10mg THC shared by several people;

- Now (2020s): 0.333g (333mg) 30% THC joint = ~100mg THC. Many pre-rolls available at licensed dispensaries contain 0.5g or 1g of 30% flower = ~150mg or 300mg THC, sometimes with added concentrate crystals for higher amounts of THC.

1 vape cart today

Could be as powerful as

≥90 joints in 1970-1990

903mg THC in 1g vape cart

Sativa

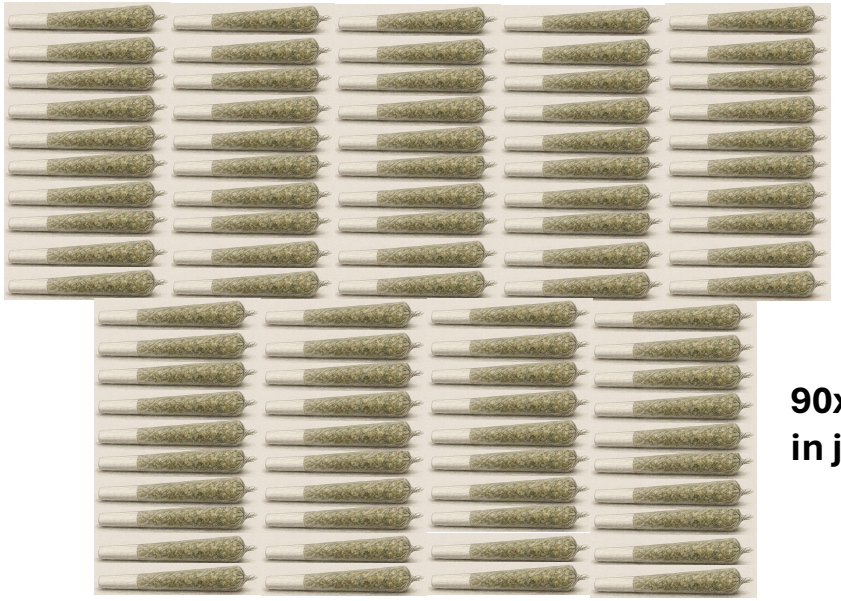
Strawberry Mochi [1000mg]

Phat Panda

Panda Pen All-In… (EA…

THC 90.30%

$55.00



90x 10mg THC in joints of 1990

National Institute on Drug Abuse (NIDA) & Federal Drug Administration (FDA)- Defined THC Dosing

NIDA Notice Issued May 7, 2021:

The purpose of this Notice is to inform research applicants of a new requirement to measure and report results using a standard THC unit in all *applicable* human subjects research, beginning May 7, 2021.

- **A standard THC unit is defined as any formulation of cannabis plant material or extract that contains 5 milligrams of THC.**

- FDA-approved dronabinol (Marinol) = lab-made d9 THC
- Approved to treat chemotherapy-related nausea and vomiting and for appetite stimulation in patients with advanced HIV.
- 2.5mg, 5mg, 10mg tabs
- **30mg max dose for 150lb person** (after 2 week titration) to avoid AEs including THC-induced psychosis and cannabinoid hyperemesis syndrome (CHS)

5g of 90% THC concentrate

Could be equivalent to

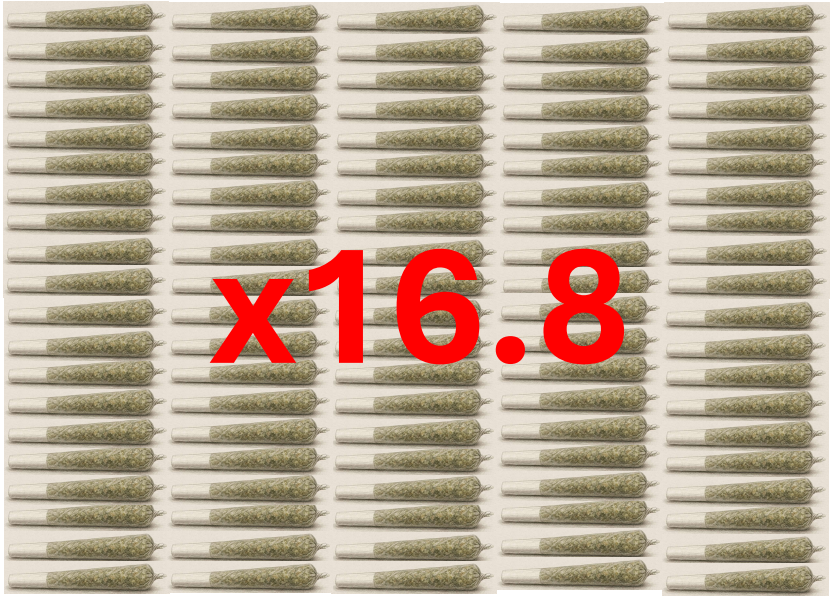
450 joints in 1990

(= 900x 5mg NIDA-defined dose units)

2oz of 30% THC flower

Could be equivalent to

1,680 joints in 1990



(= 3,360x 5mg NIDA-defined dose units)

And from the creators of JUUL: **PAX Labs**

- In 2017, JUUL (nicotine) split off from parent company PAX Labs (cannabis).
- In 2018, Altria, the parent company of Philip Morris, spent $billions for a stake in JUUL and a stake in a Canadian Cannabis company. As of 2024, Altria holds 40.9% share in Cronos.

Blueberry Haze - PAX High Purity THC Pod

by PAX VAPE

THC 91.0%

Shop Nearby From $12.00

SATIVA | VAPES > SPECIALTY VAPE

Blueberry Haze offers a fusion of euphoria and relaxation. This sativa combines sweet Blueberry with the uplifting buzz of Haze, creating a blend perfect for charging up for your day. This strain envelops you in calm while stimulating the mind, making it ideal for creative hobbies and activities. -- THC: 80% CBD: <2% Terpenes: D-Limonene, beta-Myrcene, beta-Pinene Aromas: Fruity, Earthy Flavors: Blueberry, Sweet Vanilla Effects: Calming, Mood-Enhancing

Pineapple Whip - High Purity THC Pod

by PAX VAPE

THC 87.0%

Shop Nearby From $32.00

HYBRID | VAPES > SPECIALTY VAPE

Pineapple Whip is a vibrant hybrid bursting with pineapple, citrus, and creamy vanilla flavor. This fruity favorite delivers an energizing, inspired high, perfect for boosting creativity and brightening your day. Terpenes: Myrcene, Pinene, Caryophyllene Aromas: Pineapple, Citrus Flavors: Pineapple, Vanilla Effects: Happy, Creative

Current U.S. Cannabis Market

- In the 2025–2026 U.S. cannabis market, flower remains the dominant product type with 40%–45% of retail sales, though its share is declining.
- Vape cartridges constitute 22%–28% of the market
- Concentrates hold about 12%
- Pre-rolls are approximately 13%
  - Most often infused with concentrate
- Edibles account for 14%–18%

Cannabis Products in MA

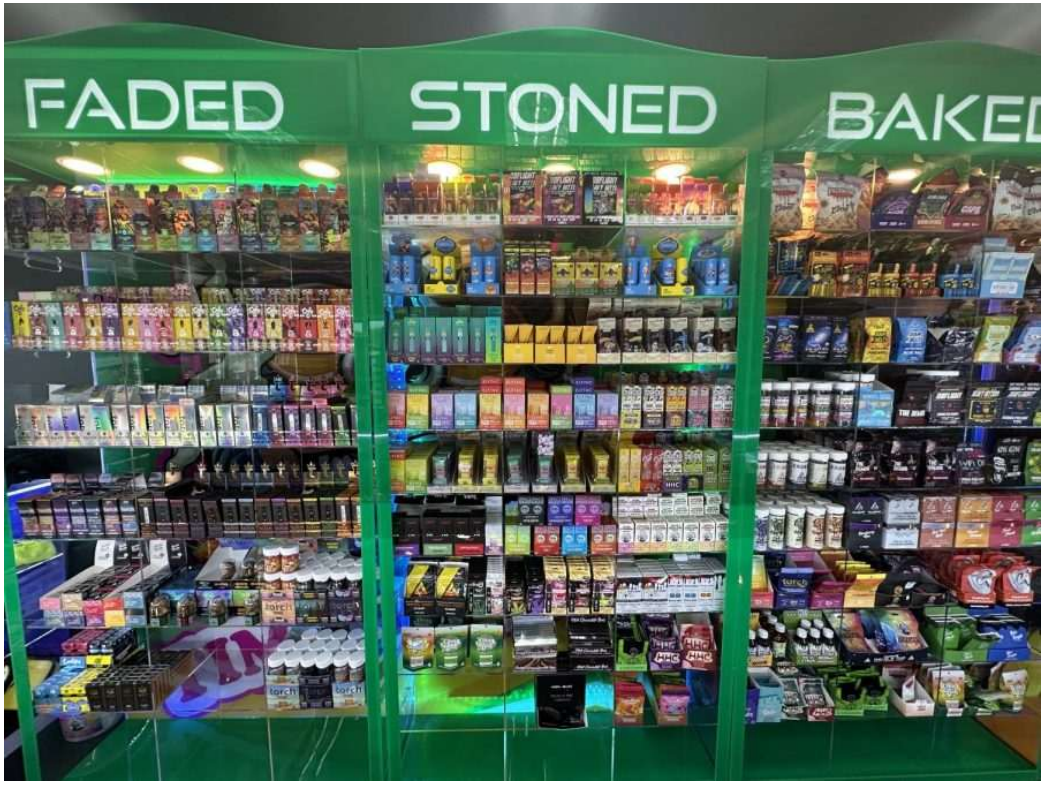
Raspberry Parfait Distillate Cartridge
Sunset Lake
Sativa THC: 760 mg

Green Crack Distillate Cartridge Dirigo
Dirigo Cannabis
Sativa THC: 828.8 mg

The 2018 Federal Farm Bill Created a Loophole for Intoxicating Hemp-derived Cannabinoids

- The statute broadly legalized hemp "derivatives /extracts / cannabinoids /isomers" but set the potency threshold based specifically on delta-9 THC (≤0.3% dry weight **≤ 3mg/gram**)

- Market participants interpreted (exploited) this as allowing intoxicating hemp-derived products (e.g., delta-8 THC products) so long as they stayed under the delta-9 THC limit.



The Illicit Market Does Not Go Away With Legalization: Role of Organized Crime

- Illegal/unlicensed marijuana distributors “hide in plain sight”.
- Legalization makes it easier for these illegal operators to grow and sell products appealing to young people.
- Illegal products available are driven by what legal products are available.
- Online access/availability to endless illicit products.

➢In legal states, hundreds of grow operations with ties to organized crime pop up in neighborhoods and rural areas.

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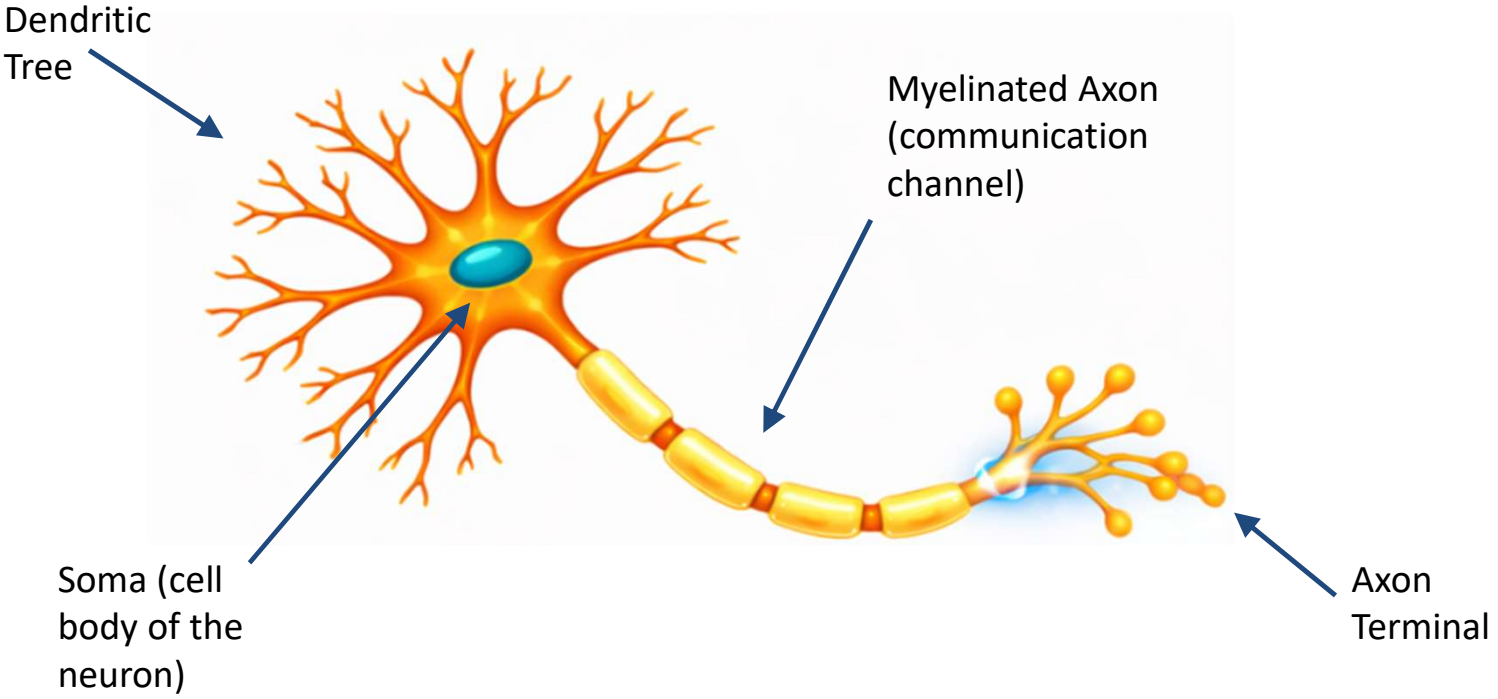
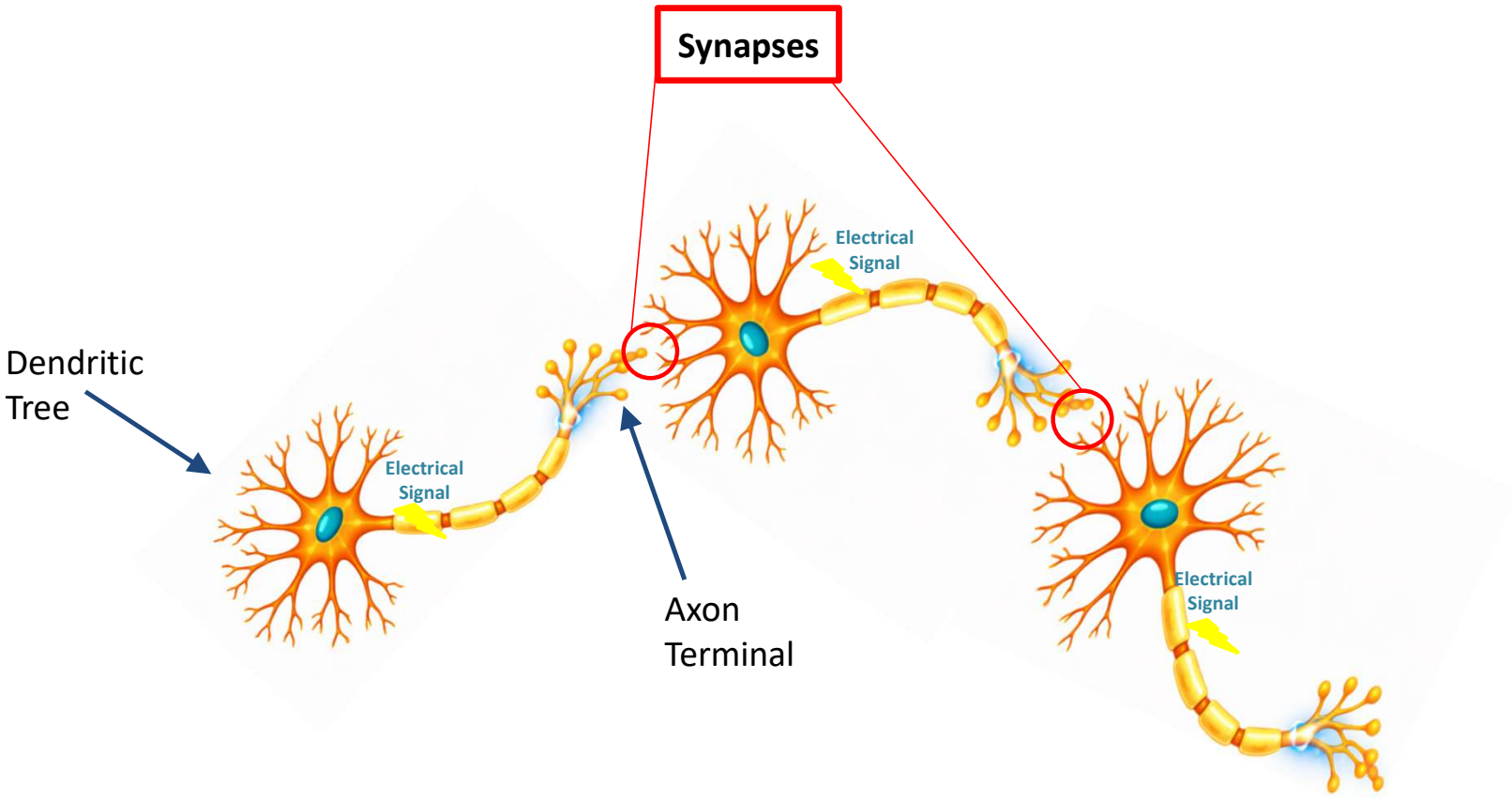
Adolescent Brain Development:

Training the Brain

Brain Communication: Neuron



Brain Communication: Neuron-to-Neuron



Brain Communication: Synapse

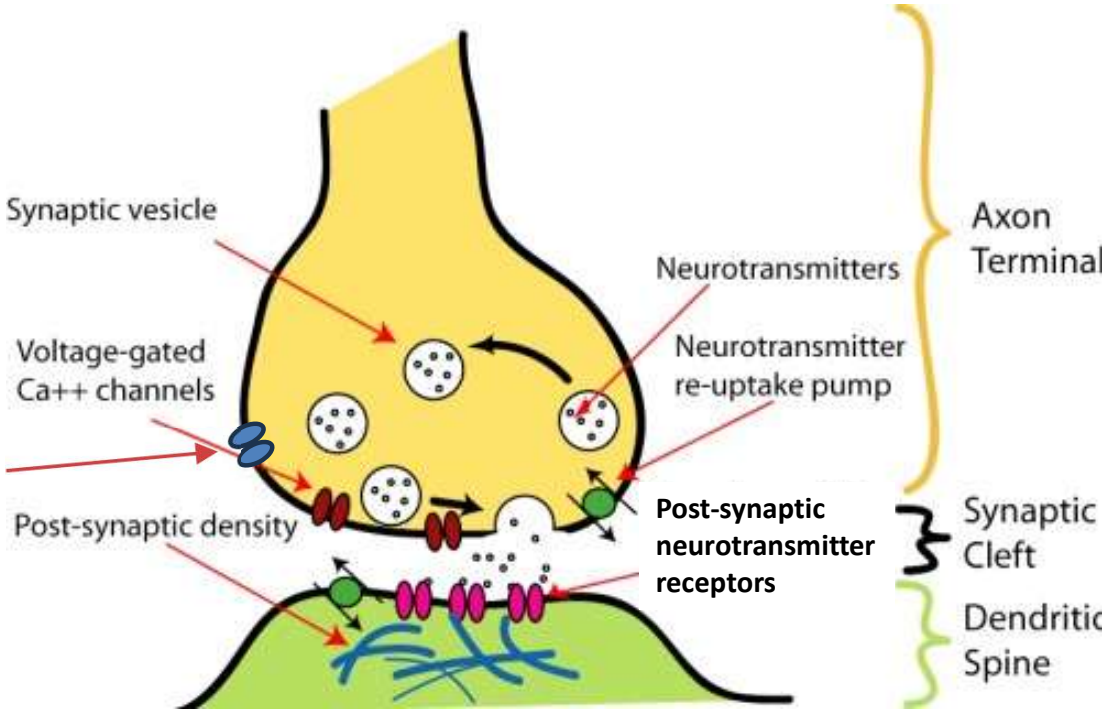


Image Credit: By Nrets Via Wikimedia Commons

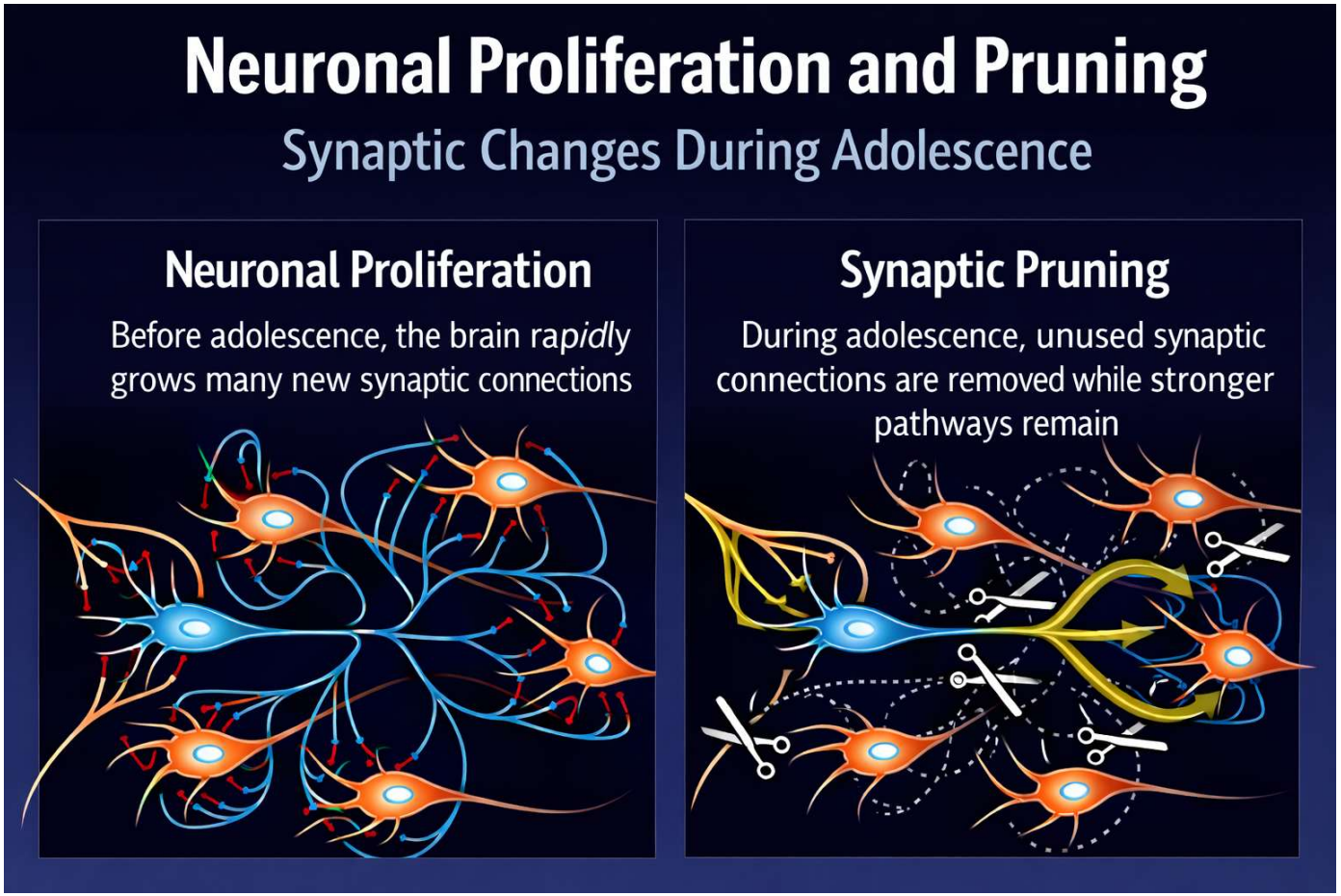
Adolescent brains are building super-highways for the pathways used regularly.

The reward system is particularly active in the teen brain.

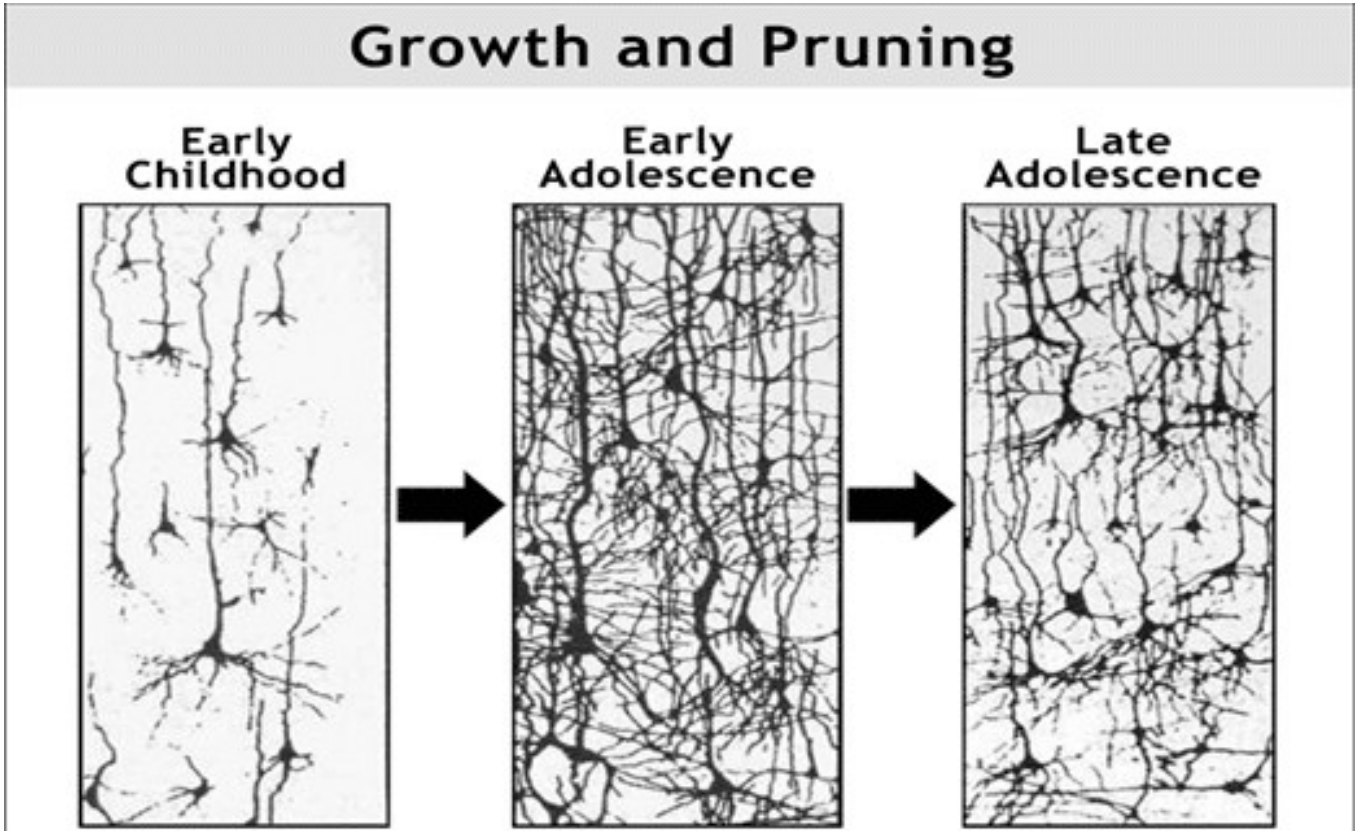
There are radical changes in neuronal connectivity going on inside the teen brain.

The centers for logic and reasoning are still developing.

Adolescence: A time of vulnerability and amazing <u>OPPORTUNITY</u>!

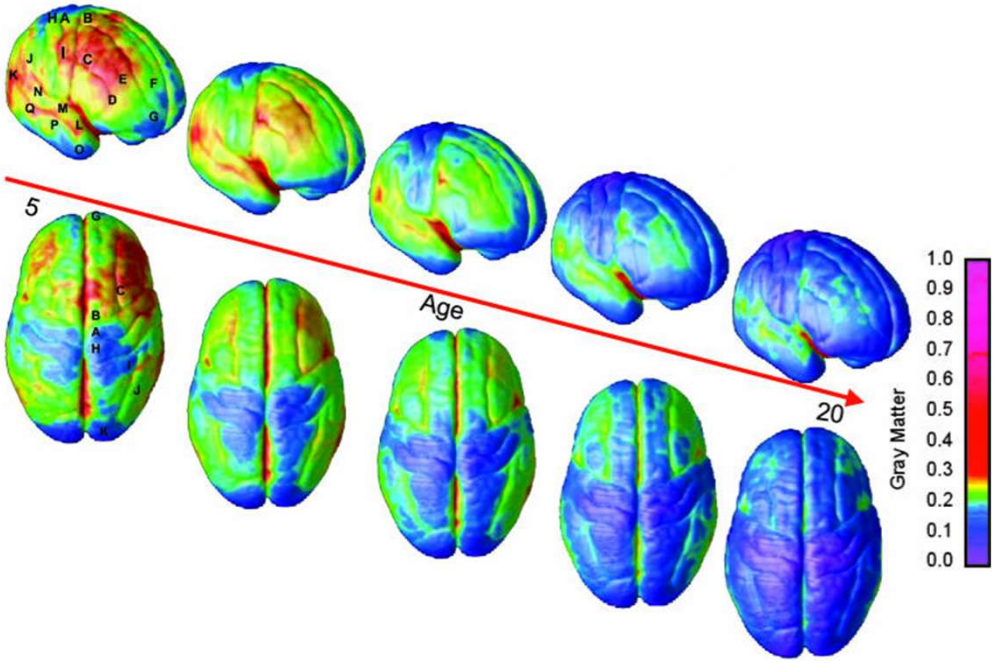


Growth and Pruning During Adolescence

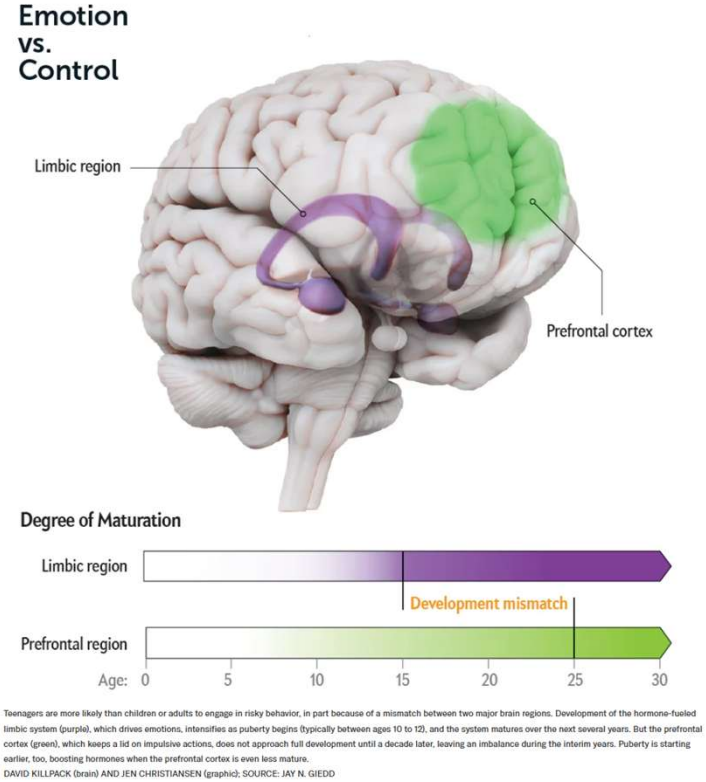


Huttenlocher PR., 1979

Prefrontal Cortex vs. Limbic Region Development
Mismatch Allows for Healthy Risk Taking



Gogtay N et al. Dynamic mapping of human cortical development during childhood through early adulthood. Proc Natl Acad Sci U S A. 2004 May 25;101(21):8174-9.



Giedd JA. The Amazing Teen Brain. Scientific American. May 1, 2016

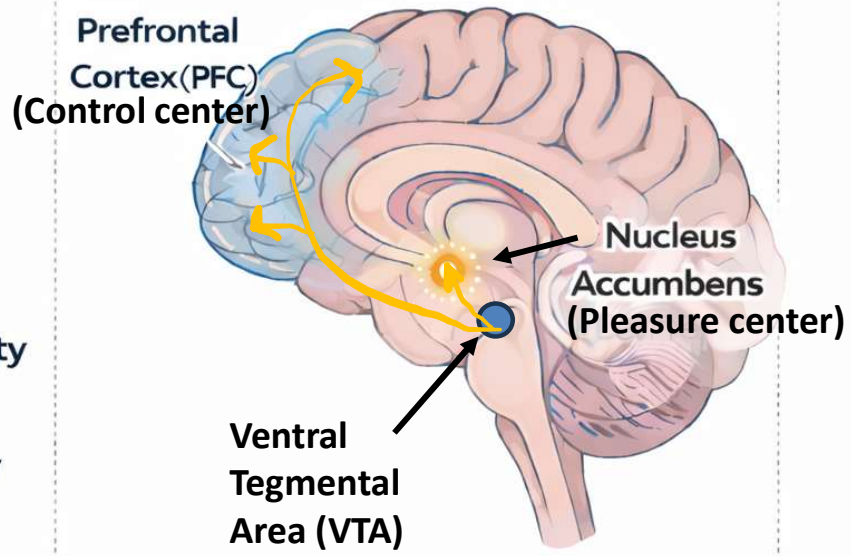
THE *NATURAL* REWARD PATHWAY

DURING ADOLESCENCE

THE STIMULUS

- Social Interaction
- Music / Fun
- Physical Activity
- Food / Novelty

THE BRAIN'S RESPONSE



THE OUTCOME

Pleasure & Motivation

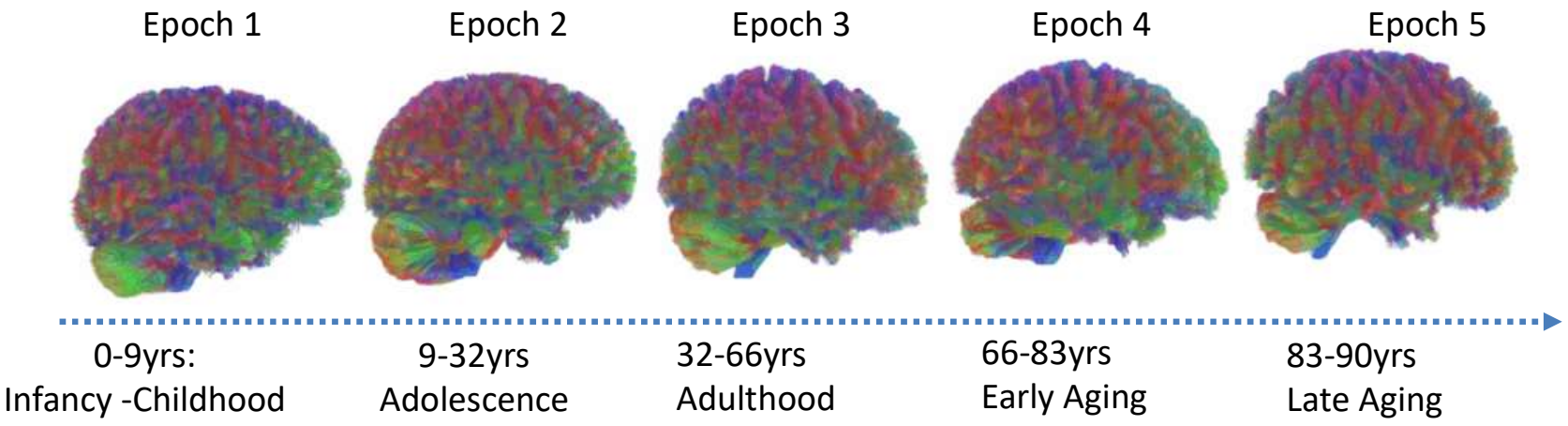
Reinforcement Learning

Dopamine Pathway

Dopamine Alerts Adolescents to Pleasurable Experiences So They Can Repeat Them


Adolescent brain development allows for healthy risk-taking and unique opportunities
Exploring new skills and environments.
Developing new social connections
Coping with and overcoming challenges
HEALTHY RISK-TAKING AND UNIQUE OPPORTUNITIES
Healthy risk-taking and exploration is important for learning, growth, and creativity.

New: Brain Changes Occur in Five Epochs



Mousley, A., Bethlehem, R.A.I., Yeh, FC. et al. Topological turning points across the human lifespan. Nat Commun 16, 10055 (2025). https://doi.org/10.1038/s41467-025-65974-8

https://www.youtube.com/watch?v=EpfnDijz2d8

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The Endocannabinoid system

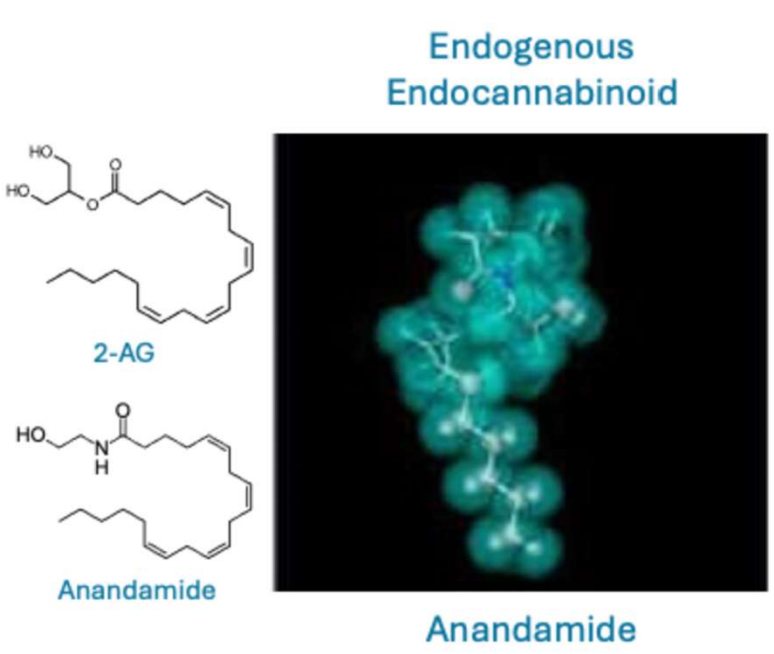


Image: NIDA

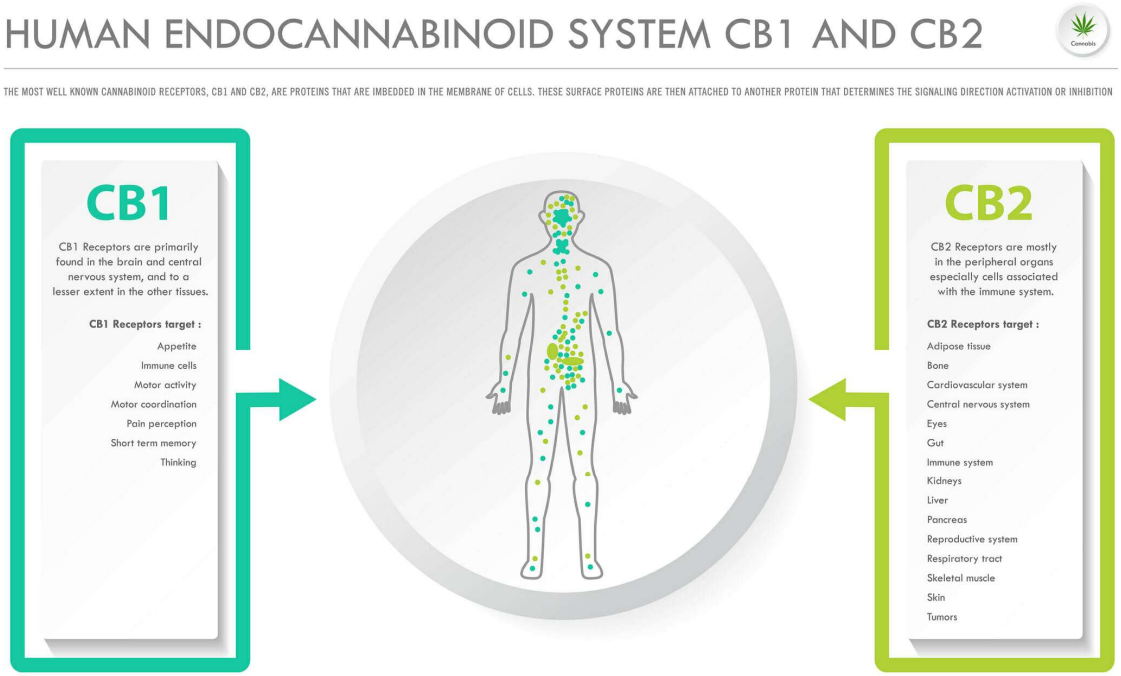


Image: Lopez, 2023

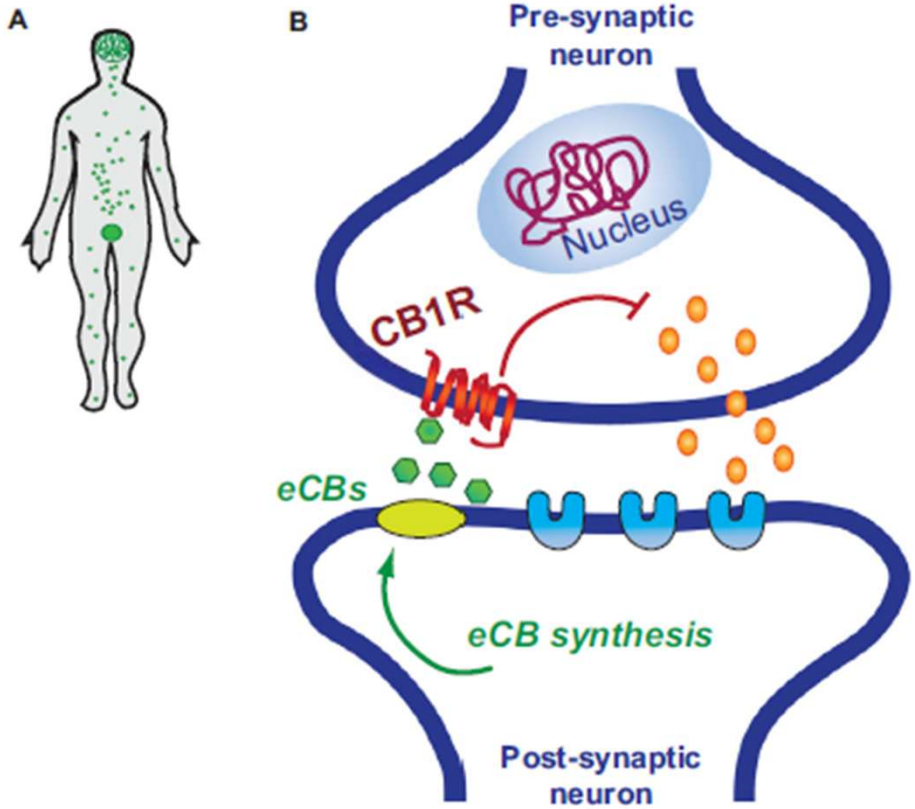
Endogenous Cannabinoid (Endocannabinoid) System Modulates Other Neurotransmitter Systems

CB1 receptors are especially dense in the brain, especially:

- Prefrontal cortex
- Amygdala
- Nucleus accumbens
- Hippocampus
- Basal ganglia

} Limbic structures

➢ **These are precisely the circuits that are reorganizing during adolescence.**

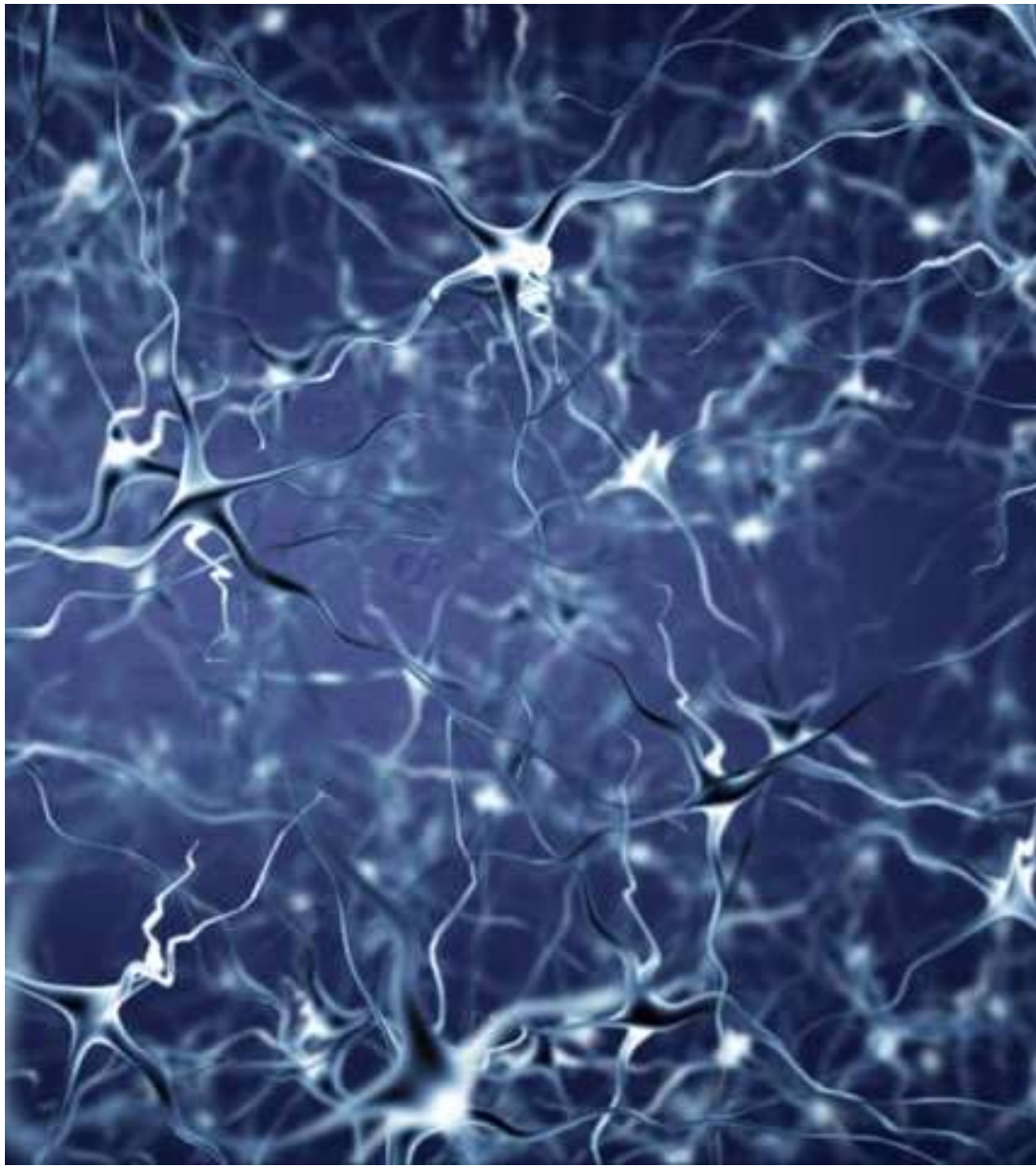


Szutorisz H & Hurd YL, 2016

During adolescence, the endocannabinoid system is BUSY!

- ✓ Regulates synaptic pruning
- ✓ Modulates emotional learning
- ✓ Calibrates reward sensitivity
- ✓ Shapes executive function development
- ✓ Integrates stress responses

- ➢ It modulates responses to rewards, fear, anxiety, and stress.
- ➢ It acts as a **neurodevelopmental tuning system**, helping the brain wire itself according to experiences.



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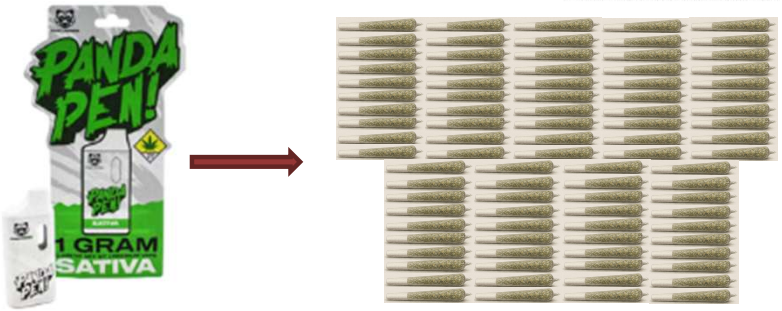
REMINDER: Cannabis/THC Products Today



Green Crack Distillate Cartridge Dirigo

Dirigo Cannabis

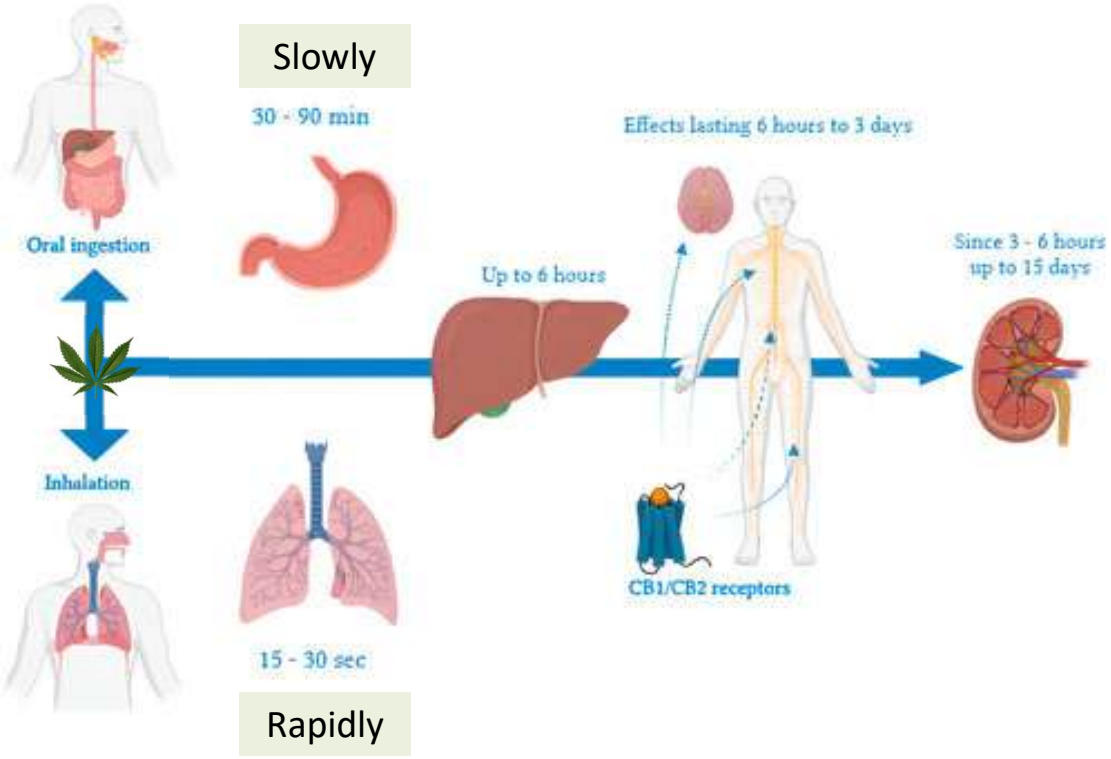
Sativa THC: 828.8 mg

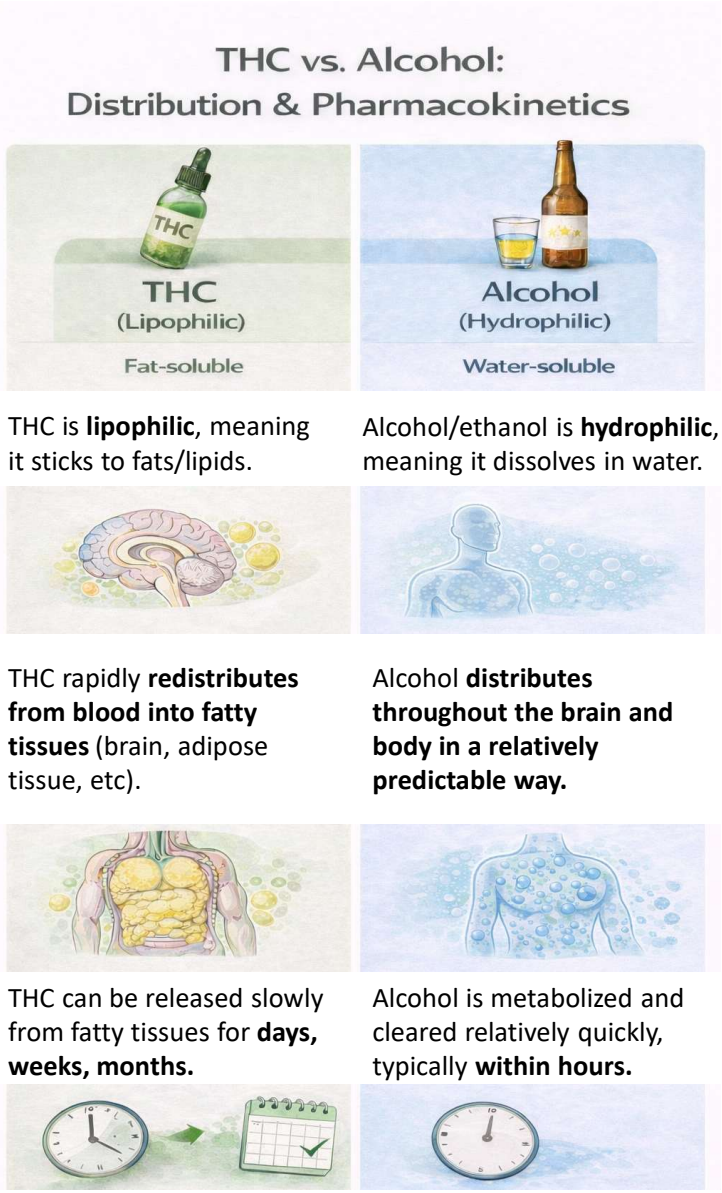
Raspberry Parfait Distillate Cartridge

Sunset Lake

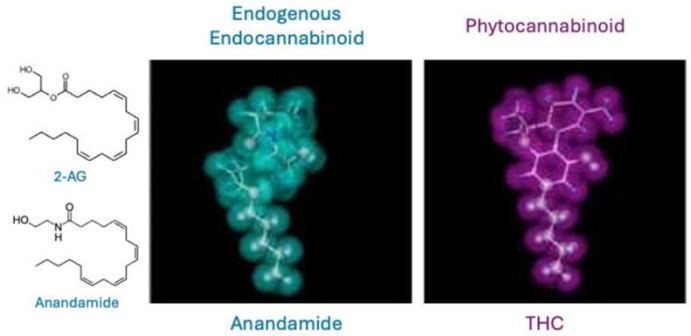
Sativa THC: 760 mg

Cannabis products deliver THC to the brain and body.

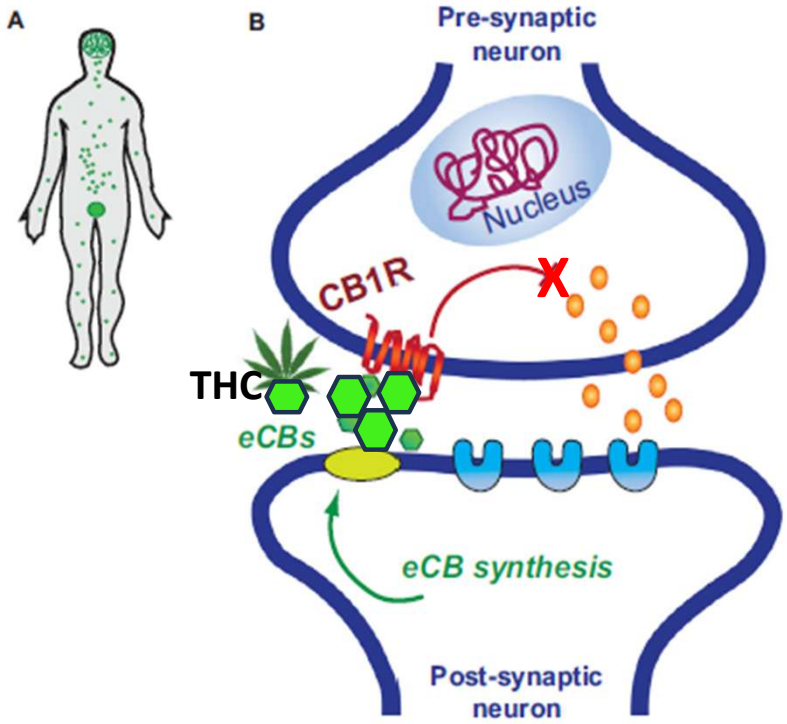




THC Interferes with Endocannabinoid System Modulation of Other Neurotransmitter Systems

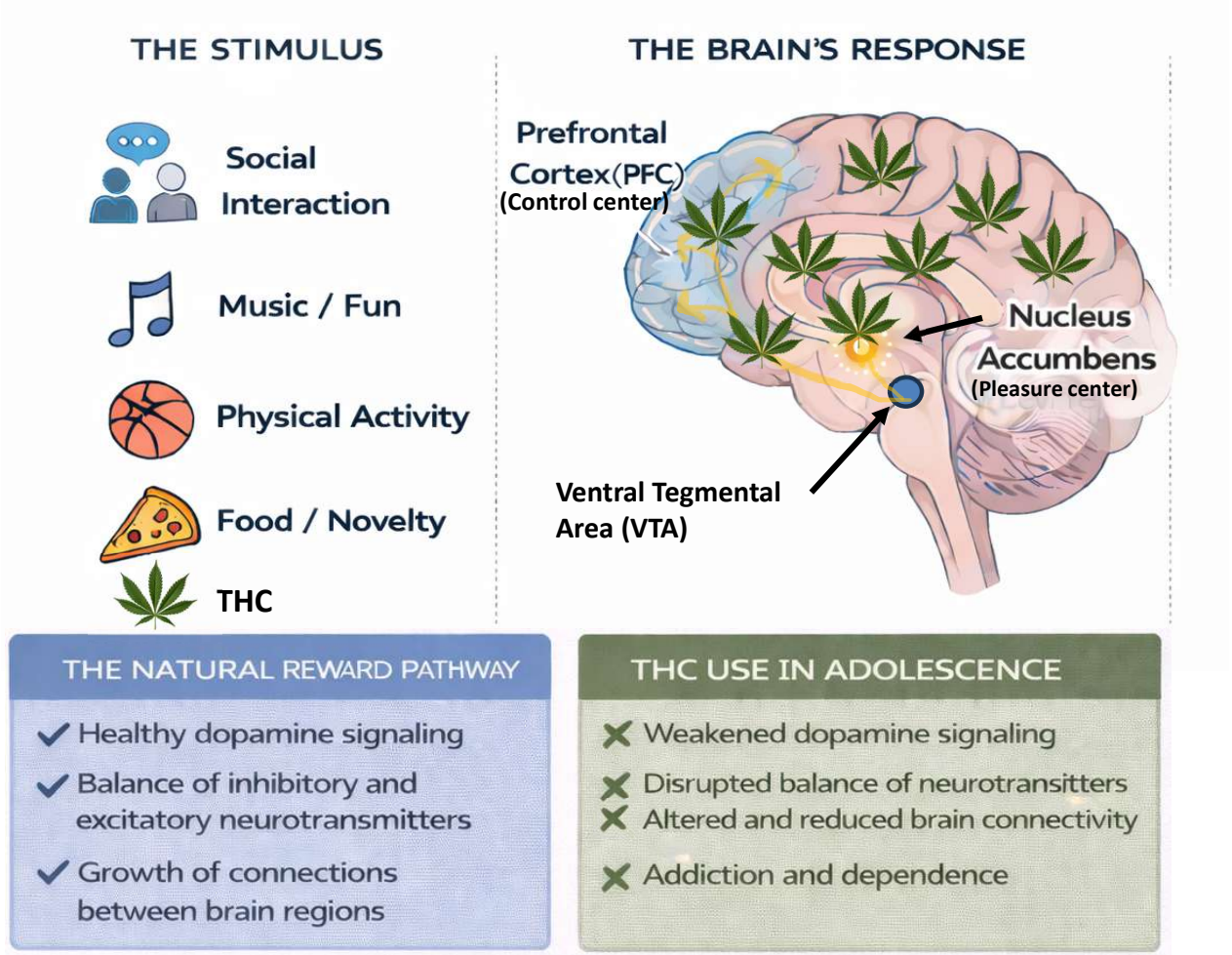


- **THC binds brain CB1 receptors and has a STRONGER, LONGER effect than anandamide at these receptors**
- **Frequent exposure to high dose THC:**
  - **Floods the brain with THC**
  - **Obscures selective anandamide signals needed to guide brain development**
- **In the presence of THC, anandamide can't do its job to protect and balance neuronal activity critical in development.**

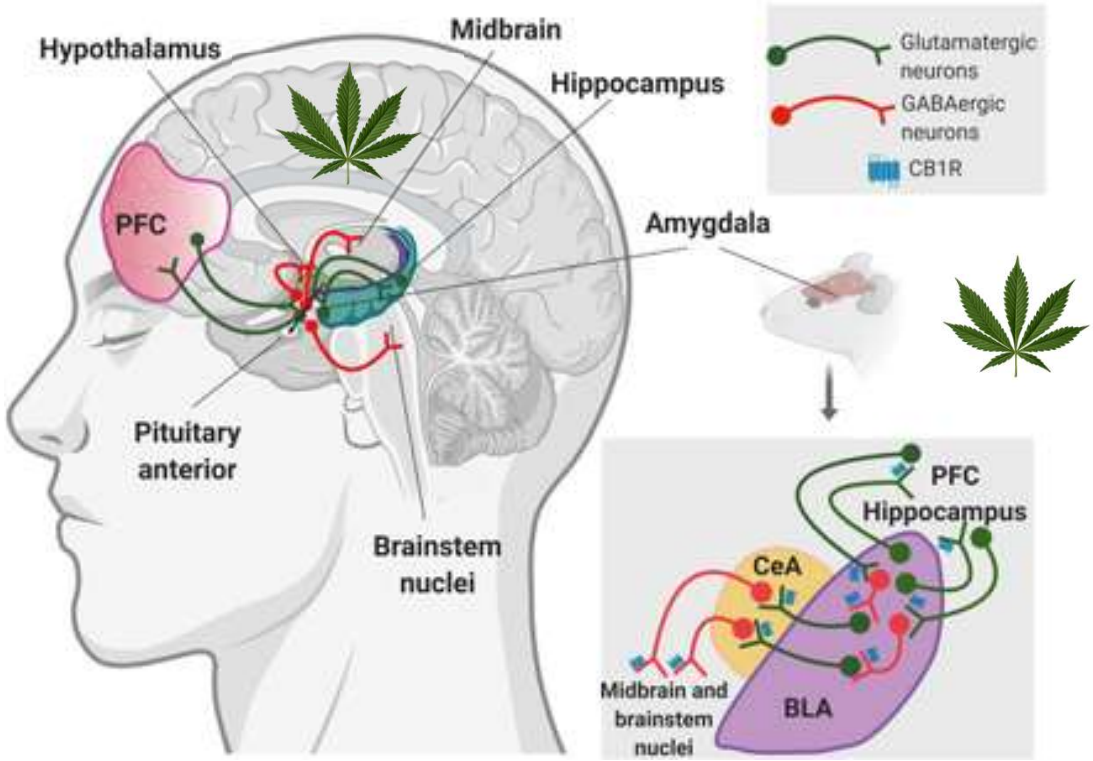


Szutorisz H & Hurd YL, 2016

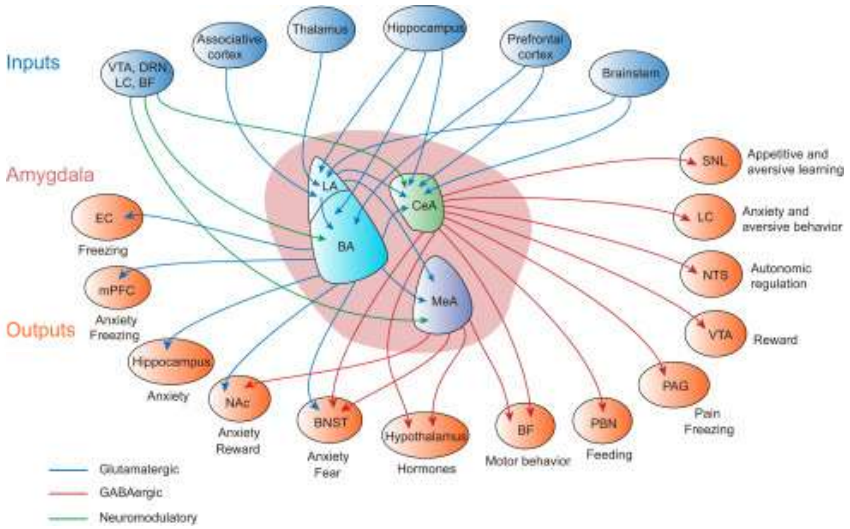
Dopamine alerts us to pleasurable experiences so we want to repeat them– this can be hijacked by THC



THC Can Alter Responses to Rewards, Fear, Anxiety, and Stress



Maldonado, 2022



Zhang, 2021

Adolescents Who Use Cannabis Are More Susceptible

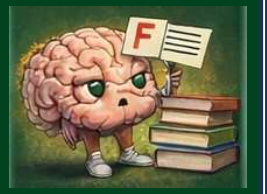
BRAIN CHANGES

*Functional
*Anatomical
*Cellular
*Molecular

ADDICTION

*Higher in teens

COGNITIVE DEFICITS



*Learning
*Memory
*Poor school performance
*IQ decline
*Executive functioning deficits

AMOTIVATION

*Higher school drop-out
*Lower educational attainment
*Lower employment

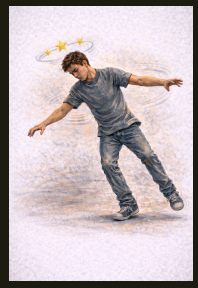
PSYCHIATRIC SYMPTOMS

*Psychosis
*Anxiety
*Depression
*Suicidality
*Disordered sleep
*Emotional dysregulation

CANNABINOID HYPEREMESIS SYNDROME (CHS)

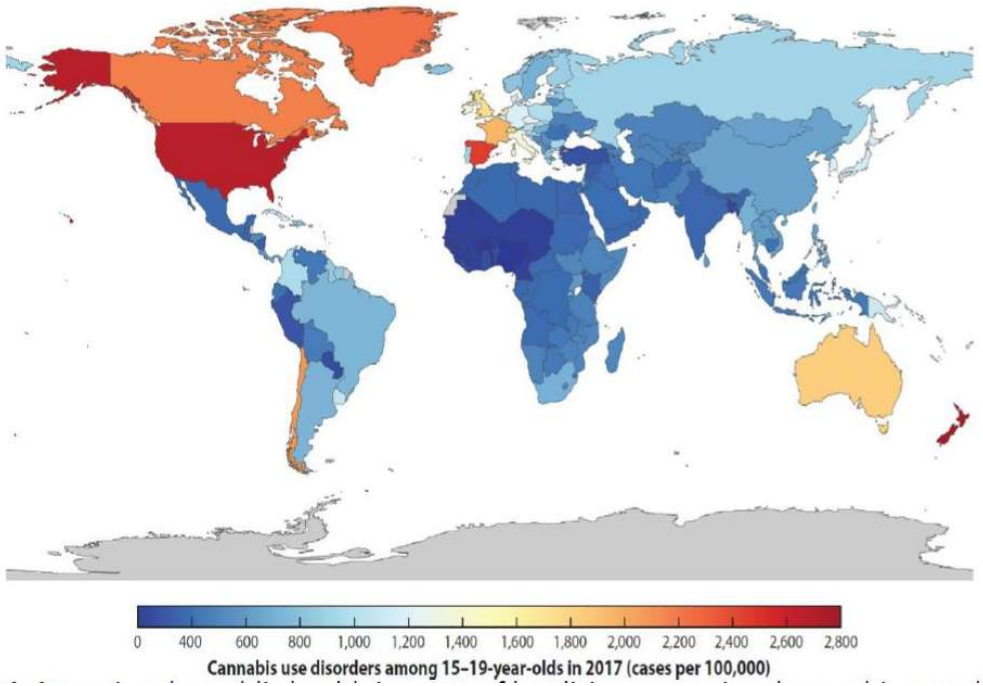
*Abdominal pain
*Nausea
*Vomiting

FUNCTIONAL & HEALTH DEFICITS



*Impaired motor coordination/ driving
*Cardiovascular effects

North America Leads The World in Youth Cannabis Use



New Hampshire, age-group–specific, past-year cannabis use prevalence estimates from National Survey on Drug Use & Health (2022–2023):

- 12–17yr: **11.09%** (estimated 10,000)
- 18–25yr: **45.21%** (estimated 61,000)
- 26+yr: **22.34%** (estimated 222,000)
- 18+yr: **25.09%** (estimated 284,000)
- 12+yr: **24.02%** (estimated 294,000)

- **~30% (3 in 10) U.S. past year cannabis users meet criteria for Cannabis Use Disorder (MUD/CUD).** (CDC; Hasin, 2015)
- **Risk is higher with earlier first use (adolescence) and more frequent/high-potency THC use.**
- **~38% of those with CUD also had a moderate or severe mental illness (MI) in 2022-23.** (Choi, 2024)

Estimated number of people with CUD, in NH:

- 12–17yr: 3,000
- 18–25yr: **18,300***
- 26+yr: 66,600
- 12+yr: **88,200***

*likely underestimated because does not account for out of state college student population

2022-23 (based on above data)

Estimated number of people with CUD + mod/sev MI, in NH:

- 12–17yr: 1,140
- 18–25yr: **6,954***
- 26+yr: 25,308
- 12+yr: **33,516***

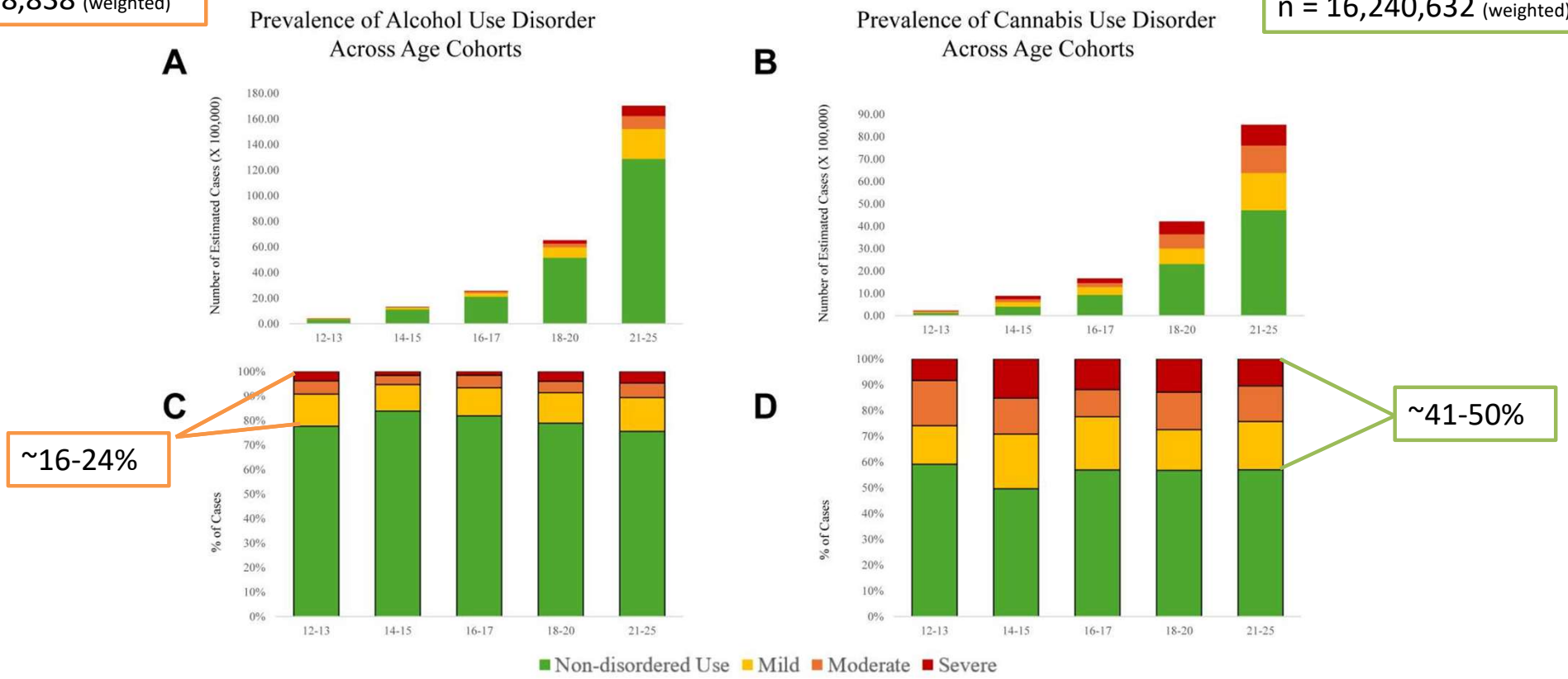
*likely underestimated because does not account for out of state college student population;

2022-23 (based on above data)

Prevalence of AUD & CUD Among U.S. Adolescents Who Reported Past-Year Use, NSDUH 2022

ALCOHOL
n = 27,858,838 (weighted)

CANNABIS
n = 16,240,632 (weighted)



~16-24%

~41-50%

Figure 4. from Adams et al, 2025

Adolescents Who Use Cannabis Are More Susceptible

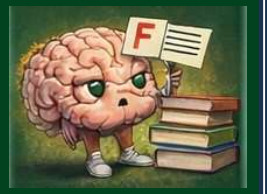
BRAIN CHANGES

*Functional
*Anatomical
*Cellular
*Molecular

ADDICTION

*Higher in teens

COGNITIVE DEFICITS



*Learning
*Memory
*Poor school performance
*IQ decline
*Executive functioning deficits

AMOTIVATION

*Higher school drop-out
*Lower educational attainment
*Lower employment

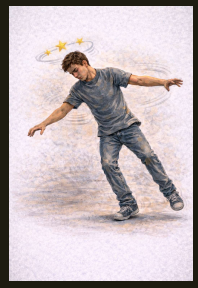
PSYCHIATRIC SYMPTOMS

*Psychosis
*Anxiety
*Depression
*Suicidality
*Disordered sleep
*Emotional dysregulation

CANNABINOID HYPEREMESIS SYNDROME (CHS)

*Abdominal pain
*Nausea
*Vomiting

FUNCTIONAL & HEALTH DEFICITS



*Impaired motor coordination/ driving
*Cardiovascular effects

Acute Cannabis-induced Psychosis (CIP) Dx

Clinician diagnostic codes for cannabis-induced psychosis (DSM-5/ICD-10-CM) :

- **DSM-5 diagnosis:** *Cannabis-Induced Psychotic Disorder* (with code assignment using ICD-10-CM; icd10data.com).

With "cannabis abuse" (legacy term; maps to mild use disorder):
• **F12.150** – with delusions • **F12.151** – with hallucinations • **F12.159** – unspecified.

With " cannabis dependence" (maps to moderate/severe use disorder): • **F12.250** – with delusions • **F12.251** – with hallucinations • **F12.259** – unspecified.

With use, unspecified (no cannabis use-disorder diagnosis coded):
• **F12.950** – with delusions • **F12.951** – with hallucinations • **F12.959** – unspecified.

Products with >10% THC = higher psychosis risk

- >10% THC is higher risk because more potent products deliver more THC
- Many THC concentrates/carts exceed 60–90%+ THC
- Flower now ~30%+ THC

Prevalence of CIP Rises Steeply With Increased Cannabis Use

- Core symptoms of CIP at presentation are typically paranoid, persecutory delusions and hallucinations (auditory ± visual), often with marked anxiety, agitation, and mood lability.
- Among cannabis users, the proportion ever experiencing psychotic symptoms associated with cannabis use/withdrawal increased from ~12.4% in cannabis users with no CUD diagnosis to ~80.0% among those with severe cannabis dependence. (Smith, 2009)
- CIP is most common among young adult men who use THC frequently, but scientific findings indicate that CIP can happen to males and females at any age, and to those with or without a family history of mental illness.

Regulated & Approved THC Drugs Have Safety Warnings for Serious Psychiatric Events

Sativex® (nabiximols)

- Approved in EU & Australia; Phase III clinical trials in US
- *Cannabis sativa* extract
- 2.7mg THC & 2.5mg CBD per spray

- **Requires boxed WARNING in AUS**
- Prescribing information includes risk of "toxic psychosis"
- Maximum recommended dose: 12 sprays/day = **32mg THC**

SATIVEX®

nabiximols

WARNING

The maximum recommended dose of Sativex should not be exceeded. High doses of Sativex increase the risk of serious psychiatric adverse events including psychosis, hallucinations, delusions, and homicidal and suicidal ideation.

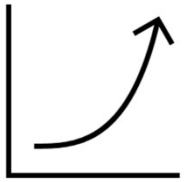
Parents of adolescents (10-24yrs) with CUD often report their loved one is using >100mg THC/day.

THC Can Cause Acute Psychosis & Increases Conversion to Serious Mental Illness (SMI): Increased Risk with Frequent Use of High THC Products

47%

- **Cannabis-induced psychosis (CIP) has the highest conversion rate to chronic SMI, among substance-induced psychoses.**
  - ~47% of CIP cases later received schizophrenia or bipolar diagnoses in Danish registry data (median follow-up 20 years). (Starzer, 2018)

- **In cities where high-THC products are widespread, a large fraction of new psychosis cases (FEP) appears attributable to cannabis use.**
  *Amsterdam: 50.3% *London: 30.3% (DiForti, 2019)

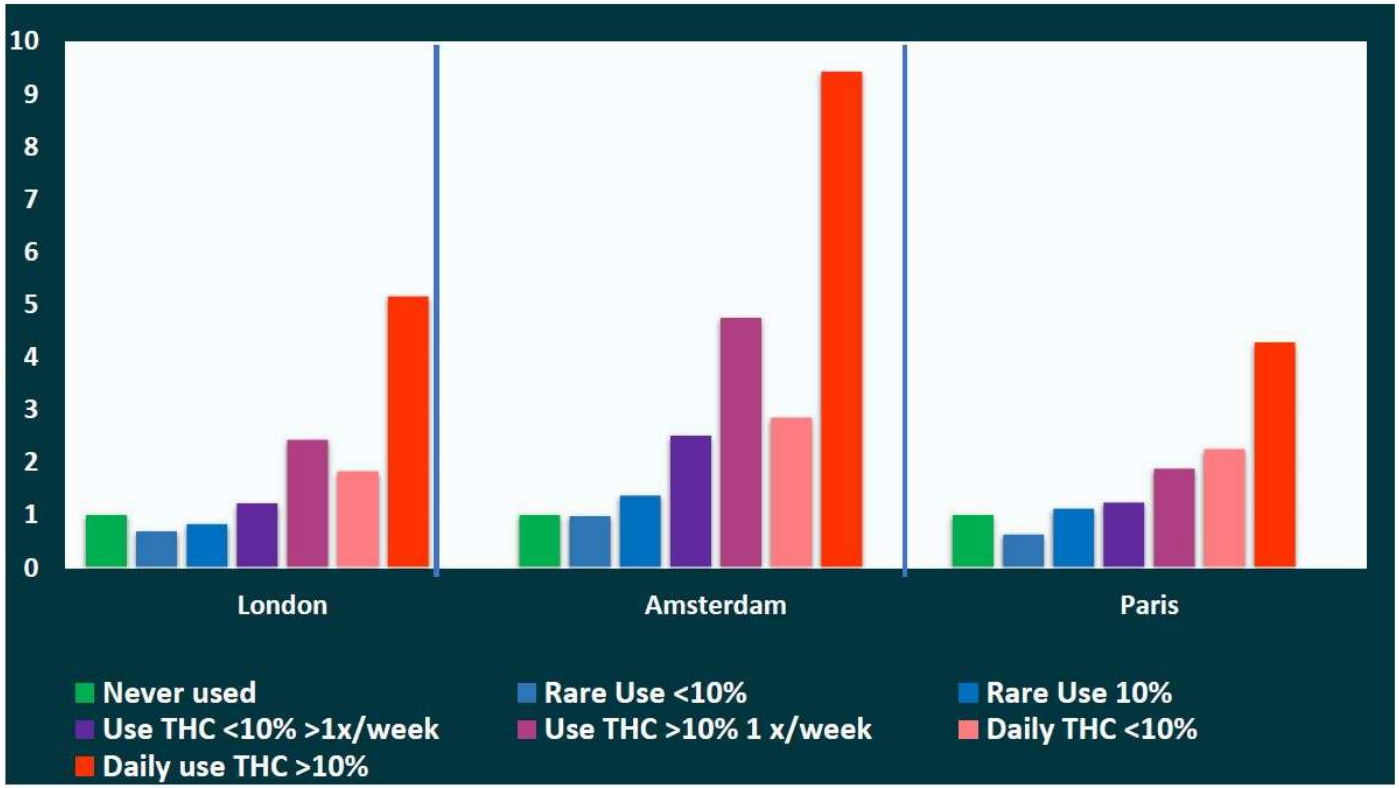


- **In Ontario, Canada, the proportion of incident cases of schizophrenia associated with CUD almost tripled after legalization. (Myran, 2025)**
  - PARF of CUD for schizophrenia rose from 1.6–3.7% pre-legalization to ~10% after legalization/commercialization; among males 19–24, PARF reached ~19% by 2022.
  - This means that almost 20% of SCZ cases were associated with CUD, among 19-24yo males.
  - Similar pattern has been seen in Portugal (Gonçalves-Pinho, 2020)

Dose (%THC) and Frequency of Use Associated with Risk for Psychotic Disorder

3 Cities
(Actually 11 Sites)

Di Forti et al
Lancet Psychiatry 2019
May;6(5):427-436.



Dose-response:

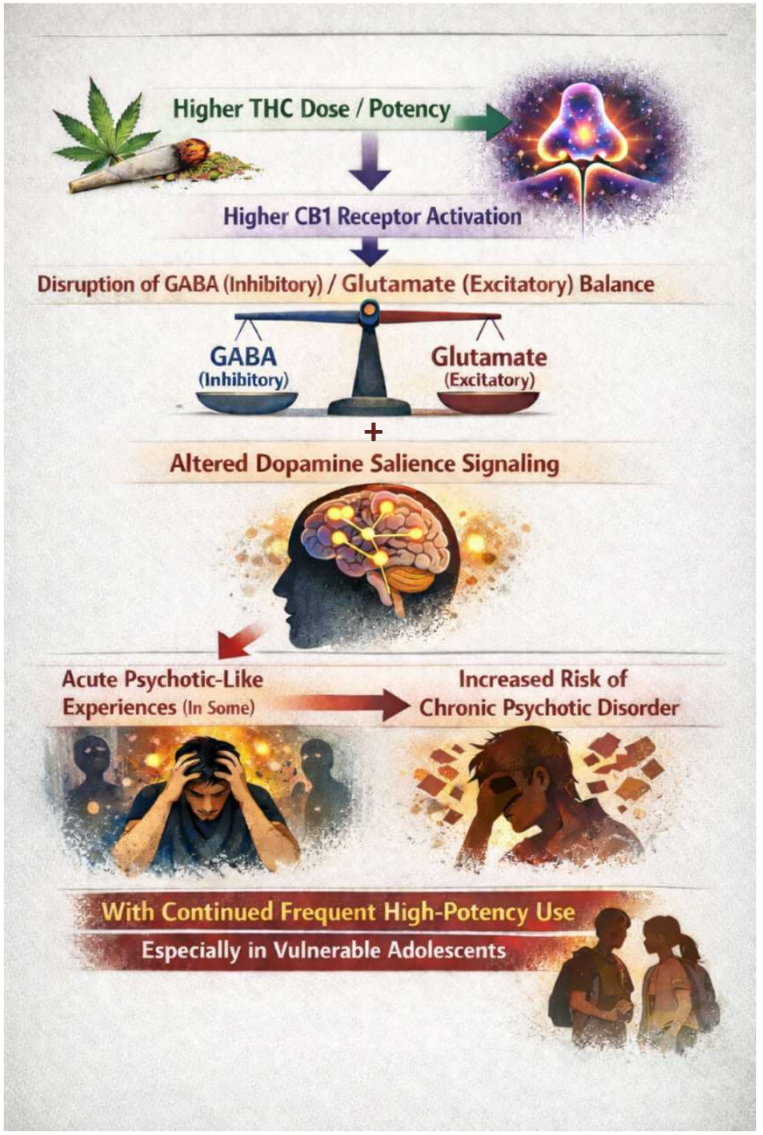
- van Os J, et al 2002;
- Henquet C, et al 2005;
- Moore THM et al: 2007;
- Haney and Evins, 2016;
- Marconi et al 2016;

Slide credit: Bertha Madras, PhD

Rising THC Potency Increases Harm

- Dr. Emily Kline (Boston Medical Center) stated in 2021 testimony, “I treat many patients who have developed psychosis after using high potency THC products… Earlier age of first use, frequent use, and higher THC concentration are well known risk factors for developing psychosis. While some of my patients are "lucky" in that they are able to stop using THC and eventually recover from their psychotic episode, most are not so lucky. For some, the psychosis does not go away even though they stop using marijuana (i.e. the harm to their brain is irreversible). For others, they are addicted to THC and cannot abstain from using, and thus cannot recover from their psychosis. Such histories are typical of a larger and larger proportion of our schizophrenia patients. A growing body of research demonstrates that these individuals are NOT necessarily people who would have developed schizophrenia without using marijuana.”

- To be clear, she is talking about PREVENTABLE cases of schizophrenia!



Adolescent Cannabis Use Associated with Doubling of Risk of Psychotic Disorders by Age 26

JAMA Health Forum

Original Investigation

Adolescent Cannabis Use and Risk of Psychotic, Bipolar, Depressive, and Anxiety Disorders

Kelly C. Young-Wolff, PhD, MPH; Catherine A. Cortez, MPH; Stacey E. Alexeeff, PhD; Lynn D. Silver, MD, MPH; Rosalie Liccardo Pacula, PhD; Natalie E. Slama, MPH; Alisa A. Padon, PhD; Derek D. Satre, PhD; Cynthia I. Campbell, PhD, MPH; Maria T. Koshy, MD; Monique B. Does, MPH; Stacy A. Sterling, DrPH, MSW, MPH

Abstract

IMPORTANCE As cannabis becomes more accessible and socially accepted, concerns have grown about its potential implications for adolescent mental health. While prior research has linked adolescent cannabis use to psychiatric symptoms, few large, population-based, longitudinal studies have examined associations with clinically diagnosed psychiatric disorders.

OBJECTIVE To evaluate whether adolescent cannabis use is associated with an increased risk of incident psychotic, bipolar, depressive, and anxiety disorders during adolescence and young adulthood.

DESIGN, SETTING, AND PARTICIPANTS This cohort study included adolescents aged 13 to 17 years who were screened for past-year cannabis use at Kaiser Permanente Northern California from 2016 to 2023. Adolescents were followed up through age 25 years or until December 31, 2023. Data were analyzed from February 21, 2024, to August 27, 2025.

EXPOSURE Time-varying self-reported past-year cannabis use based on universal, confidential screening during standard pediatric care.

MAIN OUTCOMES AND MEASURES Incident clinician-diagnosed psychotic, bipolar, depressive, and anxiety disorders, which were identified through electronic health records using *International Classification of Disease* codes. Cox proportional hazards regression models were used to measure the strength of associations between adolescent cannabis use and incident psychiatric diagnoses, with adjustments for sex, race and ethnicity, neighborhood deprivation index, insurance type, and time-varying alcohol and other substance use.

Key Points

Question Is adolescent cannabis use associated with an increased risk of developing psychiatric disorders by young adulthood?

Findings In this cohort study of 463 396 adolescents aged 13 to 17 years who were universally screened for cannabis use, past-year cannabis use was associated with a significantly increased risk of incident psychotic, bipolar, depressive, and anxiety disorders by age 26 years.

Meaning This study found that adolescent cannabis use is associated with increased risk of psychiatric disorders in adolescence and young adulthood, highlighting the importance of early prevention efforts, effective public health messaging, and policy development to limit youth exposure as cannabis legalization expands.

Young-Wolf et al, 2026

Massachusetts Cannabis-Psychosis Data

Teens frequently report psychotic-like symptoms during/after THC use. (2019)

- In a Boston Children's Hospital survey of 146 adolescent cannabis users, ~43% reported at least one acute psychotic-like symptom (paranoia/anxiety or hallucinations) in the prior year; risk was higher with more-frequent use and with cannabis use disorder (CUD).
- "Our findings suggest that experience of marijuana-related acute psychotic symptoms may be considerable."

In a study of BMC ED psychosis visits, THC+ screens signaled greater psychosis severity. (2023)

- A Boston Medical Center study of **2,134 ED visits for acute psychosis (2019–2021)** reported that **THC+ screens** were linked to **greater acuity (severity)** including higher odds of **physical restraint** and **parenteral antipsychotic/benzodiazepine** use) versus THC-negative or not-screened visits.
- "Cannabis use is associated with increased severity of psychotic symptoms and the risk of acute agitation and aggressive behavior in inpatient (IP) and outpatient settings."

After recreational legalization, cannabis use rose among people with psychosis. (2025)

- A recent **multi-state** study (including **Massachusetts**) found **current cannabis use increased** by 10 percentage points, among individuals with psychosis following legalization/commercialization—highlighting a particularly **high-risk subgroup**.
- "Cannabis can negatively affect illness course and health service utilization in individuals with psychosis, these results should be considered by regulators designing policies around taxation, potency, advertising, and health warnings."

Canada's Cannabis Health Warnings

Government of Canada | Gouvernement du Canada

Search Canada.ca

MENU

Canada.ca > Health > Drug and health products > Drugs and medication > Cannabis > Cannabis laws and regulations > Regulations under the Cannabis Act

Cannabis health warning messages

This document took effect on March 12, 2025.

Part 1: The cannabis health warning messages in this Part apply to dried cannabis products and cannabis extracts intended for smoking.

WARNING: **The smoke from cannabis includes toxic chemicals that increase your risk of heart and lung disease**. The more often you smoke, the greater the risk.

WARNING: Using cannabis before age 25 can harm brain development. This can worsen your attention, concentration, and memory, especially when using cannabis every day or most days.

WARNING: Using cannabis before age 25 increases your risk of mental disorders like psychosis and schizophrenia. The more often you use, the greater the risk.

WARNING: Cannabis can cause psychotic symptoms like severe paranoia. The risk is greatest in people younger than 25 or when using products higher in THC.

WARNING: Using cannabis every day or most days can lead to dependence. Dependence also increases your risk of anxiety and depression.

WARNING: Cannabis can be addictive. The higher the THC, the greater the risk.

WARNING: Long-term cannabis use increases your risk of anxiety and depression. The more often you use, the greater the risk.

WARNING: The higher the THC, the greater the risk of adverse effects. These can include paranoia, anxiety, and dependence.

WARNING: Do not use cannabis if pregnant or breastfeeding. Using cannabis can harm your baby's growth and development.

WARNING: Do not drive under the influence of cannabis. It puts your life and other people's lives at risk.

CANNABIS AND YOUR BODY

Rutgers Addiction Research Center
Brain Health Institute

According to the National Survey on Drug Use and Health, cannabis (marijuana) is one of the most frequently used drugs in the United States, and its use is widespread among young people. The plant contains the mind-altering chemical THC and other similar compounds. Here's how marijuana can affect your body:

BRAIN

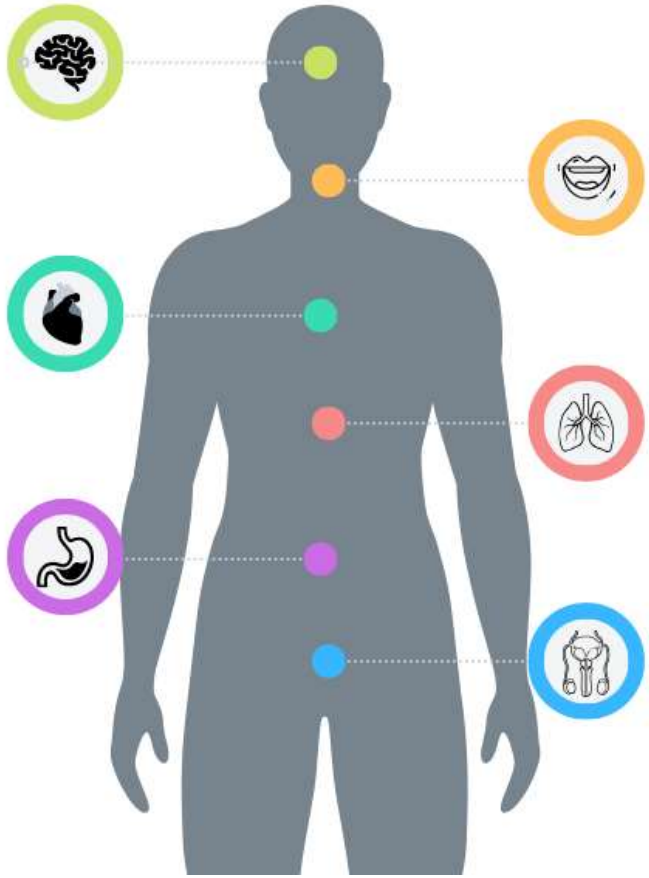
THC binds to cannabinoid receptors and interferes with cannabinoid neurotransmitter systems. Marijuana leads to impaired short-term memory, perception, judgment and motor skills. Teenage marijuana use can impair thinking, learning abilities, and disrupt the brain's development of connections needed for these functions.

HEART

As cannabis is absorbed into the body, THC travels through the bloodstream, reaching various parts of the body. Marijuana raises heart rate for up to 3 hours after using. This effect may increase the chance of heart attack. Older people and those with heart problems may be at higher risk.

STOMACH

When consumed orally, absorption is slower and has a more delayed peak in THC levels. Frequent marijuana consumption can result in certain individuals developing Cannabinoid Hyperemesis Syndrome. This condition triggers recurring episodes of intense nausea, vomiting, and dehydration, occasionally necessitating urgent medical intervention.



MOUTH

Cannabis smoking is associated with periodontal complications, xerostomia, and leukoplakia as well as potentially increased risk of developing mouth and neck cancer.

LUNGS

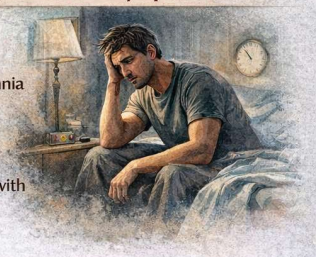
Smoking marijuana results in rapid absorption with peak THC plasma concentrations occurring prior to the end of smoking. Frequent marijuana smoking can cause lung irritation and similar respiratory issues in tobacco smokers, such as daily coughing, increased phlegm, and more frequent lung illnesses.

REPRODUCTIVE SYSTEMS

Research shows that some cannabis users have a lower sex drive. Irregular menstrual cycles, interferences with ovulation, and lower sperm counts have also been reported.

THC (Cannabis) Withdrawal Symptoms

Most Common THC (Cannabis) Withdrawal Symptoms are:



- ✓ **Irritability**
- ✓ **Anxiety / Nervousness**
- ✓ **Sleep problems** (especially insomnia or vivid/strange dreams)
- ✓ **Depressed mood**
- ✓ **Restlessness**
- ✓ **Decreased appetite** (sometimes with weight loss)
- ✓ **Anger or aggression**
- ✓ **Craving for cannabis**

Less Common Physical Symptoms:

- ✓ **Headache**
- ✓ **Sweating or chills**
- ✓ **Stomach/Abdominal pain**
- ✓ **Psychosis**
- ✓ **Tremor / shakiness**

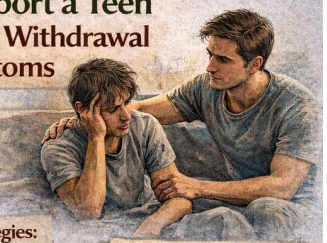
Symptoms usually begin within **24–48 hours** after stopping, often peak around days **2–6**, and can last **1–3 weeks or longer** in heavy users.

⚠ Immediate Medical Help May Be Needed For:

- ✓ Severe depression
- ✓ Panic that feels unmanageable
- ✓ Suicidal thoughts
- ✓ Psychosis
- ✓ Chest pain
- ✓ Dehydration from vomiting
- ✓ Alcohol or benzodiazepine withdrawal

THC withdrawal is usually uncomfortable but not typically dangerous; however, support from a **medical professional** can be helpful.

How to Support a Teen Experiencing Withdrawal Symptoms



Explain the biology, provide **compassion, encouragement, and understanding**

Treatment / Harm Reduction Strategies:

- ✓ Acknowledging that abstinence is best
- ✓ **SMART-B** Goals
- ✓ **Reduce use incrementally if not ready for abstinence**

SMART-B Goals

- ✓ Specific
- ✓ Measurable
- ✓ Achievable
- ✓ Realistic
- ✓ Timely
- ✓ Balance of reasons for / against use

Behavioral treatment to prevent relapse / treat cannabis use disorder:

- ✓ **CBT** (cognitive behavioral therapy)
- ✓ **MET** (motivational enhancement therapy)
- ✓ **CM** (contingency management)

Reviews suggest that a combination of **MET + CBT + CM** produces the best abstinence outcomes among studied treatments, even though results are still modest overall.

#1 Most Important:

form a **genuine and meaningful connection,** based in understanding... meet the person where they're at, but **don't leave them there.**

THANK YOU FOR ALL YOU DO!

WE ALL HAVE A SHARED RESPONSIBILITY TO SUPPORT POSITIVE YOUTH DEVELOPMENT

Thank you!

"IF WE WANT HEALTH, WE MUST PROMOTE HEALTH"
–Dr. Jeff Linkenbach

Amy.Turncliff@RockfernScientific.com

- Acknowledgments: Dr. Bertha Madras PhD; Dr. Eden Evins, MD MPH; Dr. Ruth Potee, MD; Dr. Safdar Medina MD, FAAP