

Marijuana and Cognition: A Hazy Issue



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COLLEGE OF PHARMACY

Overview

- History
- How does marijuana work?
- Effects (some data)
 - What about college students?
- Medical marijuana
- Status and the future

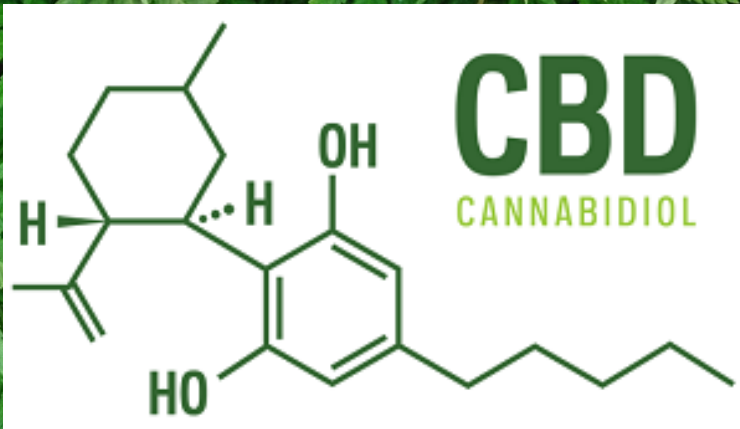
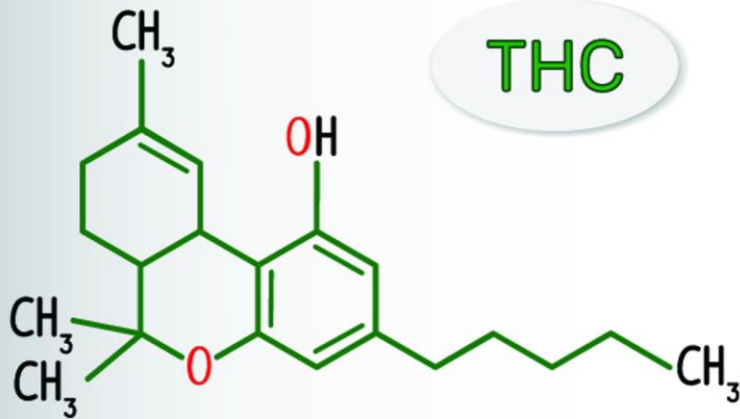




What is Marijuana?

- *Cannabis sativa*
- *Cannabis indica*
- Weed, Pot, Reefer
Grass, Ganja
Mary Jane, Hash
Skunk, Blunt

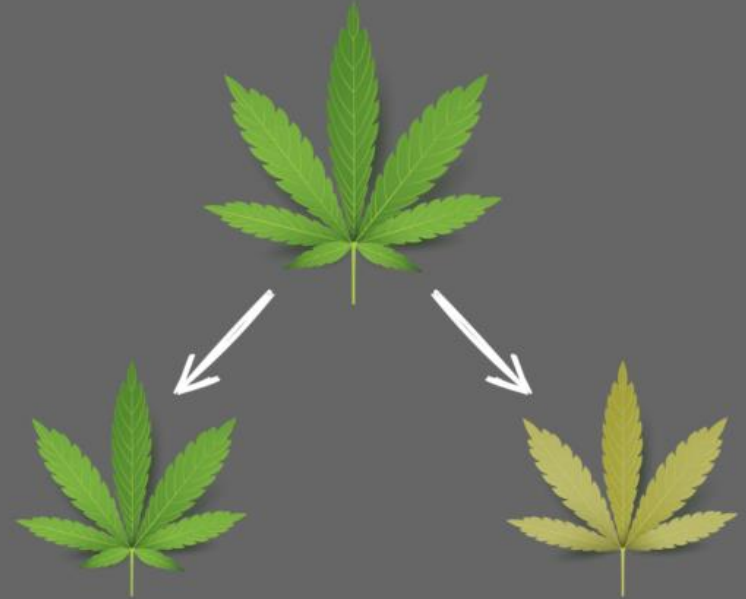
Components



CANNABIS VS HEMP VS MARIJUANA

Cannabis

is a plant family that includes many species, including both hemp and marijuana.



Hemp

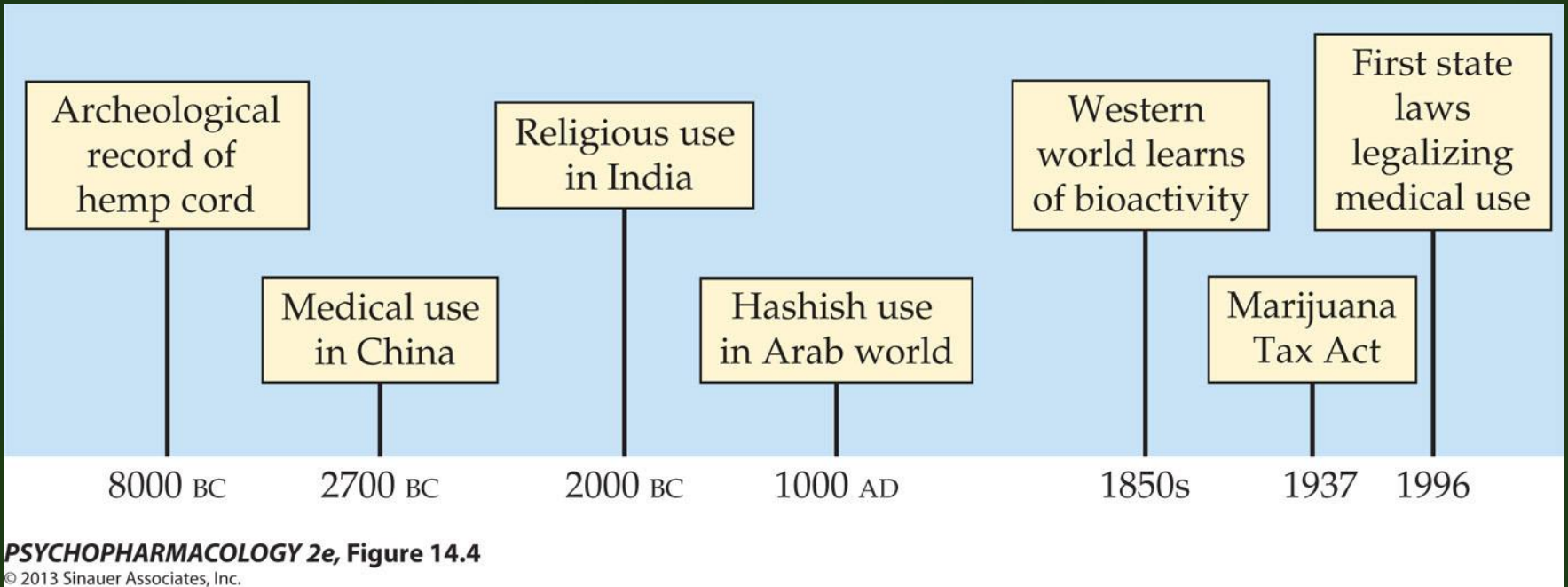
is a variety of cannabis grown for its tall, sturdy stalks and **low levels of THC.**

Marijuana

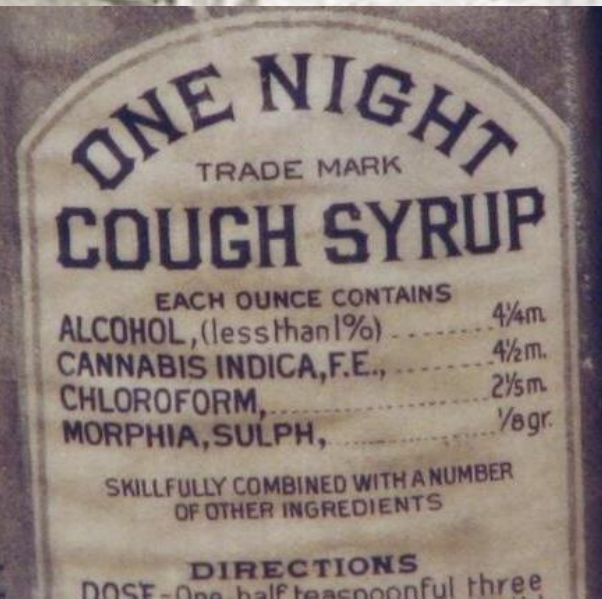
is a variety of cannabis grown for its **high levels of THC.**

Even though Hemp contains low levels of THC it also contains higher levels of other beneficial cannabinoids (like CBD) which may promote relaxation and calming effects in the body.

Marijuana History



Our History with Drugs



ONE NIGHT
TRADE MARK
COUGH SYRUP

EACH OUNCE CONTAINS

ALCOHOL, (less than 1%)	4¼m.
CANNABIS INDICA, F.E.,	4½m.
CHLOROFORM,	2½m.
MORPHIA, SULPH,	⅛gr.

SKILLFULLY COMBINED WITH A NUMBER OF OTHER INGREDIENTS

DIRECTIONS
DOSE - One half teaspoonful three

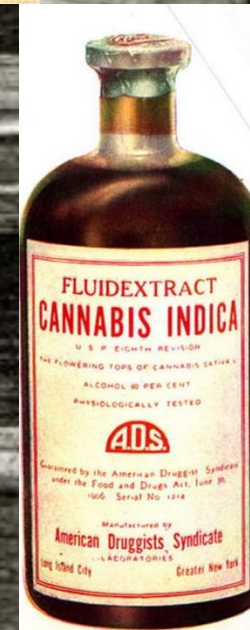


COCAINE
TOOTHACHE DROPS

Instantaneous Cure!
PRICE 15 CENTS.

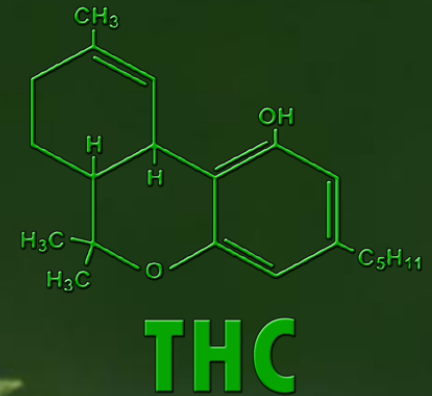
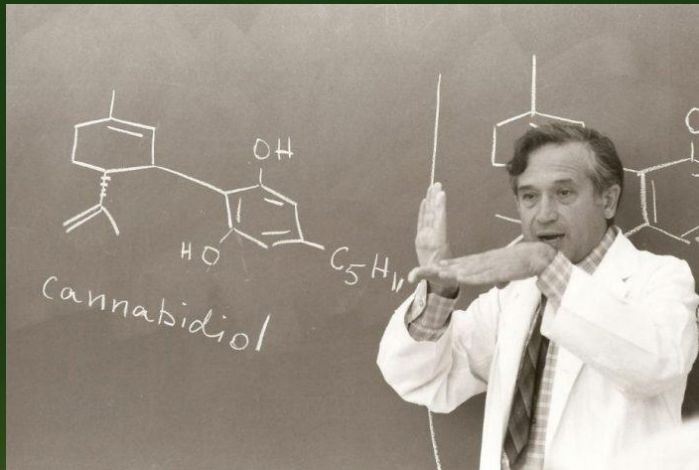
Prepared by the
LLOYD MANUFACTURING CO.
219 HUDSON AVE., ALBANY, N. Y.

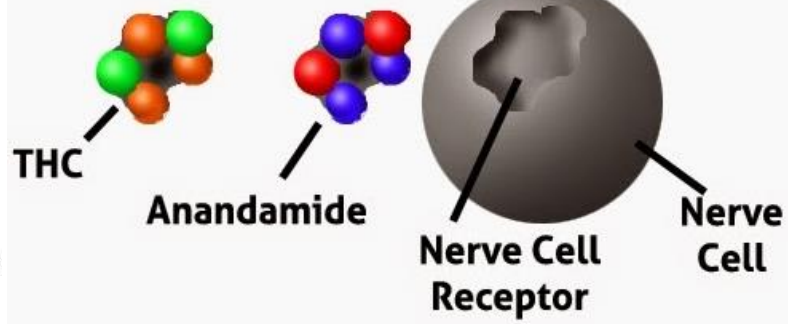
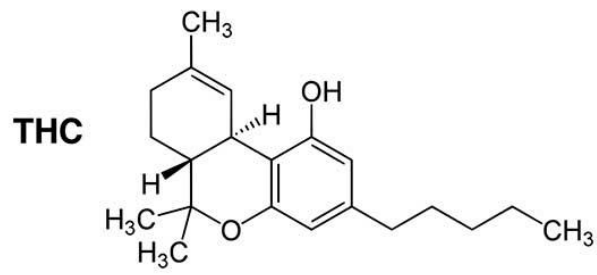
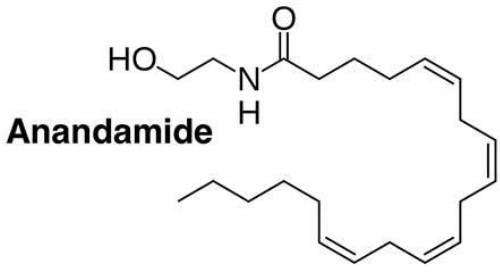
For sale by all Druggists.
(Registered March 1885.) See other side.



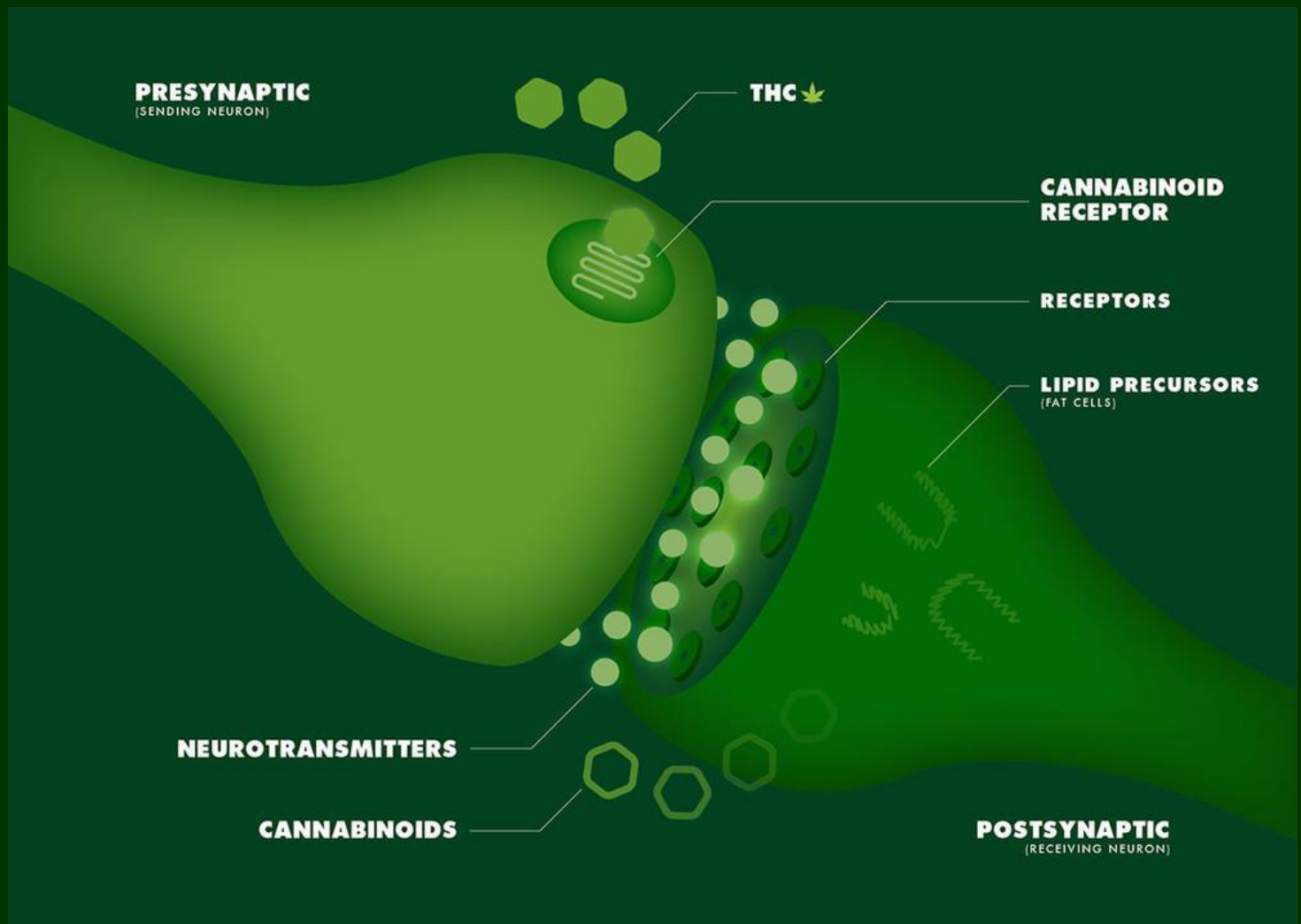
Hey Man, What Exactly is in Marijuana?

- **1805** - **Morphine** was isolated from opium
- **1855** - **Cocaine** was isolated from coca leaves
- **1963** - **THC** in marijuana
- **Raphael Mechoulam, Israel**
 - Got 5 kilos of confiscated Lebanese hash from the Israeli national police
 - Experimented with monkeys (normally aggressive → sedated)
 - Isolated **THC** then **CBD**





Dude,
How
does it
work?



Receptor Sites

CB receptors

CB1

CB1 receptors
Expressed in the CNS
Psychoactive effects

CB2

CB2 receptors
Expressed in immune system
and hematopoietic cells

Endogenous ligands

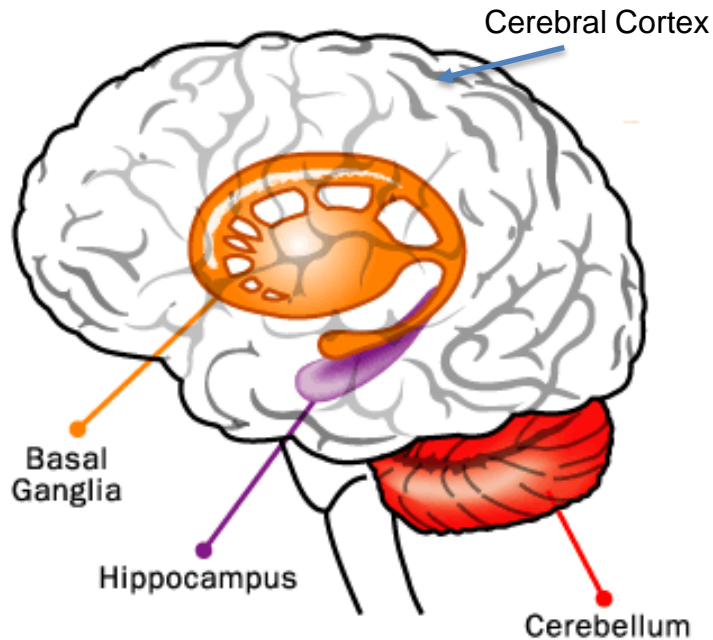
AEA

Anandamide

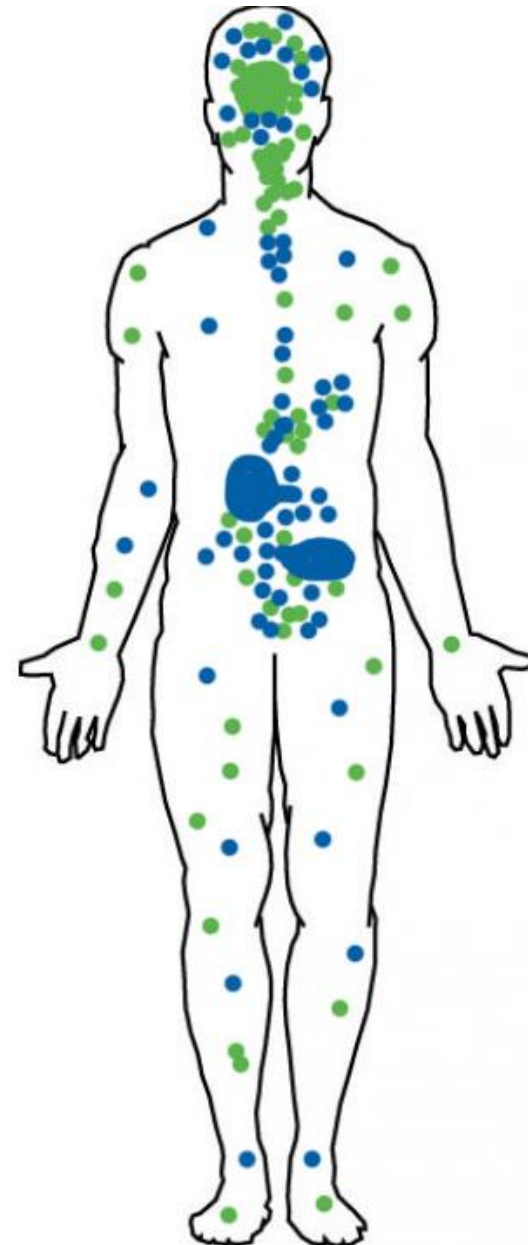
2-AG

2-Arachidonoylglycerol

Cannabinoid Receptor Sites



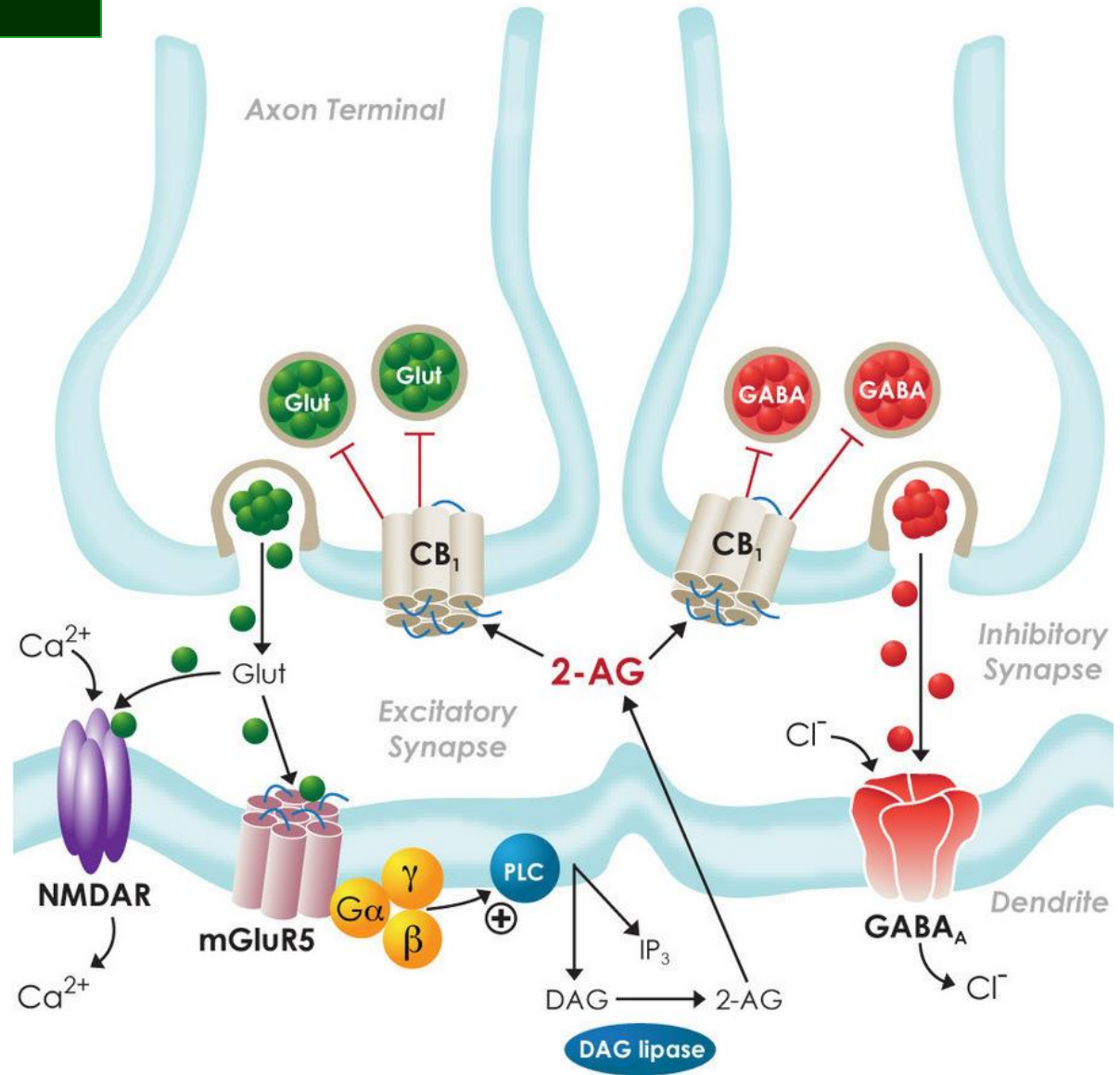
©2001 HowStuffWorks



CB1

CB2

Receptors



Acute Effects

There is no dispute that cannabis produces cognitive impairment during acute intoxication

- Impaired coordination, memory, attention and judgement
- Euphoria
- Peripheral effects - Increased HR

Frequent vs
Occasional Users



Residual Effects

- **Persistent effects (lasting a few days or weeks) due to:**
 - Residue of cannabinoids in the brain
 - Memory and learning skills
 - Withdrawal symptoms
- **Long-term effects due to toxicity to the brain**
 - Cumulative effects of chronic abuse

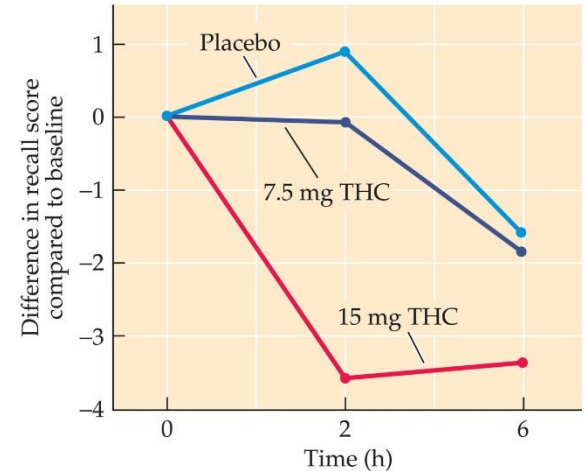


Common Effects of Marijuana with Regard to Students



Affects several mental and physical activities:

- Short-term memory
- Coordination
- Learning
- Problem solving

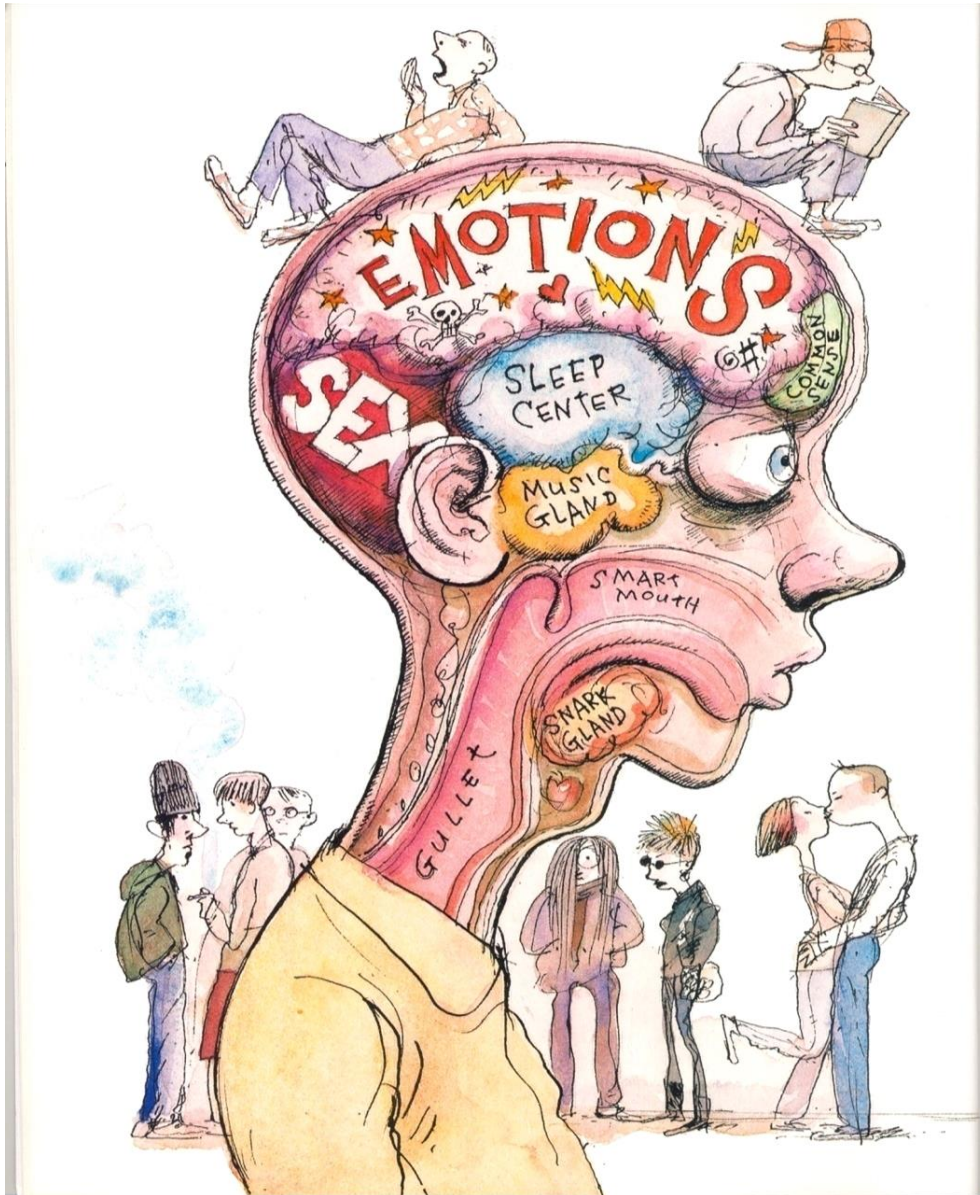


Does marijuana make you lazy?

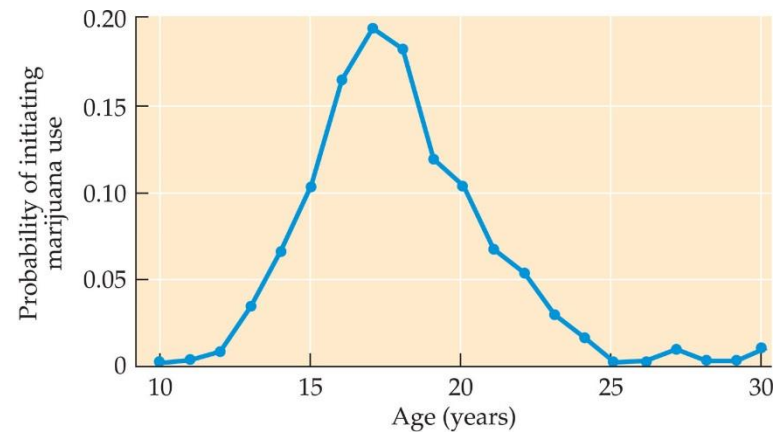


That's just,
like, your
opinion,
man

The Adolescent Brain



The adolescent brain is undergoing significant neurodevelopment well into the 20s, and the regions that are last to develop are most populated by cannabis receptors and are critical to cognitive functioning



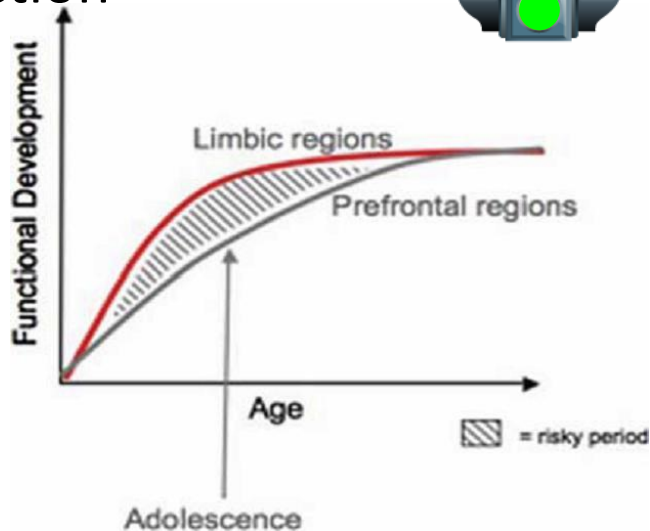
PSYCHOPHARMACOLOGY 2e, Figure 14.17
© 2013 Sinauer Associates, Inc.

Brain Maturation

Nucleus Accumbens

(highly active in adolescence)

- Pleasure center
- Active during pleasurable activities, including feeding, sex, and drug use
- Impulsive behavior
- Plays a major role in addiction



Prefrontal Cortex

(matures late adolescence or early adulthood)

- Impulse control
- Decision-making
- Organizing and planning
- Abstract thought, rational thinking
- Attention, focus
- Working memory



Drug Use and College Students

- Annual use of illicit drugs other than marijuana - 18% in 2017 for college and non-college youth
- The 2017 annual prevalence of nonmedical use of prescription narcotic drugs (other than heroin), such as OxyContin and Vicodin, was 3.1% for college students and 4.1% for non-college youth

National study shows marijuana use among US college students and noncollege youth is on the rise



Marijuana use among US college students remains at highest level in three decades

38%

In 2017, 38% of full-time college students aged 19-22 used marijuana at least once in the prior 12 months.

For high school graduates aged 19-22 who are not full-time college students, 41% used marijuana at least once in the previous year.

41%

13%

Daily marijuana use has continued to rise for same-age noncollege youth, reaching its highest level in 2017 at 13%, doubling over the past decade.

There is an ongoing decline in perceptions of risk of harm from regular marijuana use. In 2017, 27 percent of those aged 19-22 perceived regular use of marijuana as carrying great risk of harm, the lowest level since 1980.

27%

Reasons Young Adults Use Marijuana – Experimentation vs Motivation

- Peer pressure
- Belief That Marijuana Is Harmless
- Availability and Opportunity
- To feel good
- Ease boredom
- Relieve tension or frustration
- Seek deeper insights
- Escape problems
- To increase (or decrease) the effects of other drugs



Marijuana and College Students

- **The more students report using marijuana, the more they skip classes, have lower GPAs, have enrollment gaps, and do not graduate on time**
 - *Discontinuous enrollment during college: Associations with substance use and mental health* Amelia M. Arria, Ph.D et al, *Psychiatr Serv*, 2013
- **College students who use marijuana have lower GPAs than those who do not and are more likely to drop out and less likely to graduate on time**
 - *Marijuana use trajectories and academic outcomes among college students* Suerken CK et al, *Drug and Alcohol Dependence*, 2016
- **A significant decline in GPAs over two years when students used both marijuana and alcohol at moderate to high levels**
 - *Longitudinal influence of alcohol and marijuana use on academic performance in college students*, Meda SA et al, *PLOS one*, 2017

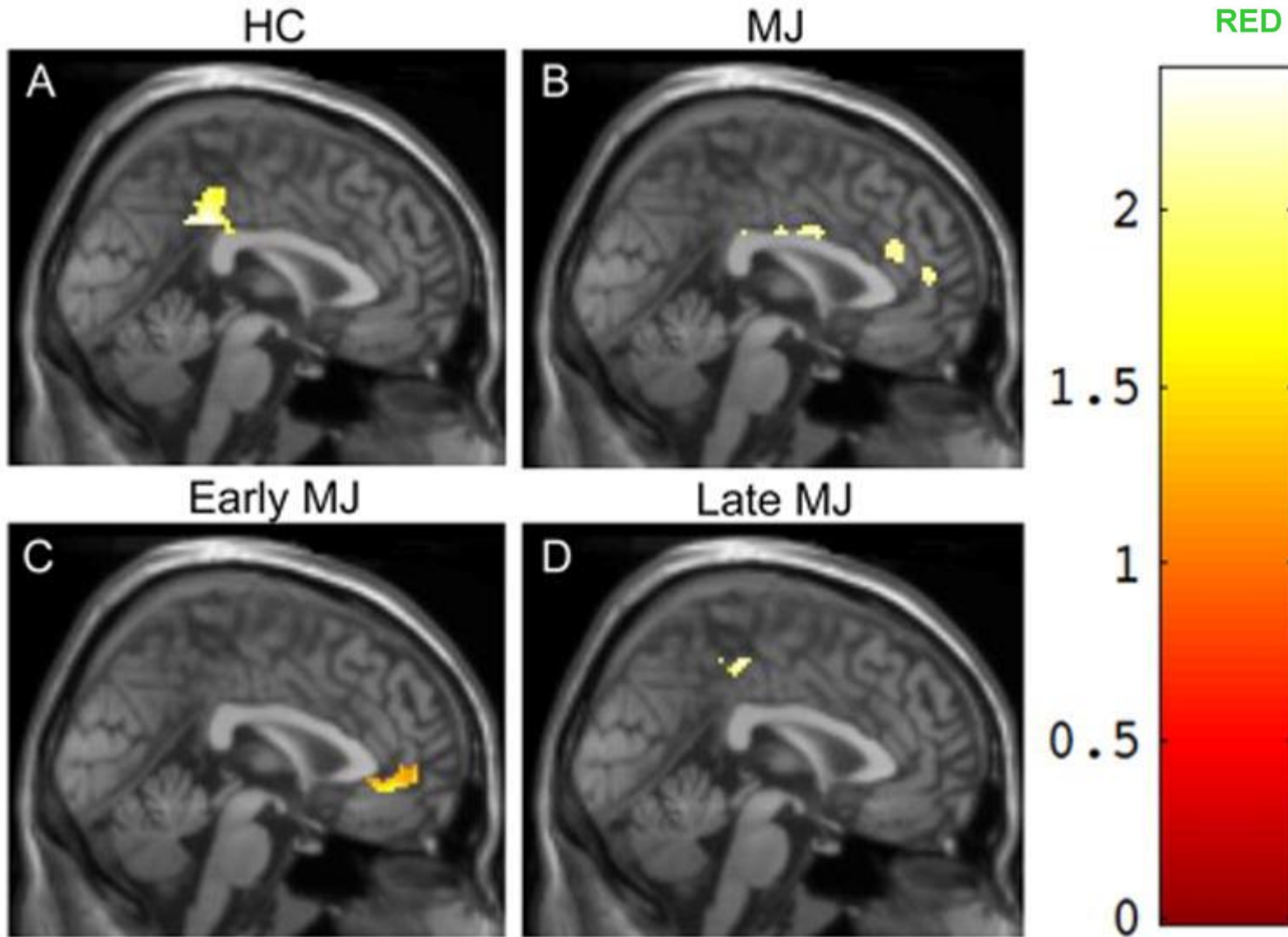
What do the
data show?



STUDIES	Cognitive	Brain Structure	Brain Function Effects
Meier et al., 2012	↓ IQ		
Pope et al., 2003	↓ IQ		
Ehrenreich et al., 1999	↓ attention		
Huestegge et al., 2002	↓ visual search		
Fontes et al., 2011	↓ executive functioning		
Solowij et al., 2012	↓ executive functioning		
Churchwell et al., 2010		↓ prefrontal cortex volume	
Gruber et al., 2011	↑ impulsivity	↓ white matter integrity in prefrontal cortex	
Lopez-Larson et al., 2011		↓ prefrontal cortex thickness	
Wilson et al., 2000		↓ total gray matter,	
Becker et al., 2010a			↑ prefrontal cortex activity during working memory task
Gruber et al., 2012			↓ anterior cingulate activity during inhibition task
Jager et al., 2010			↑ prefrontal cortex activity during in working memory

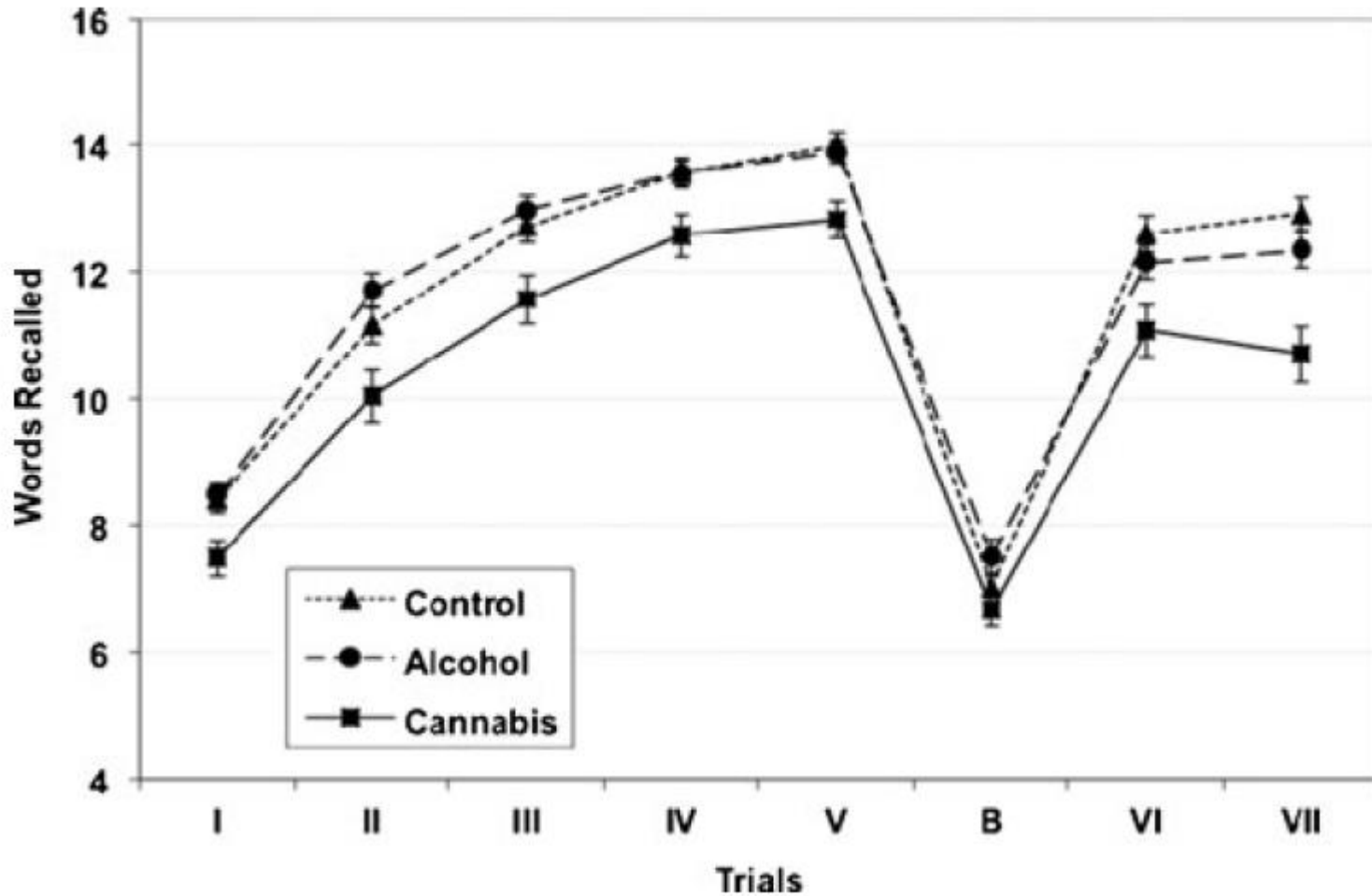
Stroop Test fMRI Activation

PURPLE YELLOW RED
BLACK RED GREEN
RED YELLOW ORANGE
BLUE PURPLE BLACK
RED GREEN ORANGE



Sagar, K. A., Dahlgren, M. K., Gönenç, A., Racine, M. T., Dreman, M. W., & Gruber, S. A. (2015). The impact of initiation: Early onset marijuana smokers demonstrate altered Stroop performance and brain activation. *Developmental Cognitive Neuroscience*, 16, 84-92.

Memory

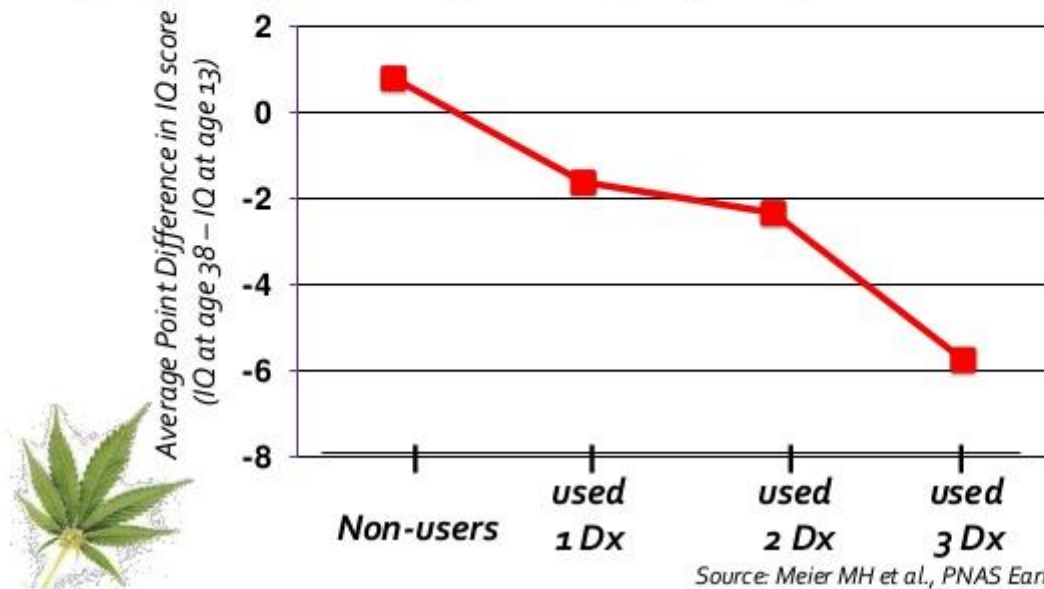


Persistent cannabis users show neuropsychological decline from childhood to midlife

Madeline H. Meier^{a,b,1}, Avshalom Caspi^{a,b,c,d,e}, Antony Ambler^{e,f}, HonaLee Harrington^{b,c,d}, Renate Houts^{b,c,d}, Richard S. E. Keefe^d, Kay McDonald^f, Aimee Ward^f, Richie Poulton^f, and Terrie E. Moffitt^{a,b,c,d,e}

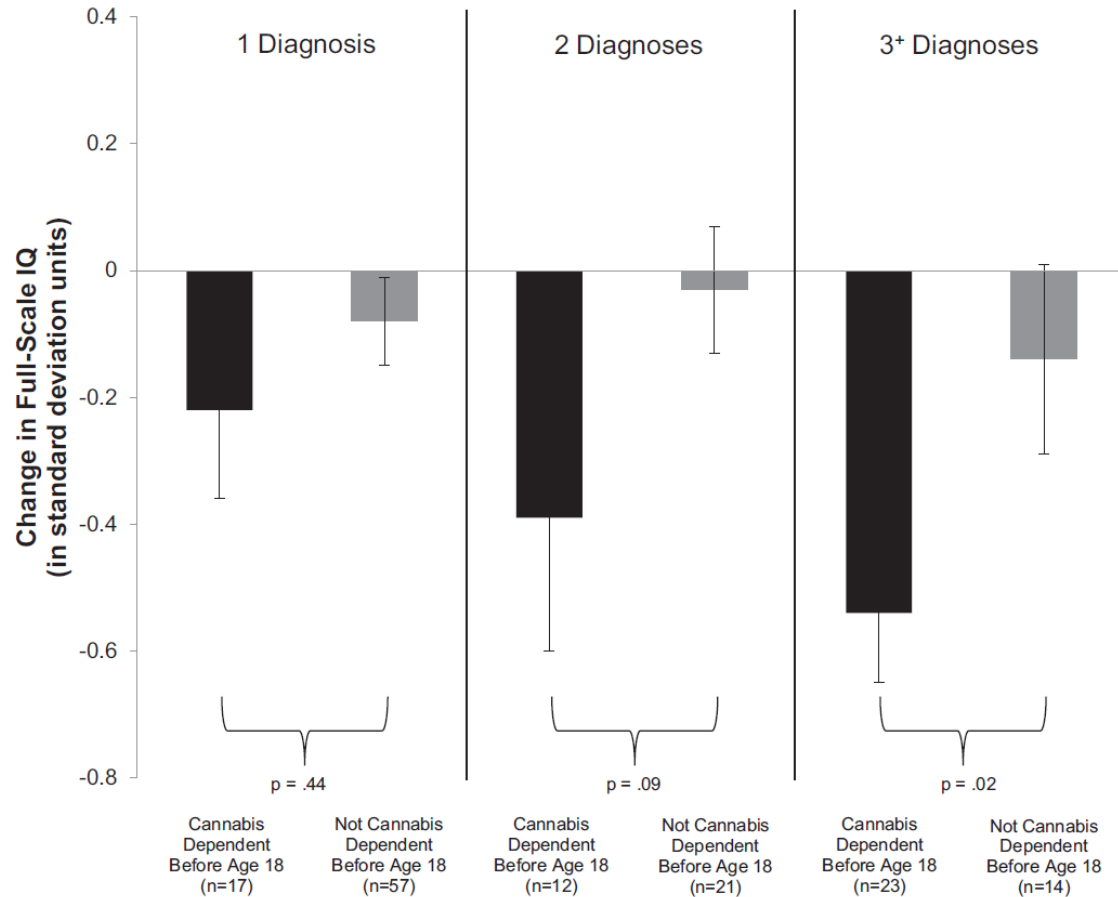
Persistent Marijuana Users Show A Significant IQ Drop between Childhood and Midlife

Followed 1,037 individuals from birth to age 38. Tested marijuana use at 18, 21, 26, 32 and 38. Tested for IQ at ages 13 and 38



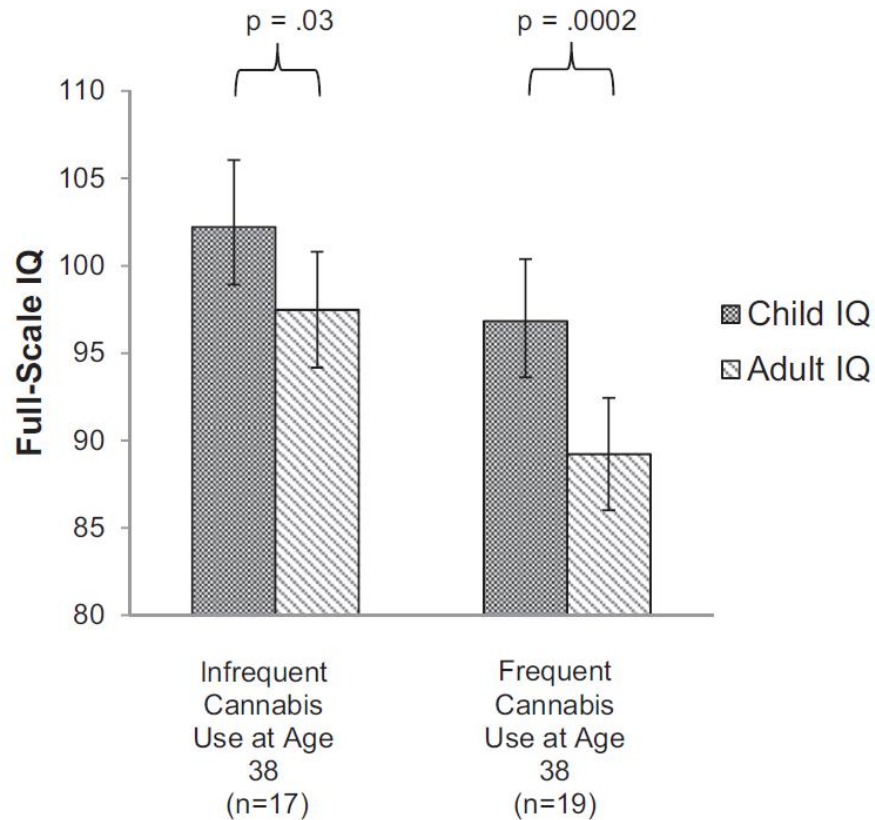
Source: Meier MH et al., PNAS Early Edition 2012

Marijuana Use and IQ

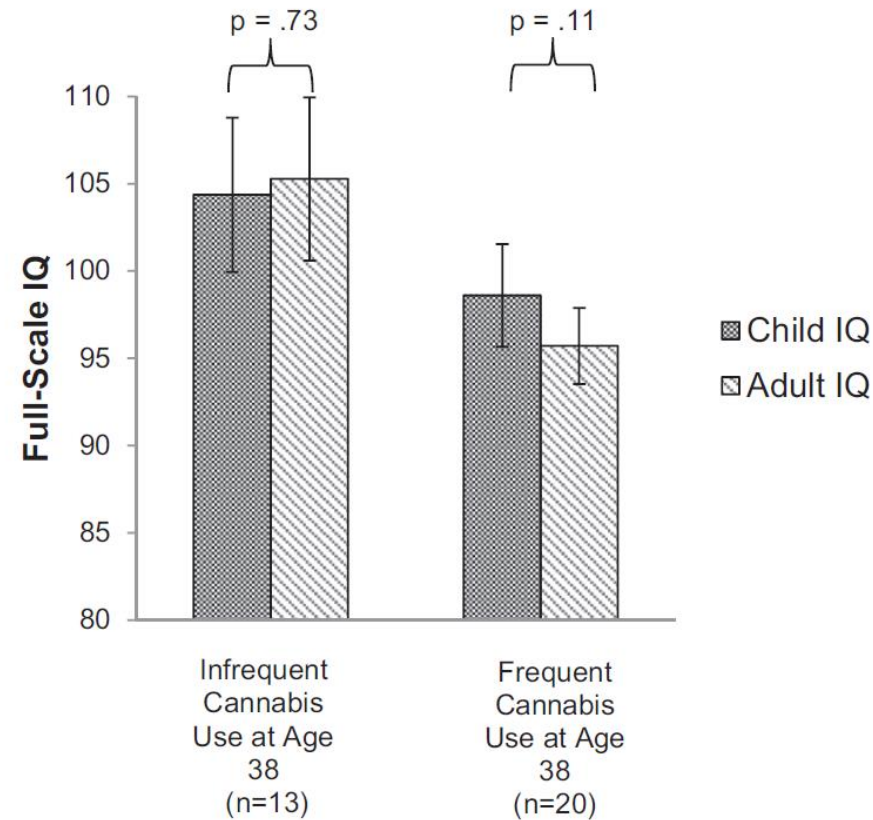


Persistent cannabis users show neuropsychological decline from childhood to midlife; M.H. Meier, A. Caspi, A. Ambler, H. Harrington, R. Houts, R.S.E. Keefe, K. McDonald, A. Ward, R. Poulton, and T.E. Moffitt; PNAS (2012) 109 (40)

Does Cessation of MJ use Restore Neuropsychological Functioning?



Adolescent-Onset (Used Cannabis Weekly Before Age 18)



Adult-Onset (Did Not Use Cannabis Weekly Before Age 18)

Persistent cannabis users show neuropsychological decline from childhood to midlife; M.H. Meier, A. Caspi, A. Ambler, H. Harrington, R. Houts, R.S.E. Keefe, K. McDonald, A. Ward, R. Poulton, and T.E. Moffitt; PNAS (2012) 109 (40)

Harvard Study Shows Smoking Marijuana Improves Cognitive Function

Scientific findings indicate that pot use improves cognitive performance.

in f t

Medical Marijuana Improves Executive Function in the Brain



SHUTTERSTOCK

Wait.... What??

Unlike recreational marijuana, medical marijuana has benefits that haven't been fully tested out — until now.

THC



CBD

Medical Marijuana

Euphoria

Relaxation

**Appetite
Stimulant**

Drowsiness

Analgesic

Neuro-protective

Anti-convulsant

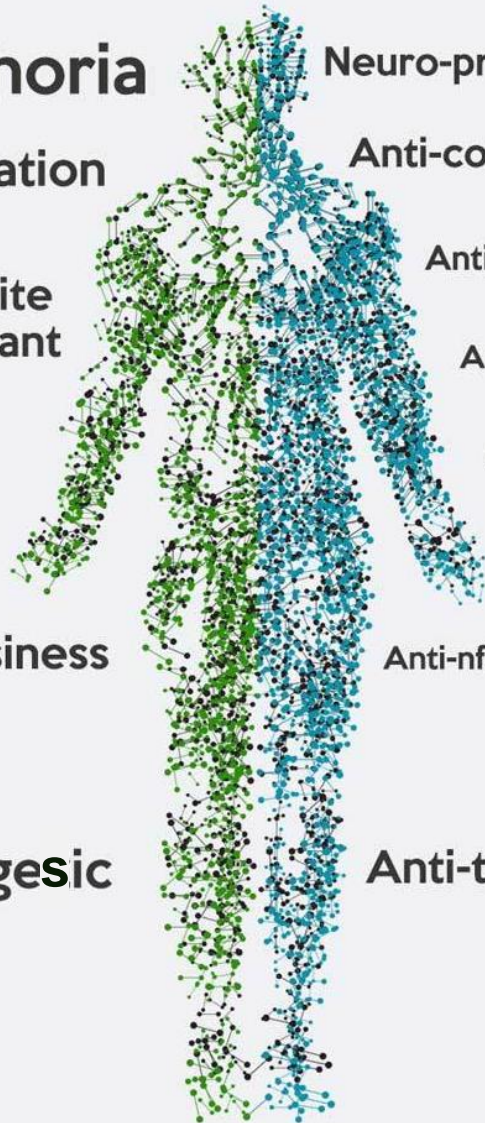
Anti-psychotic

Anti-oxidant

Anti-emetic

Anti-inflammatory

Anti-tumoral



- **THC**

- Helps with pain, nausea, sleep apnea, stress disorders

- **CBD**

- Helps with inflammation, stress, depression, anxiety, cancer, epilepsy, schizophrenia, multiple sclerosis, migraines, arthritis, the side effects of cancer treatments
- Does not have psychoactive effects like THC

Medical Marijuana



Parkinsons



Federal Government Stance on Marijuana

Legal



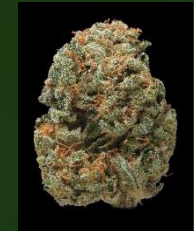
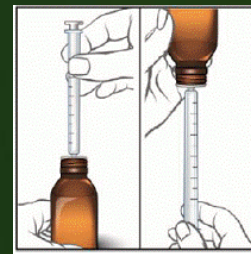
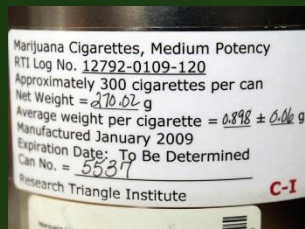
Legal



Legal



Illegal



Since 1976

Since 1985

Since 2018

Since 2010

HealTHCare

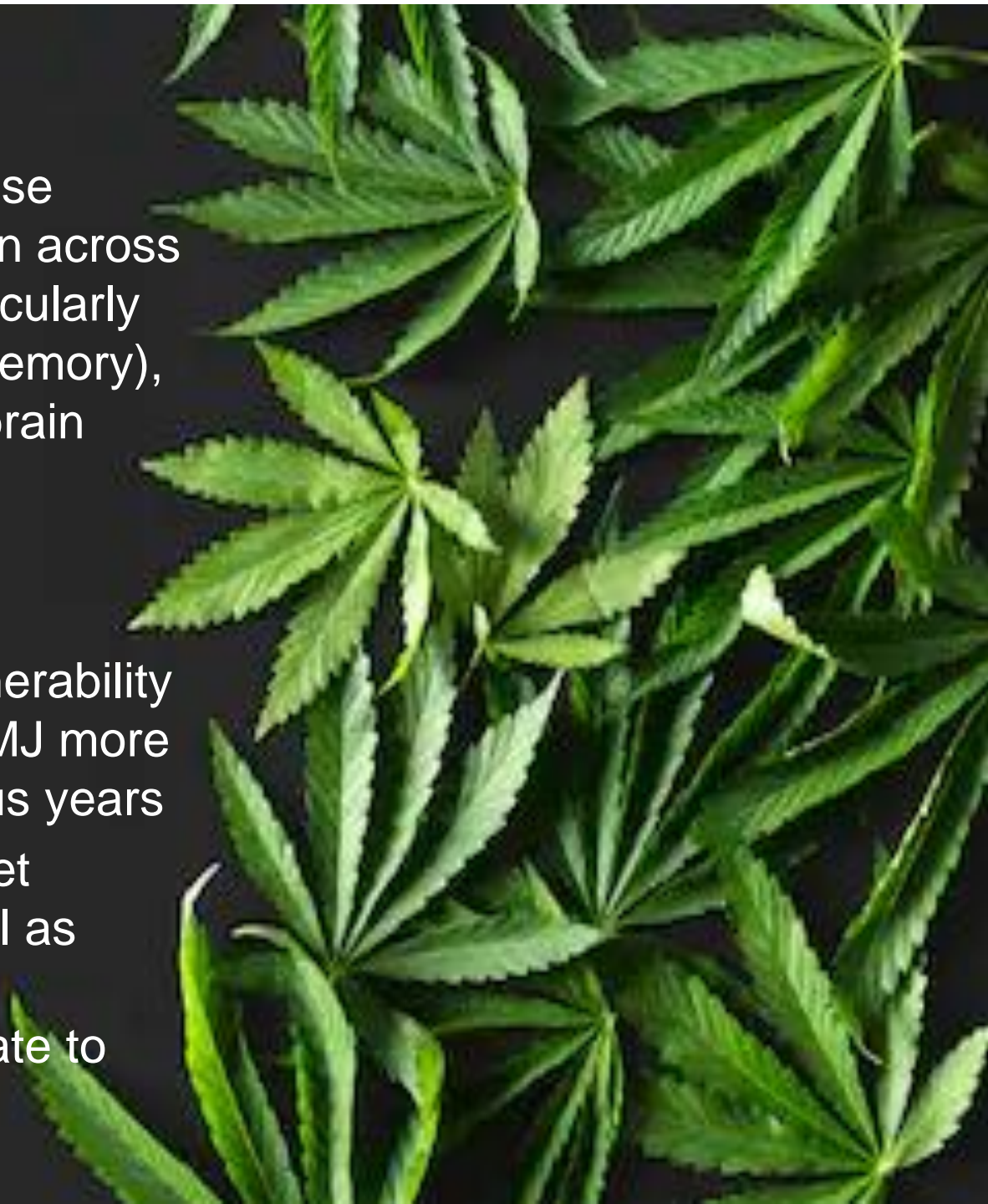


- In chemotherapy induced nausea and vomiting, oral cannabinoids are effective antiemetics
- In chronic pain, patients who were treated with cannabis or cannabinoids are more likely to experience a clinically significant reduction in pain symptoms
- In multiple sclerosis (MS) related spasticity, short-term use of oral cannabinoids improves patient-reported spasticity symptoms
- Evidence suggests that CBD may be an effective treatment for patients with drug-resistant forms of epilepsy



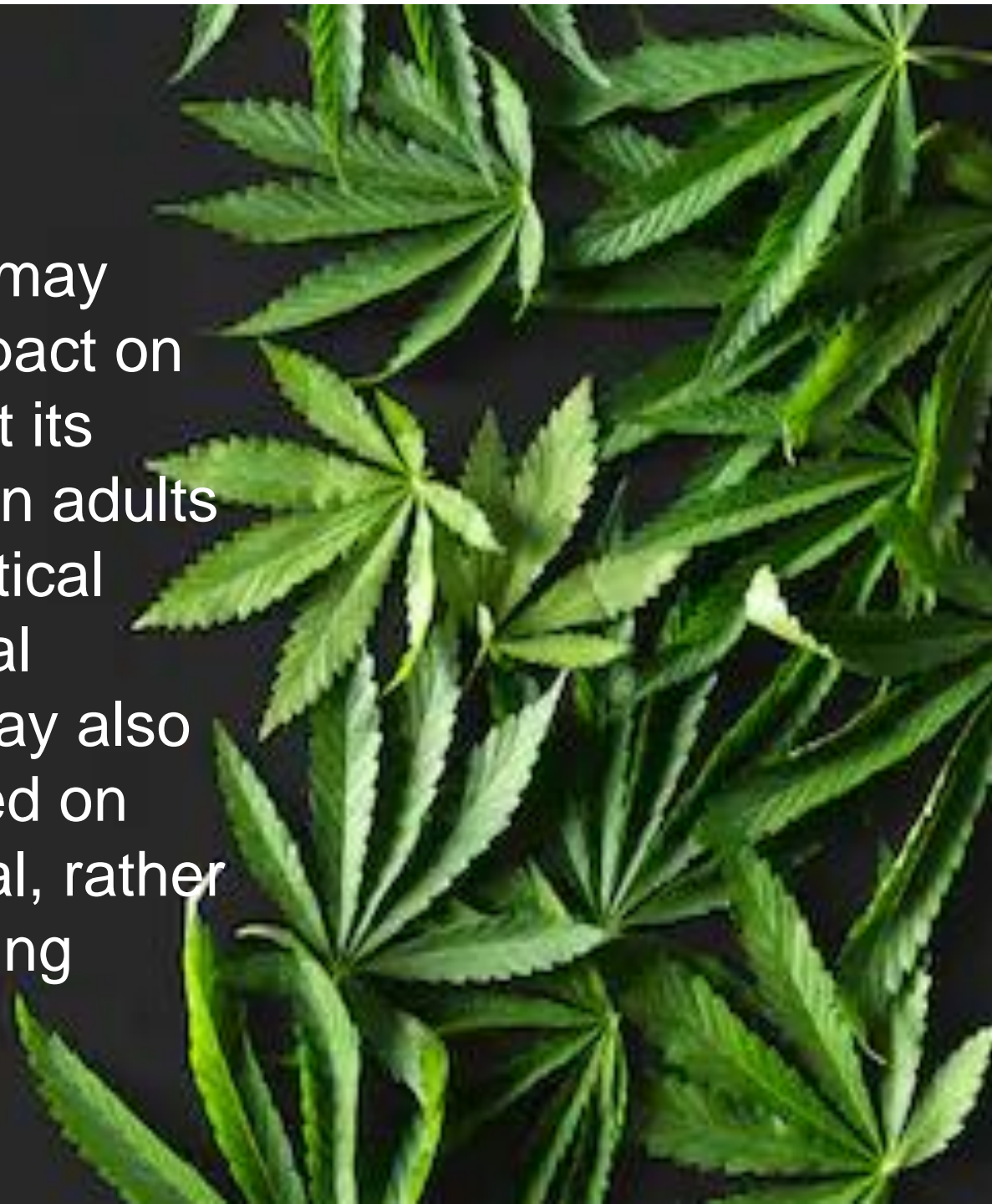
Key Points

- **Recreational marijuana** use relates to poorer cognition across numerous domains (particularly executive function and memory), as well as alterations in brain structure and function
- Those with the highest neurodevelopmental vulnerability (adolescents) are using MJ more frequently than in previous years
 - Earlier age of MJ onset (adolescence), as well as higher frequency and magnitude of use, relate to further impairment



Key Points

- **Medical marijuana** may confer a unique impact on the brain, given that its consumers are often adults who are beyond critical neurodevelopmental periods and who may also seek products based on therapeutic potential, rather than for mood altering effects



Thank You!



NaturalNews.com