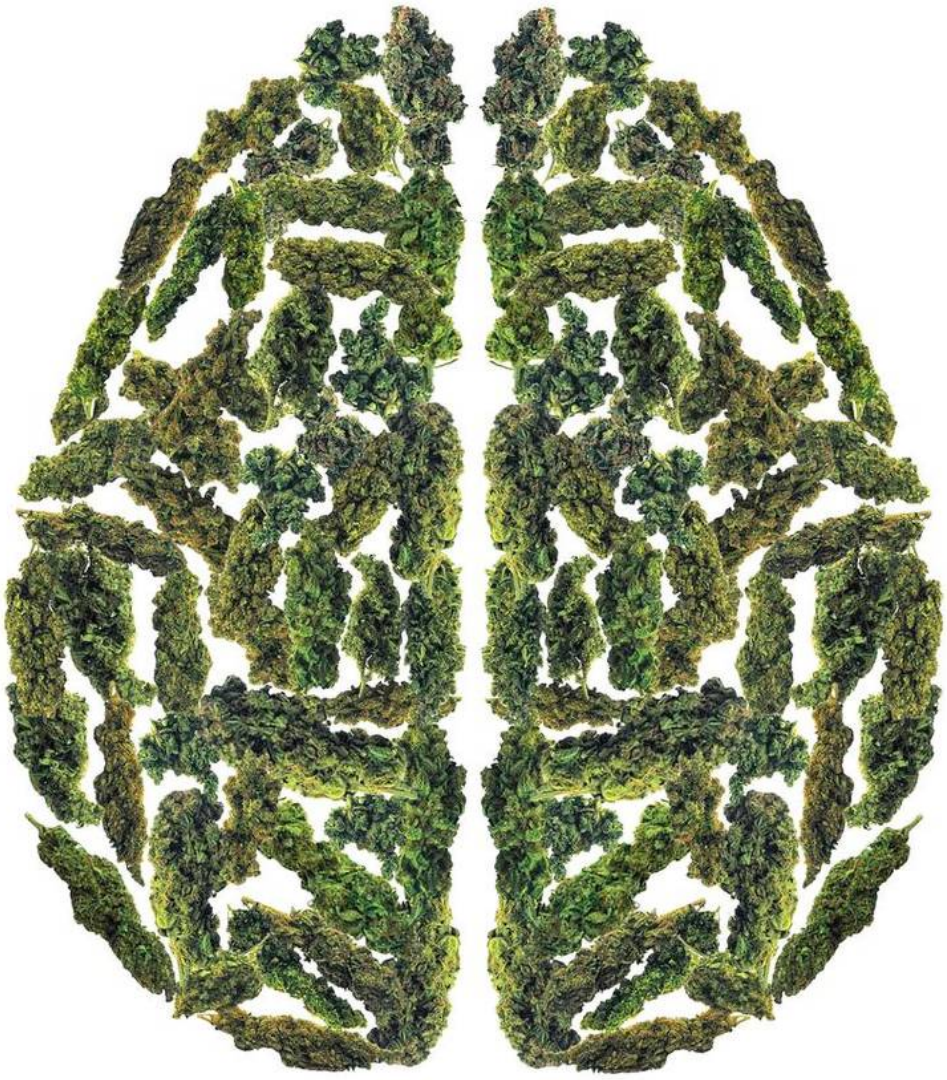
your brain on…



WEED

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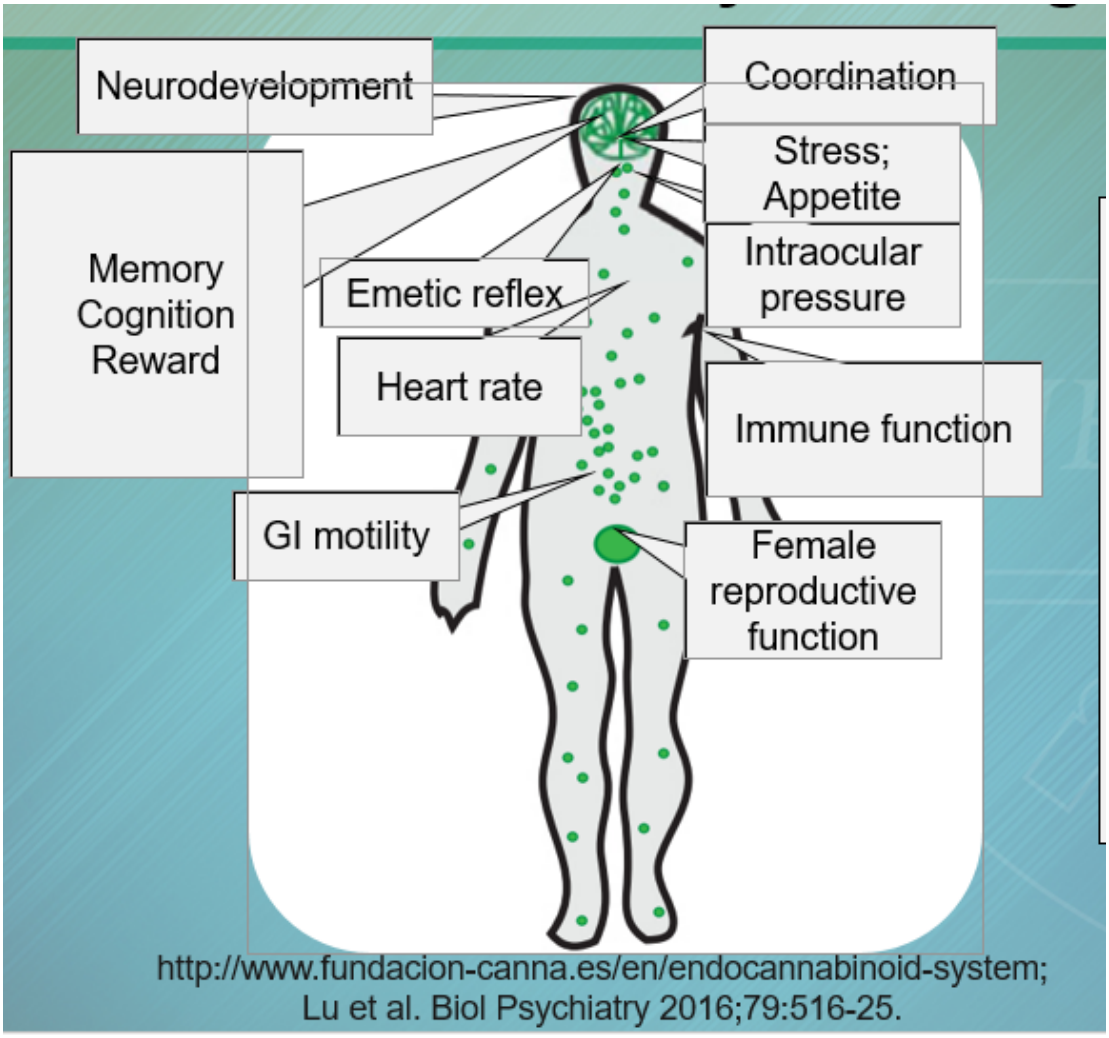
IN THIS ISSUE:

ENDOCANNABINOIDS

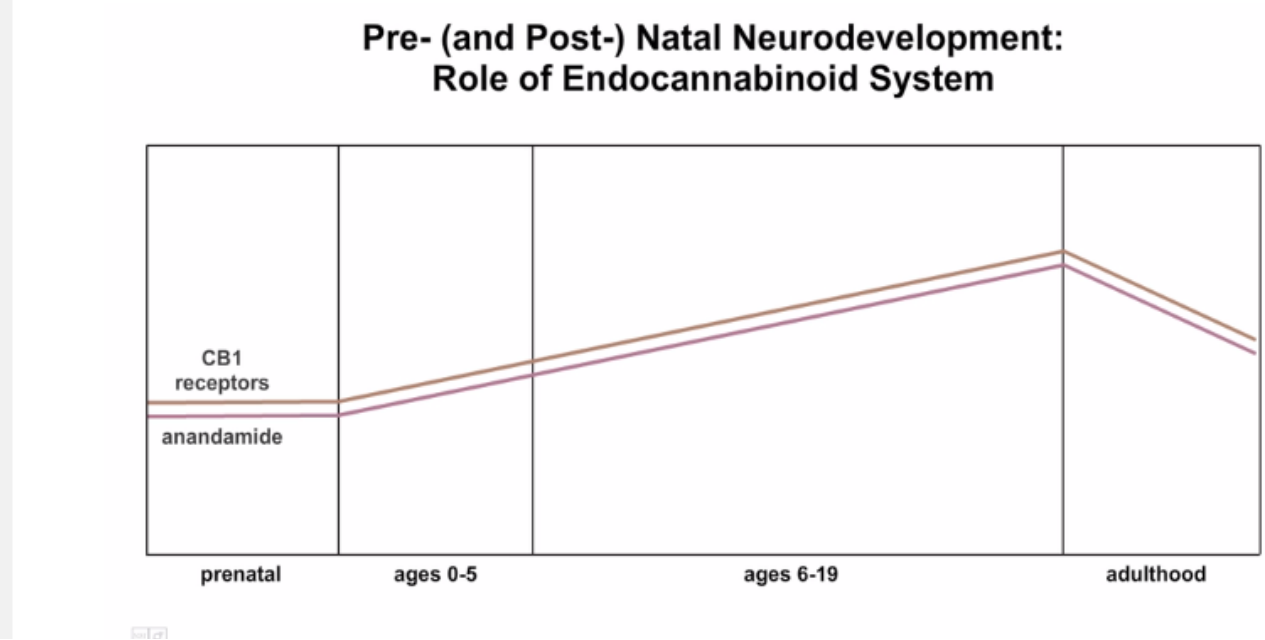
The body has its own system of cannabinoids – these are known as "endogenous" (produced by the body) cannabinoids, or endocannabinoids for short.



- Endocannabinoids have numerous critical functions throughout the body, shown above. Some of the most important include brain development, immune function, regulating appetite and digestion, and monitoring heart rate.

The MOST important function of endocannabinoids is neurodevelopment. There is a high density of **receptors** for cannabinoids as well as of **anandamide**, our most common endocannabinoid, from the prenatal period through childhood and rises sharply during adolescence.

Our endocannabinoid systems are at their **peak function during early adulthood**, as you can see from the graph below.



So what exactly are they DOING?

Endocannabinoids help our brains develop properly. From birth to age 6, they help neurons grow and spread connections furiously. Then, in adolescence, a very important process called “synaptic pruning” occurs. This is when the neural connections in our brain are carefully adjusted, refined, reduced – in short, “pruned” - in preparation for adulthood. Our natural cannabinoids help regulate this process.

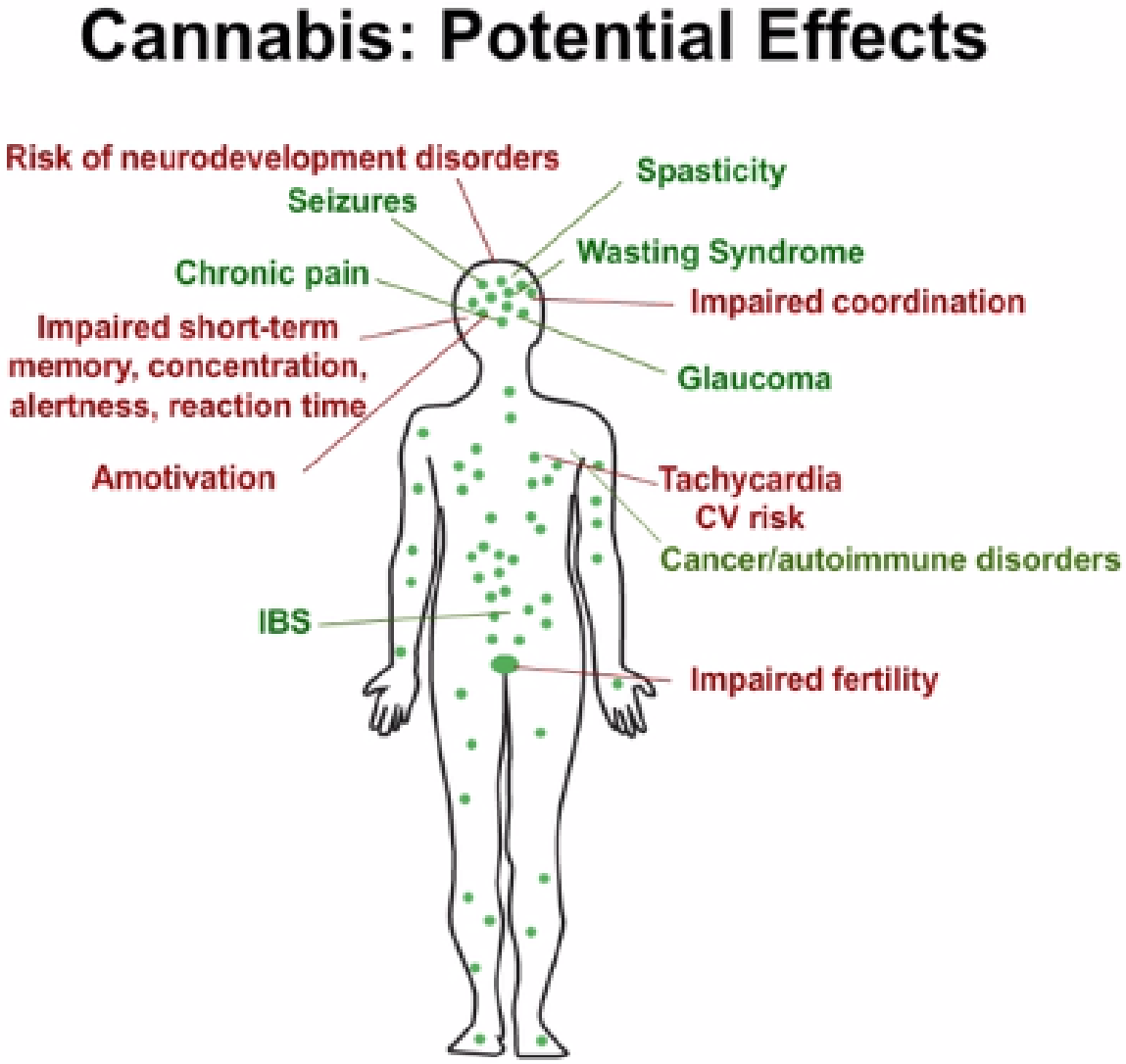
C A N N A B I S

Since our natural cannabinoids have so many widespread effects, it makes sense that cannabis can have just as many effects throughout the body.

Cannabis interacts with the cannabinoid system via receptors in the brain known as CB1 and CB2 receptors. There are over 500 chemicals in cannabis, and at least 60-100 of those can actively interact with our endocannabinoid system.

The most active subtance in cannabis is THC. The other most studied cannabinoid is CBD, which is not psychoactive, and does not interact directly with the cannabinoid system. Rather, it has effects on other neurotransmitter systems, such as serotonin, which may explain some of its beneficial effects.

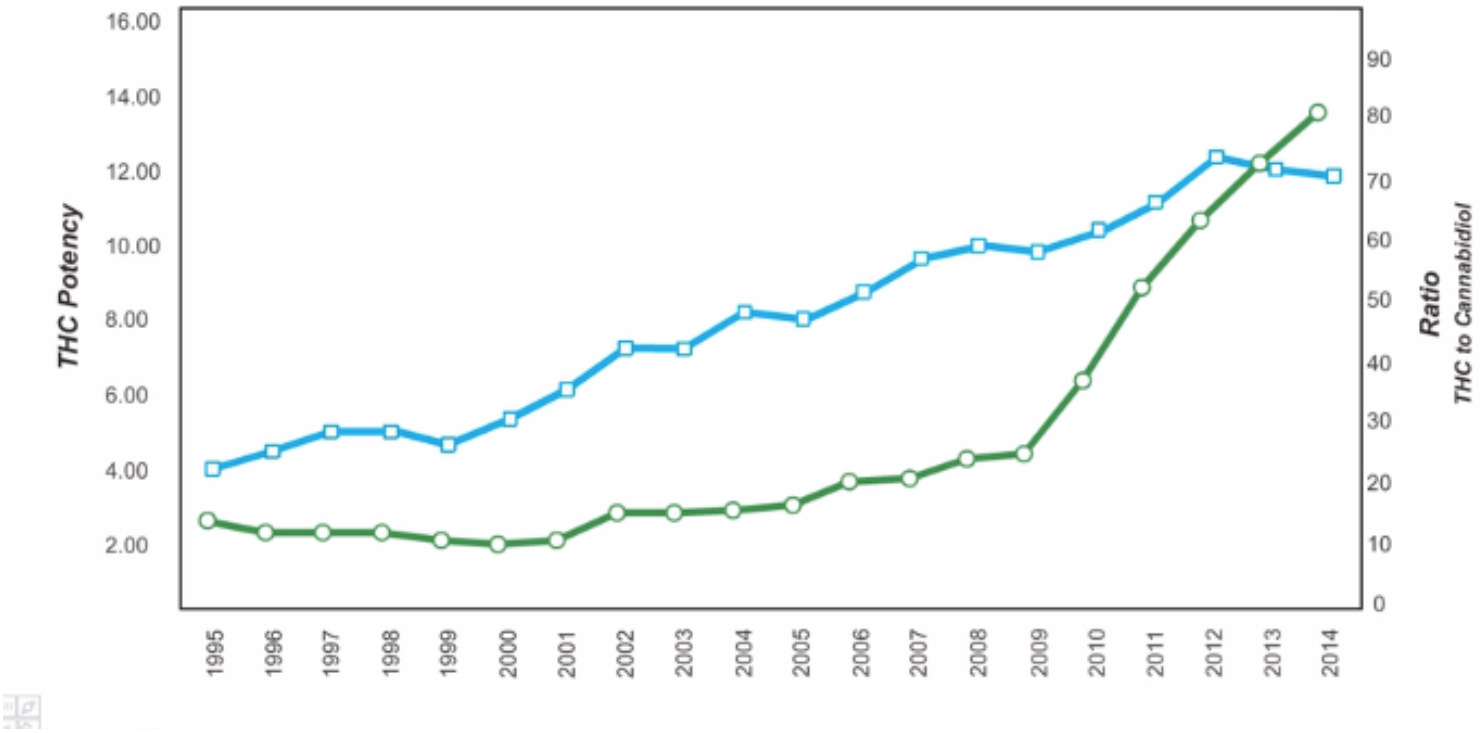
Some of the potential positive and negative effects of cannabis are shown below. Beneficial effects are in green, while harmful effects are in red.



Some of the negative effects of cannabis include reduced motivation, impaired fertility, increased heart rate and cardiovascular risks, impaired coordination, impaired memory and concentration, and increased risk of neurodevelopmental disorders.

not your grandma's marijuana….

The chart below shows how THC potency and the ratio of THC to CBD in cannabis has changed over the decades.



In 1969, for example, marijuana typically contained about 1% of the psychoactive ingredient – tetrahydrocannabinol, or THC. Today, it has closer to 10-15%, on average, and some particularly potent strains can have up to 30%.

This is important because the relative concentrations of THC to CBD increase the risk for adverse effects, including psychosis, anxiety and depressive disorders

	 Cannabis w/ Low CBD Content	 Cannabis w/ High CBD Content	 CBD alone
Psychosis symptoms	Higher risk of hallucinations and delusions	Lower risk of hallucinations and delusions	Possible antipsychotic effects
Psychotic disorder	Earlier age of onset	Later age of onset	
Cognition	Higher risk of acute memory impairment	Lower risk of acute memory impairment	
Anxiety	Anxiogenic; Increased amygdalar activity		Anxiolytic; Reduced amygdalar activity

Iseger TA, Bossong MG. Schizophr Res 2016;162:153-61

A LOT of recent research has focused on the effects of marijuana use on developing brains. Here's a summary:

- Large scale, long-term study at Duke University: the earlier and more frequently a person smoked, the greater the loss of intelligence by age 38. Compared to their IQs measured at age 13, people who had started using cannabis as teens and maintained a daily habit into adulthood had, on average, a six-point drop in IQ. The decline was not trivial: By age 38, their average IQ was below that of 70 per cent of their peers. Quitting pot did not restore intellectual functioning for those who started as teens.
  - Same study showed that those who used cannabis heavily before age 18 had higher chance of later suicide attempts, ongoing cannabis use, and use of other illicit substances.

- Large scale Canadian study: Compared young adults ages 19-21 who had smoked at least once per week for 3 years or more with those who did not smoke regularly. fMRI scans showed significantly higher brain activity for pot smokers for tests measuring impulsivity, working memory, spatial processing, and sustained attention. This means their brains had to work much harder to complete the same executive functioning tasks.

- MRI scans found abnormalities in brain regions of 18-25 year olds who smoked at least once a week – the greater the use, the higher the deficits in areas related to emotion and reward processing.

- Rat studies found that rats exposed to cannabis in adolescence had ongoing mental deficits 9 years later – rats exposed in young adulthood did NOT have similar impairments

- Earlier a teen starts smoking, less white and gray matter volume in the prefrontal cortex – the part of your brain that does most of the THINKING!

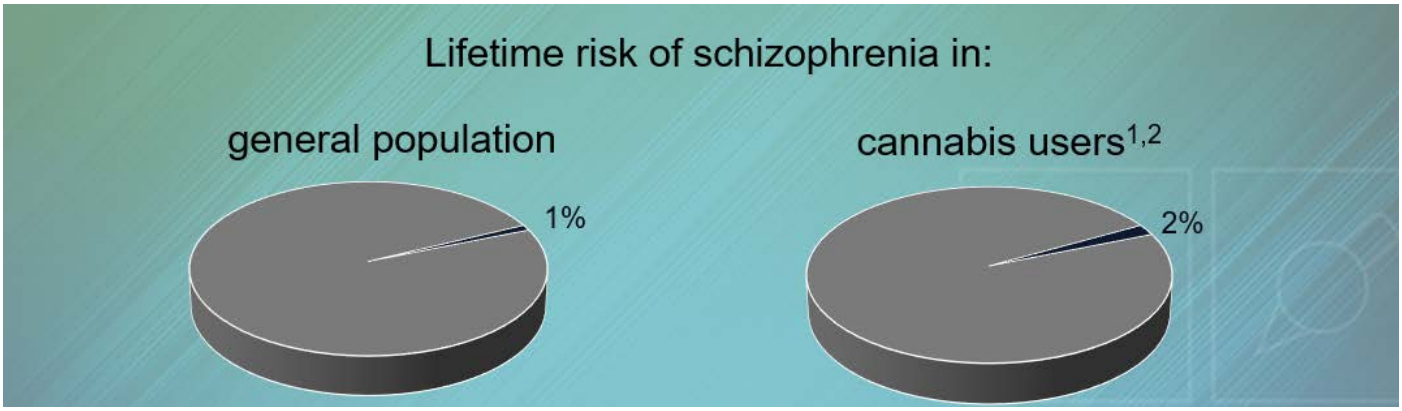
- Animal models show persistent deficits in learning, working memory, object recognition, disruption in social behavior, depressive behaviors

CANNABIS and MENTAL HEALTH

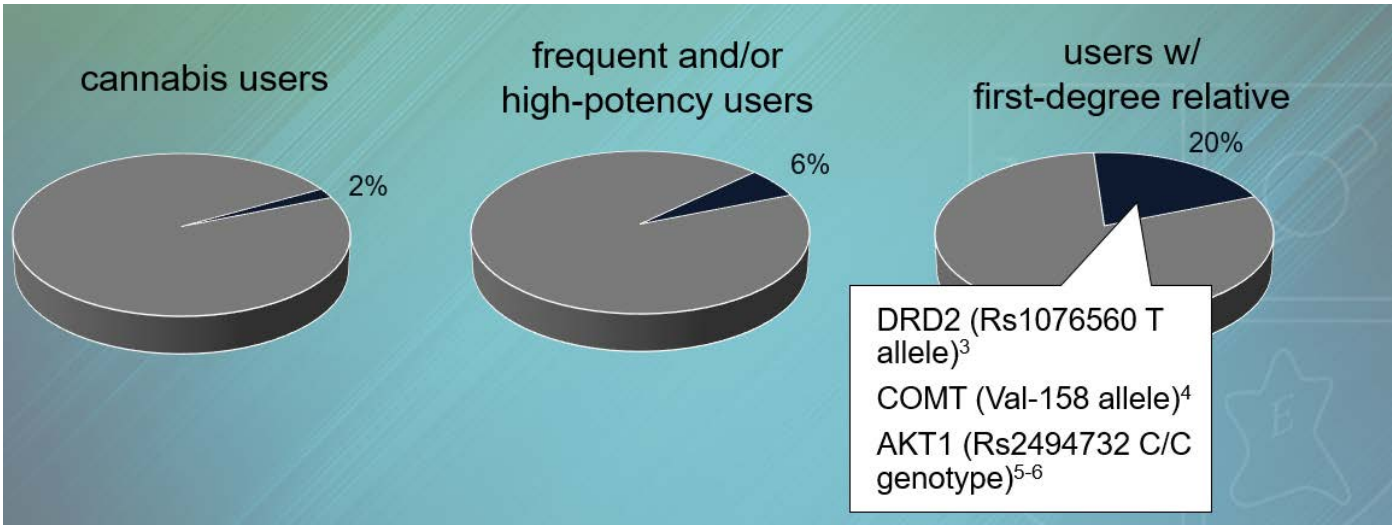
Those exposed to cannabis in their teens may develop larger amygdalas (a part of the brain responsible for processing emotions) – leading to depression and anxiety

While some people experience reduced anxiety when they use cannabis, with long term use, cannabis can cause worsening anxiety disorders (except social anxiety disorder), panic attacks, and paranoia

Cannabis users have double the risk of developing psychotic disorders such as schizophrenia – particularly if there is a genetic vulnerability.



For frequent users (once a week or more) – the risk jumps to 6%, and for users with a first degree relative with schizophrenia, the risk is 20% - 20 TIMES the general population risk. Large-scale studies in Sweden, Germany, and the Netherlands have confirmed these results.



Gage SH et al. Biol Psychiatry 2016;79:549-56; Volkow N et al. JAMA Psychiatry 2016;73(3):292-7; Colizzi M et al. Schizophr Bull 2015;41(5):1171-82; Henquet C et al. Neuropsychopharmacol 2006;31(12):2748-57; van Winkel R et al. Neuropyschopharmacol 2011;36(12)2529-37; Di Forti M et al. Biol Psychiatry 2012;72(10):811-6.

IN SUMMARY!

- Marijuana interacts with systems in your brain critical for healthy development

- Higher risks for impaired developmental processes and mental health issues are related to an earlier age of starting use, frequency of use, duration of use, and potency of the cannabis

- Research shows well-established risks for psychotic disorders, anxiety, depression and impaired neurodevelopment, including deficits in learning, memory, critical thinking, IQ and social/emotional skills

- Research shows well-established therapeutic benefits for chronic pain conditions, nausea/vomiting related to chemotherapy, and spasticity in multiple sclerosis. A new cannabidiol drug has recently been approved for some types of epilepsy.

- There is not good evidence to support therapeutic use of marijuana for any mental health disorder

Additional Reading

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"Here's What we Know about What Weed Does to Teens," Markham Heid, April 18, 2017, *VICE*, https://www.vice.com/en_us/article/mgd5y4/heres-what-we-know-about-what-weed-does-to-teens-weedweek2017

" What Pot Really Does to the Teen Brain," Claudia Wallis, December 1, 2017, *Scientific American*, https://www.scientificamerican.com/article/what-pot-really-does-to-the-teen-brain/

"Is cannabis safe to use? Facts for young adults aged 18–25 years," The Government of Canada, August 2018, https://www.cpha.ca/sites/default/files/uploads/resources/cannabis/

evidence-brief-young-18-25-e.pdf