

# Not Just IQ: Marijuana Changes the Brain

Marijuana is the most commonly used illicit drug in the U.S. with approximately 15.2 million users<sup>1</sup>. Marijuana's active ingredient, delta-9-tetracannabinol or **THC**, affects many areas of the user's brain due to the high numbers of cannabinoid (CB) receptors. THC content is considerably higher in marijuana today compared to the marijuana of the 1990s<sup>1</sup>. Areas of the brain where structural and functional changes have occurred due to marijuana use are highlighted in the figure below.

**Mental blocks:** Learning new information and memory can be impaired by THC. Teenagers found to be dependent on marijuana before age 18 and continued use into adulthood had an average IQ 8 points lower than non-users by their late thirties<sup>2</sup>.

**Impaired critical thinking:** Complex thinking, judgment, and sensations can be negatively affected by THC. Decision-making and motivation areas of the brain can be adversely affected, with more pronounced effects in those who started at a young age<sup>3</sup>.

**Off-balance:** Marijuana users show decreased activation of the cerebellum, an area of the brain associated with motor control and coordination, compared to non-users<sup>4</sup>.

**Hijacked reward center:** Marijuana, like many other addictive drugs, can alter the reward pathway circuitry of the brain, and users may be more prone to depression, anxiety, irritability, and increased sensitivity to stress<sup>1</sup>.

**Panic attack:** THC can increase feelings of panic, paranoia, and psychosis<sup>3</sup>.

## References:

1. Gilman JM, Kuster JK, Lee S, Lee MJ, Kim BW, Makris N, van der Kouwe A, Blood AJ, Breiter HC. Cannabis use is quantitatively associated with nucleus accumbens and amygdala abnormalities in young adult recreational users. *J Neurosci*. 2014 Apr 16;34(16):5529-38.
2. Meier MH, Caspi A, Ambler A, Harrington H, Houts R, Keefe RS, McDonald K, Ward A, Poulton R, Moffitt TE. Persistent cannabis users show neuropsychological decline from childhood to midlife. *Proc Natl Acad Sci U S A*. 2012 Oct 2;109(40):E2657-64.
3. Volkow ND, Baler RD, Compton WM, Weiss SR. Adverse health effects of marijuana use. *N Engl J Med*. 2014 Jun 5;370(23):2219-27.
4. Squeglia LM, Jacobus J, Tapert SF. The influence of substance use on adolescent brain development. *Clin EEG Neurosci*. 2009 Jan;40(1):31-8. Review