

# Brain study connects cannabis, oxygen changes

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Credit: University of Texas at Dallas

New research from the Center for BrainHealth at The University of Texas at Dallas reveals that levels of THC, the psychoactive ingredient in cannabis that leaves a euphoric feeling, directly correlate to changes in how the brain utilizes oxygen.

Dr. Francesca Filbey, director of Cognitive Neuroscience Research in Addictive Disorders at the Center for BrainHealth, led the team that found chronic cannabis users have higher cerebral [blood flow](#) and extract more [oxygen](#) from [brain blood flow](#) than nonusers. The rate at which oxygen is metabolized in the [brain](#) was found to be higher in users as well.

While THC is known to relax [blood](#) vessels and alter blood flow in the brain, the study focused on how prolonged THC use might affect the brain by analyzing the differences in regional brain blood oxygenation and metabolism in chronic cannabis users.

Due to the prospective nature of the study, published in the journal

*Neuropsychopharmacology*, researchers cannot say whether cannabis use directly causes the observed changes, or whether other underlying conditions also may be at play.

While the reason for the brain changes related to chronic marijuana use is unclear, Filbey said that these changes may reflect underlying differences in brain tissue [metabolic rate](#).

"Past marijuana research has shown changes in cognitive functions such as memory and executive functioning. Our study seeks to understand the possible neurophysiological mechanisms that may drive these cognitive changes," said Filbey, who is also Bert Moore Chair in BrainHealth and head of the cognitive neuroscience program in the School of Behavioral and Brain Sciences.

The study consisted of 74 cannabis users and 101 nonusers matched for age and IQ. All users reported at least 5,000 usages over their lifetime and daily use for 60 days leading up to the study. Participants were required to refrain from cannabis for 72 hours before the study to eliminate acute effects of the drug. Participants underwent magnetic resonance imaging, and THC metabolite levels were measured using urinalysis.

Filbey and her team found that [cannabis users](#) showed higher global oxygen extraction fraction and cerebral metabolic rate of oxygen compared to nonusers. Also, blood flow in the putamen—an area of the brain associated with reward learning and habit formation—was found to be greater in users than nonusers.

Increased blood flow in the putamen may either reflect the capacity of THC to dilate blood vessels or the development of additional circulatory pathways.

"Currently, cannabis is the most widely used illicit drug. As it becomes more widely legalized,

understanding neurophysiological alterations and its effects on the brain's health and performance are becoming increasingly relevant," Filbey said.

**More information:** Francesca M Filbey et al.  
Residual Effects of THC via Novel Measures of  
Brain Perfusion and Metabolism in a Large Group  
of Chronic Cannabis Users,  
*Neuropsychopharmacology* (2017). [DOI:  
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