

Does Weed Kill Brain Cells? And 5 Other Things to Know



Medically reviewed by [Alan Carter, Pharm.D.](#) — Written by [Carly Vandergriendt](#) on June 3, 2019

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Is it possible?

We don't know for sure if using marijuana can kill your brain cells.

More research is also needed to determine whether each form of use — including smoking, vaping, and ingesting edibles — has a different effect on your brain's overall health.

Studies evaluating the cognitive effects of long-term marijuana use are ongoing.

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What about that infamous IQ study?

A well-known 2012 study from New Zealand evaluated marijuana use and cognitive ability in more than 1,000 individuals over a 38-year period.

The researchers reported an association between ongoing marijuana use and cognitive decline.

In particular, they found that:

- People who started using marijuana heavily as adolescents and continued as adults lost an average of six to eight IQ points by the time they reached midlife.
- Among the group above, people who stopped using marijuana as adults didn't regain lost IQ points.
- People who started using marijuana heavily as adults didn't experience any IQ loss.

This study had a significant impact for a few reasons.

First, it was among the first large, longitudinal (long-term) studies to assess marijuana use and cognitive functioning.

Next, the results suggest that marijuana use during adolescence may have an irreversible effect on adolescent brain development. Some additional research supports this conclusion.

However, the New Zealand study also has significant limitations.

For one, it isn't possible to conclude that marijuana use causes lower intelligence based on this study alone.

While the researchers controlled for differences in participant education levels, they didn't rule out additional factors that may have contributed to cognitive decline.

A 2013 reply to the New Zealand study suggests that personality factors may play a role in both marijuana use and cognitive decline.

The author cited conscientiousness as an example. Low conscientiousness might explain both drug use and poor performance on tests of cognition.

Genetic factors may also contribute to cognitive decline, as suggested by

In this case, the researchers compared changes in IQ between twins who used marijuana and their abstinent siblings. They didn't find any significant differences in IQ decline between the two groups.

The key takeaway? More research needs to be done to understand how marijuana use affects intelligence over time.

Does the age of use matter?

Marijuana use appears to be more harmful for people under the age of 25, whose brains are still developing.

Adolescents

Studies examining marijuana's effects on adolescent users report a variety of negative outcomes.

In particular, a 2015 review⁹ concluded that adolescent marijuana use is associated with potentially permanent attention and memory deficits, structural brain changes, and abnormal neural functioning.

In addition, a 2017 longitudinal study¹⁰ reported that heavy marijuana use over the 18-month study period was associated with decreases in IQ and cognitive functioning.

Adolescent marijuana use is also associated with the development of substance use and mental health disorders, which can trigger additional brain changes.

According to a 2013 review¹¹, early cannabis use is associated with an increased risk of mental health conditions, including major depression and schizophrenia.

A 2017 report cited moderate evidence that using marijuana as an adolescent is a risk factor in the development of problem cannabis use

The effect of marijuana use on brain structure and function among adults is less clear.

A 2013 review found that long-term marijuana use may alter brain structure and function in adults, as well as adolescents.

Another review, also published in 2013, found that across the 14 studies included, marijuana users generally had a smaller hippocampus than non-users.

The researchers concluded that chronic, long-term marijuana use might be related to cell death in the hippocampus, an area of the brain associated with memory.

A 2016 review also states that heavy marijuana users tend to perform worse on tests of neuropsychological function than non-users.

Yet other studies — including this 2015 study — report no significant differences between the brain shape and volume of daily marijuana users and non-users.

A 25-year longitudinal study published in 2016⁶ assessed marijuana use and cognitive function in 3,385 participants.

The authors found that current users of marijuana performed worse on tests of verbal memory and processing speed.

They also reported that cumulative exposure to marijuana was associated with poor performance on tests of verbal memory.

However, cumulative exposure didn't appear to affect processing speed or executive function.

Key takeaways

- We can't conclude that marijuana use actually causes any of the changes in brain structure and function described above.
- These might be pre-existing differences that make certain people more likely to use marijuana in the first place, and not direct effects of actual marijuana use.

- Few studies have investigated differences in the cognitive effects of smoking, vaping, or ingesting marijuana.

What short-term cognitive effects are possible?

The short-term effects of marijuana use on the brain include:

- confusion
- fatigue
- impaired memory
- impaired concentration
- impaired learning
- impaired coordination
- difficulty making decisions
- difficulty judging distances
- increased reaction time
- anxiety, panic, or paranoia

In rare cases, marijuana triggers psychotic episodes featuring hallucinations and delusions.

Still, there may be some potential brain benefits to using marijuana.

For instance, a 2017 study reported that a low dose of delta-9-tetrahydrocannabinol (THC) restored age-related cognitive deficits in mice.

More studies need to be done to understand if this effect also applies to humans.

What long-term cognitive effects are possible?

Research into the long-term effects of marijuana use on the brain is ongoing.

For now, we know that long-term marijuana use is associated with an increased risk of substance use disorders.

In addition, long-term marijuana use may affect memory, concentration, and IQ.

These effects appear to be more pronounced among people who start using marijuana at a young age and use it frequently over long periods of time.

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How does weed compare to alcohol and nicotine?

Alcohol, nicotine, and marijuana affect different neurological systems, and as a result have different long-term effects in the brain.

One key difference is that alcohol and nicotine are neurotoxic. That means they kill brain cells.

We don't yet know for sure if marijuana kills brain cells.

However, all three substances share some important similarities. For one, their cognitive effects are more pronounced among young people.

People who drink, smoke cigarettes, or use marijuana from a young age are also more likely to do so later on in life.

In addition, frequent, long-term use of alcohol, tobacco, or marijuana is also associated with worse cognitive outcomes, though these differ based on the substance.

The bottom line

There's still a lot that we don't know about how marijuana use affects the brain over short- or long-term periods of time.

Long-term and frequent marijuana use probably affects cognitive functions such as attention, memory, and learning, but more research needs to be done to understand how.

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