



Nicotine and the Teenage Brain

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Let's discuss the impact of nicotine on your brain. You've probably heard by now that smoking cigarettes is bad for you. But do you know why and how it affects your brain? I'm not here to simply advise "Just say no!" I'm here to explain to you the impact nicotine has on your developing brain, so you can make up your own mind about what to do and when someone offers you a puff of a cigarette or even has a vaping device around.

Your teenage brain is glorious - if you didn't know that already. Neuroscience has shown that the brain goes through critical periods of growth and development - while in the womb, the first year of life, and the early years, right into adulthood. What scientists have more recently discovered is that the brain undergoes a 'secret mission' of change during the period between the ages of 12 to 19 years, that is truly unique.

Research has shown that some teenagers start to smoke due to peer pressure, their parents smoking or because they want to push boundaries. The most widely used psychoactive substances are caffeine, nicotine, alcohol, and cannabis. Some substances have a minimum age requirement and others do not. Many people wrongly assume that some psychoactive substances are benign with minimal impact on the teenage brain. Neuroscience has a special perspective to offer on understanding how your teenage brain is affected by these psychoactive substances. The brain responds differently to different types of psychoactive chemicals. Caffeine and nicotine function primarily as brain stimulants, alcohol as depressants, opioids as pain relievers, and cannabis as a hallucinogens. Nicotine comes in many forms, typically - cigarettes, e-cigarettes, chewing tobacco and snuff, pipes, and dissolvable tobacco lozenges.

Nicotine and Your Body

The International Agency for Research on Cancer (IARC Monographs) is responsible for researching and identifying environmental factors that are carcinogenic (i.e. cancer producing) and hazards to humans. IARC has technically

not listed nicotine as a carcinogen, however, significant research is emerging on the harmful impact of nicotine on the body and brain.

Studies conducted on a large scale and over long time periods, tracking the health outcomes of people that smoke have shown a strong relationship between nicotine use and an increased risk of cardiovascular (heart), respiratory (lungs), gastrointestinal (bowel and gut), and reproductive health (pregnancy / sexual dysfunction) disorders.

Nicotine in the body leads to an increased likelihood of developing cancer, as it increases the rate at which your body undergoes cell proliferation and apoptosis (cell growth/death - related to growth of greater number of tumors), keeping the body in a state of oxidative stress (a body full of toxins), and general gene/DNA mutations. Overall, nicotine appears to have an aging, and damaging impact on the body. This may not seem like an issue for you to worry about as a teenager, but the impacts of nicotine can age your body and brain quickly, like causing you to grow slower, making you shorter than you could be.

Nicotine functions as a general immune suppressant, making you sick more often, and reducing your body's ability at recovering from illness. Nicotine disrupts sleep, and sleep issues impact your body's ability to grow, repair itself, and contributes to psychiatric disorders.

Nicotine and Your Brain

The impact of nicotine on the teenage brain is becoming clearer with the advent of new research methods, and is providing clearer relationships between the impact of the chemical on the developing brain. The unique ability of nicotine to enter the body rapidly via your lungs when you inhale it, means it can travel in the bloodstream via the oxygenated blood your lungs delivers to the heart, and your heart pumps throughout your body. The body has a system of preventing toxins from entering the brain, known as the blood-brain barrier - with the function of protecting the brain from being damaged by substances carried in the blood. However, nicotine is processed in the adrenal medulla (at the top of your kidneys) and your liver, and is able to enter the central nervous system (CNS) and connect to nicotine acetylcholine receptors (nAChRs) in brain, causing a release of adrenaline and dopamine. Nicotine reaches the brain typically within 7-10 seconds of it entering your system, and you can feel it's effects within about 60 seconds.

Nicotine can stimulate the brain's reward system almost immediately leading to a release of dopamine - causing you to feel good and setting the stage for addiction.

The more you smoke the more you stimulate the dopamine receptors in your brain, causing them to become desensitized over time, and requiring you to smoke more, and more often, to feel good again.

The teenage brain is so beautifully tuned, like a new car, that nicotine receptors respond very quickly and you can become addicted to nicotine within one to two days.

The difficulty with early onset smoking, and the malleability of your teenage brain is that it increases your likelihood of finding it more difficult to give up smoking once you start.

Nicotine stimulates your developing prefrontal cortex - affecting your thought processes and impacting your visual system.

The molecular changes induced by exposing your brain to nicotine alters the functioning of your synapses in the prefrontal cortex, resulting in lasting reductions to your cognitive function. Basically, smoking impairs your ability to see and think. Research has also shown that a teenager that smokes is more likely to suffer from an attention deficit disorder, and that this is worsened the longer that you smoke.

Nicotine has an impact on your brain's ability to make and retain memories. Brain imaging studies are showing that smoking causes neurons to die, and areas of the brain to become damaged - primarily the prefrontal cortex, hippocampus, and thalamus. In addition, nicotine prevents the dentate gyrus from forming new brain cells/neurons. The impact on lower neuronal generation may explain why smokers typically have lower IQs than non-smokers.

Some teenagers that might be trying to cope with negative feelings or emotions, are typically more interested in smoking. The relationship between teenagers that start smoking young, and psychiatric disorders is unclear, but it seems as though nicotine disrupts the normal course of brain maturation, and is having lasting consequences for your mental health, and even your personality. Research has shown that smoking during adolescence increases your risk of developing various psychiatric disorders.

There is strong evidence that teenagers who smoke are at a greater risk of depression, and all smokers regardless of age show more depressive symptoms than non-smokers, and depressed people have a harder time giving up smoking.

Overall, the research shows that nicotine is damaging to the body, and in particular to the developing teenage brain. Now that you understand the negative impact of nicotine on your glorious brain and growing body, you can decide if that's something you want to expose your body and brain to. For more information, visit www.teenbrain.info.

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