

Name \_\_\_\_\_

  
**mind**  
matters

# DRUGS AND THE BRAIN

*Hi there! Mind Matters is a series that explores the ways that different drugs affect your brain, body, and life. In this issue, we are going to talk about how drugs affect the brain.*

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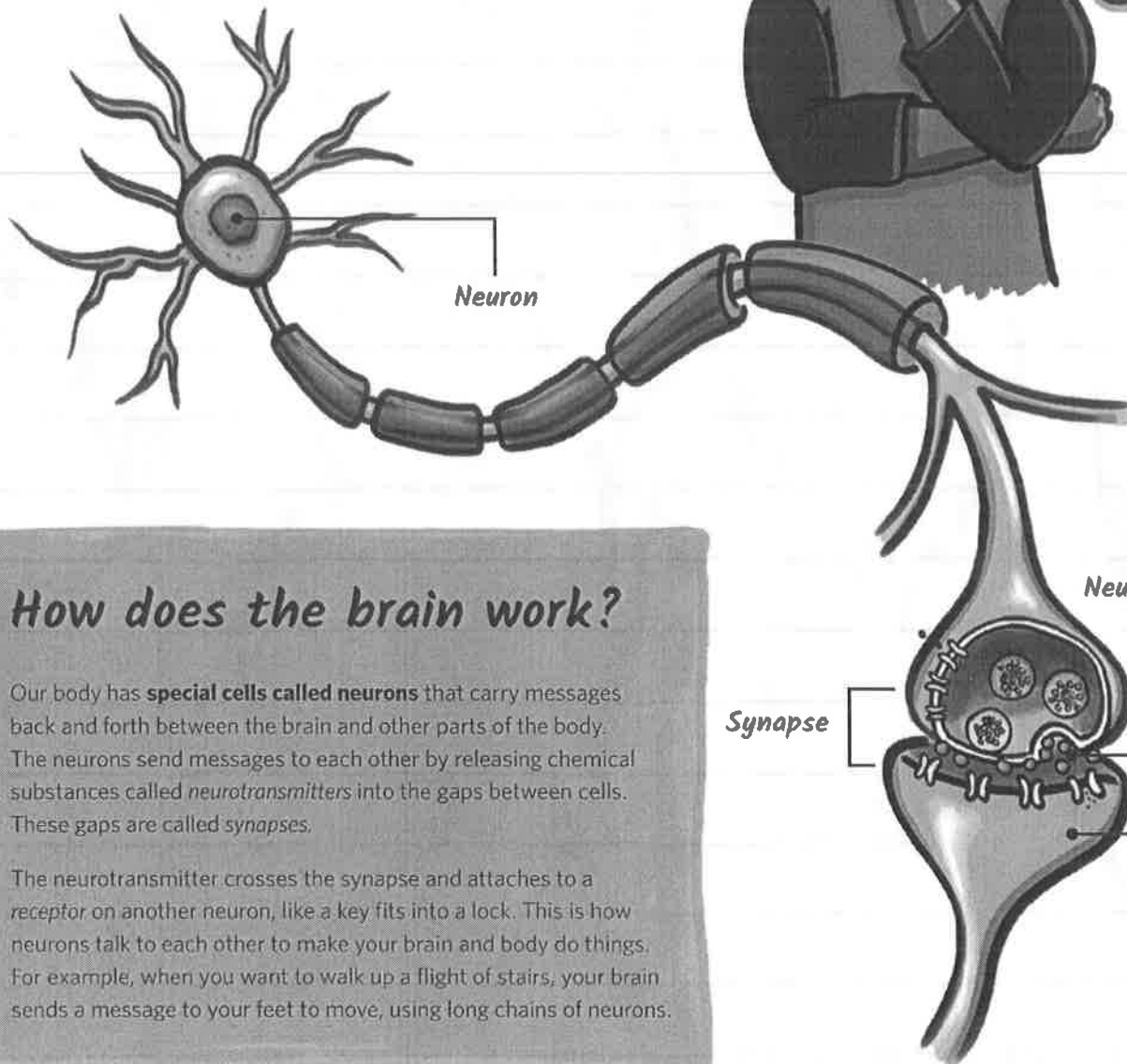
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## The human brain is a very complicated organ.

Your brain weighs three pounds and controls everything you do. You need your brain to see, hear, smell, taste, and feel. Your brain is you — everything you think and feel and who you are.



## How does the brain work?

Our body has **special cells called neurons** that carry messages back and forth between the brain and other parts of the body. The neurons send messages to each other by releasing chemical substances called *neurotransmitters* into the gaps between cells. These gaps are called *synapses*.

The neurotransmitter crosses the synapse and attaches to a *receptor* on another neuron, like a key fits into a lock. This is how neurons talk to each other to make your brain and body do things. For example, when you want to walk up a flight of stairs, your brain sends a message to your feet to move, using long chains of neurons.

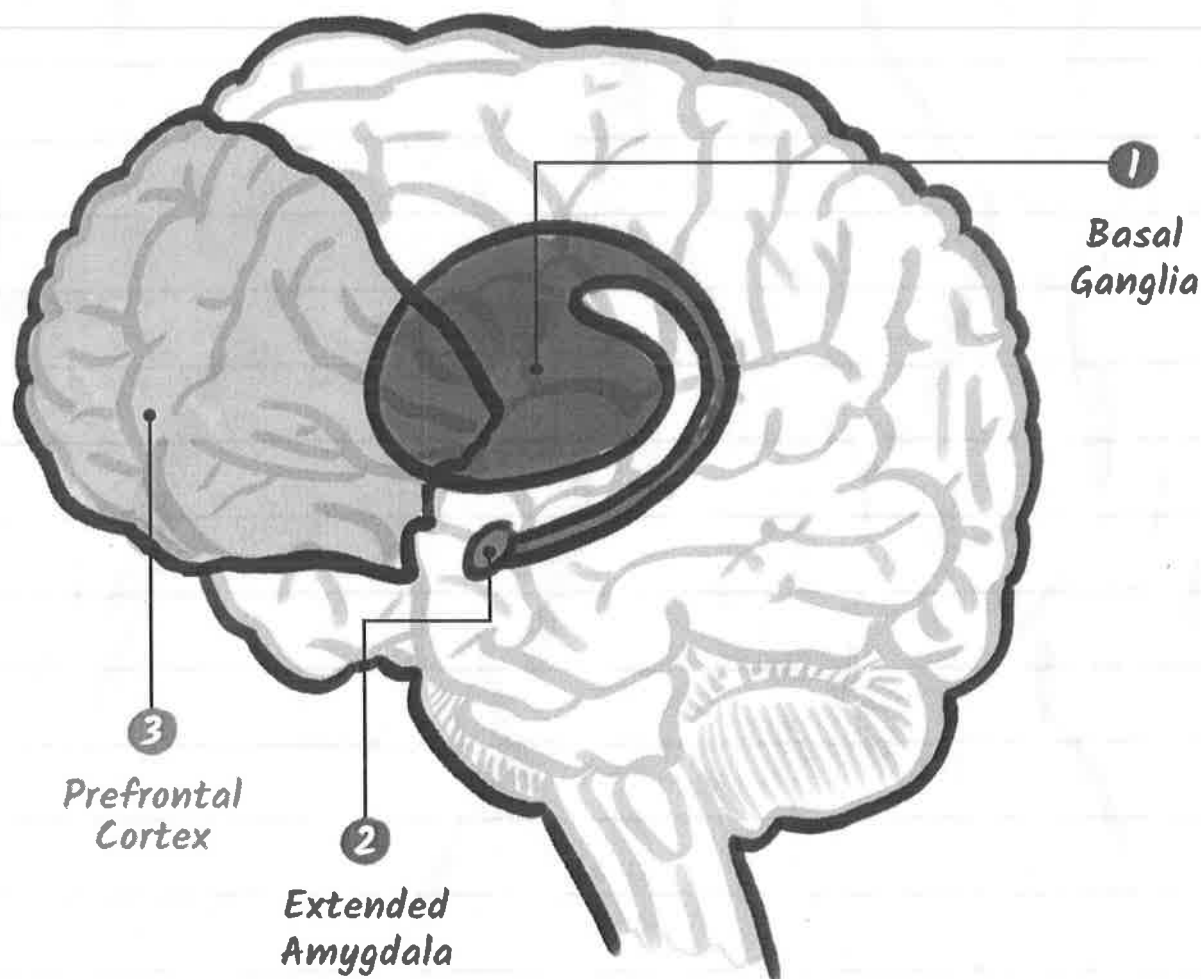
## How do drugs work in the brain?

Drugs change the way that neurons talk to each other. These changes cause neurons to make you act in ways that you normally wouldn't.

*There are three main parts of the brain that are affected by drug use:*

- 1 **The basal ganglia** is the part of the brain that motivates us to do healthy activities, like eating or hanging out with friends. Drugs flow into this area of the brain and cause people to feel really happy. But if you use a drug a lot, the basal ganglia can get used to having the drug around and make it hard to feel pleasure from anything but the drug.
- 2 **The extended amygdala** is what makes you feel stressed out or cranky. When people use drugs, this part of the brain gets very sensitive. When your body is used to the drugs and you stop, the extended amygdala makes you feel really sick, so people will use drugs again just to get rid of that feeling.
- 3 **The prefrontal cortex** helps you think, make decisions, and control your actions. When someone uses drugs, this part of the brain becomes less able to make good judgments or step in to say "no" to a harmful impulse.

Also, some drugs affect other parts of the brain, like the brain stem. The brain stem controls heart rate and breathing. When a person takes certain drugs like opioids, their breathing can become dangerously slow. When the breathing stops, it's called an overdose, and can cause death.



## Why do people keep taking drugs when they know they're bad for you?

**Drugs change the brain** in ways that make quitting hard, even when you want to. This is because when you take drugs, the neurotransmitter *dopamine* is released in the basal ganglia in large amounts. Dopamine signals in this brain area "teach" other parts of your brain to keep seeking out the drug so you can take it again and again.

When people can't stop using drugs even though they want to, and drug use is causing serious consequences, it is called *addiction*. Their brain has learned to crave the drug all the time.

## What are the long-term effects of drug use?

**Drug use can lead to serious changes in the brain** that affect how a person thinks and acts. It can also cause other medical problems, even death. Some drugs can cause heart disease, cancer, lung problems, and mental health conditions, like depression. A few drugs can even kill cells in your brain and body and make it hard to walk and talk and understand what's happening around you.



Heart

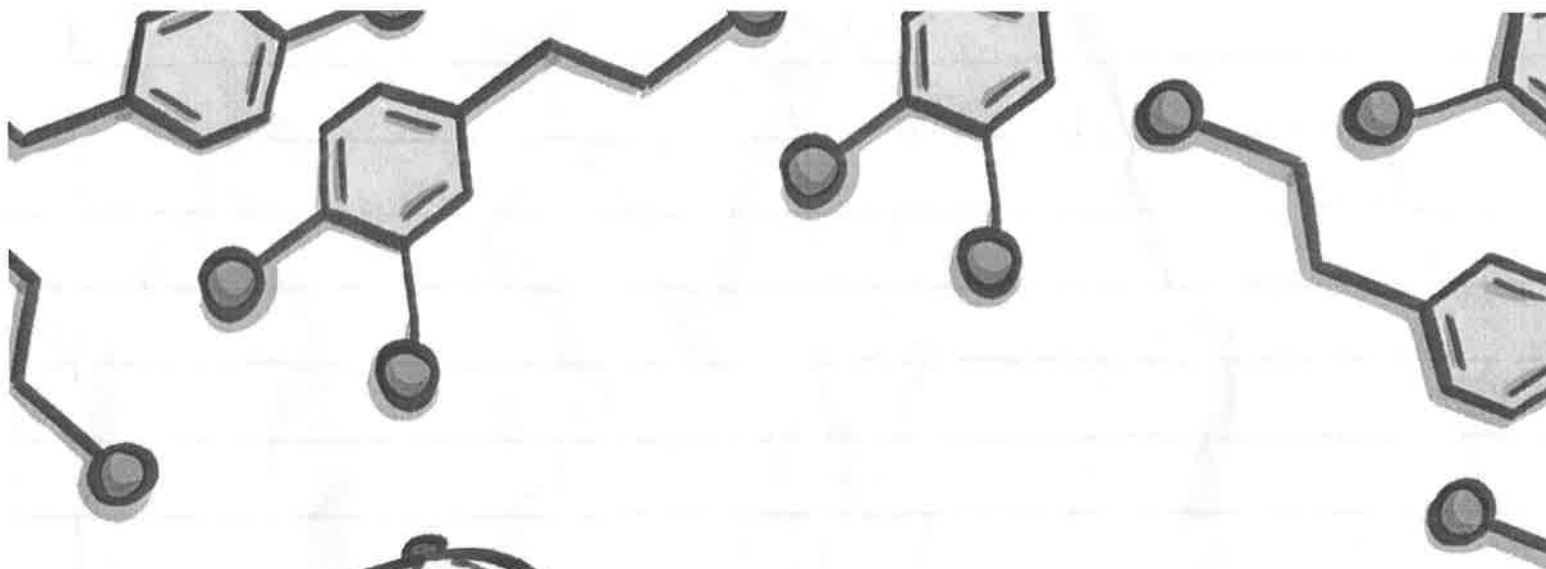


Lungs



Brain





*What if someone I  
know needs help?*

**If you think a friend or family member has a problem with drugs, talk to an adult you trust — like a parent, coach, or teacher — right away. Remember, treatment is available and people can get better.**

**For more information, go to [nida.nih.gov](https://nida.nih.gov).**



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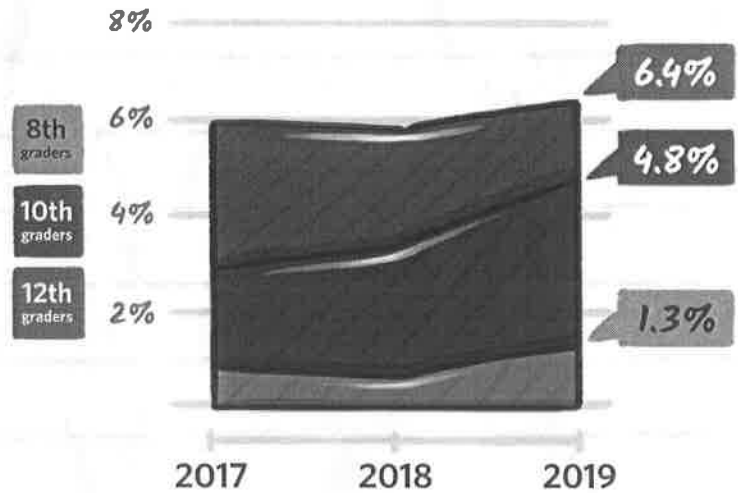
## What is marijuana?

Marijuana is made of dried flowers, leaves, and seeds from the *Cannabis* plant. Many people use marijuana to get high, but some also use it as medicine. You might have heard marijuana called other names, like **"weed"** or **"pot."**

People think that because marijuana is a plant, it can't be bad for them. But many dangerous drugs like cocaine, heroin, and tobacco also come from plants and are "natural" like marijuana. In fact, marijuana has **hundreds of chemicals** in it, some of which can harm your brain.

## DAILY MARIJUANA USE

sees significant increase among 8th and 10th graders since 2018



## How do people use marijuana?

People can smoke marijuana rolled up like cigarettes, put it into tea, or cook it into food or candy. Some people think that it is safer to inhale marijuana using electronic cigarettes, or vaping devices, because they are not inhaling smoke. This is called **"vaping."** But studies show that vaping can be harmful because you still inhale the same brain-altering chemicals.





## How does marijuana work?

### **Marijuana changes how the brain works.**

It affects brain cells (neurons) in parts of the brain that control body coordination, memory, pleasure, and judgment.

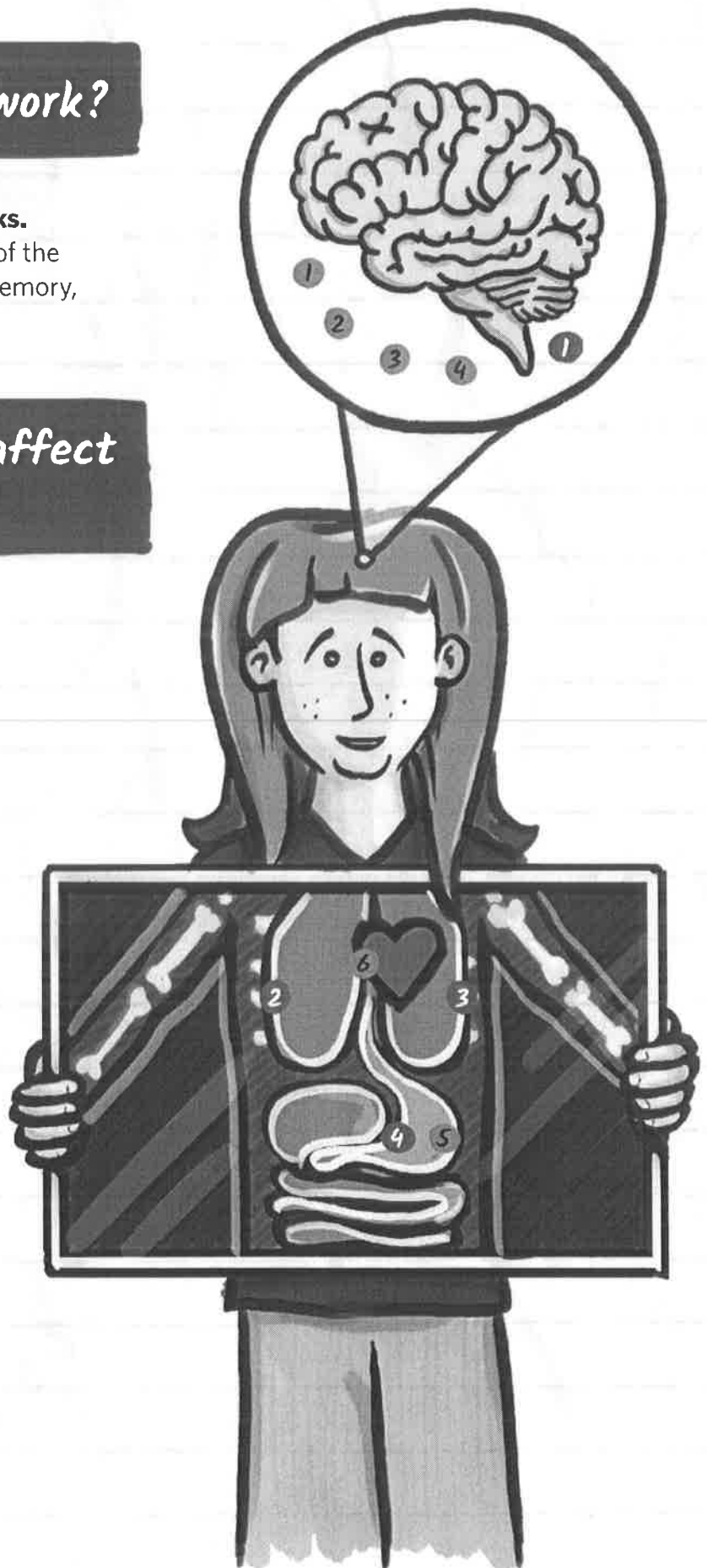
## How does marijuana affect your brain and body?

### **Short-Term Effects**

- 1 Loss of coordination and slower reactions
- 2 Altered sense of time
- 3 Feeling relaxed
- 4 Anxiety, fear, distrust, or panic (in some users or when taken in high doses)
- 5 Increased hunger
- 6 Faster heart rate

### **Long-Term Effects**

- 1 Problems with memory and learning skills
- 2 Problems with breathing
- 3 Cough or lung sickness
- 4 Severe nausea and vomiting





## Can you become addicted to marijuana?

**Yes, you can.** Over time, your body can get used to marijuana, so you feel bad if you don't take it. You might take it all the time just to feel normal and keep taking it even if it gets in the way of school, work, or friendships. **This is called addiction.**

Anyone can become addicted to marijuana. It doesn't matter how smart you are or where you live. There is no way to predict who is likely to become addicted.



*Did you know that using marijuana as a teen can change how your brain grows?*

That's because your brain is still growing and changing until you get into your 20s.

## What about medical marijuana?

Research shows that some of the chemicals in marijuana might be helpful with some kinds of pain, nausea, or possibly other conditions. Some states allow people with a wide range of illnesses to get marijuana legally as medicine, even though science hasn't proved it works for many of these illnesses. The government has also approved a few medicines in pill form that have marijuana chemicals in them but don't make you high.

**Only a doctor can give you these medicines.** Scientists are looking at ways that chemicals in marijuana can help with other conditions, but it will take years of research.

## Is marijuana legal?

Laws about marijuana for recreational use vary by state but it is **not legal for teens** in any state.



## What is nicotine?

Tobacco is a leafy plant grown all around the world. Tobacco is used by so many people because it contains a powerful drug called nicotine. **Nicotine is very addictive.**



## How do people use tobacco and nicotine?

People can **smoke, sniff, chew, or inhale** the vapors of tobacco and nicotine products.

### SOME PRODUCTS THAT YOU SMOKE OR INHALE:



**CIGARETTES**



**CIGARS**



**VAPING DEVICES**



**HOOKAHS**

### SMOKELESS PRODUCTS:



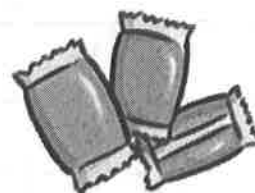
**CHEWING  
TOBACCO**



**SNUFF**  
*Ground tobacco that can be sniffed  
or put between your cheek and gums*



**DIP**  
*Wet snuff that is chewed*



**SNUS**  
*Small pouch of wet snuff*

## How does nicotine work?

Nicotine is absorbed into your bloodstream and goes to your adrenal glands just above your kidneys. The glands release adrenaline which **increases your blood pressure, breathing, and heart rate**. Adrenaline also gives you a lot of good feelings all at once.

Just being around people who are smoking can be dangerous.

Breathing other people's smoke can lead to lung cancer and heart disease.

## What are other health effects?

While nicotine is addictive, most of the health effects come from other tobacco chemicals. Tobacco use harms every organ in your body. Smoking tobacco products can cause lung, mouth, stomach, kidney, and bladder cancers. It can also cause lung problems, like coughing, and lead to heart disease, eye problems, and yellow teeth.

**Smokeless tobacco products are dangerous, too.** They can cause oral cancer and heart and gum disease.



Eyes



Mouth



Heart



Stomach



Bladder



Kidney

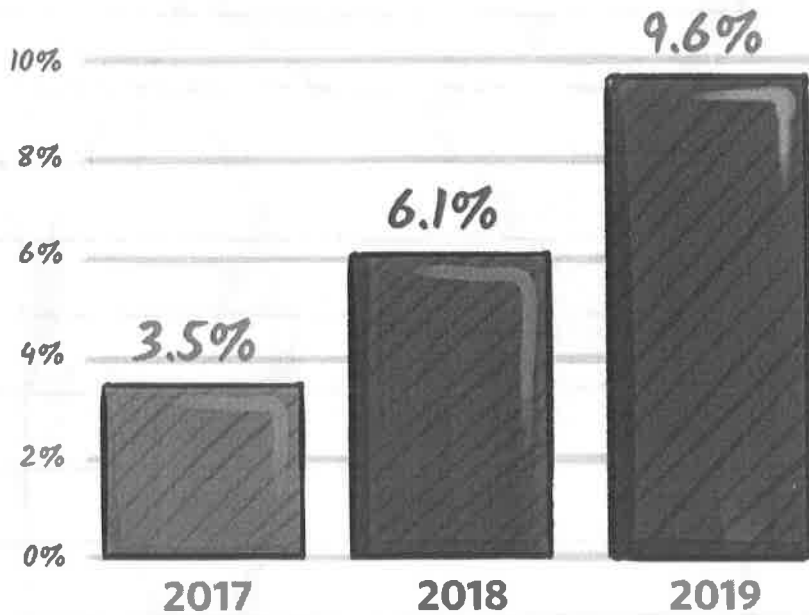
## How do you become addicted to nicotine?

Over time, the nicotine in tobacco can change the way your brain works. If you stop using it, your body can get confused and you can start to feel really sick. This makes it hard to stop using these products even when you know it's bad for you. This is called addiction.

**It can be very hard to stop smoking, but there are some medications that can help.**



## 8TH GRADERS WHO VAPED IN THE PAST MONTH



### Tobacco and Nicotine Vaping Threatens Progress

In 2019, 0.8% of 8th graders said they smoked cigarettes daily, but 1.9% said they vaped nicotine daily.

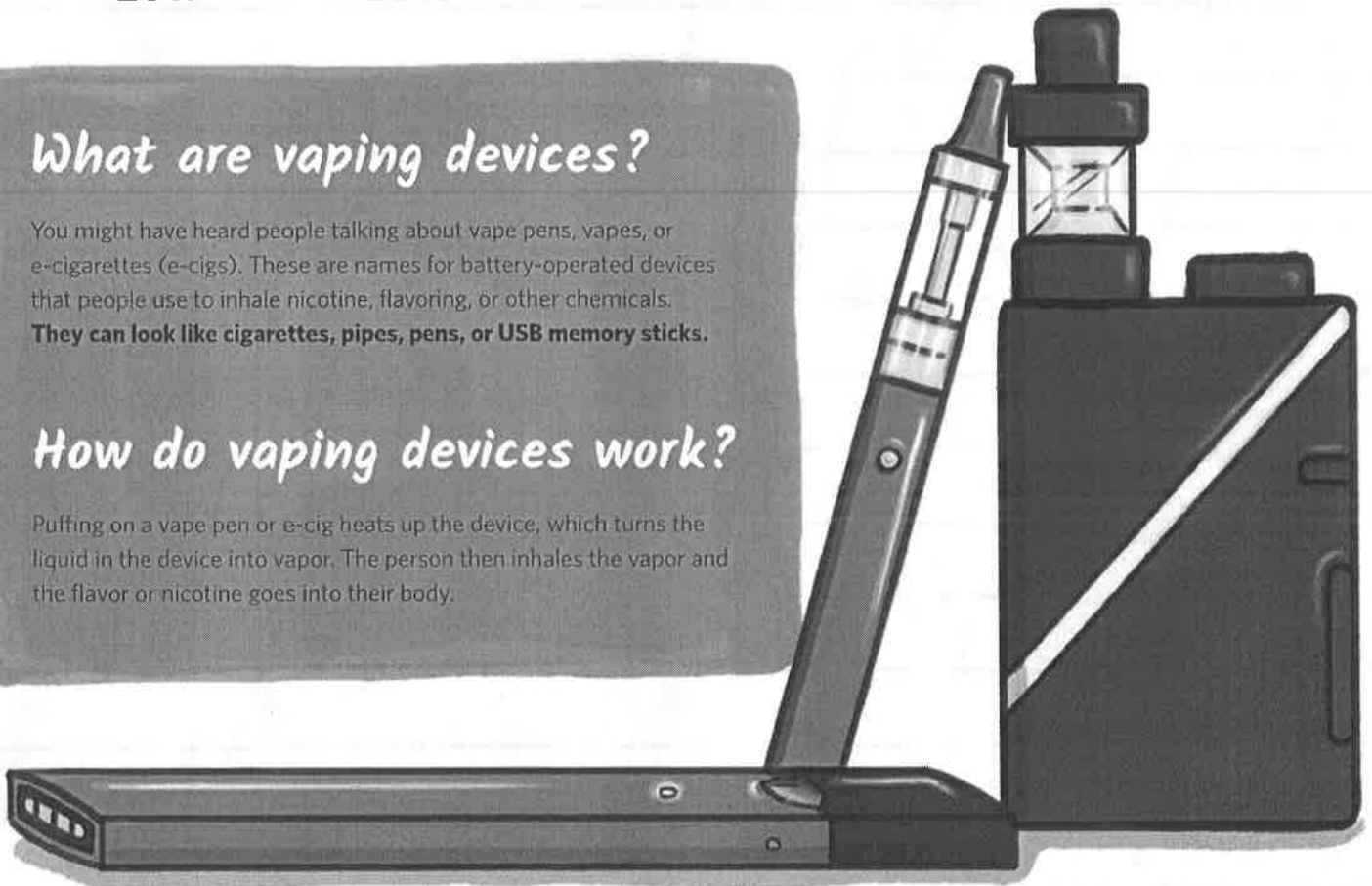
### What are vaping devices?

You might have heard people talking about vape pens, vapes, or e-cigarettes (e-cigs). These are names for battery-operated devices that people use to inhale nicotine, flavoring, or other chemicals.

**They can look like cigarettes, pipes, pens, or USB memory sticks.**

### How do vaping devices work?

Puffing on a vape pen or e-cig heats up the device, which turns the liquid in the device into vapor. The person then inhales the vapor and the flavor or nicotine goes into their body.



### Can vaping devices help you stop smoking?

Some people think that vaping can help you stop smoking. But actually, **there is not enough science to prove this.** In fact, some research shows that non-smoking preteens and teens who vape nicotine might go on to use other tobacco products like cigarettes.



# HOW **NICOTINE** AFFECTS THE TEEN BRAIN

**Found in both conventional cigarettes and most vaping devices, nicotine is a highly addictive drug with many health risks for teens.**

A message from Scholastic and the National Institute on Drug Abuse (NIDA)

**F**irst, some good news: The number of teens who smoke cigarettes today is less than half of what it was 10 years ago. This decrease is a great win for the overall health of young people, but experts are still concerned. Why? While youth cigarette use is decreasing, the number of teens who use vaping devices, or e-cigarettes,

has been increasing. Just like regular cigarettes and smokeless tobacco, most vaping devices contain **nicotine**. In fact, one cartridge of the Juul brand and some disposables like Puff Bars have as much nicotine as a whole pack of cigarettes. No matter what product it comes in, nicotine is a highly addictive drug and a serious risk.

## How Addiction Happens

Our brains come with a built-in reward system. When you do anything enjoyable—like laughing—your brain releases a natural chemical called **dopamine**. In essence, dopamine says to your brain, “Hey, I like this activity. It’s worth remembering and repeating.”

Nicotine takes advantage of that same reward system. When someone inhales nicotine, the drug enters the brain and triggers a surge of dopamine. But the amount of dopamine released is much greater than that from pleasurable everyday activities like eating a favorite food. Nicotine also causes the dopamine levels to remain elevated for longer than normal. The result: The brain receives a strong signal that it really wants to vape some more. Over time, this can lead to **addiction**, a disorder that causes a person to continue taking a drug, despite negative consequences.

## Long-Term Effects

Once someone has a nicotine addiction, quitting can be very difficult. One reason is that they may have **withdrawal symptoms** (such as cravings, depression, anxiety, and problems focusing and sleeping) just a few hours after they stop using nicotine. The person has a strong urge to vape again to relieve these symptoms, which makes it even harder for them to stop.

Repeated exposure to surges of dopamine from nicotine can change how the brain reacts to natural levels of dopamine. When this happens, activities a person used to like may seem less enjoyable. Nicotine can also cause long-lasting changes to the brain circuits that control memory and self-control—leading to learning issues.

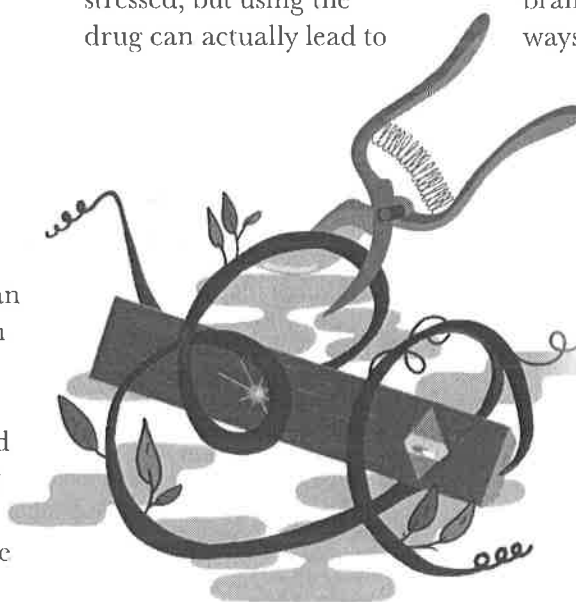
Sometimes people turn to nicotine because they’re stressed, but using the drug can actually lead to

anxiety. If a person becomes dependent on nicotine, they can experience irritability and anxiety when they are without it for too long.

## Protecting Your Brain

Your young brain is still developing. In fact, it won’t fully mature until you reach your mid-twenties. That leaves teens especially vulnerable to the negative effects of nicotine, including addiction. Studies have shown that teens who use e-cigarettes are more likely to continue using nicotine as adults, and may be at greater risk of eventually smoking conventional cigarettes.

On the bright side, you have an opportunity during your teen years. If you avoid drugs like nicotine and instead take on healthy and stimulating challenges—learning to cook, playing an instrument, creating videos—you can affect your brain development in positive ways that can last a lifetime.



## GETTING HELP

Visit [teen.smokefree.gov/quit-vaping](https://teen.smokefree.gov/quit-vaping) for teen-focused tools and tips, including:

- » More facts on nicotine risks
- » Ways to deal with stress and anxiety
- » How to quit vaping



## VOCABULARY LIST

# How Nicotine Affects the Teen Brain



Find the article at:

[scholastic.com/headsup/hownicotineaffectsthe teenbrain](http://scholastic.com/headsup/hownicotineaffectsthe teenbrain)

**addiction** (*noun*): a brain disorder or illness associated with compulsive (uncontrollable) behavior, such as drug use, despite negative consequences

**addictive** (*adjective*): something, such as a drug, that causes addiction

**conventional** (*adjective*): traditional

**cartridge** (*noun*): a container that can be easily changed and holds a substance such as a liquid that is difficult to handle

**circuit** (*noun*): a path between points over which signals can move

**consequence** (*noun*): a result or outcome

**dopamine** (*noun*): a chemical in the brain that helps send signals between nerve cells and is associated with feelings of pleasure

**elevated** (*adjective*): increased, especially to an abnormal level or amount

**exposure** (*noun*): the condition of being affected or influenced by something else

**nicotine** (*noun*): the chemical found in tobacco that is addictive

**stimulating** (*adjective*): exciting or interesting in an enjoyable way

**surge** (*noun*): a sudden increase to a high level

**tobacco** (*noun*): a plant with nicotine-rich leaves that are processed in order to be chewed or smoked

**vaping device** (*noun*): an electronic device, often shaped like a cigarette, that uses a battery to heat up a liquid, which usually contains nicotine, so that it can be inhaled. Also called an electronic cigarette (e-cigarette).

**vulnerable** (*adjective*): able to be hurt or damaged

**withdrawal symptom** (*noun*): a physical change that occurs as part of the body's response to the sudden removal of a drug to which it has gotten used to being exposed

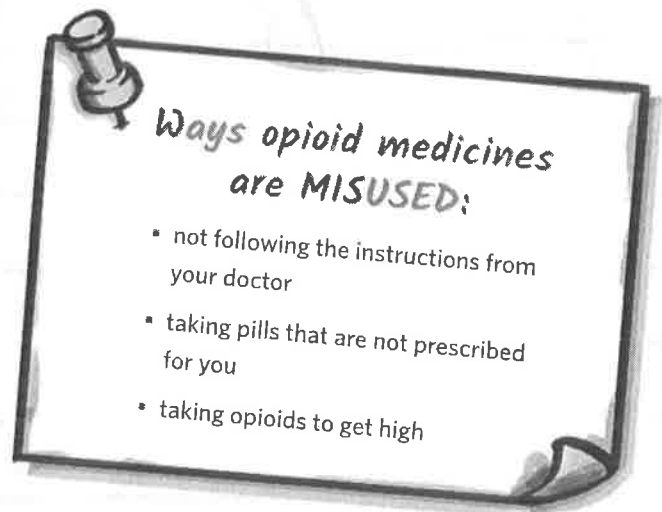




You may have heard a lot about opioids lately. It's possible you know them as drugs called Oxy or Vikes.

Opioids have been used for thousands of years. Some opioids come from plants. Others are made in a lab.

Prescription opioids are used as medicine but can also be misused. Illegal opioids are only used to get high. Misusing prescription opioids or taking any illegal opioid can be dangerous.



## What are opioids?

### MEDICINE

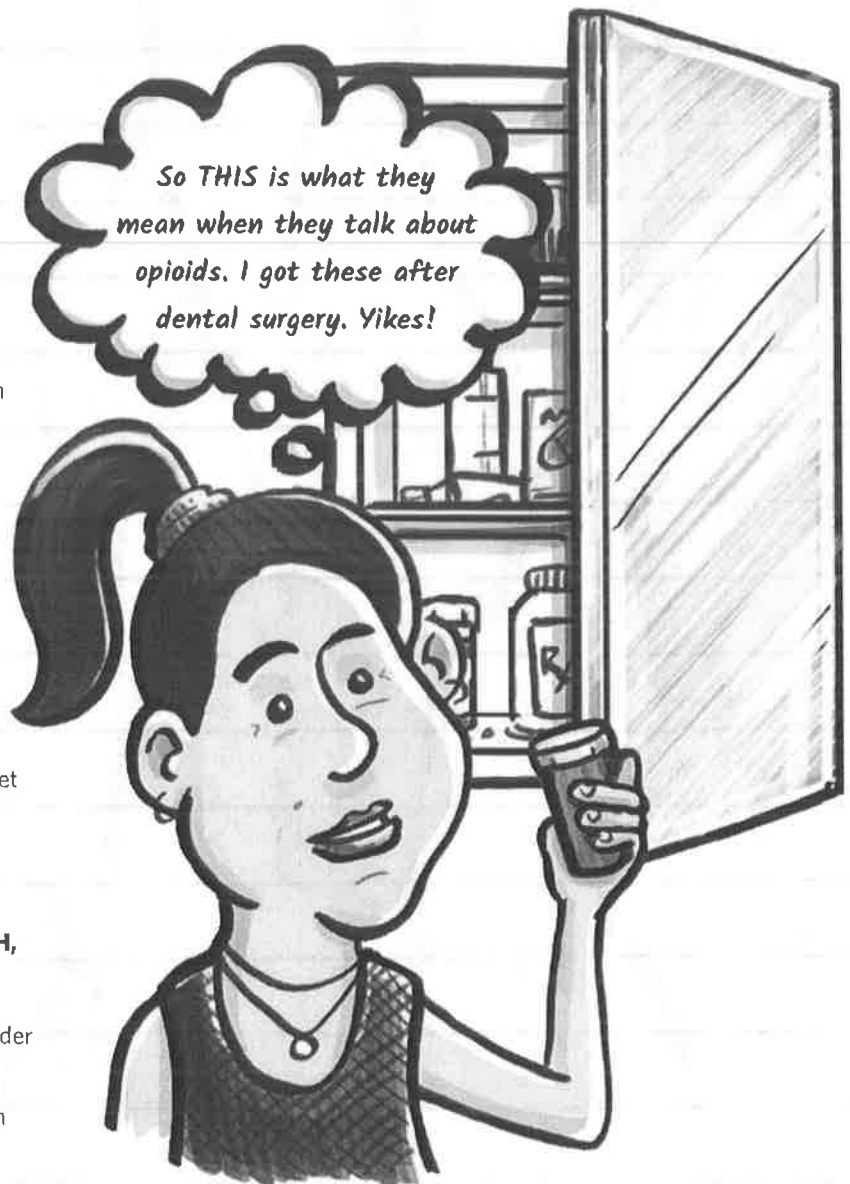
- Doctors prescribe opioids to people who are in serious pain from things like dental surgery, sports injuries, and cancer.
- If people follow their doctor's instructions and take the right amount of medicine, opioids can help their pain go away.
- But these medicines can also be dangerous if misused.

Examples of opioid pills are **OxyContin®**, **Percocet®**, and **Vicodin®**. People sometimes call opioid medicines different names like **Happy Pills**, **Hillbilly Heroin**, **OC**, **Oxy**, **Percs**, or **Vikes**.

### HEROIN AND FENTANYL

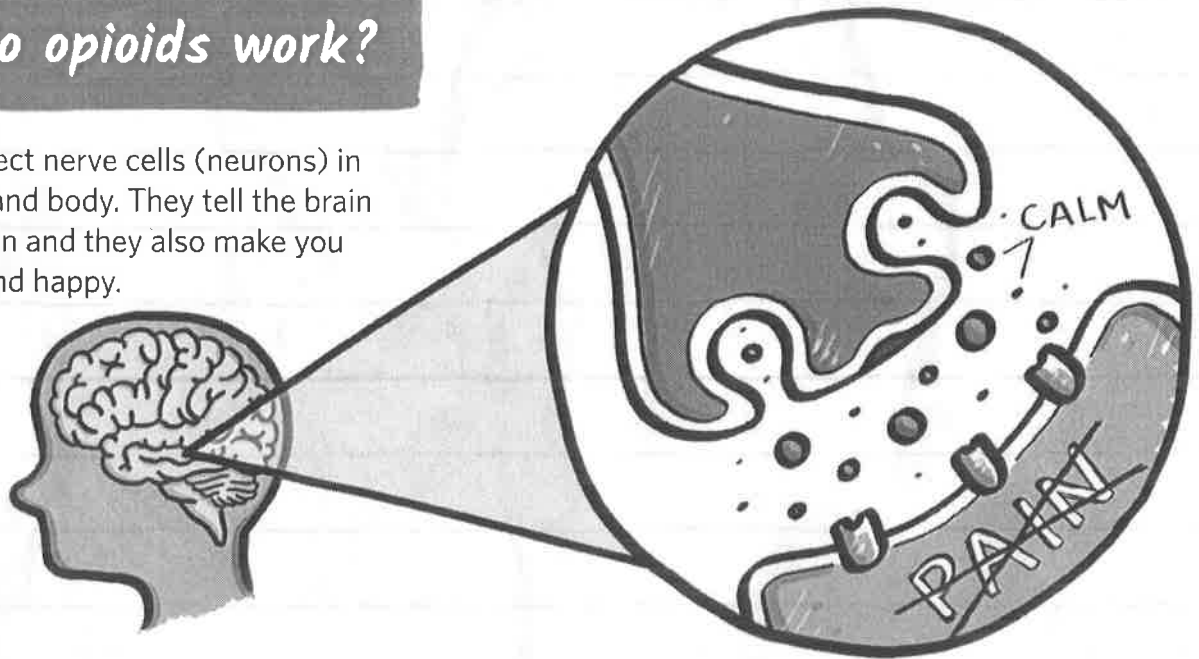
- Heroin is an illegal opioid that people use to get high, often with a needle.
- It can be a white or brown powder, or a black sticky substance called black tar heroin.
- Sometimes people call heroin names like **big H**, **horse**, **brown sugar**, **hell dust**, and **smack**.
- Another illegal opioid is fentanyl, a white powder many times more powerful than heroin.
- Sometimes street heroin is laced (mixed) with fentanyl, and this causes many overdoses.

**Both opioid medicine and illegal opioids like heroin and fentanyl can cause addiction, overdose, or even death.**



## How do opioids work?

Opioids affect nerve cells (neurons) in your brain and body. They tell the brain to block pain and they also make you feel calm and happy.



## What are opioids' effects?

### Short-Term Effects

- 1 Feelings of calm, sleepiness, confusion
- 2 Slowed or stopped breathing (can cause fatal overdose)
- 3 Nausea, vomiting
- 4 Constipation

### Long-Term Effects

- 1 Addiction
- 2 Heart infection
- 3 Lung infection
- 4 Muscle pain



## How do you become addicted to opioids?

Over time, the body gets used to having the drug and feels terrible without it. **Withdrawal** is like having the flu but much worse, and it can make it hard to stop taking the drug. If a person starts seeking and taking an opioid despite how it is interfering with work, school, or relationships, it is called **addiction**.

It's important to know that **anyone can become addicted to opioids**. It doesn't matter where you live or how smart you are. There is no way to predict who is likely to become addicted.

*More people die from opioid overdoses than from other drugs.*

## How do opioids affect your life?

If you are addicted to opioids, the drug can take over your life. Getting more opioids and getting high can become all you think about. And it makes it hard for you to enjoy things that used to make you happy.

*Can you imagine if the things you loved no longer made you feel happy?*

