

# STIMULANTS



## MODULE 4

MODULE 4

◆ National Institute on Drug Abuse ◆

# MODULE 4: HOW STIMULANTS AFFECT THE NERVOUS SYSTEM

## Introduction

During the previous two modules, the students learned about the structures of the brain and what each does, and also about neurotransmission, the process through which information is exchanged between the brain and the rest of the body. In the next two modules, students learn about drugs—some legal with beneficial attributes and negative consequences, some legal with negative consequences, and some illegal. The group of drugs covered in module 4 is called stimulants. Stimulants change the functioning of the brain and body. Students will be learning about caffeine, nicotine, methylphenidate (Ritalin), amphetamine, and cocaine in this module.

## Learning Objectives

- ★ Students learn how certain stimulants affect the brain and the nervous system.
- ★ Students study PET scans showing the difference between a normal brain and one exposed to stimulants.
- ★ Students discuss the impact of drug use.

## Relationship to the *National Science Education Standards*

This mission aligns with the following standard identified in the NSES: science in personal and social perspectives. The chart that follows identifies how the mission aligns with this standard.

### Science in Personal and Social Perspectives

Levels K-4	How Mission is Aligned
Personal health	Students observe the effects that stimulants have on the brain and the nervous system. They discuss the impact this information has on their lives and how they can use it to make wise decisions about their own health.



## Background

The kinds of drugs discussed in this module are known as stimulants. Stimulants cause accelerated heart rate, increased blood pressure, and an increase in the rate of the body's metabolism. Stimulants also interfere with the functioning of a neurotransmitter, known as dopamine. Dopamine activates the brain's reward system and is associated with feelings of pleasure, such as the pleasant sensations of eating or riding a roller coaster. Stimulants vary in the extent to which they interfere with dopamine, and in the effects they have on other neurotransmitters.

There are many different kinds of stimulants. The ones focused on here are nicotine, caffeine, cocaine and amphetamine, and methylphenidate (Ritalin). Each kind of drug is explained in the chart below.

Drug	Other Terms	How the Drug is Used	Effects of the Drug	Negative Effects on the Body	How the Drug Works
Nicotine	Tobacco; found in cigarettes, cigars, and smokeless tobacco	Smoked, chewed, or inhaled	Reduces appetite, increases alertness	Can cause nausea and vomiting. Nicotine is addicting and use results in the harmful effects of tobacco use, such as lung cancer, emphysema, and bronchial disorders. Prenatal exposure to tobacco can impact the developing baby.	A mild stimulant, nicotine reaches the brain just 8 seconds after being inhaled. It activates areas in the brain that experience pleasure and reward by increasing the release of the neurotransmitter, dopamine. Causes increased heart rate and blood pressure by acting on the same receptor as the neurotransmitter, acetylcholine.
Caffeine	Found in coffee, tea, cocoa, soft drinks, and some medications	Taken orally in pill form or consumed in food and drinks	Increases alertness		Stimulates the central nervous system by increasing the metabolism inside neurons. Increases wakefulness by blocking the neurotransmitter, adenosine.



Drug	Other Terms	How the Drug is Used	Effects of the Drug	Negative Effects on the Body	How the Drug Works
Cocaine and amphetamine	Cocaine is also called crack; amphetamine is known as speed, uppers, meth, copilots, and crank	Snorted, smoked, or injected	Causes alertness, arousal, and euphoria	Cocaine causes dizziness, headaches, anxiety, insomnia, and depression upon withdrawal in those who use it chronically. Amphetamine can cause increased heart rate, reduced appetite, and insomnia. These drugs also can make people feel anxious, raise blood pressure, cause dangerous and irregular heartbeats, chest pain, shortness of breath, nausea, vomiting, and diarrhea.	Alters the actions of the brain's neurotransmitters—mostly dopamine. Over time, these drugs change how the dopamine neurons work. This, in part, is why users become addicted to the drugs. The user needs them to keep from feeling bad.
Methylphenidate*	Ritalin	Taken orally in pill form, crushed up and snorted, or dissolved with water and injected	When taken as prescribed helps with focus and learning. When abused causes increased wakefulness and euphoria	When abused, causes nervousness, loss of appetite, headache, increased blood pressure and heart rate, and the inability to fall or stay asleep; when injected, it can block small blood vessels causing damage to the lungs and retinas.	Prescribed for attention deficit hyperactivity disorder (ADHD). When taken in doses other than those prescribed, Ritalin can rapidly increase brain dopamine and disrupt normal communication between brain cells. This can lead to addiction.

\*Several studies have shown that children who have ADHD and are treated with methylphenidate are less likely to abuse drugs and alcohol when they are older than those who were not, but more research needs to be done. Methylphenidate taken without a doctor's prescription can cause addiction and other negative health effects.



## Materials

- ✓ Paper and pencils
- ✓ DVD and DVD player
- ✓ Computer with Internet access
- ✓ Brain Fact Sheets (from Module 2 - Parts of the Brain and Lobes of the Brain)
- ✓ Markers

## Preparation

- ★ Read the Background material to familiarize yourself with specific stimulants and how they affect the brain, the body, and the nervous system.
- ★ Organize the students into small groups of three or four students.

## Procedure

1. Begin the mission by watching the first segment of the DVD. Stop the DVD at the break and ask the students what stimulants are. Then go over the following key points:
  - Stimulants are drugs that cause the heart rate to increase, blood pressure to rise, and metabolism to increase.
  - Stimulants include legal prescription drugs, such as methylphenidate (Ritalin); legal substances, such as nicotine and caffeine; and illegal drugs, such as cocaine and amphetamine.
2. Divide the students into small groups of three or four. Tell them that as a result of the tools available for studying the brain, which they learned about in Module 2, it is possible to see the difference between a brain that has been exposed to stimulants and one that has not. In particular, PET scans show brain activity and can show the effect that drugs have on the brain.
3. Direct students to the following Web site:

[www.pbs.org/wnet/closetohome/science/html/change.html](http://www.pbs.org/wnet/closetohome/science/html/change.html)



Have the groups look at the images of a brain that has not been exposed to drugs and one that has. It might be a good idea for students to refer to the Brain Fact Sheets.

4. Ask the students to answer the following questions:

- Can you tell what parts of the brain are being shown on the scans?
- What does it mean when certain parts of the brain have been activated?
- Is it good or bad that different parts of the brain have been activated?
- What do you think would happen to the brain if it is exposed to cocaine all the time?

5. Have each group write a couple of paragraphs or a list answering these questions. Then share some of their responses. What were some ideas expressed by the students?

6. Conclude the mission by watching the remainder of the DVD. Once the DVD is over, write a class statement about the effects of cocaine on the brain. Write the statement on a piece of newsprint and save it for further use.

## Discussion Questions

- ? Based on what the students have learned about the brain so far, ask them why they think people take drugs in the first place. Remind the students to think about the scrapbooks they created in the first module and the impact of drugs on our society.
- ? Have the students discuss this question with their friends and family. What new ideas did people come up with?



## Extensions

The activities listed below provide a link to other areas of the curriculum.



Language arts



Math



Drama



Art



Science



Social Studies



Reading

	<p>Ask the students to brainstorm on how they think other stimulants, such as cocaine and nicotine, affect the brain. They may want to do some research on the Internet to find more information. The Neuroscience for Kids Web site is a great place to start: <a href="http://faculty.washington.edu/chudler/neurok.html">http://faculty.washington.edu/chudler/neurok.html</a></p>
	<p>Have the students look in books, newspapers, and magazines for examples of stories on how drugs have affected people's lives. The stories can be positive, describing how Ritalin made a person with ADHD function better, or negative, showing how drugs can cause tremendous damage in an individual's life. Ask the students to share their findings with the class.</p>

## Assessment

1. Consider the following questions as the students work on this activity:




- Can the students observe and understand the PET scans?
- Can the students answer the questions about the brain?
- Do the students participate in class discussions?
- Were the students able to generate new ideas about why people take drugs based on what they have learned so far?





## Additional Activities

Below are some additional activities that can be done after completion of the fourth mission. These activities are extensions to many areas of the curriculum.

	<p>Play a "game show" using questions about drugs and how they affect the body. The students can take turns being the player, and the rest of the class can be the audience. If the player doesn't know the answer, he or she has the option of asking the audience for help. Make sure that everyone has a chance to be the player.</p>
	<p>As a class, go to the Library/Media Center and look for books or Web sites about one or more of the drugs studied during the module. Take the books back to the class and read them together. Discuss the books' content and how they apply to what the students learned during the module.</p>
	<p>Make up a class story about drugs. Have each student add a line to the story. Tell the students that the story could be about anything they have learned in the program to date.</p>





Notes:



## Resources for Teachers

### National Institute on Drug Abuse (NIDA)

[www.drugabuse.gov](http://www.drugabuse.gov), 301-443-1124

This Web site contains information about drug abuse and a section designed specifically for parents, teachers, and students. Publications and other materials are available free of charge at [drugpubs.drugabuse.gov](http://drugpubs.drugabuse.gov).

### National Institute on Drug Abuse (NIDA): Mind Over Matter

[teens.drugabuse.gov/MOM/TG-intro.php](http://teens.drugabuse.gov/MOM/TG-intro.php)

This Web site was developed to educate children about the biological effects of drug abuse on the body and brain.

### National Clearinghouse for Alcohol and Drug Information (NCADI)

<http://store.samhsa.gov>, 1-800-729-6686

NCADI provides information and materials on substance abuse. Many free publications are available here.

*Drug Abuse Sourcebook. Health Reference Series, [Shannon, JB, ed.]* Detroit, MI: Omnigraphics, Inc., 2010.

Basic health-related information about the abuse of legal and illegal substances, such as caffeine, cocaine, and amphetamine.



## Resources for Students

*Focus on Drugs and the Brain.* [Friedman, D. & Neuhaus, D.] Frederick, MD: Twenty-First Century Books, 1990.

This book, part of the "Drug-Alert Book" series, describes the function of the brain and nervous system and how drugs affect the body.

*Focus on Medicines.* [DeStefano, S. & Neuhaus, D.] Frederick, MD: Twenty-First Century Books, 1990.

This book, part of the "Drug-Alert Book" series, gives a good overview of medicines and how various medicines work with the body and the brain to help healing.

*Focus on Nicotine and Caffeine.* [Perry, R.] Frederick, MD: Twenty-First Century Books, 1997.

This book, part of the "Drug Alert Book" series, gives a good overview of nicotine and caffeine, and how each of these drugs affects the body and brain.

*The Encyclopedia of Drugs and Alcohol (Reference).* [Roza, G.] New York: Franklin Watts, Inc., 2001.

Written for ages 9 through 12, this book covers more than 250 commonly used and abused, legal and illegal drugs, including prescription, over-the-counter, and recreational drugs.

National Institution Drug Abuse (NIDA): Mind Over Matter  
<http://teens.drugabuse.gov/MOM>.

This series is designed to encourage students in grades 5-9 to learn about the effects of drug abuse on the brain and body.

National Institute on Drug Abuse (NIDA): NIDA for Teens  
<http://teens.drugabuse.gov>

This site is developed specifically for teens. It provides information on drugs.



## Introductory Story for Module 4: HOW STIMULANTS AFFECT THE NERVOUS SYSTEM

Beth and Juan are hanging out in their club house, rolling a soccer ball between them as they talk. Beth asks, "So, how do you think the *Spectacular Scientists Club* kids did on their mission?"

Juan replies, "I don't know. They're nice kids, but they're not Junior Scientists like we are."

Corty pops up on the soccer ball in Beth's hands and says, "Why are you guys being so competitive? Scientists work together to solve problems. It's called teamwork!"

"But we want to win, triumph, beat the other team. Be the best!" says Juan.

Corty replies, "Winning is about finding the right answers, and you can probably do that faster together. We'll talk about that later. For now, we're going to learn about drugs.

Juan, can you tell us about the different kinds of drugs?"

Juan can't think of anything. "Um, I don't think we covered that."

"Well, drugs are categorized into classes, and one of the classes is stimulants," says Corty.

"Oh, wait a second! We learned about stimulants, like cocaine and caffeine, like in coffee," says Beth. "Nicotine in cigarettes is a stimulant, too, and so are amphetamines."

Corty says, "Can you come up with one other?" The kids think for a moment but shake their heads. "Ritalin is a prescription drug that's also a stimulant. Do you know what stimulants do?" asks Corty.

Beth answers quickly, "They make you more awake and active. They also make your heart beat faster, your blood pressure go up, and you get hyper and sometimes even angry and irritable."

"Whoa! That can't be good for you," Juan comments.

"It isn't! Your mission is to make a chart that lists each stimulant," says Corty.

"That sounds like a great way to learn about stimulants. We can write down all the different stimulants, record the different names they have, how they're used, and the effects on the body, the brain, and neurotransmission," Juan suggests.

"But first, to help out, I'm going to show you a PET scan," says Corty.

"Oh, that's like when we took my dog to the vet to have x-rays. He ate one of my dad's slippers," Juan says, as Beth giggles.



Corty says, "No. PET stands for Positron Emission Tomography." Corty leads them over to the computer and "wakes it up," using the mouse. Two PET scans appear, one showing the normal brain and the other the brain on stimulants. "All you need to know is that these PET scans show a normal brain and a brain affected by stimulants." The kids see how the PET scan affected by stimulants shows less activity than the PET scan of a normal brain.

The kids move away from the computer, and Juan says, "Let's get started on those charts." The kids gather their materials together and start working on the charts. Corty leaves while they are working.

As the kids are finishing up, Corty jogs in holding a steaming cup of coffee. He sips the coffee. He gradually gets more hyper and jogs in place. Corty begins talking very fast, "That's a very nice chart. Very impressive! Are you almost done? You do know a lot about stimulants. Tell me everything you know about stimulants." Corty starts doing jumping jacks.

Juan and Beth look at each other, at Corty, then at the cup of coffee he's now set aside. Juan goes over, moves the coffee cup away, and says, "I think you've had enough coffee, Corty. It's starting to go to your head."

Corty continues to talk very fast. "Caffeine is legal; anyone can get it. It's in coffee, tea, and soft drinks. But it's not a good idea for kids to have caffeine, even in sodas, because it makes you hyper, and it can cause headaches and sleep problems."

Beth walks over to Corty and says, "Corty, I think you've done enough research for the moment. You need to take your own advice and lay off the stuff."

Corty is suddenly exhausted from all of his activity. He sprawls out on the table and says, "Maybe you're right."

"And that brings me to a question we had: If drugs are so bad for you, then why do people keep on taking them?" asks Beth.

Corty responds, "That's a really good question. As Junior Scientists, did you come to any conclusions on that?"

Juan replies, "Well, some drugs are addictive, like nicotine and cocaine. So, once people start taking them, it can be very hard to stop. Even caffeine can be addictive."

Corty says, "That's what I need - a little more coffee. That'll wake me up!" He reaches for his coffee cup, but Juan moves it away again and says, "I don't think so."

Corty gets up and shakes himself off and says, "Well, maybe you're right. And anyway, I'm on to my next mission; gotta visit the *Spectacular Science Club* kids. Later!"



**Brain Power!**



**NIDA**

**Junior Scientists**

**Brain Power!**



**NIDA**

**Junior Scientists**

## Cocaine

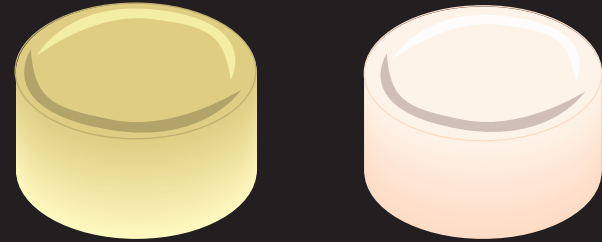
NIDA



Cocaine is a powerful and addictive stimulant that can be snorted, smoked, or injected. Cocaine stops dopamine from re-entering neurons, so dopamine stays in the synapse longer. This causes dopamine to overstimulate neurons. This then causes the brain and spinal cord to speed up activity and the heart to beat faster. Sometimes the heart stops working! Cocaine also makes a person not want to eat or sleep, which are things the body needs to stay healthy.

## Ritalin

NIDA



Ritalin is a stimulant prescription drug that some people take for medical reasons, like ADHD. Only a doctor can prescribe Ritalin. It is illegal to take a prescription drug that is not prescribed for you. For people who don't need to take Ritalin as a medicine, it can have similar effects as cocaine: increased heart rate, sleeping problems, and loss of appetite. This is not healthy!



**Brain Power!**



**NIDA**

**Junior Scientists**

**Brain Power!**

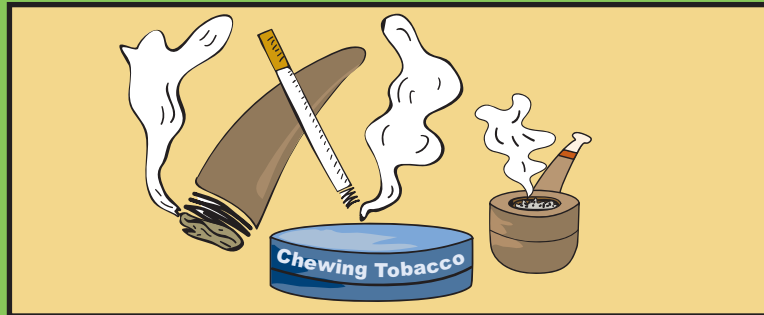


**NIDA**

**Junior Scientists**

## Nicotine

NIDA



Nicotine is a mild stimulant drug found in cigarettes and chewing tobacco. When nicotine is smoked, chewed, or inhaled, it gets in the blood stream and causes the heart to work harder to do its job. In the brain, nicotine attaches to specific receptors for the neurotransmitter acetylcholine. This increases the activity of the receptors. Smoking and chewing tobacco can cause cancer of the lungs, throat, and mouth. Nicotine is a very addictive drug, but it's actually the tobacco or smoke in these products that is harmful and can cause cancer.

## Caffeine

NIDA



Caffeine is a stimulant found in coffee, tea, cocoa, soft drinks, and some medicines. A little bit of caffeine can cause a person to feel more awake, but in larger doses it can disrupt sleep patterns and make a person not want to eat. Caffeine can also cause headaches, dizziness, nervousness, and irritability. Caffeine is addictive.

**Brain Power!**



**NIDA**

**Junior Scientists**

**Brain Power!**



**NIDA**

**Junior Scientists**

# Amphetamine



Amphetamine is a powerful stimulant drug that affects the brain in many ways. It causes increased heart rate and blood pressure, sleeplessness, decreased appetite, decreased tiredness, shaking, cloudy thinking, and violent behavior. This can be dangerous! In the brain, amphetamine increases the amount of the neurotransmitters dopamine and norepinephrine in the synapse (space between the neurons). Ecstasy is a drug that has effects that are similar to amphetamine.

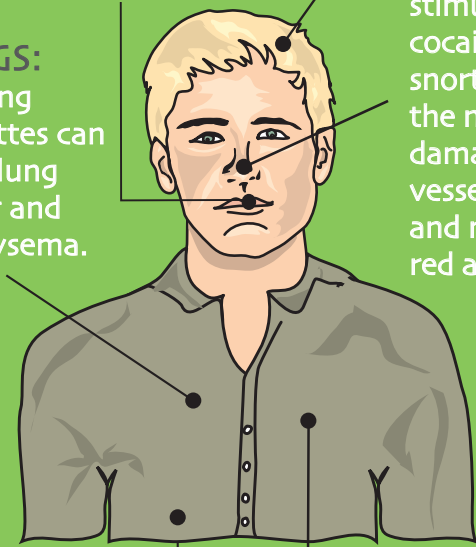
# Effects of Stimulants

**MOUTH:** Drugs like nicotine are smoked and inhaled through the mouth. Tobacco can also be chewed to release the nicotine. This can cause cancer of the mouth and throat.

**BRAIN:** Stimulants attach to receptors in the brain and disrupt normal neurotransmission.

**LUNGS:** Smoking cigarettes can cause lung cancer and emphysema.

**NOSE:** Some stimulants, like cocaine, can be snorted through the nose. This can damage the blood vessels in the nose and make the nose red and itchy.



**LIVER:** The liver filters waste from the blood to keep the body healthy. Stimulants cause the liver to work harder to do its job.

**HEART:** All stimulants cause the heart to beat faster by making the blood vessels smaller. The heart has to work very hard to send blood all through the body.

Cocaine

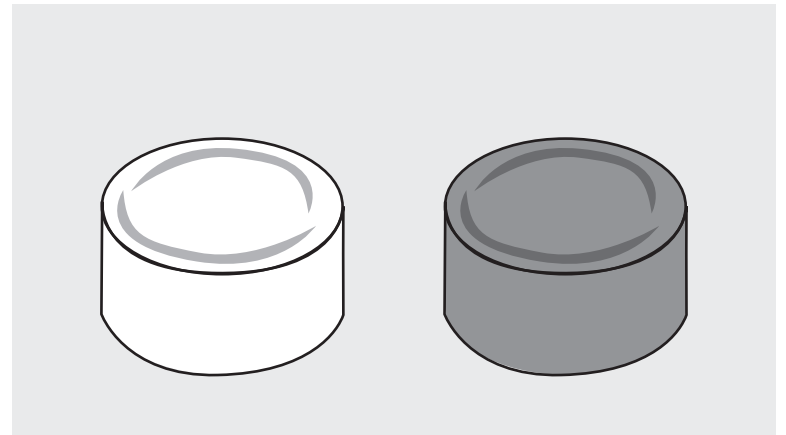
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Cocaine is a powerful and addictive stimulant that can be snorted, smoked, or injected. Cocaine stops dopamine from re-entering neurons, so dopamine stays in the synapse longer. This causes dopamine to overstimulate neurons. This then causes the brain and spinal cord to speed up activity and the heart to beat faster. Sometimes the heart stops working! Cocaine also makes a person not want to eat or sleep, which are things the body needs to stay healthy.

Ritalin

NIDA

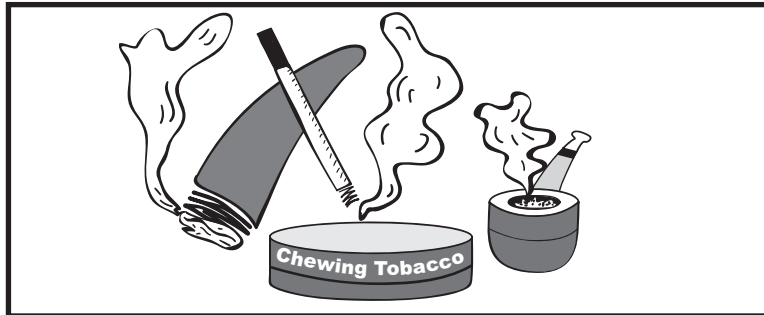


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## Nicotine

NIDA



Nicotine is a mild stimulant drug found in cigarettes and chewing tobacco. When nicotine is smoked, chewed, or inhaled, it gets in the blood stream and causes the heart to work harder to do its job. In the brain, nicotine attaches to specific receptors for the neurotransmitter acetylcholine. This increases the activity of the receptors. Smoking and chewing tobacco can cause cancer of the lungs, throat, and mouth. Nicotine is a very addictive drug, but it's actually the tobacco or smoke in these products that is harmful and can cause cancer.

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Caffeine is a stimulant found in coffee, tea, cocoa, soft drinks, and some medicines. A little bit of caffeine can cause a person to feel more awake, but in larger doses it can disrupt sleep patterns and make a person not want to eat. Caffeine can also cause headaches, dizziness, nervousness, and irritability. Caffeine is addictive.



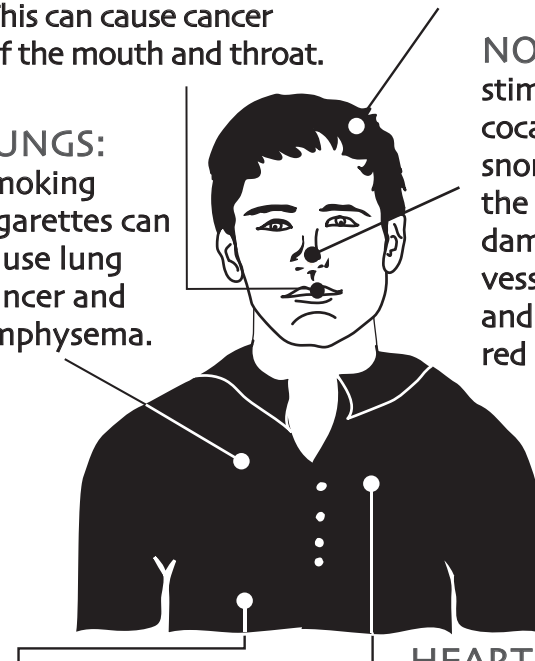
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# BRAIN POWER NEWS

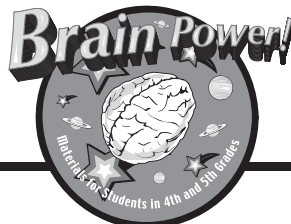
PARENT NEWSLETTER

VOLUME 1, NUMBER 4

## How Stimulants Affect the Nervous System

During the previous two modules, your child learned about the parts of the brain and what each does, as well as about neurotransmission. In the next two modules, he or she will learn about drugs—some legal with beneficial attributes and negative consequences, some legal with negative consequences, and some illegal. The group of drugs covered in module 4 is called stimulants. There are many different kinds of stimulants. The ones focused on in this program are nicotine, caffeine, cocaine and amphetamine, and Ritalin (the prescription drug used legally to treat ADHD). Stimulants cause accelerated heart rate, increased blood pressure, and an increase in the rate of the body's metabolism.

Drug	Other Terms	How the Drug is Used	Negative Effects on the Body	How the Drug Works
Nicotine	Tobacco; found in cigarettes, cigars, and smokeless tobacco	Smoked, chewed, or inhaled	Can cause nausea and vomiting. Nicotine is addictive and use results in the harmful effects of tobacco use such as lung cancer, emphysema and bronchial disorders. Prenatal exposure to tobacco use can impact the developing baby.	A mild stimulant, nicotine reaches the brain just 8 seconds after being inhaled. It activates areas in the brain that experience pleasure and reward by increasing the release of the neurotransmitter, dopamine. Causes increased heart rate and blood pressure by acting on the same receptor as the neurotransmitter, acetylcholine.
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Cocaine and amphetamine	Cocaine is also called crack; amphetamine is known as speed, uppers, meth, copilots, and crank	Snorted, smoked, or injected	Cocaine causes dizziness, headaches, anxiety, insomnia, and depression upon withdrawal in those who use it chronically. Amphetamine can cause increased heart rate, reduced appetite, and insomnia. These drugs also can make people feel anxious, raise blood pressure, cause dangerous and irregular heartbeats, chest pain, shortness of breath, nausea, vomiting, and diarrhea.	Alters the actions of the brain's neurotransmitters—mostly dopamine. Over time, these drugs change how the dopamine neurons work. This, in part, is why users become addicted to the drugs. The user needs them to keep from feeling bad.



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\*Several studies have shown that children who have ADHD and are treated with methylphenidate are less likely to abuse drugs and alcohol when they are older than those who were not, but more research needs to be done. Methylphenidate taken without a doctor's prescription can cause addiction and sometimes death.

This activity aligns with the following standard identified in the National Science Education Standards: science in personal and social perspectives. The students observe the effects that three drugs have on the brain and the nervous system. They discuss the impact this information has on their lives and how they can use it to make wise decisions about their own health.

## Science at Home

Talk to your child about the different types of drugs and how they affect the brain and body. Have your child begin to think about the reasons people would abuse drugs when they know how harmful they can be.

It is very important to discuss with your child the differences between taking Ritalin for ADHD in the dose and method prescribed by a doctor and abusing Ritalin. Inform your child that Ritalin will increase the attention and focus in people with ADHD, while it can cause serious side effects and addiction in those who inappropriately use it. Research has shown that people with ADHD do not develop addiction to Ritalin when used in the form and amount prescribed.

## Additional Resources

### National Institute on Drug Abuse (NIDA)

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This Web site contains information about drug abuse and a section designed specifically for parents, teachers, and students. Publications and other materials are available free of charge at [drugpubs.drugabuse.gov](http://drugpubs.drugabuse.gov).

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# NOTICIAS SOBRE EL PODER DEL CEREBRO

## Los estimulantes y cómo afectan el sistema nervioso

Durante los dos módulos anteriores, su hijo aprendió sobre las partes del cerebro y lo que hace cada una, así como sobre la neurotransmisión. En los siguientes dos módulos aprenderá sobre las drogas, algunas legales y con atributos beneficiosos y consecuencias negativas, y algunas ilegales. El grupo de drogas cubierto en el Módulo 4 se llama estimulantes. Hay muchos tipos distintos de estimulantes. En este programa nos concentraremos en la nicotina, la cafeína, la cocaína y las anfetaminas, así como en la Ritalina. Ritalina es la droga de venta con receta utilizada en forma legal para tratar el trastorno de déficit de atención e hiperactividad (TDAH, o ADHD por sus siglas en inglés). Los estimulantes provocan la aceleración del ritmo cardíaco, aumento de la presión arterial y aumento de la velocidad del metabolismo del cuerpo.

Droga	Otros términos	¿Cómo se usa la droga?	Efectos en el cuerpo	¿Cómo funciona la droga?
Nicotina	Tabaco; se encuentra en cigarrillos, cigarros y tabaco sin humo	Se fuma, se mastica o se inhala	Puede causar náuseas y vómitos. La nicotina es adictiva y el uso resulta en los efectos nocivos del consumo de tabaco como el cáncer de pulmón, enfisema, y trastornos bronquiales. La exposición prenatal al tabaco puede afectar al bebé durante su desarrollo.	La nicotina, un estimulante leve, llega al cerebro en tan sólo 8 segundos después de haber sido inhalada. Activa áreas del cerebro que hacen sentir placer y recompensa, aumentando la liberación de un neurotransmisor llamado dopamina. Causa aumento del ritmo cardíaco y de la presión arterial que actúa sobre el mismo receptor neurotransmisor llamado acetilcolina.
Cafeína	Se encuentra en el café, el té, el cacao, las bebidas gaseosas y algunos medicamentos	Se toma oralmente en forma de píldora o se consume en comida y bebidas	Disminuye la coordinación de la motricidad fina, altera los patrones del sueño y puede causar dolor de cabeza, nerviosismo y mareos	Estimula el sistema nervioso central aumentando el metabolismo dentro de las neuronas. Aumenta la vigilia al bloquear el neurotransmisor adenosina.
Cocaína y anfetaminas	La cocaína también se llama crack; las anfetaminas se conocen como speed, anfetam, metanfetaminas, copilotos y crank	Se aspiran, se fuman o se inyectan	La cocaína causa mareos, dolor de cabeza, ansiedad, insomnio y depresión ante la abstinencia de aquellos que la usan crónicamente. Las anfetaminas pueden causar un aumento del ritmo cardíaco, disminución del apetito e insomnio. Estas drogas también pueden hacer que la gente se sienta ansiosa, que aumente la presión arterial, causar latidos cardíacos irregulares peligrosos, dolor de pecho, falta de aliento, náusea, vómitos y diarrea.	Alteran las acciones de los neurotransmisores del cerebro, principalmente la dopamina. Con el tiempo, estas drogas alteran la manera en que funcionan las neuronas de dopamina. Esto es, en parte, el motivo por el cual los consumidores se vuelven adictos a las drogas: el consumidor las necesita para evitar sentirse mal.



# Estimulantes

Droga	Otros términos	¿Cómo se usa la droga?	Efectos en el cuerpo	¿Cómo funciona la droga?
Metilfenidato*	Ritalina	Se toma por vía oral en forma de píldora, o triturado e inhalado, o disuelto en agua e inyectado.	Cuando se toma según las indicaciones, ayuda con la atención y el aprendizaje. Cuando se abusa, hace que la vigilia aumente y causa euforia.	Es prescrita para déficit de atención e hiperactividad (ADHD). Cuando se toma en dosis distintas a las prescritas, la Ritalina puede aumentar rápidamente la dopamina del cerebro e interrumpir la comunicación normal entre las células cerebrales. Esto puede llevar a la adicción.

\*Varios estudios han demostrado que los niños que sufren del TDAH y son tratados con metilfenidato son menos propensos a abusar de las drogas y el alcohol cuando son mayores que aquellos que no fueron tratados. Pero el metilfenidato tomado sin receta médica puede causar adicción y a veces la muerte.

Esta actividad cumple con el siguiente estándar identificado en los Estándares Nacionales de Educación Científica (National Science Education Standards): ciencia desde una perspectiva personal y social. Los estudiantes observan los efectos que tres drogas tienen en el cerebro y el sistema nervioso. Comentan sobre el impacto que esta información tiene en su vida y cómo pueden usarla para tomar decisiones inteligentes sobre su propia salud.

## La ciencia en el hogar

Hable con su hijo sobre los distintos tipos de drogas y cómo afectan al cerebro y al cuerpo. Haga que su hijo comience a pensar sobre los motivos por los cuales las personas abusan de las drogas a pesar de saber lo nocivas que pueden ser.

Es muy importante conversar con su hijo sobre las diferencias entre tomar Ritalina para el TDAH en la dosis y método indicados por el médico y abusar de ella. Informe a su hijo que la Ritalina aumentará los niveles de atención y concentración de las personas con TDAH, pero que puede causar graves efectos secundarios y adicción en quienes la usan de manera inadecuada. Las investigaciones han demostrado que las personas con TDAH no desarrollan adicción a la Ritalina cuando la utilizan en la forma y cantidad recetadas.

## Recursos adicionales

### National Institute on Drug Abuse (NIDA)

[www.drugabuse.gov](http://www.drugabuse.gov), 301-443-1124

Este sitio Web tiene información acerca del abuso de drogas y una sección destinada específicamente a padres, maestros y estudiantes. Hay publicaciones y otros materiales disponibles sin costo en [drugpubs.drugabuse.gov](http://drugpubs.drugabuse.gov). Muchas publicaciones están disponibles en español.

### National Institute on Drug Abuse (NIDA): Mind Over Matter

[www.teens.drugabuse.gov/mom](http://www.teens.drugabuse.gov/mom)

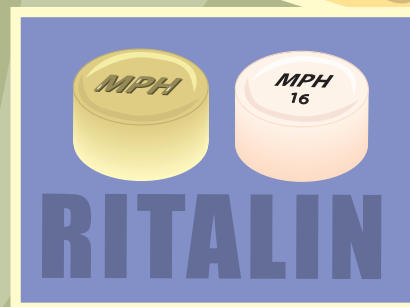
Este sitio Web ha sido elaborado para educar a los niños acerca de los efectos biológicos del abuso de drogas en el cerebro y el cuerpo.

### National Clearinghouse for Alcohol and Drug Information (NCADI)

<http://store.samhsa.gov>, 1-800-729-6686

NCADI provee información y materiales relacionados con el abuso de sustancias. Aquí se pueden obtener muchas publicaciones gratuitas.





# STIMULANTS

## EFFECTS OF STIMULANTS

INCREASED HEART RATE  
INCREASED BLOOD PRESSURE  
INCREASED RESPIRATION  
STIMULATED NERVOUS SYSTEM  
DECREASED HUNGER  
DISRUPTED NORMAL NEUROTRANSMISSION

ANXIETY  
DEPRESSION  
PARANOIA  
INSOMNIA  
DIZZINESS  
HEADACHES