

# WHAT IS ADDICTION?



## MODULE 6

◆ National Institute on Drug Abuse ◆

# MODULE 6: WHAT IS ADDICTION?

## Introduction

This module is the last in the *Brain Power!* program. Over the past five modules, the students have thought about society's views toward drug use and have learned about the structure of the brain, how neurotransmission works, and how stimulants, alcohol, marijuana, and inhalants affect the brain, the nervous system, and the body. During this mission, students round out their knowledge of drugs by learning about addiction. Then they revisit their ideas about the impact of drug use on society and have the opportunity to modify their thinking based on new knowledge.

## Learning Objectives

- ★ Students learn about addiction.
- ★ Students discuss how addiction relates to the drug abuse problem in this country.
- ★ Students rethink the scrapbooks they developed during Module 1 to reflect their new ideas about drugs.

## Relationship to the *National Science Education Standards*

This mission aligns with the following two standards identified in the NSES: science as inquiry and science in personal and social perspectives. The charts that follow identify how the mission aligns with each of these standards.

### Science as Inquiry

Levels K-5	How Mission is Aligned
Abilities necessary to do scientific inquiry	Students experience some of the steps in the process of scientific inquiry: making observations, developing a hypothesis, completing an investigation to test the hypothesis, and drawing conclusions.



## Science in Personal and Social Perspectives

Levels K-5	How Mission is Aligned
Personal health	Students learn about the effects of several different drugs on the body, 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

Despite the negative consequences of drug use, some people who take drugs are unable to stop. Drugs change the way the brain works. Some of these changes are short term, while other changes can last a very long time.

In some people drug use can change the brain and its neurotransmitters so profoundly that addiction results. Addiction is characterized by the following:

- **Compulsive use:** A strong compulsion or drive to use drugs despite negative consequences. In other words, a person persists in using drugs even if he or she is having serious problems.
- **Tolerance:** The person needs more of the drug to produce the same effect as before.
- **Withdrawal:** Intense craving for the drug when it is not available. The craving results from changes in the brain. Once a person is addicted, he or she must have the drug just to keep from feeling bad. This is because drugs can cause changes in the normal functioning of neurotransmitters in the brain.

Addiction is considered a disease because the drugs have changed the way the brain functions. Different drugs cause different changes in the brain, some more severe than others. Research in animals and humans suggests that some drugs may cause changes that last long after the individual has stopped taking drugs or even permanently.

### Research

Addiction affects men and women of all ages and ethnicities. Because of the severity of the problem, scientists have been studying how drugs act in the brain to produce addiction using a range of methods, from brain imaging to psychological testing. These researchers are trying to identify causes and methods of effective treatment and prevention of drug abuse. As a result of this international attention and research, scientists and physicians now have a greater understanding of how drugs act in the brain. This has led to the development of new treatments for drug addiction.



### *Treatment*

When a person becomes addicted to a drug, neurological, physiological, psychological, and social changes take place. These biopsychosocial changes must be addressed for the person to get better. The appropriate treatment is dependent on the individual, drug of abuse, and severity of addiction.

Often, detoxification is the first step in addiction treatment. Detoxification is the medically controlled withdrawal of the abused drug. However, this is only the first step in successful treatment, and many drugs, such as cocaine, do not cause the typical detoxification symptoms when their use is discontinued. After a person has gotten off of a drug, he or she still must deal with any changes that have occurred in his or her brain as a result of drug use. Often these changes are much harder to deal with than the initial detoxification from the drug use, and research has shown that some drugs can cause changes in the brain that last for a long time and may even be permanent.

For some abused drugs, medications are available that can be used in conjunction with psychological and social treatments. For other drugs, however, medications are not yet available, so successful treatment relies on psychological and social treatments. These treatments can help a person recovering from addiction deal with a range of emotions, including shame, denial, emotional distress, and neglect of family, friends, work, and school. They can also help them deal with a variety of social problems, such as trouble at school and hurt family members and friends. The person recovering from addiction must work to mend relationships with family and friends, reestablish a responsible role in school, and avoid situations that might provoke a relapse. During treatment and recovery, addicted people and their families often have to learn how to communicate in new and healthy ways. This is typically accomplished during family therapy.

These treatments are offered in a variety of settings, such as hospitals and clinics, and recovery continues through the assistance of self-help and individual and group therapy. Addiction is a serious disease and, in some cases, drug abusers start using drugs again after treatment and need to go back into treatment. Although addiction can be treated successfully, the best way to avoid addiction is to never start using drugs in the first place.



## Materials

- ✓ DVD and DVD player
- ✓ Fact Sheets from previous modules
- ✓ Notes from previous modules
- ✓ Scrapbooks from *Module 1*
- ✓ Old newspapers and magazines
- ✓ Paper and pencils

## Preparation

- ★ Preview the DVD before showing it to the class.
- ★ Make sure the students have their scrapbooks from Module 1 as well as materials from other modules before beginning work on this activity.
- ★ Students will work in the same groups they worked in during Module 5.

*During this activity, keep in mind that some children may be trying to cope with an addicted loved one at home. It is recommended that the lines of communication be open between the teacher, students, and guidance counselor to handle any issues that may occur.*

## Procedure

1. Tell the students that this is the final module in the program. Their goal is to try to pull together material they learned in earlier modules to draw some conclusions about drug use.
2. Have the students watch the DVD. Stop the DVD at the break. Make sure that each student has all the Instruction Sheets, Fact Sheets, and notes from previous modules, as well as the scrapbooks from Module 1.
3. Tell students that their challenge is to add a page to their scrapbooks from Module 1 to reflect what they have learned during the program. These pages will serve as a before and after summary and will assess their growth and understanding over time about the brain and drugs. Based on what they know now, how would they depict people drinking and smoking in ads? How would they describe drug use to friends?
4. Give the students class time to modify their scrapbooks. They may choose to find new pictures to put in, or they may simply change what they say about the images.



5. Finish watching the DVD. When the DVD is over, bring the class back together to share their scrapbooks. What conclusions did the students come to? Did most students change their ideas about drugs and how they should be depicted in the media?
  
6. Divide the class into two groups (A and B) and instruct each group to come up with four to six trivia questions about drugs and addiction to ask the other group. Give the students time to come up with questions and then play the game. If students have difficulty coming up with questions on their own, have them use these examples:
  - What is it called when a person needs more of a drug to produce the same effect? Answer: tolerance
  
  - What is it called when someone who is addicted to drugs feels bad when not using drugs? Answer: withdrawal
  
7. One member from Group A should read the question to be answered by Group B. Group B should discuss among themselves before agreeing on an answer. Group B has two options at this point: (1) Group B members can agree on an answer that a group member will announce, or (2) they can ask for a clue from Group A. The point system is explained in the chart below.

How Question is Asked	Right or Wrong	Points Awarded
Group B with no help	Right Answer	2 points for Group B
Group B with a clue from Group A	Right Answer	2 points for Group B, and 1 point for Group A
Group B with no help	Wrong Answer	No points awarded
Group B with a clue from Group A	Wrong Answer	No points awarded

8. After all the questions have been asked to both groups, declare the group with the higher number of points the winner. Take the time now to emphasize how collaboration results in more points for both groups in this activity. Explain how scientists benefit from collaboration as well. When researchers work together, they make better progress.



## Discussion Questions

- ? Discuss what addiction means. Ask whether that piece of information changes their opinions about drug use.
- ? Discuss what collaboration means. Ask whether scientists benefit more from competition or collaboration.

## Extensions

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



Language arts



Math



Drama



Art











Science



Social Studies



Reading

  	<p>Have the students conduct research on the Internet or in newspapers and magazines about scientific research. For example, have them look up brain research and find out about a couple of different discoveries over the past 10 years. Ask students to determine whether progress was made through collaboration or competition. What does that say about the role of collaboration in scientific research?</p>
 	<p>Ask the students to look for examples in the media of how addiction affects people's lives. Then have them write a short summary of what they find out. In general, do they find that drug use usually has a positive or negative effect on people's lives? What does this tell them about drugs?</p>
  	<p>Go to the Library or Media Center and find books or articles about addiction. What additional information is available? Then tell the students to write or draw how addiction changes the brain and the functioning of neurotransmitters.</p>







## Assessment

This mission is an embedded assessment of what students have learned throughout the *Brain Power!* program. As the students work, observe whether they have mastered the following:

1. Can the students clearly express their thinking about drugs?
2. Can the students modify their work to reflect their new thinking?
3. Do the students understand what addiction is?
4. Are the students approaching the task logically and methodically?
5. Are the students able to summarize their thinking and express their conclusions about the program?
6. Do the students understand how drugs can change the brain?

## Additional Activities

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

	<p>Have the students develop an awareness campaign about drugs in their school. As part of the campaign, they should develop posters, brochures, and flyers. They can include PET scans, diagrams of the brain, and illustrations of neurotransmission to develop compelling, persuasive pieces.</p>
 	<p>Challenge the students to develop a model of the brain. They can use clay or other materials to build an anatomically correct, detailed model.</p>
	<p>Have the students make a list of aspects of their lives that involve competition and those that involve collaboration. For example, in baseball, you compete against another team, but you need to collaborate with your teammates to win each game. Do the students think that there is a place for both in their lives? When is one more appropriate than the other?</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.

*Drugs, the Brain, and Behavior: The Pharmacology of Abuse and Dependence.* [Brick, J. & Erickson, C. K.] Binghamton, NY: Haworth Press, 1998.

This book presents a good overview of the brain, major classifications of drugs, how drugs work in the brain, and addiction.



## Resources for Students

### NIDA for Teens

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

This Web site created for teens provides information on the science of drug abuse and addiction, including personal stories from teens and activities for students.

### NIDA Partners with Scholastic Magazines

<http://headsup.scholastic.com>

This Web site provides science-based information about drug abuse to children.

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

This book, part of the "Drug-Alert Book" series, includes a section on each drug of abuse and addiction.

### 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, developed specifically for teens, provides information on drugs.



## Introductory Story for Module 6: WHAT IS ADDICTION?

Beth, Juan, Jay, and Latisha sit in the club house. There is a sense of tension as the kids whisper to their teammates about who may be ahead in the game. Corty comes in and says, "Hi, kids! Glad to see you're all sitting together - kind of. At least you're in the same room. I'm here to bring you the final mission, and you're all going to work on it together."

"All right! Now we can have a neck and neck competition," Juan says. "This is our chance to shine!" Latisha says.

Corty says, "I mean all together. Now, the mission is to learn more about addiction."

"We already know about addiction," says Beth. "That's too easy."

"I know you know a little about addiction. However, this mission will help you answer the question that's been on all of our minds," says Corty.

"Who's going to win the competition?" suggests Juan.

"No! Forget about the competition for a minute. Learning about addiction will tell us why people continue to use harmful drugs even though they know the drugs are bad for them," Corty says. "Now, who can describe addiction?"

Beth says, "Addiction is a disease of the brain that comes from drug use."

Corty asks, "How does addiction affect the brain?"

Jay replies, "It affects the neurotransmitters. It changes the way they function, so the messages aren't loud and clear like they should be. They're garbled, like a bad telephone connection."

Corty says, "What else do drugs do to the neurotransmitters - *Brain Power!* kids?" Beth and Juan exchange glances - they're not sure.

Beth says, "I guess we didn't do the mission on neurotransmission, so we're not sure."

Corty says, "Right. The other team did. But you aren't talking to them. Too bad. Now you do know how addiction affects the brain, right?"

"Yeah. Addiction changes the brain so that even if someone stops using a drug, it takes a while for the brain to get back to normal. And sometimes it never does," says Juan.

"Right. *Spectacular Scientists* kids, what can cocaine do to someone who uses it?" asks Corty. Latisha and Jay look at each other and shrug - they don't know.



Corty asks, "Do you know what class of drugs cocaine is in?" They look at each other again and shake their heads.

"Cocaine is a stimulant," Beth says. "We didn't learn about stimulants," says Jay.

"The *Brain Power!* kids did. Hmm. Should have worked together. I'll bet the *Brain Power!* kids can't tell us what effects inhalants have on the brain," says Corty. Beth and Jay look at each other and shake their heads.

Latisha says, "Inhalants affect the cerebral cortex, the cerebellum, and the brain stem."

"We didn't learn about inhalants," says Juan. The kids sigh and look unhappy, finally understanding that they should have worked together and feeling bad that they didn't.

Beth says, "Um, I guess we kind of all missed out because we were so busy competing instead of working together. Is it too late to try being a team?"

"Let's do it!" says Latisha.

Corty does a little victory dance. "Woo-hoo. Woo-hoo. It took you too long, but now I'm singin' my song. You learned teamwork late, but it was well worth the wait!"

The kids pull out their charts and body outlines, and exchange notes on what they learned.

Corty says, "So now let's answer the question we're all asking."

Beth says, "Why do people continue to use harmful drugs even when they know the drugs are bad for them? We haven't figured that out yet."

Corty says, "Well, let's figure it out now. We'll start by learning some more about addiction. Do you know some of the signs of addiction?" The kids look at each other, and then shake their heads. They don't know.

Corty says, "One is called tolerance—the longer someone takes a drug, the more of the drug they need to get the same feeling from it. Of course, a person is supposed to continue taking drugs that a doctor prescribes for him or her for medical reasons. That person would not be considered addicted to those medicines.

Another sign is compulsive use—when someone needs to use a drug over and over again, even if bad things are happening, like with the people they love, or their job, or with the police!

And then, there's withdrawal. Do you know what that is?" The kids shake their heads.

Corty says, "That's when people need the drug to keep from feeling bad. With cocaine, for instance, if a user can't get it, they get depressed and nauseated, and they feel like they'll do anything to get it." The kids are listening closely.



**Brain Power!**



**NIDA**

**Junior Scientists**

**Brain Power!**



**NIDA**

**Junior Scientists**

## Addiction

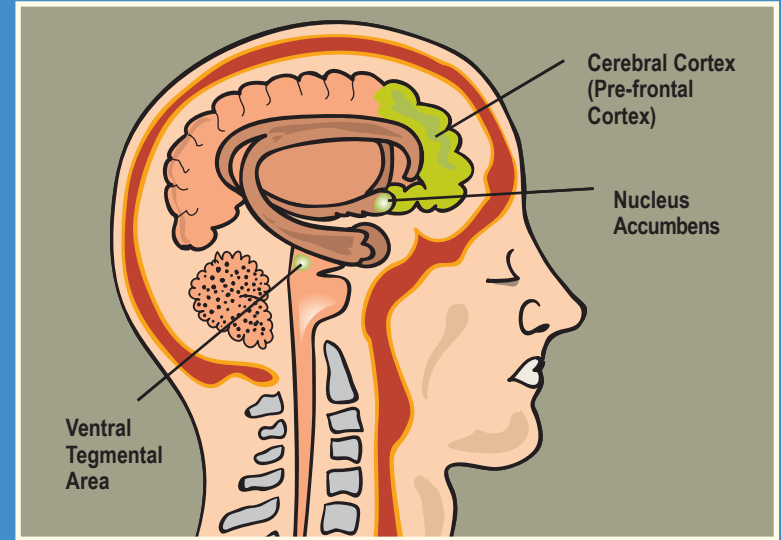
NIDA



Long-term drug abusers can become addicted to drugs. Addiction is a disease that changes the way the brain works. People addicted to drugs need drugs to feel normal. It's hard for them to stop using the drug, even though it causes major problems. They usually need medical help to overcome the addiction.

## Reward System

NIDA



The "reward system" is made up of a specific part of the brain stem called the ventral tegmental area, the limbic system, and part of the cerebral cortex. It is activated when you are feeling good. For example, when you eat a tasty meal, neurotransmitters in the brain's "reward system" are released and make you feel good. Illegal drugs affect the brain in the same way.

**Brain Power!**



**NIDA**

**Junior Scientists**

**Brain Power!**



**NIDA**

**Junior Scientists**



## Compulsive Use:

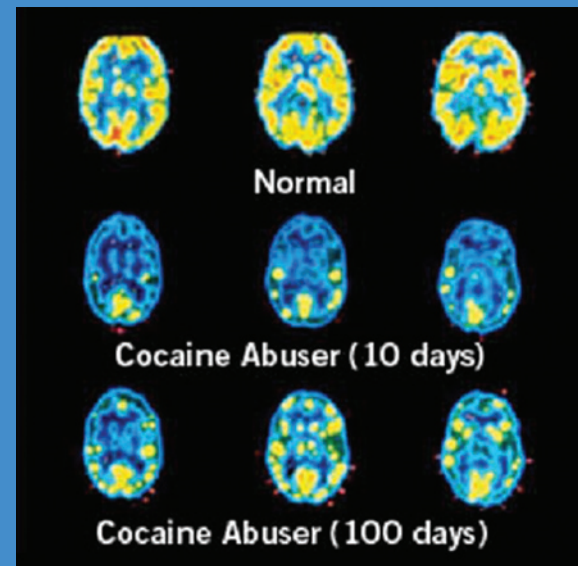
An addicted person keeps using the drug over and over again. Even if he is having serious problems.

## Tolerance:

An addicted person uses more and more of the drug over time to get the same effect as before.

## Withdrawal:

An addicted person has an intense craving for the drug when he or she doesn't have it.



Cocaine abuse can cause changes in the brain. The PET scans above show normal brains, brains of abusers that have not taken cocaine in 10 days, and abusers that haven't taken cocaine in 100 days. Even after 100 days without the drug, the activity (bright areas) in the cocaine abusers' brains is still much less than in the normal brains.

**Brain Power!**



**NIDA**

**Junior Scientists**

**Brain Power!**

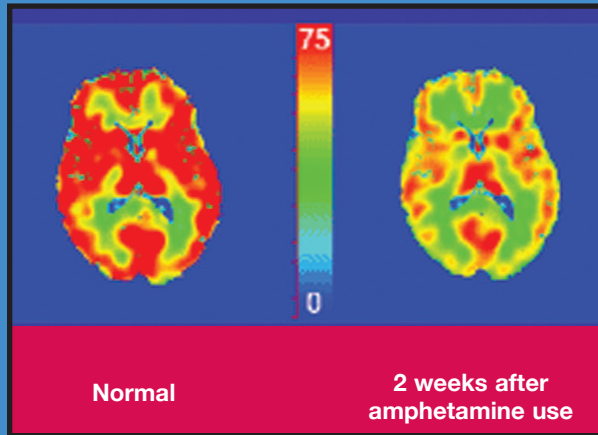


**NIDA**

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## Amphetamine Effects

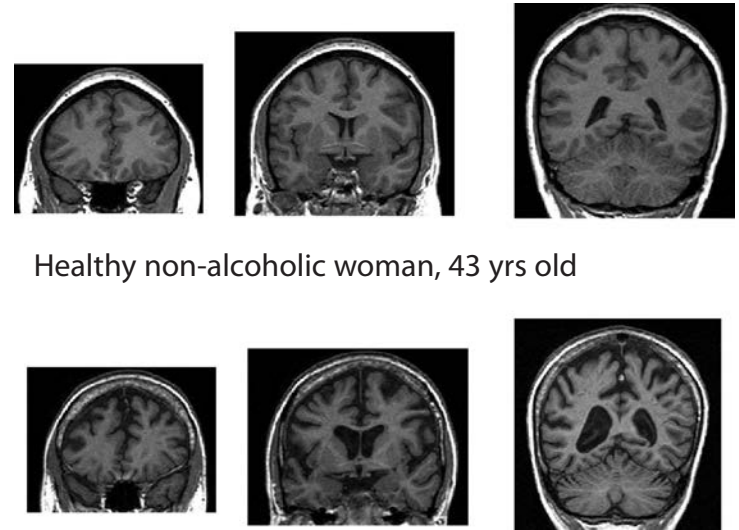
NIDA



The picture above shows how blood flow in the brain is affected by amphetamine use. The image on the left is a PET scan of the person before using amphetamine. The one on the right shows the same brain 2 weeks after amphetamine use. There is less blood flow through the brain of a person who has used amphetamine. When the flow of blood is affected like this, the level of activity is decreased.

## Alcohol Addiction

NIDA



Research has shown that alcohol addiction can cause changes in the structure of the brain. The MRI above shows the differences between the brain of a healthy woman and an alcohol-addicted woman. Notice how much larger the holes are in the middle of the alcoholic woman's brain.

**Brain Power!**

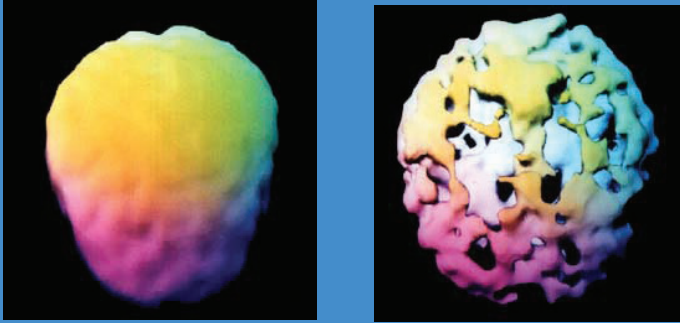


**NIDA**

**Junior Scientists**

## Heroin Addiction

NIDA



The images above show two brain scans using SPECT imaging. The image on the left shows a normal brain, and the image on the right shows the brain of someone who has abused heroin for 20 years. The holes in the picture aren't actually holes in the brain. They show areas of the brain that should be working but aren't. The brain of the heroin abuser has much less activity.

## Addiction

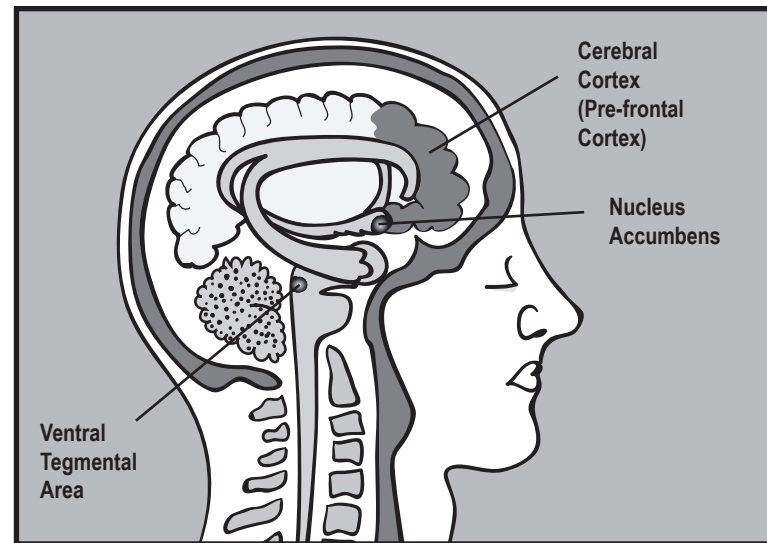
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Long-term drug abusers can become addicted to drugs. Addiction is a disease that changes the way the brain works. People addicted to drugs need drugs to feel normal. It's hard for them to stop using the drug, even though it causes major problems. They usually need medical help to overcome the addiction.

## Reward System

NIDA



The "reward system" is made up of a specific part of the brain stem called the ventral tegmental area, the limbic system, and part of the cerebral cortex. It is activated when you are feeling good. For example, when you eat a tasty meal, neurotransmitters in the brain's "reward system" are released and make you feel good. Illegal drugs affect the brain in the same way.

## Compulsive Use:

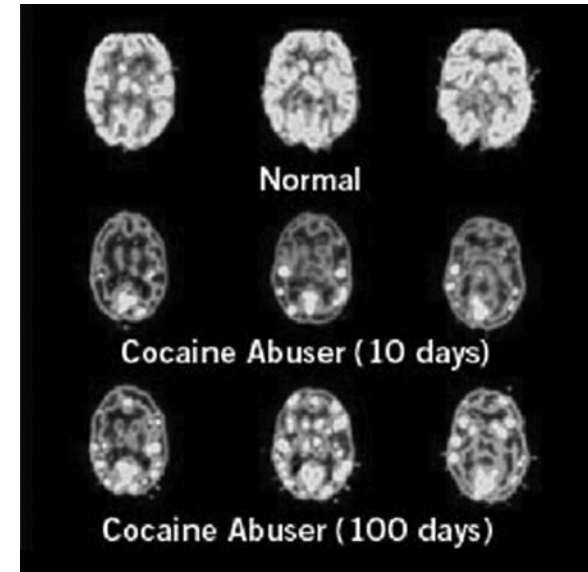
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## Tolerance:

An addicted person uses more and more of the drug over time to get the same effect as before.

## Withdrawal:

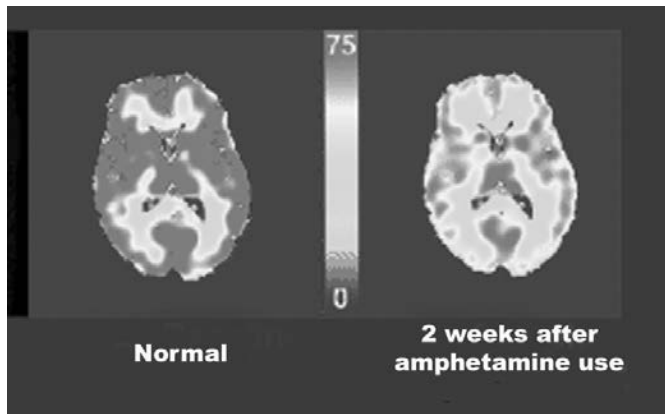
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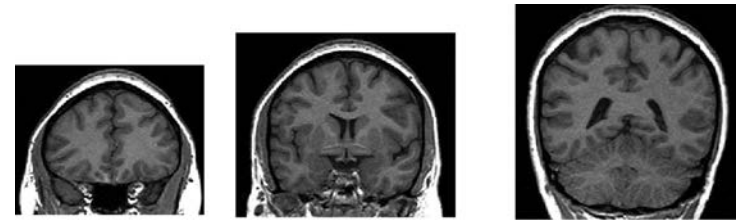
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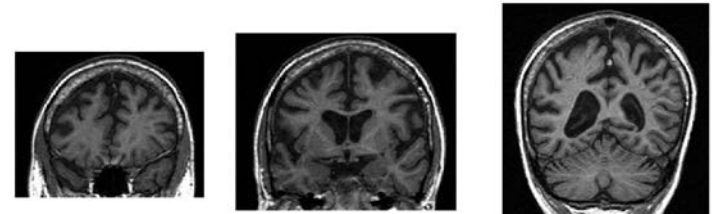
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## Alcohol Addiction

NIDA



*Healthy non-alcoholic woman, 43 yrs old*



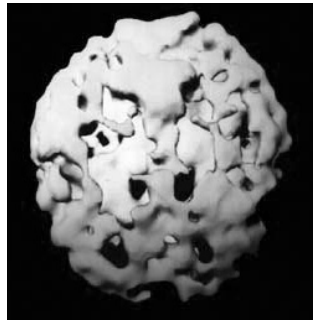
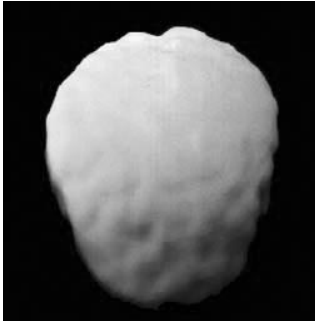
*Alcoholic woman, 43 yrs old*

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## Heroin Addiction

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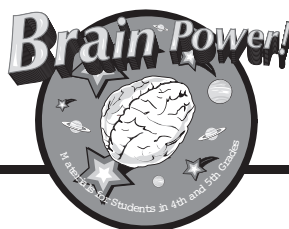
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Most people know that many drugs are bad for them, yet some people use them anyway. Prolonged drug use can change the brain and its neurotransmitters so profoundly that addiction results. Addiction is a disease caused by changes in the brain. It is characterized by the following:

- **Compulsive use:** A strong compulsion or drive to use drugs despite negative consequences. A person persists in using drugs even if he or she is having serious problems.
- **Tolerance:** The person needs more of the drug to produce the same effect as before.
- **Withdrawal:** Intense craving for the drug when it is not available. Once a person is addicted, he or she must have the drug just to keep from feeling bad. This is because drugs can cause changes in the functioning of neurotransmitters in the brain.

This activity aligns with the following standards identified in the NSES: science and inquiry and science in personal and social perspectives. The students experience some of the steps in the process of scientific inquiry: developing a hypothesis, completing an investigation to test the hypothesis, and drawing conclusions. Students also learn about the effects of several different drugs on the brain, the body, 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 addiction. Talk about the effects that addiction has on people's lives. Revisit the original question addressed during Module 1: If people know how bad drugs can be, why do they still use them and abuse them? Have your child use the space below to write down the answer.

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## Additional Resources

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# NOTICIAS SOBRE EL PODER DEL CEREBRO

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BOLETÍN INFORMATIVO PARA PADRES

VOLUMEN 1, NÚMERO 6

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## ¿Qué es la adicción?

Este módulo es el último del *Programa Brain Power!* Durante los cinco módulos anteriores, su hijo ha pensado en la visión de la sociedad sobre el uso de drogas y ha aprendido acerca de la estructura del cerebro, cómo funciona la neurotransmisión y cómo los estimulantes, el alcohol, la marihuana y los inhalantes afectan al cerebro, al sistema nervioso y al cuerpo. Durante este módulo, su hijo aprenderá sobre la adicción. Repasará las ideas acerca de cómo la sociedad ve el uso de drogas y modificará su pensamiento con base en su nuevo conocimiento.

La mayoría de las personas sabe que muchas drogas son malas, y aún así, algunas personas las usan de todas maneras. El uso prolongado de drogas puede cambiar el cerebro y sus neurotransmisores de un modo tan profundo que resulte en adicción. La adicción es una enfermedad causada por cambios en el cerebro. Se caracteriza por lo siguiente:

- **Uso compulsivo:** Una fuerte compulsión o impulso hacia el uso de drogas, a pesar de sus consecuencias negativas. Una persona continúa usando drogas incluso si está experimentando problemas graves.
- **Tolerancia:** La persona necesita más droga para producir el mismo efecto de antes.
- **Deseo intenso:** Deseo intenso por la droga cuando no la tiene. Una vez que la persona es adicta, debe consumir la droga para evitar sentirse mal. Esto se debe a que las drogas pueden causar cambios en el funcionamiento de los neurotransmisores en el cerebro.

Esta actividad cumple con los siguientes estándares identificados en los Estándares Nacionales de Educación Científica (National Science Education Standards): ciencia e investigación y ciencia desde una perspectiva personal y social. El estudiante experimenta algunos de los pasos en el proceso de la investigación científica: desarrollo de hipótesis, realización de una investigación para probar la hipótesis y elaboración de conclusiones. Los estudiantes también aprenden sobre los efectos que tienen varias drogas diferentes en el cerebro, el cuerpo 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 la adicción. Hable sobre los efectos que tiene la adicción en la vida de las personas. Vuelva a hablar sobre la pregunta original abordada en el Módulo 1. Si las personas saben lo malas que pueden ser las drogas, ¿por qué siguen usándolas y abusando de ellas? Haga que su hijo use el espacio a continuación para escribir la respuesta.

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## 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 sobre los efectos biológicos que tiene el 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.

### **NIDA for Teens**

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

Este sitio Web, creado para adolescentes, brinda información sobre la ciencia del abuso de las drogas y la adicción, incluyendo historias personales de adolescentes y actividades para estudiantes.

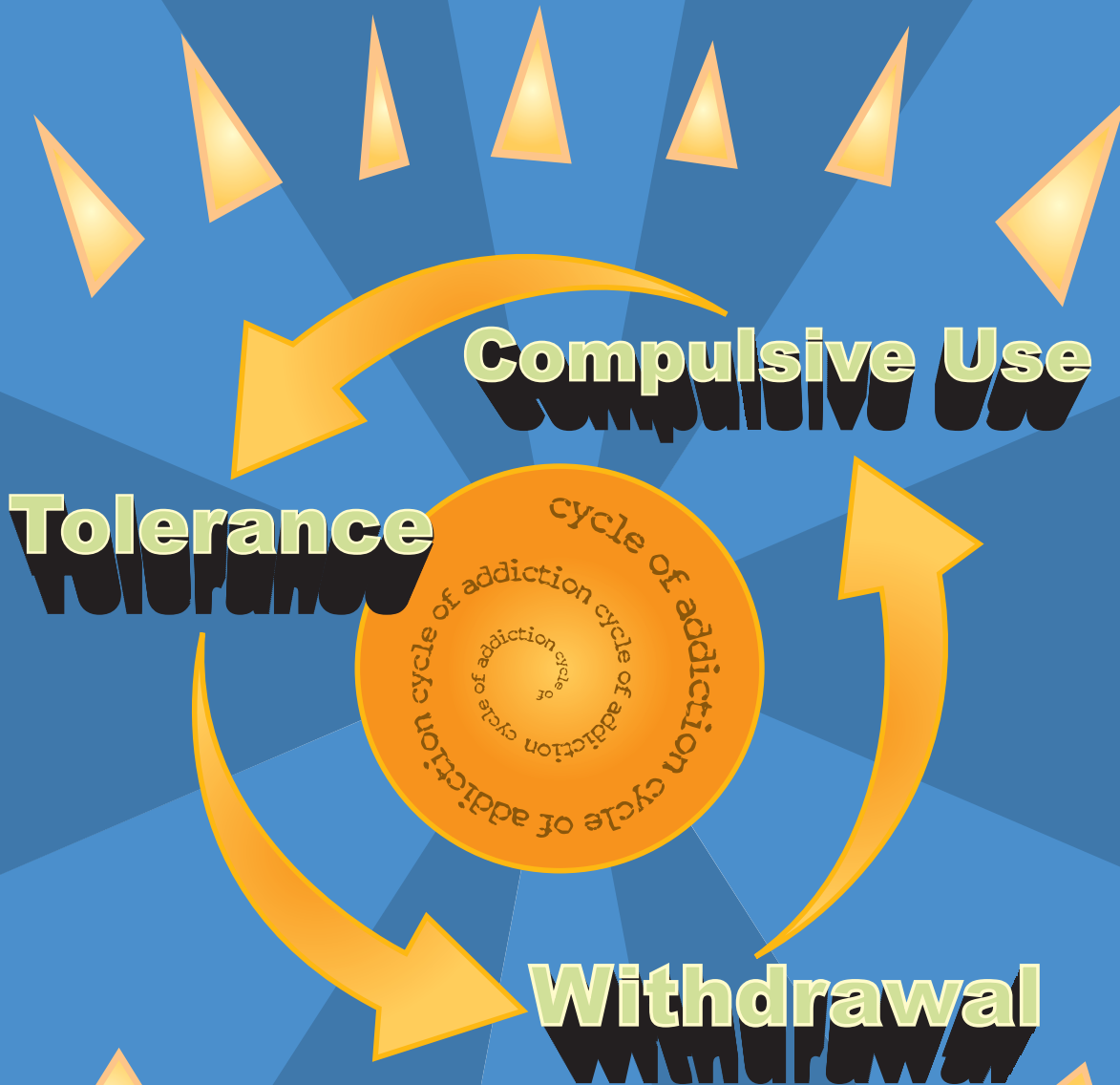
### **NIDA Partners With Scholastic Magazine**

<http://headsup.scholastics.com>

Este sitio Web ofrece a los niños información con base científica sobre el abuso de drogas.

*Focus on Drugs and the Brain*. [Friedman, D.] Frederick, MD: Twenty-First Century Books, 1990. Parte de la serie de libros de alerta sobre las drogas; incluye una sección sobre cada droga de abuso y la adicción.

# What is Addiction?



DRUG ABUSE CHANGES THE BRAIN

# Brain Power!

This is to recognize that:

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*has completed Brain Power! The NIDA Junior Scientists Program*

**Brain Power!**



Signature: \_\_\_\_\_

Date: \_\_\_\_\_