

# Heads Up: Real News About Drugs and Your Body

## Welcome to Heads Up

Brought to you by Scholastic and the scientists at the National Institute on Drug Abuse, **Heads Up** gives you the facts about the real effects of drugs on the teen brain and body.

Check out the articles and features inside to get the latest news so you can make informed choices about your health and your future.

## Inside This Compilation:

### Page 2: **Out of It: Consequences of Impairment**



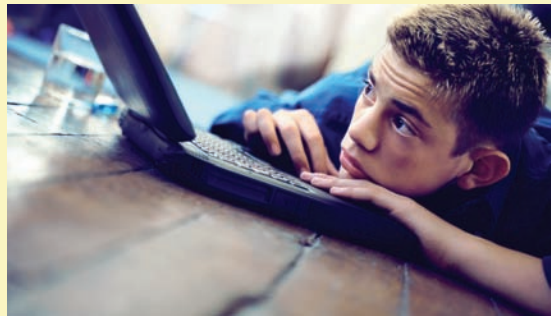
### Page 6: **The Lowdown on Hydrocodone**



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- Plus additional supplements to each article (Answers to quiz questions found in Teacher Editions)

For more real news about drugs and your body, visit [www.scholastic.com/headsup](http://www.scholastic.com/headsup) and <http://teens.drugabuse.gov>

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# Out of It



Nearly everyone knows that drug abuse impairs the way a person thinks and functions—but what are the consequences?

**A**sk someone to name the harmful health effects of drug abuse and addiction, and you might get the following very scary list: overdose; cancer; heart disease; lung disease; liver dysfunction; mental disorders; infectious diseases such as HIV/AIDS, hepatitis, and tuberculosis.

All of these are correct. Research shows that drug abuse and addiction can cause or worsen a whole array of health problems. Some can occur when drugs are used in high doses or after prolonged use, and some after just one use.

But you're likely to be more aware of other effects, which may not seem as scary. Or are they? You probably know that drugs affect feelings,

moods, judgment, learning, memory, and movement. What's harmful about these effects?

As it turns out, **impairment** from drug abuse can cause a lot of serious consequences. Impairment refers to *diminished ability*, such as when drug abuse interferes with thinking or muscle movements. When a person is impaired from drugs, he or she is open to a wide range of errors in judgment and perception, which can lead to making bad choices. Physical abilities also can be affected, so a person might not react as he or she normally would.

The consequences of impairment can be both short-term and long-term, and can impact the most important things to a person: family, friends, school, possessions, dreams, goals, even life itself.

Photo: © David Young-Wolff/Stone/Getty Images.

## DIMINISHING RETURNS

Drugs of abuse, such as marijuana, heroin, cocaine, inhalants, nicotine, and alcohol—even some medications when they are not taken according to dosage and directions—can change the way a person’s brain functions. This is important for teens to know because the teen brain’s frontal cortical regions, which integrate all the various pieces of information that go into making good decisions, will still be developing until around age 25.

Since drugs act on the brain, they can affect a wide range of abilities. These include:

**perception** (*what* someone understands or observes), **cognition** (knowledge gained,

as through perception), **judgment** (the ability to make a decision), attention, balance, and coordination.

The consequences of impairment are almost infinite when you think about them. For example, after using drugs, someone might not score well on a test, thus affecting grades, college placement, or obtaining a particular job. Someone might misperceive a situation, respond inappropriately, and cause a regrettable argument. Someone could recklessly create serious physical risk by getting behind the wheel of a car. (See the sidebar on “drugged driving.”) Or someone might become involved in a dangerous social situation that could lead to a sexually transmitted disease or an unwanted pregnancy.

As Nora D. Volkow, M.D., Director of NIDA, says: “The choices teens make can have profound effects, both immediate and long-term. It is important that teens understand the consequences associated with their decisions—particularly decisions that affect the brain and behavior.”



## THE DANGERS OF DRUGGED DRIVING

Believe it or not, “one drink for the road” was once a common phrase in American culture. But due to the efforts of many, including Students Against Destructive Decisions (SADD), the number of

people killed or injured in alcohol-related driving accidents has steadily declined. Now a similar problem, “drugged driving,” is getting increased attention.

Evidence shows drugs, often in combination with alcohol, are involved in many automobile accidents. Driving under the influence of a drug can impair one’s perception, motor skills, **reaction time** (the time it takes to respond to any stimulus), and judgment. Research shows marijuana to be the most common illegal drug found in both impaired drivers and crash victims. Other drugs, such as prescription drugs, cocaine, opiates, and inhalants, have also been reported.

Drugged driving not only puts drivers and passengers at great risk for injury and death, but also others on the road. Statistics present a very serious teen issue. Motor-vehicle accidents are the *number-one cause of death* among people ages 15–20. Furthermore, NIDA’s 2006 Monitoring the Future survey indicates that 10.6 percent of high-school seniors reported driving under the influence of marijuana and 12.4 percent reported driving under the influence of alcohol in the two weeks prior to completing the survey.



For more about drugged driving, visit [www.drugabuse.gov/Infacts/driving.html](http://www.drugabuse.gov/Infacts/driving.html).

For more about the effects of marijuana and other drugs on the brain, visit [www.scholastic.com/headsup](http://www.scholastic.com/headsup).

# HEADS UP: WHAT DO YOU KNOW?

Answer the questions below to test yourself on vocabulary and facts you learned in the article “Out of It.”

## VOCABULARY

Match the words in Column A to their meanings in Column B.

### Column A

1. impairment  
\_\_\_\_\_
2. perception  
\_\_\_\_\_
3. cognition  
\_\_\_\_\_
4. judgment  
\_\_\_\_\_
5. reaction time  
\_\_\_\_\_

### Column B

- A. the time it takes to respond to any stimulus
- B. *what* someone understands or observes
- C. diminished ability
- D. knowledge gained, as through perception
- E. the ability to make a decision

## READING COMPREHENSION: Multiple Choice

Fill in the circle next to the correct answer for the multiple-choice questions below.

1. The brain’s frontal cortical regions, which are affected by drug abuse, are responsible for what?  
(A) movement  
(B) decision making  
(C) reaction time  
(D) sight  
(E) hearing
2. Which of the following cannot be listed as a possible effect of drug abuse and addiction?  
(A) impairment  
(B) HIV/AIDS  
(C) cancer  
(D) heart disease  
(E) none of the above
3. Among people ages 15–20, what is the number-one cause of death?  
(A) drug overdose  
(B) cancer  
(C) motor-vehicle accidents  
(D) impairment  
(E) plane crashes
4. What is the most common illegal drug found in impaired drivers?  
(A) marijuana  
(B) prescription drugs  
(C) inhalants  
(D) cocaine  
(E) opiates

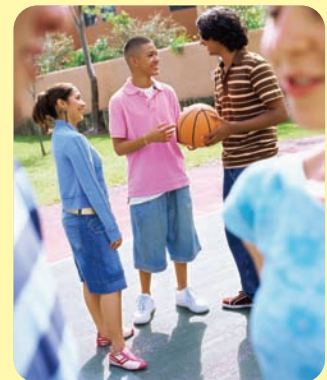
## BONUS: Think It Through

The article “Out of It” discusses serious short-term and long-term consequences of drug abuse. When you’re faced with a situation that requires you to respond, it’s important to make smart choices. Here are some tips:

- When you’re faced with a decision, remember two simple words: **STOP** and **THINK**.
- Give yourself time to weigh options. A rule of thumb is to wait at least 20 minutes before making any decision. Take more time if needed.
- Identify possible *actions* and *consequences* (e.g., “If I do this, this could happen...”).
- Identify *pros* and *cons* of the situation.
- Consider what other factors could be influencing the decision (e.g., sleep deprivation, health, alcohol, drugs, others’ opinions).
- Talk to a trusted friend or an adult for advice.
- Remove yourself as soon as possible from any dangerous situation.

Considering these tips, as well as facts from the article “Out of It,” how might you respond to the following situations?

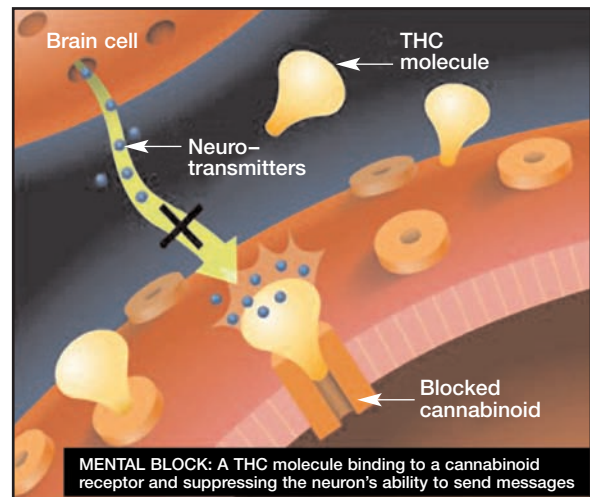
1. A driver who has taken a drug prescribed for someone else offers you a ride home.
2. You’re invited to a party where you’ve heard people will be taking drugs.
3. You’re in a car when someone asks if anyone wants to smoke marijuana.



# The Effects of Marijuana on the Brain

**M**arijuana is the most commonly abused illegal drug in the United States. It affects memory, judgment, and perception. A dry, shredded green/brown mix of flowers, stems, seeds, and leaves from the hemp plant (*Cannabis sativa*), marijuana is usually smoked. The main psychoactive (affecting the mind and behavior) chemical in marijuana is THC (delta-9-tetrahydrocannabinol). The membranes of certain nerve cells contain protein receptors that bind to THC. When THC binds to these receptors in the brain, a series of cellular reactions ultimately lead to the high that users experience.

Since marijuana can affect judgment, its use can lead to risky behaviors, resulting in exposure to sexually transmitted diseases like HIV, the virus that causes AIDS. THC also can interfere with the normal functioning of the hippocampus—the part of the brain that controls learning and memory. It can cause difficulties in processing information and may make it hard to remember things that happened recently. Grades can suffer. Judgment and decision making also can be affected, increasing a person’s chances of getting into



situations where he or she might be at risk—or where he or she might put others at risk.

THC also interferes with the normal functioning of the cerebellum, which gives a person balance and coordination, and the basal ganglia, which controls movement. Since marijuana can affect coordination and the perception of time and speed, a person’s performance in everything from playing sports to driving may suffer. In fact, marijuana is the most prevalent illegal drug found in impaired drivers and crash victims involved in "drugged driving" accidents.

## For more information check out:

- “Marijuana: Facts for Teens”  
[www.nida.nih.gov/MarijBroch/Marijteenstxt.html](http://www.nida.nih.gov/MarijBroch/Marijteenstxt.html)
- “NIDA InfoFacts”  
[www.drugabuse.gov/Infofacts/marijuana.html](http://www.drugabuse.gov/Infofacts/marijuana.html)
- “NIDA Research Report Series”  
[www.drugabuse.gov/ResearchReports/marijuana](http://www.drugabuse.gov/ResearchReports/marijuana)
- “NIDA for Teens”  
[www.teens.drugabuse.gov/facts/facts\\_mj1.asp](http://www.teens.drugabuse.gov/facts/facts_mj1.asp)
- “NIDA InfoFacts: Drugged Driving”  
[www.drugabuse.gov/infofacts/driving.html](http://www.drugabuse.gov/infofacts/driving.html)



## The Lowdown on **Hydrocodone**

**The active ingredient in many prescription pain relievers such as Vicodin® is a powerful drug—and dangerous when not used as prescribed.**

**T**here is great news from the latest Monitoring the Future (MTF) Study, a survey that tracks teen drug use from year to year: Overall drug abuse is down among teens. Unfortunately, there's some bad news too: Abuse of prescription drugs remains at high levels. Of particular concern is the continued abuse of Vicodin®, whose principal ingredient is hydrocodone, with nearly one in ten high school seniors abusing Vicodin® in 2006.

Taken under the supervision of a doctor, hydrocodone can be helpful in relieving acute and chronic pain. Yet the risks of abuse and addiction can be very real. As Nora D. Volkow, M.D., Director of NIDA, points out: "Hydrocodone is a powerful pain medication, but when abused—used without a prescription, from someone else's prescription, or in a different form or dosage than what a doctor would prescribe—it can lead to

serious health consequences, even death, especially when combined with alcohol or other drugs."

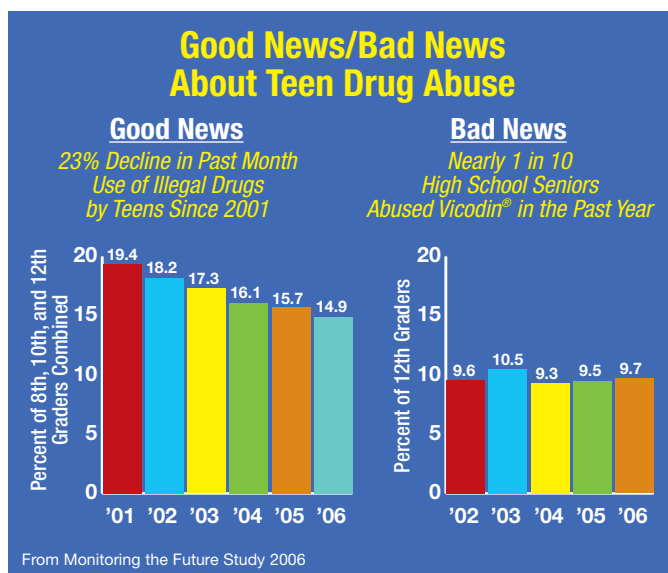
### **SO, WHAT IS HYDROCODONE?**

Hydrocodone is a powerful **opioid** (a pain reliever acting on the central nervous system) for the relief of moderate to severe pain. Hydrocodone is formulated under a number of different brand names, such as Vicodin®, Anexsia®, Lorcet®, and Norco®. Another well-known opioid is oxycodone, the generic name for the drugs Oxycontin®, Percodan®, and Percocet®. Available by prescription only, hydrocodone is similar in potency to oral **morphine** (an analgesic derived from poppies) and is in the same opioid drug class as heroin. Opioids act by attaching to specific proteins called **opioid receptors** found in the brain, spinal cord, and gastrointestinal tract, and can effectively change the way a person

Photo, composite image: © Masterfile; pills, © Jessica Moon.

experiences pain. Additionally, opioids affect regions of the brain, including the **nucleus accumbens** (a key structure in reward, motivation, and addiction), resulting in initial euphoria.

The high levels of Vicodin® abuse may be linked to its widespread availability—a fact that becomes even more troubling when considering the health risks of abusing hydrocodone and other prescription drugs. (See the sidebar “Prescription for Disaster.”) According to NIDA researcher Sean McCabe and others, some of the leading sources for teens obtaining prescription opioids are family members and friends. Many people assume that if a drug is “legal” and prescribed by a doctor, it’s okay to use. But hydrocodone and other prescription medicines can be as harmful as illicit street drugs when abused or combined with alcohol or other



medications. (Visit [www.scholastic.com/headsup](http://www.scholastic.com/headsup) for information about the dangers of mixing hydrocodone with alcohol and other drugs.)

The steady decline in drug use noted in the MTF Study is encouraging. Teens are getting the message about the dangers and serious consequences of drug abuse. But, unfortunately, the message may not be getting through as clearly when it comes to the abuse of hydrocodone and other prescription medications.

## PRESCRIPTION FOR DISASTER

A prescription is a doctor’s instructions to a particular patient: Only this person can take this medication, in this amount, for this length of time. When the medication is taken on purpose for any other reason, by any other person, including the patient, that is called *abuse*.



The following categories define and describe the kinds of prescription drugs most abused by teens.

**Opioids**, like *Vicodin®* and *OxyContin®*, are prescribed to treat severe pain. Dangers when abused:

- Extremely addictive
- Can slow one’s breathing
- Particularly dangerous with alcohol

**Benzodiazepines**, like *Xanax®*, *Valium®*, and *Librium®*, are central-nervous-system depressants prescribed to treat anxiety, acute stress reactions, and panic attacks. Dangers when abused:

- Addictive
- Can slow breathing and heartbeat, especially if combined with prescription pain medicines, certain over-the-counter cold and allergy medications, or alcohol
- Can lead to withdrawal and possible seizures when discontinued after prolonged use or high doses

**Stimulants**, like *Ritalin®* and *Adderall®*, are prescribed mainly for attention-deficit hyperactivity disorder. Dangers when abused:

- Addictive
- Can create extremely high body temperature
- Can cause seizures/irregular heartbeat

For additional information on prescription drug abuse and addiction, see:

[www.drugabuse.gov/researchreports/prescription/prescription.html](http://www.drugabuse.gov/researchreports/prescription/prescription.html)

[www.scholastic.com/headsup](http://www.scholastic.com/headsup)

# HEADS UP: WHAT DO YOU KNOW?

Answer the questions below to test yourself on vocabulary and facts you learned in the article “The Lowdown on Hydrocodone.”

## VOCABULARY

Match each word in Column A to its meaning in Column B.

### Column A

1. opioid
2. morphine
3. opioid receptors
4. nucleus accumbens

### Column B

- A. analgesic derived from poppies
- B. proteins found in the brain, spinal cord, and gastrointestinal tract
- C. pain reliever acting on the central nervous system
- D. key structure of the brain involved in reward, motivation, and addiction

## READING COMPREHENSION: Multiple Choice

Fill in the circle next to the correct answer for the multiple-choice questions below.

1. Overall drug use among teens is
  - (A) minimal.
  - (B) going up.
  - (C) going down.
  - (D) the same.
2. What prescription drug is abused by one out of ten high school seniors?
  - (A) Valium®
  - (B) Librium®
  - (C) Ritalin®
  - (D) Vicodin®
3. As an opioid, hydrocodone is in the same drug class as
  - (A) Tylenol®.
  - (B) heroin.
  - (C) alcohol.
  - (D) antihistamines.
4. Both opioids and benzodiazepines can slow a person’s breathing.
  - (A) true
  - (B) false
5. Stimulants can lower a person’s body temperature.
  - (A) true
  - (B) false

## BONUS: Making Smart Choices

The article “The Lowdown on Hydrocodone” discusses the dangers associated with the abuse of hydrocodone and other prescription drugs. If you’re faced with a situation involving the abuse of prescription drugs, it’s important to make smart choices. Here are some things to remember:

- If you have a physical or emotional problem that you need help with, talk to a doctor, nurse, or school counselor.
- A doctor knows important specifics about each patient and can monitor progress when drugs are prescribed.
- It is illegal to use or sell medications prescribed for someone else.

Considering these facts, as well as those in the article “The Lowdown on Hydrocodone,” how might you respond to the following scenarios?

1. Your back hurts a little and a friend offers you a pill she got from her mother’s medicine cabinet. “It’s for pain,” she says. “My mom used it after her surgery.” You wonder, “Should I take it?”
2. You’re at a party and somebody offers you a prescription medication, saying “Don’t worry, it’s legal. Look at all the celebrities who are doing it.”
3. You’ve been prescribed a pain reliever by a doctor. You think, “If one pill every four hours is good, wouldn’t three pills every four hours speed up my recovery?”





# Dangerous Liaisons: Mixing Hydrocodone with Alcohol and Other Drugs



also depress the central nervous system—such as alcohol, antihistamines, barbiturates, or benzodiazepines—could lead to life-threatening respiratory problems.

Hydrocodone may make you drowsy, less alert, or unable to function well physically, so it's necessary to avoid using other medicines that also make you sleepy (such as cold medicines, other pain medications, muscle relaxants, and medicines for seizures, depression, or anxiety). The interaction between two medications could

**H**ydrocodone, the active ingredient in pain relievers such as Vicodin®, Anexsia®, Lorcet®, and Norco®, is one of the most commonly abused prescription drugs among teens and is especially dangerous when mixed with other substances. Hydrocodone depresses the central nervous system and slows breathing. Mixing hydrocodone with other substances that

result in extreme drowsiness or coma, making it particularly dangerous to drive a car, operate machinery, or perform other activities.

Mixing hydrocodone with alcohol is extremely dangerous and can cause impairment of judgment, thinking, and psychomotor skills. Death has been reported due to overdose.

## Supplement to “The Lowdown on Hydrocodone” (continued)

Alcohol can be found in many over-the-counter medicines, such as cough syrup, so it is important to read all medicine labels to avoid the risk of taking medications that contain alcohol while using hydrocodone.

Hydrocodone is usually formulated with acetaminophen, a drug commonly found in over-the-counter pain relievers like Tylenol®. Acetaminophen can be toxic to the liver. Extended use of pain relievers such as Vicodin®, or mixing them with over-the-counter medicines that also contain acetaminophen, may lead to an upset stomach, internal bleeding and ulcers, and serious long-term damage.

When a doctor prescribes hydrocodone to treat a particular medical problem, he or she knows important specifics about the patient, such as weight, current condition, medical history, any particular allergies or sensitivities, and can prescribe the appropriate dose and form of the drug, warn of side effects, and monitor progress. When a person uses hydrocodone in a different form and dosage than a doctor has prescribed (with or without a prescription) or mixes it with other substances like alcohol, serious problems can occur.

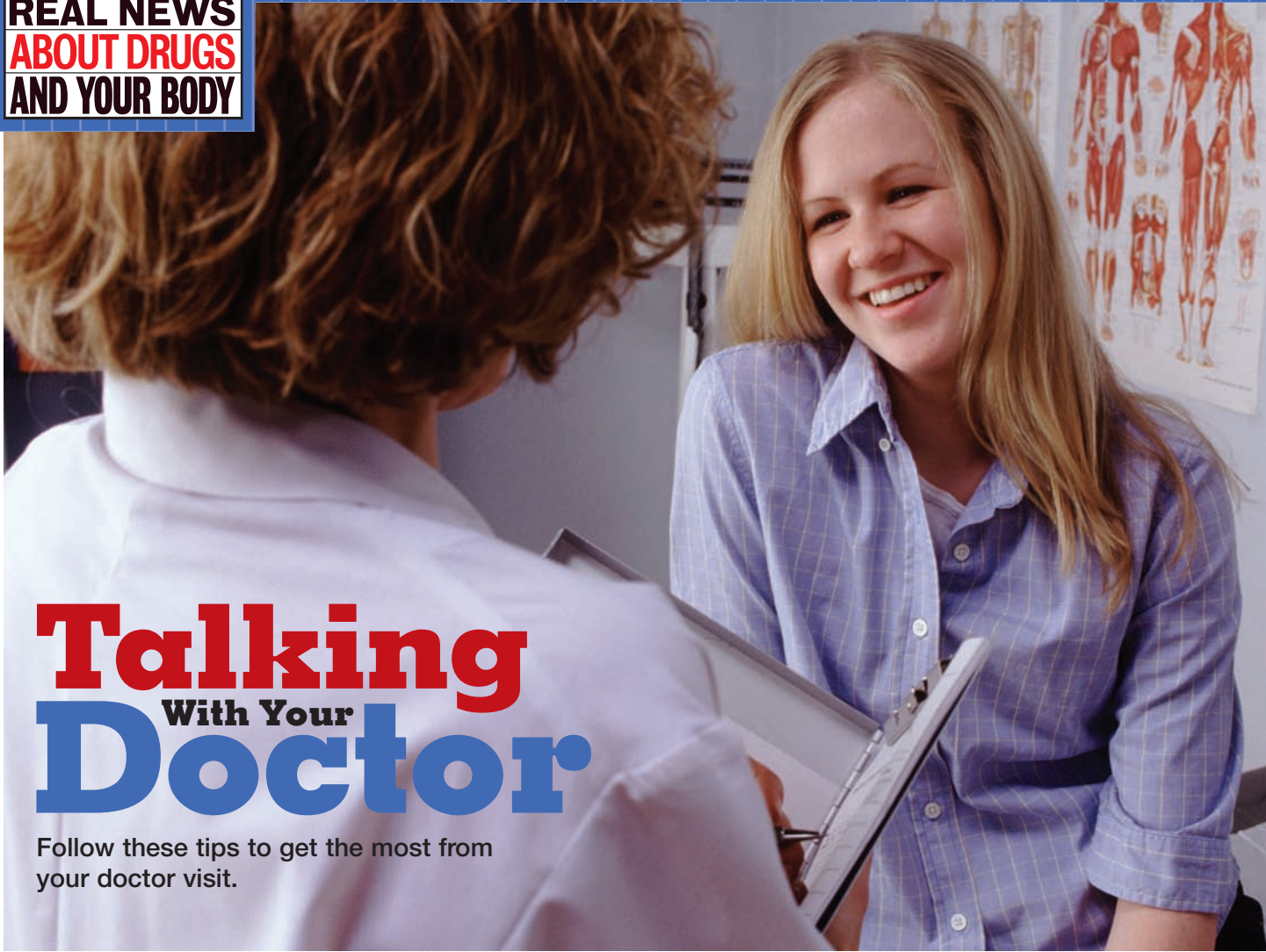
### What are the possible signs of trouble?

Get emergency medical help if you observe any of these signs of an allergic reaction: hives; difficulty breathing; swelling of the face, lips, tongue, or throat.

Call a doctor at once if you experience any of these other serious side effects:

- slow heartbeat;
- seizures (convulsions);
- cold, clammy skin;
- confusion;
- severe weakness or dizziness; or
- feeling light-headed or faint.

- For more information about hydrocodone and its effects, see MedlinePlus from the National Institutes of Health: [www.nlm.nih.gov/medlineplus/druginfo/medmaster/a601006.html](http://www.nlm.nih.gov/medlineplus/druginfo/medmaster/a601006.html).



# Talking With Your Doctor

Follow these tips to get the most from your doctor visit.

**I**f there's one word that best sums up the teen years, it's "change." Your body grows more between ages 13 and 19 than at any other point in life besides infancy. Think about it.

While change can be exciting, it also brings a range of questions. You may be confused about or troubled by acne, weight issues, or body changes. You may experience mood swings that can make you feel stressed, depressed, or like you're riding an emotional roller coaster. And you might face decisions that involve the use of substances such as alcohol, tobacco, and other drugs or activities such as sex, all of which can have serious consequences.

You might not realize it, but questions and issues you face as a teen are more related to your health than you might think. How do you sort it out? One of the best ways is to talk to your doctor. Here's a checklist to get the conversation started:

**WRITE IT DOWN** Keep a list of your questions and concerns, and bring them to your appointment. Consider keeping a health journal to record your daily moods and feelings. The more information you provide to your doctor, the better he or she will be able to help you. And remember, when it comes to your health, there are no dumb questions. *None.*

Photo: © LWA-Damm Tardif/CORBIS.

**GET THE FACTS** Use your appointment as an opportunity to debunk myths and rumors about drugs, alcohol, and health in general. Ask how substance abuse might affect your body. Let your doctor know if drug addiction or alcoholism runs in your family. Ask how drugs and alcohol can affect medications prescribed for you or increase your chances of contracting certain diseases. Find out your personal risks. Want more information on a health topic? Ask your doctor for brochures, CDs, and other material that you can take with you.

**GET IT OUT** Let's face it. Talking about things like pimples, sexual development, or drug abuse isn't exactly fun. It's normal to be uncomfortable, but don't let embarrassment keep you from speaking up. Your doctor can't help you without knowing everything that's going on, including your feelings. Teens might not realize that negative feelings, including depression, often occur at the same time as alcohol and drug use.

**Tip:** A form from the American Medical Association can help teens compile personal facts about their health. To download this form, visit [www.ama-assn.org/ama/pub/category/1980.html](http://www.ama-assn.org/ama/pub/category/1980.html). It's a great idea to fill out the questionnaire and bring it to your doctor visit. Most doctors give confidential time to teens and you can share it at this time with your doctor.

**FOLLOW UP** If your doctor has prescribed medications, be sure to ask questions about how to take your medicine properly. Make sure to schedule a follow-up appointment if necessary.

**EMPOWER YOURSELF** As a patient, you have a right to be an advocate for your health. This includes finding the right doctor. If you don't feel comfortable talking with your doctor, ask your parents about finding another health-care professional to speak with. Remember that it's OK to ask questions and expect answers, and it's always OK to get a second opinion.

When it comes to your health, talking to your doctor is a great way of getting the information you need to make smart choices regarding drug abuse and other important health issues. The more you know about your body, the more you can be in control of your health—and your life.

### Listening to Teens: A Doctor's Viewpoint

When a teen patient goes for a physical with Dr. Norman Wetterau, a family physician and expert on substance abuse in upstate New York, Dr. Wetterau asks him or her to fill out a confidential questionnaire. He uses this to get insight into issues teens may want to talk about.

"Teenagers are sort of forgotten," says Dr. Wetterau. "Some doctors feel like they have difficulty relating to teens. 'What are we going to say to them?' some doctors think. And I keep saying, why don't you learn from them? Why don't you listen to them?"



Dr. Wetterau finds that many teens who use and abuse drugs are emotionally hurting. "They're depressed, suicidal, maybe their parents have alcohol and drug problems. Sometimes when I listen to their stories, I want to weep. They should know that if they're getting upset they can see the doctor—before they get sick, before something worse happens."

Teen patients in Dr. Wetterau's office can talk to other health-care professionals besides the doctor if they'd like to. "I have a female physician's assistant some of my female patients talk to about their sexual concerns. There are nurse practitioners, too," says the doctor. "But, the most important thing for teen patients, I think, is to show them that you care."

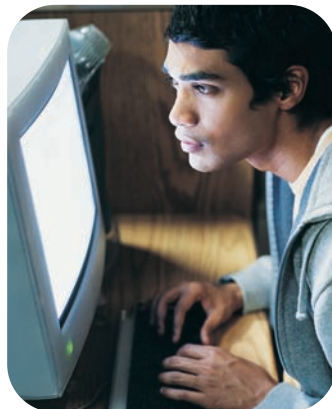
## Getting Facts

**T**alking with your doctor is an important way to get information about drug abuse and health issues. A recent online event, **Drug Facts Chat Day**, sponsored by the National Institute on Drug Abuse, provided teens across the country with a chance to pose questions to the nation's top scientific experts about drugs.

*“Does drinking at a young age make you more likely to become an alcoholic?”*

*“Can smoking casually still have bad effects on your body?”*

*“If you do drugs every day, when would you die?”*



These are only a few of the more than **36,000 questions** teens put to a team of NIDA experts on October 12, 2007. To read a transcript of questions and answers from this event, visit:

[www.drugabuse.gov/chat/2007](http://www.drugabuse.gov/chat/2007)

## Getting Help for a Drug Problem

The best way for someone to stop using drugs is to get treatment from a doctor or a therapist. The sooner a person gets treatment, the better are his or her chances for recovery.

If you are in crisis and need to speak with someone immediately, please call the National Suicide Prevention Lifeline at **1-800-273-TALK**—they don't just talk about suicide, they cover a lot of issues and will help put you in touch with someone in your area.

For more help, or to locate treatment centers, go to [www.findtreatment.samhsa.gov](http://www.findtreatment.samhsa.gov), or call the national hotline at **1-800-662-HELP**.

Photo: © Digital Vision/Veer

## Test Yourself

After reading the article “Talking With Your Doctor,” take this quiz. Check True or False for each statement. Answers are in the teacher's supplement.

**1** Negative feelings, including depression, often occur at the same time as alcohol and drug use.

True

False

**2** When you talk to a doctor, it's best not to ask too many questions, especially if they may sound dumb.

True

False

**3** A doctor is the only person you can talk to about your health when you go for a medical appointment.

True

False

**4** By sharing information with your doctor about drugs, alcohol, and health in general, you may be able to find out your personal risks.

True

False

**5** Your body grows more between the ages of 13 and 19 than at any other point besides infancy.

True

False

# Answering Teen Questions About Drugs

“Drug Facts Chat Day” Provides a Forum for Teens to Ask the Experts Questions

- *How many people a year die from drugs?*
- *What drug is the most addictive?*
- *Do drugs affect relationships?*
- *Why don't some users stop and try to seek help?*
- *Can drugs used once kill you?*
- *Is it easier for a teenage kid to get addicted than an adult?*

These are all real questions about drug abuse from teens. They are only a few of the over 36,000 sent in to the medical doctors and scientists at the National Institute on Drug Abuse during “Drug Facts Chat Day” on October 12, 2007. This unique online event at [www.drugabuse.gov](http://www.drugabuse.gov) provided an opportunity for students and teachers in classrooms across the United States to ask questions of the nation’s top experts in the field of drug abuse and addiction.

Questions like the ones above came from students in over 200 schools across the United States, as well as from Puerto Rico, Guam, and the Virgin Islands. To answer these questions, NIDA enlisted the services of over 30 scientists, doctors, and communications specialists.

To view a transcript of these questions and answers, visit: [www.drugabuse.gov/chat/2007](http://www.drugabuse.gov/chat/2007).

Here’s a sample of what you’ll find:

**Q: JEtgrl, Lower Merion:** Could LSD kill you? Could Ecstasy kill you?

**A: Nancy Pilotte**—These are kind of scary questions, but I know the answers are important to you. LSD itself is not likely to kill you. However, it alters your perceptions and your abilities to make good decisions, and when you are under its influence, you may do something that will lead to your own harm. Ecstasy, which is

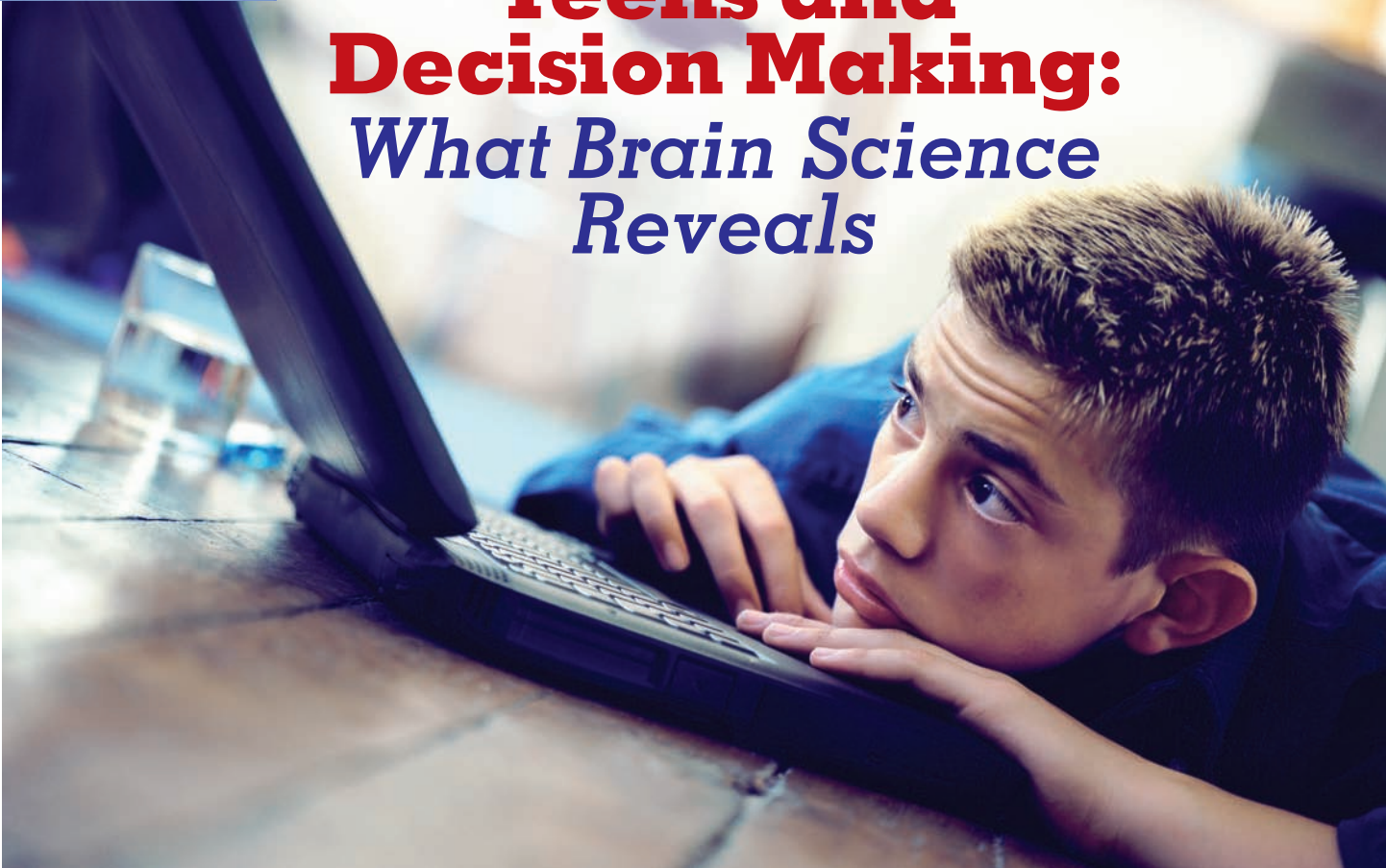
methylenedioxymethamphetamine (MDMA), is another powerful chemical that affects your brain, and, like LSD, can affect your decision-making. In addition, MDMA can also lead to severe dehydration because it has effects on the part of your brain that regulates temperature and you may not recognize that you need to keep yourself hydrated (drinking water). This can have serious consequences for you. MDMA can also cause nausea, chills, sweating, involuntary teeth clenching, muscle cramping, and blurred vision. MDMA overdose can also occur—the symptoms can include high blood pressure, faintness, panic attacks, and in severe cases, a loss of consciousness and seizures. Here is a source of free information about the latest science-based drug abuse facts, publications, and teaching materials for parents, teachers, and students. <http://www.backtoschool.drugabuse.gov/>

**Q: a, asd:** Have most teens used marijuana in their life?

**A: Marsha Lopez**—Although it may seem that everyone is doing it, it is probably way fewer than you guess. In a national school survey last year, about 15% of 8th graders,

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# Teens and Decision Making: What Brain Science Reveals



***Do you ever act before thinking? Have you ever wondered why? Do you worry this might create problems? If you answered “yes” to any of these questions, read on.***

**P**icture this: Your finger is poised on the *send* button, your eyes scanning an angry e-mail you’ve dashed off to a friend who has upset you. Some things you’ve written are a little harsh. In your brain a little red light goes off, but, what the heck, you’re steamed and your friend deserves it. You push the button.

Whether you’re aware or not, rushed decisions like this—acting before *thinking it through*—happen more often in teens than in adults. Recent discoveries in brain science may help explain why this is so.

First, a bit on how a brain makes decisions. Decisions don’t “just happen” automatically in your conscious mind. They stem from a series of events in the brain, which happen almost instantaneously. This involves a relay system in which different structures—made up of specialized cells called neurons—talk with each other by way of electrochemical impulses and chemical messengers, called neurotransmitters. Information flowing through this decision-making circuit is analyzed in the different structures. Then the network, as a whole,

puts out a response. This output provides the basis for our behaviors and actions.

While this process is basically the same for teens and adults, the devil is in the details. Since the brain is not fully developed until the early 20s, the way in which a teen's decision-making circuit integrates information may put him or her at a higher risk of making decisions the teen could later regret.

### THE TEEN BRAIN: Under Construction

Not long ago, scientists thought the human brain was fully mature long before the teen years. While research shows that one's brain reaches its maximum size between ages 12 and 14 (depending on whether you are a girl or a boy), it also shows that brain development is far from complete. Regions of the brain continue to mature all the way through a person's early 20s.

A key brain region that matures late is the **prefrontal cortex**, located directly behind your forehead. The prefrontal cortex is very important as a control center for thinking ahead and sizing up risks and rewards. (This area is, in fact, the little red light that was trying to warn you about sending that e-mail.) Meanwhile, another part of the brain that matures earlier is the **limbic system**, which plays a central role in emotional responses.

Since the limbic system matures earlier, it is more likely to gain an upper hand in decision making. This relationship between the emotional center (limbic system) and control center (prefrontal cortex) helps to explain a teen's inclination to rush decisions. In other words, when teens make choices in emotionally charged situations, those choices are often more weighted in *feelings* (the mature limbic system) over *logic* (the not-yet-mature prefrontal cortex).

This is also why teens are more likely to make "bad" choices, such as using drugs, alcohol, and tobacco—all of which pose a risk of serious

health consequences. "Most kids don't really 'plan' to use drugs," says Professor Laurence Steinberg of Temple University, "at least not the first time. They are more likely to experiment *on the spur of the moment*, particularly when influenced by others [peer pressure]."

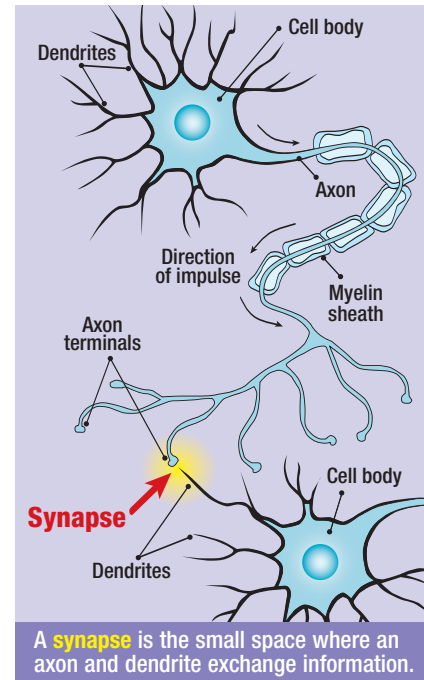
### FINE-TUNING THE BRAIN

Like the rest of the body, the brain needs to mature in order to reach peak performance. This process involves slow changes—strongly influenced by brain activity—that have evolved to fine tune

how neural impulses flow throughout the brain, allowing it to process information faster and more reliably.

Inside the brain, information travels through a network of neurons, which have thread-like fibers called *axons* and branch-like structures called *dendrites*. Dendrites bring information into the neurons, while axons take it away and pass it along to the next neuron. Thus, neurons are assembled into circuits where the far end of an axon (its terminal) is positioned close to a dendrite. The small space between the two is called a **synapse**—where information is exchanged.

Throughout childhood and adolescence, the brain is busy fine-tuning itself through two key processes: myelination and synaptic pruning.





In **myelination**, axons wrap themselves in a fatty substance (myelin sheath), which works like the insulating plastic that surrounds electrical wires. This boosts the brain's efficiency by increasing the speed with which a signal travels down the axon by up to 100 times. In **synaptic pruning**, synapses not used very often are removed, allowing the brain to redirect precious resources toward more active synapses. This strategic loss of weak synapses shapes the brain and makes it more efficient. This important pruning process molds the brain in response to a person's experiences and activities.

This means that teens have the potential, through their choices and the behaviors they engage in, to shape their own brain development—



strengthening some circuits and getting rid of others. This makes the type of activities teens are involved in especially important. Skill-building activities, such as many physical, learning, and creative endeavors, not only provide stimulating challenges, but can simultaneously build strong brain pathways. When teens learn and repeat

appropriate behaviors, they are helping to shape their brains—and their futures.

## WAIT A MINUTE!

Learning how your brain works can help explain why sometimes you behave like you do. With this knowledge, you can be better equipped to make smart choices.

One tip to follow is to *take a moment* before acting. When making a decision, something as simple as stopping to think can mean the difference between a positive and a negative outcome. By waiting a minute before acting, you allow yourself to:

- consider consequences;
- weigh harmful outcomes (e.g., harm to yourself or others) against short-term benefits (e.g., fitting in or feeling high);
- determine whether peer pressure is making you do something you'd otherwise not do;
- get information or advice, if you need it.

For more information about drugs and your body, visit <http://teens.drugabuse.gov> and [www.scholastic.com/headsup](http://www.scholastic.com/headsup).

To learn more about “pausing” to allow yourself to make smart choices, check out [www.myspace.com/pause](http://www.myspace.com/pause).

## Vocabulary

Match each word in Column A to its meaning in Column B.

### Column A

1. synapse
2. myelination
3. prefrontal cortex
4. limbic system
5. synaptic pruning

### Column B

- A. brain area important for thinking ahead and sizing up risk and reward
- B. process in which axons become wrapped up in fatty myelin sheath
- C. brain system that plays a central role in emotional responses
- D. the small space between axons and dendrites where neurons exchange information
- E. cutting back the number of synapses

# Peer Pressure: Its Influence on Teens and Decision Making

**S**ay you’re sitting around with some friends playing video games and someone mentions a particular game that happens to be one of your favorites. “Oh, that game’s easy. So not worth the time,” one of your friends says dismissively. The others agree. Inwardly, you know that it is a game you happen to enjoy quite a lot but, outwardly, not wanting to debate the issue, you go along with the crowd.

You have just experienced what is commonly referred to as peer pressure. It is probably more accurate to refer to this as peer influence, or social influence to adopt a particular type of behavior, dress, or attitude in order to be accepted as part of a group of your equals (“peers”). As a teen, it’s likely you’ve experienced the effect of peer influence in a number of different areas, ranging from the clothes you wear to the music you listen to.

Peer influence is not necessarily a bad thing. We are all influenced by our peers, both negatively and positively, at any age. For teens, as school and other activities take you away from home, you may spend more time with your friends than you do with your parents and siblings. As you become more independent, your peers naturally play a greater role in your life. Sometimes, though, particularly in emotional situations, peer influence can be hard to resist—it really has become “pressure”—and you may feel compelled to do something you’re uncomfortable with.

## What scientific research tells us about peer influence

“There are two main features that seem to distinguish teenagers from adults in their decision making,” says Laurence Steinberg, a researcher at Temple University in Philadelphia. “During early adolescence in particular, teenagers are drawn to the immediate rewards of a potential choice and are less attentive to the possible risks. Second, teenagers in general are still learning to control their impulses, to think ahead, and to resist pressure from others.” These skills develop gradually, as a teen’s ability to control his or her behavior gets better throughout adolescence.

According to Dr. B. J. Casey from the Weill Medical College of Cornell University, teens are very quick and accurate in making judgments and decisions on their own and in situations where they have time to think. However, when they have to make decisions in the heat of the moment or in social situations, their decisions are often influenced by external factors like peers. In a study funded by the National Institute on Drug Abuse (NIDA), teen volunteers played a video driving game, either alone or with friends watching. What the researchers discovered was that the number of risks teens took in the driving game more than doubled when their friends were watching as compared to when the teens played the game alone. This outcome indicates that teens may find it more difficult to



control impulsive or risky behaviors when their friends are around, or in situations that are emotionally charged.

### **The positive side**

While it can be hard for teens to resist peer influence sometimes, especially in the heat of the moment, it can also have a positive effect. Just as people can influence others to make negative choices, they can also influence them to make positive ones. A teen might join a volunteer project because all of his or her friends are doing it, or get good grades because the social group he or she belongs to thinks getting good grades is important. In fact, friends often encourage each other to study, try out for sports, or follow new artistic interests.

In this way, peer influence can lead teens to engage in new activities that can help build strong pathways in the brain. As described in the article, “Teens and Decision Making: What

Brain Science Reveals” (link to online article at [www.scholastic.com/headsup](http://www.scholastic.com/headsup)), neural connections that are weak or seldom used are removed during adolescence through a process called synaptic pruning, allowing the brain to redirect precious resources toward more active connections. This means that teens have the potential, through their choices and the behaviors they engage in, to shape their own brain development. Therefore, skill-building activities—such as those physical, learning, and creative endeavors that teens are often encouraged to try through positive peer influence—not only provide stimulating challenges, but can simultaneously build strong pathways in the brain.

While we are constantly influenced by those around us, ultimately the decision to act (or not to act) is up to us as individuals. So when it comes to decision making, the choice is up to you.

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32% of 10th graders, and 42% of 12th graders reported having used marijuana in their lifetime.

**Q: ABC1234, Lower Merion:** How come some people are greatly effected by doing drugs when others aren't?

**A: Nancy Pilotte**—That is a really great question. You probably already know that individuals have different skills and abilities in other aspects of life, so it is natural to expect that different people respond to drugs differently. The ability of drugs to affect different people in different ways is called vulnerability, and we do not really understand what makes one person more or less vulnerable to drugs than others. We believe that genetics most likely influences how people respond to drugs, but there are other factors, like the social setting and effects of your peers and your expectations that can alter your perceptions of what a drug is doing to you. We are very interested in learning more about vulnerabilities because that knowledge can help us devise treatment and prevention strategies to reduce drug use. To learn more, check out "The Science of Addiction" at <http://www.nida.nih.gov/scienceofaddiction/>

**Q: kp, Eastern:** Why do you think most people start taking drugs?

**A: Eve Reider**—This is a popular question. People take drugs for a variety of reasons: to feel better, to feel good, and because others are doing it are just some of the reasons. The important thing to realize is that the younger a person begins to use drugs, the more likely he or she will progress to more serious drug abuse. It is also important to know that the earlier you stop using drugs, the more likely you will be to avoid addiction and the harmful brain changes that lead to it. For more information, see <http://www.drugabuse.gov/scienceofaddiction/addiction.html>

The questions covered a wide range of topics related to drug abuse. Some of the top categories asked about were:

- marijuana
- alcohol
- smoking cigarettes
- inhalants
- steroids and athletic performance
- methamphetamine
- cocaine
- heroin
- mushrooms
- OxyContin® and Vicodin®
- the effects of doing drugs or alcohol during pregnancy
- getting help for a friend

For further information about the specific effects of drugs on your body, visit [www.teens.drugabuse.gov](http://www.teens.drugabuse.gov).

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