

**BRAIN SCANS:**  
Alcohol and the  
Teenage Brain

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## INTRODUCTION

Most teenagers are familiar with the highly publicized risks of drinking alcohol, including accidental injury, drunk-driving crashes, and alcohol poisoning. But when it comes to the effects of alcohol on the body, most teens don't seem concerned. After all, cirrhosis of the liver and heart disease are things that happen to people in their fifties and sixties.

Now, cutting-edge research being conducted across the country is challenging that way of thinking. According to new studies, alcohol can do serious and immediate harm to a teenager's brain. In fact, adolescents who drink face an even higher risk of brain impairment than their adult counterparts.

What does "brain impairment" mean? It appears that alcohol causes a decrease in the ability to learn new information, form memories, and perform cognitive functions. These effects are fairly immediate, occurring only hours after drinking. A new theory is now emerging to explain the cause of this impairment. Intoxication causes brain activity to slow down. Some scientists believe that the body tries to compensate by increasing the activity of neurons. This causes overstimulation, especially as the drinker enters withdrawal, or the hangover phase. Many of the overstimulated cells actually break down in their own membranes and die.

Not surprisingly, large amounts of alcohol often produce greater amounts of impairment. But a young person doesn't have to be blindly intoxicated to be harmed. In one study, young people ages 21 to 24 were given enough alcohol to raise their blood-alcohol level slightly below the generally accepted legal limit of 0.08 percent, or an amount sufficient to produce a "buzz." People ages 25 to 29 were given equal doses. After both groups performed simple cognitive tests, the younger group showed 25 percent more impairment than the older group. Even though researchers knew that the brain develops well into the twenties, they were shocked to see such a large difference in impairment across such a small age gap.

Other studies have recorded brain scans of teenagers who drink versus teens who do not. On average, the hippocampus of a young drinker was 10% smaller than that of a non-drinker. The hippocampus is the area of the brain involved in learning and memory. In addition, brain scans of young women who drink showed larger regions of sluggish mental activity compared with young women who did not drink.

The startling evidence of this and other studies is presented in the video ***Brain Scans: Alcohol and the Teenage Brain***. As the research is described, real teenagers share their personal views about alcohol. Their beliefs and the emerging evidence are often at odds with one another, providing ample opportunities for further learning and discussion.

**LEARNING OBJECTIVES**

After viewing the videotape *Brain Scans: Alcohol and the Teenage Brain* and participating in class activities and discussions, your students should be able to:

- understand that alcohol presents special risks for young drinkers
- recognize the short-term and long-term effects of alcohol on the brain
- understand new research exposing a link between teen drinking and impaired brain function
- discuss and explain important information on the other health risks of alcohol
- learn skills for avoiding peer pressure to drink alcohol
- identify and appreciate alternative drug-free hobbies and interests
- explore activities that promote healthy development of the brain
- separate the facts about alcohol from commonly believed myths
- understand how the effects of heavy drinking may affect them personally
- discuss the various effects of binge drinking on the mind and body

**PROGRAM SUMMARY**

As the program opens we meet a college student, Monica Ortiz in a room with four other students and a TV monitor. She explains that these students are going to give their uncensored opinion about drinking as well as their opinions on any health effects of alcohol on the brain. After the video is over, she explains, these same students will tell the viewers if their opinions have changed as a result of the information presented in the video.

A graphic asks viewers to ponder the question, “Why do teenagers drink alcohol?” To get the answer, we go right to the source—teens, interviewed in everyday settings. They tell us that young people drink because they want to “have a good time,” “look cool,” and because they’re “curious.” One teenager says that the biggest reason to drink is simply, “peer pressure.”

Other questions are also asked, including, “How does alcohol affect teenagers?” and “How often do you drink?” The teens interviewed provide candid answers, providing insight into the attitudes associated with alcohol.

The title of the program appears—*Brain Scans: Alcohol and the Teenage Brain*—and we meet our young narrator, Monica. She explains that most teenagers believe they can drink for twenty or thirty years before any serious physical problems develop. To challenge that belief, she speaks with Scott Swartzwelder, PhD, of Duke University. Dr. Swartzwelder is a neuropsychologist who has used rats to study the effects of alcohol on the brain.

Monica asks Dr. Swartzwelder what would happen if—as a 16-year-old—she drank on weekends and got drunk three times a month. He explains that the effects on the liver and heart wouldn’t be seen for years. The brain however, can show changes almost immediately. In his study with rats, he discovered a difference between the effects of alcohol on adolescent brains and on adult brains. He saw this change after giving the rats enough alcohol to equal the human equivalent of half the legal limit—just enough for the rats to have a “buzz.” The small amount needed to see negative effects surprised everyone, including him.

To contrast Dr. Swartzwelder’s information with teen attitudes, the program asks the question, “How much alcohol does it take to damage your brain?” The answers are not surprising. Most teens feel that a buzz is “no big deal.” They explain that getting sick is a sign of going too far, but being buzzed is just where you want to be.

In Dr. Swartzwelder’s second study, he focused on two groups of people—those who had used alcohol in their early twenties and those who had used in their late twenties. The younger subjects showed a lower ability to learn new information than those who were just a few years older. Dr. Swartzwelder theorizes that the difference would be even greater for teenagers—whose brains are developing even more actively and are, therefore, at greater risk for impairment. However, studies cannot allow teenagers to drink alcohol because they are under the legal drinking age.

Next, teenagers are asked to answer the question, “What happens when you get drunk?” Their answers mention behavior that is, “emotional,” “loud,” “rowdy,” and “stupid.” Some say they feel as though they could, “take on the world.”

Dr. Swartzwelder explains the reason for some of these responses. Alcohol’s sedative effect is less in adolescents than in adults. As a result, teenagers may be at a higher risk for the aggressive behaviors related to alcohol—such as fighting, unprotected sex, or involvement in criminal activity.

As we move on to the Medical Center at the University of California, San Diego, Monica introduces us to Dr. Susan Tapert. She is studying the effects of alcohol on the brain using magnetic resonance imaging, or MRI, technology. This involves a machine with a large magnet that takes pictures of the brain. By recruiting young people who drink alcohol, as well as those who do not, Dr. Tapert has been able compare the brain scans of young drinkers with those of their non-drinking peers. The results have been dramatic.

In one segment of her study, Dr. Tapert asked participants a series of questions to test their thinking ability. When a person is thinking, subtle changes in blood-oxygen content can be detected in MRIs of the person’s brain. Monica agrees to undergo this test by answering questions while inside the MRI machine. Research assistants Eric Caeung and Alecia Dager help to prepare Monica by explaining the procedure.

After the test, Dr. Tapert reveals Monica’s “brain scans,” explaining that the cortex and other areas look very healthy. Areas in the back of her brain were very active while she was answering questions.

Here, the program pauses to ask the question, “How much drinking is ‘a lot’?” Teens give a variety of answers—“three to five glasses,” “eight drinks,” “a case,” and “more than one drink a day.”

Dr. Tapert also provides an answer to this question with her research data. A 17-year-old test subject who regularly drinks six to nine beers on Friday and Saturday nights, took the same test as Monica. When the 17-year-old’s brain scans are compared to Monica’s, the results are obvious. The alcohol user’s MRIs show fewer changes in blood-oxygen levels, or less brain activity.

The program goes on to ask, “Does alcohol advertising affect you?” Most teens interviewed answer with a resounding “no.” However, Dr. Tapert’s research suggests otherwise. When images of alcohol advertisements were shown to the 17-year-old female who drinks, there was a change in her brain activity showing a strong response. When Monica was shown the same images, her brain did not produce the same changes. The reason? The teenager who drinks was more emotionally affected by the images of alcohol than Monica, a non-drinker.

The final question asked of viewers is, “How much do you drink?” This time, research assistants Eric and Alecia offer their own answers. Eric explains how the study has really changed the way he thinks about alcohol. Seeing the effects firsthand have made him consider the risk carefully. Alecia says she never drank much, but now she abstains from casual “weekend” drinking, since it can also do damage.

Dr. Swartzwelder says that the research linking alcohol to brain impairment is very big news. The differences between impairment in teens and adults is startling. “You want your brain to work as well as possible,” he says. “You’re really going to need it in your early twenties.” Indeed, those are the years when education, career and lifestyle choices are so important.

As the video concludes we are again introduced to the teens we met in the introduction to the video. Monica replays these teens’ comments for viewers which airs their opinions on alcohol and it’s effects. One student, Vanessa says she thinks alcohol affects the brain while one is intoxicated but not for the long term. Devon says he doesn’t believe alcohol affects the brain at all. Meeyun says she thinks cigarettes and drugs cause long term problems, but not alcohol. None of the students felt their brains were affected by images of alcohol in advertising.

Monica then confronts these teens after they viewed the video. Devon says, “I’m really shocked.” Vanessa expressed great surprise at the effects of advertising. This was echoed by the other students’ answers. Matt responded, “Every single person who watched this video will really see what it does to you.” Meeyun says, “Those images will really stay in my head.” The program ends with a simple question by Monica. “How does viewing this video affect your own attitudes about drinking?”

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# **ACTIVITY SHEETS**

In the video *Brain Scans: Alcohol and the Teenage Brain*, the questions below were posed to a variety of young people. Their answers sometimes conflicted with the information presented by scientists and physicians.

Conduct a poll by asking your friends and peers the same questions. Record their answers to each question on a separate sheet of paper. After polling at least five people, tally the responses and summarize your findings in a short paper. In addition to reporting the results, you should also address inaccurate answers using information presented in the video. You may refer to *Fact Sheet 2: Alcohol & The Brain: New Facts*, which lists much of the scientific information discussed in the program.

1. How does alcohol affect teenagers? Are most of the effects short-term or long-term?
2. How much alcohol does it take to damage your brain?
3. When does your brain stop developing?
4. Does alcohol advertising affect you?
5. How often do you drink?
6. How much do you drink in one sitting?
7. At what age is drinking safe?

Research one of the topics from the following list. Write a brief paper on your findings. You can gather information at your school or local library, as well as on the Internet. Use copies of the *Resource Tracker (Worksheet 1-B)* to collect your information and keep track of your sources.

### **ALCOHOL AND THE BRAIN**

What new discoveries have been made concerning the link between alcohol and the brain? What could be the possible effects of heavy drinking on a young person's brain? Use recent newspaper, magazine and Internet articles to support your research.

### **ALCOHOL ADDICTION**

Why is alcohol addictive? What physiological craving responses does alcohol trigger? Why are some people more at risk to alcohol addiction than others? Is addiction hereditary?

### **THE ALCOHOL LOBBY**

The alcohol industries hire lobbyists to influence lawmakers to vote in ways that help the industries. How powerful are these lobbyists (collectively known as the Alcohol Lobby)? How are they organized? What are their methods? How effective are they at influencing legislation?

### **BINGE DRINKING**

College fraternities are often perceived as places where alcohol runs freely. Do fraternities promote alcohol consumption? If not, how did fraternities get this reputation? Are any fraternities taking steps to change the public perception?

### **ALCOHOL POISONING**

How common is alcohol poisoning among young people? What are the risk factors? What are the early warning signs of alcohol poisoning? What should a person do if they suspect that someone is suffering from alcohol poisoning?

### **ALCOHOL AND MARIJUANA**

For years, researchers have pointed to the short-term and long-term effects of marijuana on the brain. What are some of these effects? How do they compare and contrast to the effects of alcohol on the brain? What might be the consequences of habitually combining alcohol and marijuana—especially while the brain is still developing?



Each fact below is related to alcohol and its effects on the brain. Imagine that you must explain the facts to an 8-year-old. Rewrite each fact using easy-to-understand language. You may want to use a dictionary to define unfamiliar words.

1. Alcohol decreases the transmission of nerve signals. During withdrawal from intoxication, the brain attempts to recover by increasing transmission. Scientists believe that this overstimulation of the brain causes neurons to break down inside their own membranes and die.
2. In a number of studies, tests show that habitual alcohol drinkers perform more poorly on cognitive tests than those who abstain from alcohol.
3. Heavy alcohol use by young people can adversely affect brain functions and cause the development of attention and memory deficits.
4. The younger someone is when she begins to consume alcohol regularly, the greater her risk of eventual alcohol addiction.
5. New evidence suggests that heavy drinking can adversely affect the prefrontal cortex—the part of the brain responsible for the ability to integrate information, think abstractly and make sound decisions.







Each statement below is a commonly held myth about alcohol and young people. Correct each myth with true information. Compare your answers with those on *Fact Sheet 5: Answering the Myths*.

1. Alcohol affects everyone the same way.
2. Drinking alcohol is part of growing up.
3. Beer will not do permanent damage.
4. The worst thing that can happen to a drinker is a bad hangover.
5. It's much worse for a teenager to use drugs than to drink alcohol.
6. Harm to the body doesn't happen until much later, after years of drinking.
7. Adults have drinking problems more often than young people.

1. In the space below, list five things you want to do with your mind before you turn 40. Some ideas might be writing a book, learning to speak a new language, teaching a class on your favorite subject, inventing a new product—even curing a disease. Try to be very specific with your ideas and make sure they are goals that truly interest you.

**1**

**2**

**3**

**4**

**5**

2. Now think about what you have learned about alcohol and the brain. Heavy drinking has been shown to lessen brain size and decrease the ability to think, remember and perform. Explain how heavy drinking might affect each of your goals.

**1**

**2**

**3**

**4**

**5**

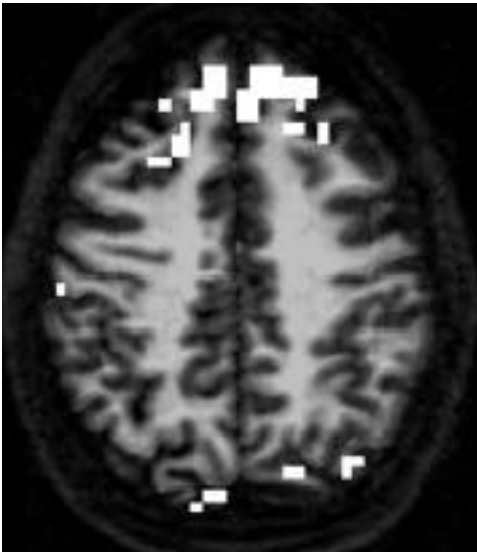
Studies show that heavy drinking can lower brain size by up to 10%. It can also decrease the mental abilities of the remaining 90%. Instead of shrinking your brain, focus on exercising it. The activities below have been shown to keep the brain more fit and effective. For each general activity, list a specific example that interests you. For instance, next to “Learning a new skill,” you might list “learning sign language.”

- 1. Engaging in a mental game with friends  
\_\_\_\_\_
- 2. Learning a new skill  
\_\_\_\_\_
- 3. Having a debate with a friend or group of friends  
\_\_\_\_\_
- 4. Finding a specific way to relax for 15 minutes each day  
\_\_\_\_\_
- 5. Doing a creative writing project  
\_\_\_\_\_
- 6. Working a written puzzle  
\_\_\_\_\_
- 7. Solving an important problem (at your school, in your home, or in your community)  
\_\_\_\_\_

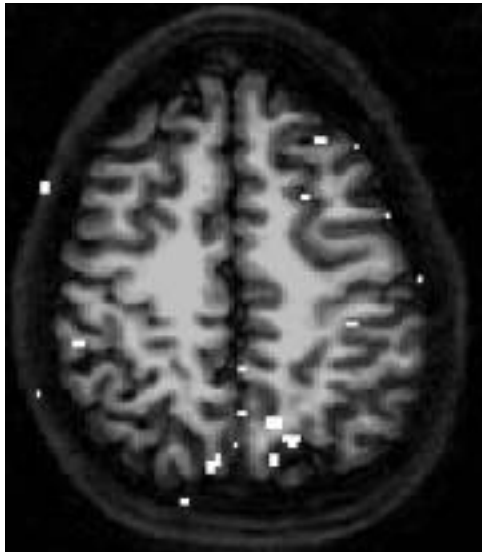
Now look over your list. Choose the activity that most interests you. During the next week, try the activity for a few minutes each day. At the end of the week, talk with your classmates about the experience. You may want to share a product of your experiment, such as a poem you wrote or a drawing of how you solved a household problem.

**ACTIVITY SHEET 10-A**  
**BRAIN SCANS (PART 1)**

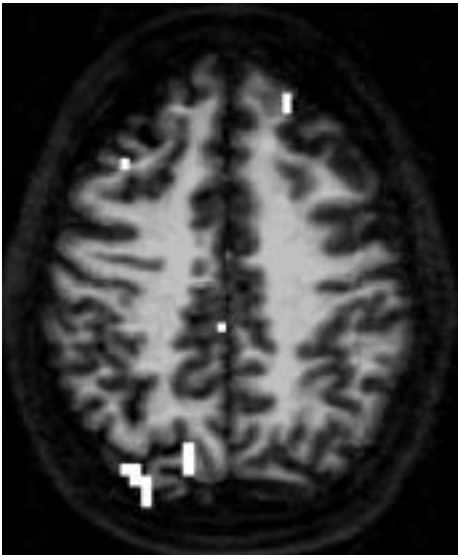
Below are the actual brain scans shown in the video *Brain Scans: Alcohol and the Teenage Brain*. Use the scans to answer the questions from Part 2 of this activity.



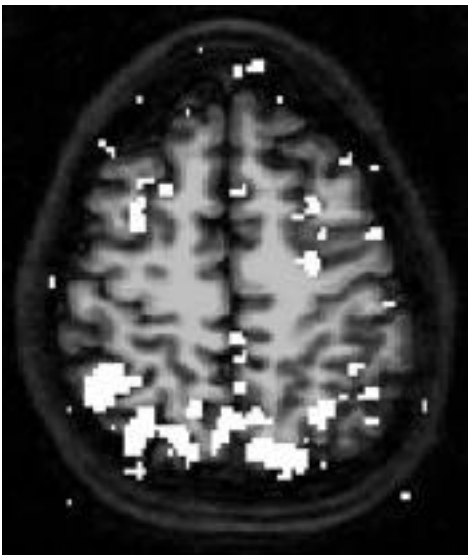
**TEENAGE DRINKER  
SCAN #1**



**MONICA (NON-DRINKER)  
SCAN #1**



**TEENAGE DRINKER  
SCAN #2**



**MONICA (NON-DRINKER)  
SCAN #2**

1. Study the scans labeled *Teenage Drinker Scan #1* and *Monica Scan #1*. These scans represent what occurred when the subjects were shown images of alcoholic beverages. White spots indicate areas of high brain activity. What do the scans say about the teenage drinker and Monica?
2. Many teens in the video stated that alcohol advertising does not affect them. How would you use the first two brain scans to contradict this belief?
3. If your own scan showed high brain activity when you were exposed to alcohol advertising, how would you feel?
4. Study the scans labeled *Teenage Drinker Scan #2* and *Monica Scan #2*. These scans represent what occurred when the subjects were given mental tasks. Again, white spots indicate areas of high brain activity. (Keep in mind that these results were not recorded while the teenage drinker was intoxicated.) What do the scans tell us about the teenage drinker and Monica?
5. In your opinion, how could the changes caused by drinking (and seen in the scan of the teenage drinker) affect daily life? List some specific examples.
6. Were you surprised by the effects of alcohol on the brain of a sober teenage drinker? Did it change your attitude about alcohol? If so, explain how.

Sometimes people drink alcohol because they can't think of anything else to do, or because they think drinking will make them feel better about themselves. With a little imagination, you can come up with plenty of better ways to spend your spare time. For each of the examples listed below, come up with four things you can do that don't involve drinking.

**List four things you can do at a party.**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

**List four things you can do on a date.**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

**List four things you can do when you are bored.**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

**List four things you can do with friends on the weekend.**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

**List four things you can do on a rainy day.**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

**List four things you can do when you are in a rotten mood.**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

# **FACT SHEETS**

Alcohol contains a drug known as ethanol. Ethanol is a depressant—it slows down brain activity, reflexes and other physical skills. Alcohol is the most abused drug in the United States.

**Short-Term Risks:**

- Makes it harder to think clearly and make good decisions, which can lead to problems like unwanted pregnancy, STDs, or involvement in a crime
- Changes vision, balance and coordination—all of which greatly increase the risk of an accident, such as a car crash or drowning
- Too much alcohol too quickly can lead to alcohol poisoning—blackouts, coma or death
- Can change behavior and emotions, making a person act foolish, clumsy, angry or loud
- Can cause painful “hangover” symptoms—headache, sleepiness, dizziness, stomach pains, vomiting and diarrhea
- Can cause bloodshot eyes, pimple breakouts, and bad breath

**Long-Term Risks:**

- Lowers the body’s immune system and can increase the risk of diseases
- Cancer of the mouth and throat
- Cirrhosis of the liver, a disease that is often fatal
- Painful stomach ulcers
- Cancer of the pancreas
- Weakened heart muscles and an irregular heartbeat
- Permanent brain damage
- Kidney failure
- Weakened muscles and bones
- High blood pressure
- Rotten teeth
- Weight gain

- Since their brains are still developing, teens who drink heavily are more likely to significantly lower their mental abilities than adults who drink heavily.
- The part of the brain most at risk appears to be the hippocampus, a structure responsible for learning and memory. Also at risk is the prefrontal cortex, an area responsible for decision making.
- The effects on the brain can include loss of motor skills, a lessened ability to perform on tests, and a greater difficulty learning new things.
- Studies suggest that early damage caused by heavy drinking as a teen can surface later in life.
- The average size difference between the brain of a healthy teen and the brain of a teen who drinks heavily is about 10 percent.
- Just a few years of heavy alcohol use by a young person can lower brain function and change the ability to learn.
- Young brains are also more vulnerable to changes that can lead to alcohol addiction. Forty percent of alcoholics began drinking before age 15, while only 10 percent began drinking at age 21 or 22.
- In a number of studies, tests show that habitual alcohol drinkers perform more poorly on cognitive tests than those who abstain from alcohol.
- Alcohol decreases the transmission of nerve signals. During withdrawal from intoxication, the brain attempts to recover by increasing transmission. Scientists believe that this overstimulation of the brain causes neurons to break down inside their own membranes and die.
- Research shows that a teen's brain is more easily damaged than an adult's brain in the areas that regulate the storage of memories.
- Alcohol can also cause emotional changes during a time when the brain is learning to deal with new and powerful feelings. That can lead to problems with friends, cause low self esteem, and raise stress levels.

**Sources:**

Fackelmann, Kathleen. "Teen drinking, thinking don't mix." *USA Today*, online article, October 17, 2000

Wuethrich, Bernice. "Getting Stupid." *Discover*, Volume 22, No. 3, March 2001

Binge drinking by a male is defined as downing five drinks in one sitting. For a female, the definition is four drinks in a sitting.

- People who binge drink frequently are ten times more likely to drive drunk than non-bingers.
- People who binge drink frequently are sixteen times more likely to get in a car with a drunk driver than non-bingers.
- Nearly three percent of the American college population will die from alcohol-related causes.
- 30 percent of academic failures by college students are alcohol-related.
- 90 percent of all vandalism on college campuses is alcohol-related.
- Alcohol is involved in two-thirds of college suicides, 90 percent of campus rapes, and 95 percent of violent crime on college campuses.
- Students who binge drink are twice as likely to die from injuries as non-bingers.
- Approximately 80 percent of all binge drinkers have had a hangover as a result of drinking.
- Approximately 50 percent of all binge drinkers have done something they later regretted as a result of drinking.
- Approximately 40 percent of all binge drinkers have blacked out as a result of drinking.
- Approximately 30 percent of all binge drinkers have had unplanned sex as a result of drinking.
- Approximately 15 percent of all binge drinkers have had unprotected sex as a result of drinking.
- Approximately 30 percent of all binge drinkers have argued with friends as a result of drinking.
- Approximately 45 percent of all binge drinkers have missed a class as a result of drinking.
- Approximately 30 percent of all binge drinkers have gotten behind in school as a result of drinking.

**Source:** *Binge Drinking on Campus*, Report by Harvard School of Public Health, 1998

When you drink alcohol, it is absorbed directly into your bloodstream and then into your body systems. Here is how alcohol can affect different parts of your body:

### **THE BRAIN**

Alcohol is a depressant. That means it slows down all the major functions of the central nervous system, causing slurred speech, mental confusion, blurry vision, and poor muscle control. If enough alcohol is consumed, it severely impairs the functioning of the respiratory system, and can arrest breathing. Prolonged alcohol use can cause confusion, memory loss, and brain damage.

### **THE LIVER**

The liver works to cleanse the system of toxins. Alcohol is a toxin. Once alcohol enters the blood, the liver tries to rid the bloodstream of it. Prolonged alcohol use can cause hepatitis, cirrhosis of the liver, and liver cancer.

### **THE STOMACH**

The stomach also tries to remove toxins from the body—usually by vomiting. If enough alcohol is consumed, it causes vomiting. Prolonged alcohol use can inflame the lining of the stomach and cause ulcers.

### **THE MUSCLES**

Prolonged alcohol use can cause weakness and loss of muscle tissue.

### **THE HEART**

Prolonged alcohol use can cause high blood pressure, an irregular pulse rate, and an enlarged heart.

### **THE PANCREAS**

Prolonged alcohol use can upset digestion and cause severe pain, malnutrition, and early diabetes.

### **THE NERVOUS SYSTEM**

Prolonged alcohol use can cause tingling and numbness in both the hands and feet.

### **THE REPRODUCTIVE SYSTEM**

Prolonged alcohol use can cause also impotence in males. In females, it can increase the risk of menstrual problems and it can severely damage the fetus of a pregnant woman.

1. Alcohol affects everyone the same way.

**Many factors affect reactions to alcohol, including body weight, mental state, and time of day. Young people are more negatively affected by alcohol than adults because their minds and bodies are still developing.**

2. Drinking alcohol is part of growing up.

**Millions of young people choose not to drink. For them, there are dozens of other activities and events that signify growing up. Using alcohol and other drugs is not a “necessary” step in the path to adulthood.**

3. Beer will not do permanent damage.

**All forms of alcohol present risks for the mind and body. A beer contains the same amount of alcohol found in a glass of wine, a wine cooler, a shot of whiskey, or the average mixed drink. Large amounts of alcohol, in any form, can do damage to the brain, heart, liver, and stomach.**

4. The worst thing that can happen to a drinker is a bad hangover.

**The risks of drinking go far beyond the effects of a hangover. These risks include alcohol poisoning, car crashes, suicide, involvement in a crime, and unprotected sex leading to pregnancy or a sexually transmitted disease.**

5. It’s much worse for a teenager to use drugs than to drink alcohol.

**First of all, alcohol is a drug. In fact, it is the most abused drug in our society. It leads to addiction and health problems that destroy lives. Secondly, drinking alcohol at an early age increases the risk of alcohol addiction, as well as addiction to other drugs.**

6. Harm to the body doesn’t happen until much later, after years of drinking.

**New research proves that drinking alcohol can have long-lasting effects on a person’s brain function—especially when the person drinks heavily at a young age. These effects can become evident immediately after drinking and may last for many years.**

7. Adults have drinking problems more often than young people.

**Alcohol addiction can happen to anyone. In fact, the younger a person starts drinking, the greater the risk of addiction. Many people wrongly believe that alcohol addiction is primarily an adult problem because those seeking treatment are most often adults. That’s because it takes most people years to recognize, understand and accept their addictions.**

**THE LEADING KILLERS OF PEOPLE UNDER 18 ARE:**

MURDER - Half of all murderers were under the influence of alcohol at the time of the murder.

CAR CRASHES - Almost 3 out of 4 young people who die in car crashes were riding with a driver who had been drinking alcohol.

SUICIDE - 1 of 3 suicides happen to someone who is under the influence of alcohol.

These were not accidents, but choices made by people who were drinking.

**OTHER RISKS:**

Having one drink after another, or binge drinking, is becoming a serious killer of young people. Binge drinking can cause alcohol poisoning, which can lead to coma or sudden death.

Hundreds of kids under 15 are taken to emergency rooms each year for alcohol poisoning. In addition to death, alcohol poisoning can cause heart, liver and brain damage.

Young people are more likely to become addicted to alcohol. It takes 5 to 10 years for an adult to become addicted to alcohol, but a young person can become addicted in just 1 or 2 years.

On average, young people who drink alcohol have lower grades and a higher risk of dropping out of school. Students who drink are also 5 times more likely to fail a grade.

Many young people who get arrested have been drinking alcohol.

It is against the law for people under 21 to use or buy alcohol, even if they are at home.

For teens, alcohol is a major factor in date rapes, unwanted pregnancy and the contraction of STDs like HIV.

Teens are more likely than adults to lose control and make poor decisions. Teens who drink have a higher risk of involvement in fights, vandalism and violent crimes.

The following terms are frequently used by researchers who examine the link between alcohol and brain function.

**neurons** - nerve cells, such as those found in the brain

**axon** - a single fiber extending away from a neuron which releases chemical messengers called neurotransmitters

**neurotransmitters** - chemical messengers which allow neurons to communicate with other cells and cause changes in the brain and throughout the body

**receptor** - area of a neuron which receives a neurotransmitter

**synapse** - tiny gap between two neurons; point at which a nerve impulse passes from one neuron to another

**hippocampus** - structure buried deep in the brain; responsible for many types of learning and memory

**prefrontal cortex** - area of the brain responsible for the ability to plan ahead, think abstractly and make good decisions

**potentiation** - process which occurs when repeated use of synapses is followed by an increase in their ability to carry impulses to other cells

**glutamate** - an important neurotransmitter which causes neurons to fire more rapidly

**MRI (magnetic resonance imaging)** - medical technology which uses a large magnet to produce images of the brain or other internal organs

**dopamine** - a neurotransmitter that creates feelings of pleasure when it is released by the brain

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**Resources:**

[www.acde.org](http://www.acde.org), *American Council for Drug Education*

[www.health.org](http://www.health.org), *National Clearinghouse for Alcohol and Drug Information*

[www.madd.org](http://www.madd.org), *Mothers Against Drunk Driving*