

# Brain Development: The Teen Brain Posts From the Sara Bellum Blog

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# Brain Development: The Teen Brain

## Posts From the Sara Bellum Blog

### Introduction

The purpose of the Sara Bellum Blog teaching guide “Brain Development: The Teen Brain” is to provide educators with a series of relevant blog posts that complement health curricula about drug abuse by providing reliable and up-to-date information on teen brain development and how drugs can affect that process. The guide contains five posts from the Sara Bellum Blog.

Discussion questions and related resources accompany each post. You’ll also find ideas for how to use the posts with teens and additional resources.

### The Sara Bellum Blog

A team of NIDA scientists and science writers created the Sara Bellum Blog in 2009 to connect teens in middle and high school with the latest scientific research and news about drug abuse and addiction. The Sara Bellum Blog discusses a wide range of topics related to drug abuse and addiction, including facts about drugs of abuse, peer pressure, and mental health.

### About the National Institute on Drug Abuse

The National Institute on Drug Abuse (NIDA) is a part of the National Institutes of Health, U.S. Department of Health and Human Services. NIDA supports most of the world’s research on how drug abuse impacts the brain and body, including how it leads to addiction. In addition to supporting and conducting research, NIDA disseminates its findings through science-based materials such as Web sites, publications, and curricula supplements.

### How To Use This Teaching Guide

You can use the blog posts in this guide as discussion starters, handouts, or take-home assignments for teens. The posts focus on a common theme—drug abuse—and can be used as a group or individually.

Following are several ideas for how to incorporate Sara Bellum Blog posts into your drug abuse prevention lessons:

- **Small Group Discussions:** In small groups, have students read one or several posts and ask the groups to discuss the information in the post(s). Provide students with the discussion questions for the post(s) to help guide their conversations. Ask each group to present to the whole class what new information they learned, what they thought was most interesting, and why they think the information is important.
- **Discussion Launch:** Review one post with the whole class and then facilitate a discussion about drug abuse and addiction using the discussion questions provided for that post.

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- **Reaction Discussion:** Read one post aloud to the class and ask students to share their reactions to the information. Does anything change how they view drugs or drug abuse? How might the information in the post be useful?
- **Supplemental Handouts:** Print individual posts to give as handouts that provide supplemental information about specific topics related to drug abuse.
- **Writing Prompt:** Ask students to read one post and then write about what they learned and how the information relates to their lives. Or, ask students to write an answer to one of the discussion questions.
- **Blog Writing Activity:** Ask students to read several posts from the guide and then write their own blog post.
  - **Facts Post:** Ask students to write a blog post that shares the facts they learned from the Sara Bellum Blog posts they read.
  - **Personal Experience Post:** Ask students to write a post in the style of the Sara Bellum Blog that shares a personal experience with drugs, drug abuse, or addiction in their schools or communities.
  - **Discussion Post:** Ask students to write a post that responds to one of the discussion questions provided with each post.
- **Presentation Project:** Ask students to read a post and develop a short presentation about the topic and why it is important.
- **Social Media Activities:** Ask students to read a post and then write Facebook or Twitter messages using the information they learned. If your class or school has its own social media channels, you could share the Facebook posts and tweets there. Asking students to summarize the posts in the short blurbs required for social media could be an interesting paraphrasing exercise.
- **Comment:** Ask students to read one post and then write a response to that post. They could even publish their comment on the original post by going to the URL provided for each post.
- **Homework Discussion Questions:** Assign one or several posts as homework, but do not include the discussion questions. Ask students to read the post(s) and develop a list of their own discussion questions for each.
- **Poster Project:** Ask students to read a post and develop a poster or cartoon that shows the key facts and points of that post.

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- **Multimedia Project:** Ask students to read several posts and develop a storyboard (scene outline) and script for a podcast, public service announcement (PSA), or video that shares the information they learned. If time allows, teens could break into groups and record the podcasts, PSAs, or videos they developed.

## Sara Bellum Blog Posts and Discussion Questions

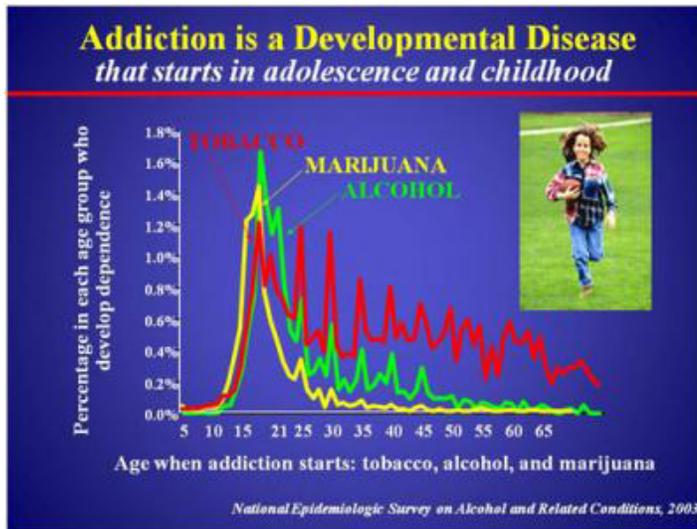
The posts in this guide discuss topics related to teen brain development. Each post is followed by discussion questions and related resources.

# Brain Development: The Teen Brain

## Posts From the Sara Bellum Blog

### Teen Brain, a Work in Progress

By The Sara Bellum Blog Team



Have you ever wondered why you have to be 16 to get your driver's license or 18 to vote or 21 to legally drink alcohol?

It's partly because your brain is not ready to take on these responsibilities, since your brain is not fully developed when you're a teen.

During the teen years, essential parts of the brain are still forming—like the prefrontal cortex, which allows people to weigh the pros and cons of situations instead of acting on impulse. This is one reason why teens are generally more likely to take risks than adults.

For example, with alcohol, teens may be less able to judge when to stop drinking. In 2012, the Centers for Disease Control and Prevention reported that each year, more than 4,700 alcohol-related deaths occur among those less than 21 years old—that is way too many.

Research shows that alcohol and other drugs change the brain's structure and how it works in the short and long term. In the short term, drugs affect your brain's judgment and decision-making abilities, while long-term use causes brain changes that can set people up for addiction and other problems. The brains of people who are addicted get altered so that drugs become their top priority—and they will compulsively seek and use drugs even though doing so brings devastating consequences for their lives and for those who care about them.

Do yourself a favor and use your brain to make smart choices, reach your goals, and achieve your full potential in life.

Find the original blog post at <http://teens.drugabuse.gov/blog/post/teen-brain-work-progress>.

# Brain Development: The Teen Brain

## Posts From the Sara Bellum Blog

### Discussion Questions: Teen Brain, a Work in Progress

1. What is one reason why things like getting your driver's license and buying alcohol have age requirements?
2. What parts of your brain are still developing as a teen?
3. Does addiction change the brain? If so, how?

### Related Resources

- *Alcohol Dangers Go Beyond Drunk Driving*, Sara Bellum Blog:  
<http://teens.drugabuse.gov/blog/post/alcohol-dangers-go-beyond-drunk-driving>
- *If You're Under Age 21, Drinking Is Always Illegal*, Sara Bellum Blog:  
<http://teens.drugabuse.gov/blog/post/if-youre-under-age-21-drinking-is-always-illegal>
- *Binge Drinking Matters—To Your Brain*, Sara Bellum Blog:  
<http://teens.drugabuse.gov/blog/post/binge-drinking-matters-your-brain>
- *Fact Sheet: Age 21 Minimum Legal Drinking Age*, Centers for Disease Control and Prevention:  
<http://www.cdc.gov/alcohol/fact-sheets/mla.htm>
- *Rethinking Drinking*, National Institute on Alcohol Abuse and Alcoholism:  
<http://rethinkingdrinking.niaaa.nih.gov>

# Brain Development: The Teen Brain

## Posts From the Sara Bellum Blog

### Be Aware for Your Brain: Drugs Change Critical Parts

By The Sara Bellum Blog Team

There's no better time than Brain Awareness Week, held in March each year, to learn more about the most fascinating organ in your body.

The included image from the Society for Neuroscience, a partner of the Dana Foundation for Brain Awareness Week, shows some of the most critical parts of your brain.

Here's what each part is primarily responsible for—and guess what? As the image shows, these are also the brain regions most affected by drugs of abuse:

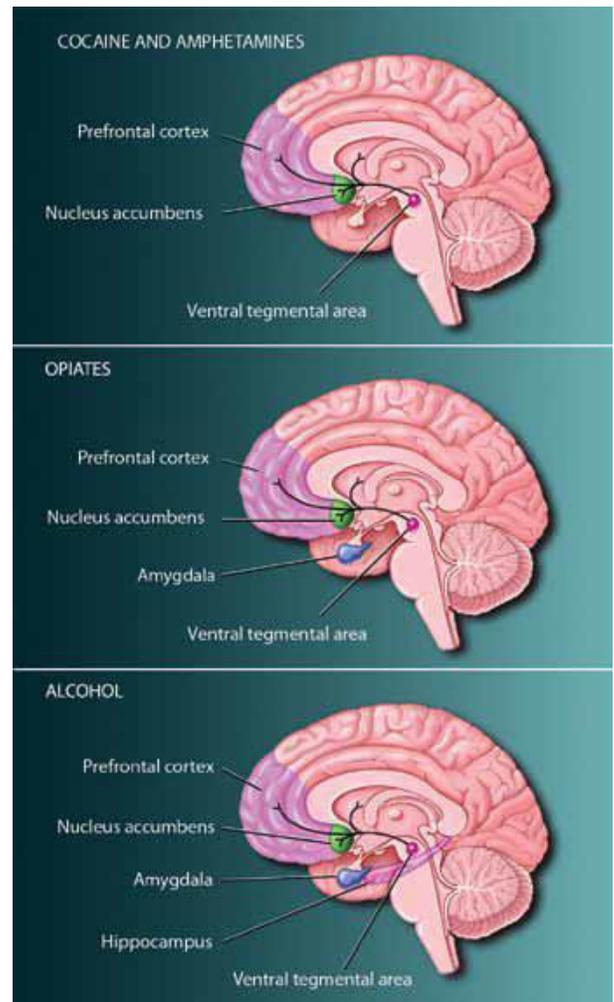
**Prefrontal cortex:** This part is often referred to as the “CEO of the brain.” The prefrontal cortex is responsible for critical thinking and abstract thought, as well as many other functions like focusing attention, organizing thoughts, controlling impulses, and forming strategies for future action. The prefrontal cortex is one of the last regions of the brain to mature, so changes caused by drug abuse could have long-lasting effects.

**Nucleus accumbens:** Part of the so-called “pleasure center,” the nucleus accumbens is thought to play an important role in reward, pleasure, laughter, aggression, and fear.

**Amygdala:** Research shows that the amygdala has a major role in processing memory and emotional reactions, such as fear. The amygdala is part of the limbic system. The limbic system is a set of brain structures that generates our feelings, emotions, and motivations. It is also important in learning and memory.

**Hippocampus:** Also part of the limbic system, the hippocampus plays important roles in moving information from short-term memory to long-term memory.

**Ventral tegmental area:** This structure is important in thinking, motivation, and intense emotions relating to love.



Lydia V. Kibiuk, Society for Neuroscience, Brain Facts

## Brain Development: The Teen Brain

### Posts From the Sara Bellum Blog

Scientists are constantly studying the brain and learning more and more about how different brain structures relate to addiction. We know drugs change the brain, but the effects of these changes are not yet fully understood.

Protect your brain. Make the healthy choice to stay away from drugs and alcohol.

Find the original blog post at <http://teens.drugabuse.gov/blog/post/be-aware-your-brain-drugs-change-critical-parts>.

# Brain Development: The Teen Brain

## Posts From the Sara Bellum Blog

### Discussion Questions: Be Aware for Your Brain: Drugs Change Critical Parts

1. What parts of the brain do cocaine/amphetamines, opiates, and alcohol affect?
2. What parts of the brain are affected by all three types of drugs?  
What do those parts of the brain do?
3. What functions do the amygdala, hippocampus, and ventral tegmental area in the brain perform?

### Related Resources

- *Word of the Day: Limbic System*, Sara Bellum Blog:  
<http://teens.drugabuse.gov/blog/post/word-day-limbic-system>
- *Word of the Day: Brain Reward System*, Sara Bellum Blog:  
<http://teens.drugabuse.gov/blog/post/word-day-brain-reward-system>
- *Your Brain: Better Than Any Computer*, Sara Bellum Blog:  
<http://teens.drugabuse.gov/blog/post/your-brain-better-than-any-computer>
- *Understanding Learning and Memory*, Sara Bellum Blog:  
<http://teens.drugabuse.gov/blog/post/understanding-learning-and-memory>
- *Drug Facts: Addiction and the Brain*, NIDA for Teens:  
<http://teens.drugabuse.gov/drug-facts/brain-and-addiction>
- *Drugs, Brains, and Behavior: The Science of Addiction*, National Institute on Drug Abuse:  
<http://www.drugabuse.gov/publications/science-addiction>

# Brain Development: The Teen Brain

## Posts From the Sara Bellum Blog

### It's All About Hormones

*By The Sara Bellum Blog Team*



Why do adults seem to blame “raging hormones” for many things teens do? Beyond causing acne and a sudden interest in dating, are hormones responsible for changes in behavior or emotional response?

The answer is yes. The hormones that change around puberty—starting between age 8 and 14—and last until the early 20s when adolescence ends may affect you in more ways than you realize.

NIDA defines a “hormone” as “a chemical substance formed in glands in the body and carried in the blood to organs and tissues, where it influences function, structure, and behavior.”

In preteen and teen years, many new chemicals move around inside your body, transforming you from a child to a teen to an adult.

### Growing on the Outside: What’s Happening on the Inside?

During puberty, your brain releases various hormones that help your body to mature by producing testosterone (in boys) and estrogen (in girls). Resulting changes can go beyond physical development to include emotional and mood changes—although some researchers think mood swings may relate more to changes in the teen brain than to hormonal spurts.

Other important hormones also come into play in the teen years. Melatonin is a hormone that helps your body regulate sleep cycles by making you feel sleepy after the sun goes down. Melatonin levels in adolescents don’t start to rise until about 10:30 p.m., which might explain why many teens want to stay up late despite their parents’ wishes. Research shows that for adolescents, melatonin levels remain high, even after they wake up, which is why teens may feel sleepy in the morning.

Our bodies also release something called “stress hormones,” such as cortisol. The stress hormone cortisol governs how well someone responds to or recovers from stressful experiences. Increased stresses in adolescence can cause cortisol levels to rise, which can affect teens’ ability to function calmly and reasonably.

So, while teen bodies are a bundle of changes, the good news is that eventually your body adjusts, and the “raging” hormones calm down as you move into adulthood.

Find the original blog post at <http://teens.drugabuse.gov/blog/post/its-all-about-hormones>.

# Brain Development: The Teen Brain

## Posts From the Sara Bellum Blog

### Discussion Questions: It's All About Hormones

1. What hormones are particularly present in your body during your teen years?
2. How does melatonin influence your sleep?
3. What is one explanation for mood swings and changes during your teen years?

### Related Resources

- *Understanding Learning and Memory*, Sara Bellum Blog:  
<http://teens.drugabuse.gov/blog/post/understanding-learning-and-memory>
- *I Feel Your Pain: Teens and Empathy*, Sara Bellum Blog:  
<http://teens.drugabuse.gov/blog/post/i-feel-your-pain-teens-and-empathy>
- *Teen Brain, a Work in Progress*, Sara Bellum Blog:  
<http://teens.drugabuse.gov/blog/post/teen-brain-work-progress>
- *Sleep Deprivation May Be Undermining Teen Health*, American Psychological Association:  
<http://www.apa.org/monitor/oct01/sleepteen.aspx>
- *Drug Facts: Addiction and the Brain*, NIDA for Teens:  
<http://teens.drugabuse.gov/drug-facts/brain-and-addiction>
- *Drugs, Brains, and Behavior: The Science of Addiction*, National Institute on Drug Abuse:  
<http://www.drugabuse.gov/publications/science-addiction>

# Brain Development: The Teen Brain

## Posts From the Sara Bellum Blog

### It's Not Just You: The Teen Years Can Be an Emotional Roller Coaster

*By The Sara Bellum Blog Team*

Ever have one of those days? One minute you're feeling great; the next, you're knocked down by a bad grade or a fight with a friend.

Setbacks like these can seem like the end of the world to some teens. Others can bounce back after they've had a little time to think and see that the situation isn't so bad. But not everyone can recover so easily.

#### What's Happening in Your Head?

No one feels good all the time. Teens are particularly vulnerable to a roller coaster of emotions because of major brain changes taking place between the ages of 12 and 25. These emotional ups and downs are all part of normal teen development.

But for teens suffering from mental health issues such as anxiety, depression, or ADHD, the stresses—from peers, family, or problems in school—may be more than they can handle. Some may start using drugs or alcohol as a way to cope, or to escape from anger, hurt, or disappointment. However, over time, these behaviors can lead to a bigger problem...addiction.

#### Pay Attention to Your Feelings

Every brain is different, and just because you feel down or stressed doesn't mean you're going to develop a problem. But, whatever you're going through, it's important to be aware of your feelings.

Take note if you're overwhelmed, stressed, anxious, or unfocused. You may just be experiencing the normal emotional reactions to events in your life. However, if these feelings don't let up, or if you feel like you can't bounce back on your own, talk to a friend, family member, or someone you trust to help you.

Find the original blog post at <http://teens.drugabuse.gov/blog/post/its-not-just-you-teen-years-can-be-emotional-roller-coaster>.



# Brain Development: The Teen Brain

## Posts From the Sara Bellum Blog

### Discussion Questions: It's Not Just You: The Teen Years Can Be an Emotional Roller Coaster

1. Why are teens particularly likely to feel like they are experiencing an emotional roller coaster?
2. How might life pressures have a greater impact on the emotional health of teens with mental health struggles?
3. What is one good way to ensure your emotions don't get out of hand?

### Related Resources

- *Understanding Learning and Memory*, Sara Bellum Blog:  
<http://teens.drugabuse.gov/blog/post/understanding-learning-and-memory>
- *I Feel Your Pain: Teens and Empathy*, Sara Bellum Blog:  
<http://teens.drugabuse.gov/blog/post/i-feel-your-pain-teens-and-empathy>
- *Teen Brain, a Work in Progress*, Sara Bellum Blog:  
<http://teens.drugabuse.gov/blog/post/teen-brain-work-progress>
- *Why Does Peer Pressure Influence Teens To Try Drugs?* Sara Bellum Blog:  
<http://teens.drugabuse.gov/blog/post/why-does-peer-pressure-influence-teens-try-drugs>
- *Drug Facts: Addiction and the Brain*, NIDA for Teens:  
<http://teens.drugabuse.gov/drug-facts/brain-and-addiction>
- *Drugs, Brains, and Behavior: The Science of Addiction*, National Institute on Drug Abuse:  
<http://www.drugabuse.gov/publications/science-addiction>

# Brain Development: The Teen Brain

## Posts From the Sara Bellum Blog

### I Feel Your Pain: Teens and Empathy

By The Sara Bellum Blog Team



Can you put yourself in someone else's shoes? Developing empathy—being able to read someone else's feelings and relate them to your own—depends to some extent on brain development.

Although it sounds simple to be able to imagine the nervousness your friend felt about playing her first JV soccer match, for example, it may be hard for teens to have empathy because their brains aren't yet hard-wired for it. Brain imaging studies show that teens

and adults may use different mental strategies for figuring out someone's intentions or motives for doing something. The ability to understand what others are feeling is important in forming close relationships, tolerating differing points of view, and keeping us from hurting others because of misunderstandings.

Even more, some people seem to be inherently better at empathizing than others. Dr. Abigail Marsh, a researcher at Georgetown University, studies empathy—or the lack of it—in teens. Dr. Marsh measures this quality by using brain imaging technology to look at activity in the brain's amygdala while showing both groups of teens pictures of fearful faces. The amygdala is part of the limbic system and processes memory and emotional reactions, such as fear. She theorizes that “exposure to and correct interpretation of certain distress cues may predict the likelihood” of developing behaviors like empathy.

According to Dr. Marsh, you can aid the development of empathy by practicing the following three ways of tuning into others' feelings:

1. **Put yourself in someone else's shoes.** Is it possible that it hurt your friend's feelings when you said her choice of birthday presents “sucked”? Can you share in your sister's excitement for acing her physics exam?
2. **Recognize others' emotions if you have felt them yourself.** How do you feel when someone makes you mad? Have you ever noticed when something you said out of anger or frustration had that effect on someone else?
3. **Pay attention.** Are you too busy tuning into how no one “gets you” to notice the needs of other people around you? Other people may need your understanding as much as you need theirs.

Find the original blog post at <http://teens.drugabuse.gov/blog/post/i-feel-your-pain-teens-and-empathy>.

# Brain Development: The Teen Brain

## Posts From the Sara Bellum Blog

### Discussion Questions: I Feel Your Pain: Teens and Empathy

1. What is empathy and why is it important?
2. Why might it be difficult for teens to feel empathy?
3. What are some ways to help you develop empathy?

### Related Resources

- *Teen Brain, a Work in Progress*, Sara Bellum Blog:  
<http://teens.drugabuse.gov/blog/post/teen-brain-work-progress>
- *Understanding Learning and Memory*, Sara Bellum Blog:  
<http://teens.drugabuse.gov/blog/post/understanding-learning-and-memory>
- *Mindset Over Matter*, Sara Bellum Blog:  
<http://teens.drugabuse.gov/blog/post/mindset-over-matter>
- *Drug Facts: Addiction and the Brain*, NIDA for Teens:  
<http://teens.drugabuse.gov/drug-facts/brain-and-addiction>
- *Drugs, Brains, and Behavior: The Science of Addiction*, National Institute on Drug Abuse:  
<http://www.drugabuse.gov/publications/science-addiction>

# Brain Development: The Teen Brain

## Posts From the Sara Bellum Blog

### More Resources

#### Web Sites and Online Tools

- Sara Bellum Blog: <http://teens.drugabuse.gov/blog>
- NIDA for Teens Web Site: <http://teens.drugabuse.gov>
  - Drug Facts: <http://teens.drugabuse.gov/drug-facts>
  - Test Your Knowledge (online drug facts quizzes):  
<http://teens.drugabuse.gov/activities/test-your-knowledge>
- NIDA's PEERx Program (teen prescription drug abuse prevention materials):  
<http://teens.drugabuse.gov/our-projects/peerx>
  - Choose Your Path Videos (where the viewer can choose what the characters do):  
<http://teens.drugabuse.gov/our-projects/peerx/choose-your-path>
- Easy-to-Read Drug Facts: <http://easyread.drugabuse.gov>
- Heads Up: Drugs and Your Body (lesson plans and materials):  
<http://headsup.scholastic.com>
- National Institute on Drug Abuse Home Page: <http://www.drugabuse.gov>
- Family Checkup: Positive Parenting Prevents Drug Abuse: <http://www.drugabuse.gov/family-checkup>

#### Publications

- Drugs, Brains, and Behavior: The Science of Addiction:  
<http://www.drugabuse.gov/publications/science-addiction>
- Preventing Drug Abuse Among Children and Adolescents:  
<http://www.drugabuse.gov/publications/preventing-drug-abuse-among-children-adolescents>
- DrugFacts Fact Sheets: <http://www.drugabuse.gov/publications/term/160/DrugFacts>