



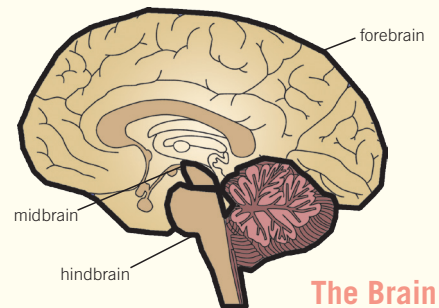
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# BRAINPAGE



In *The Teen Years Explained: A Guide to Healthy Adolescent Development*, you will find many references to the rich cognitive changes and development that occur throughout the teen years. This page will help explain the different parts of the brain and how they function.

The human brain is an extremely complex organ composed of interdependent parts, each with its own specific functions and properties. The brain has three fundamental segments: the forebrain, the midbrain, and the hindbrain.



The Brain

## The Forebrain

The **forebrain** is the most advanced and the largest section of the brain, located in its uppermost part. The forebrain is involved in all brain functions except for the autonomic activities of the brain stem. It is the part of the brain responsible for emotions, memory, and “higher-order” activities such as thinking and reasoning. The forebrain is

made up of the cerebrum and the limbic system.

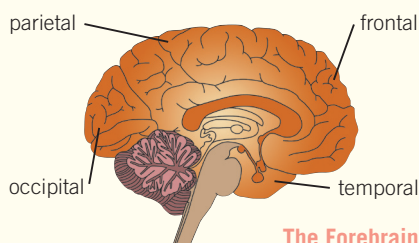
The cerebrum, or cerebral cortex, is divided into two hemispheres (left and right). Each hemisphere consists of four sections, called lobes:

• **Occipital Lobe**—Located at the back of the head just above the cerebellum, the occipital lobe processes sensory information from the eyes.

• **Temporal Lobe**—Located at the sides of the head above the ears, the temporal lobes perform several functions, including speech, perception and some types of memory.

• **Parietal Lobe**—Located at the top of the head, the parietal lobe receives data from the skin, including heat, cold, pressure, pain, and how the body is positioned in space.

• **Frontal Lobe**—Located under the forehead, the frontal lobe controls reasoning, planning, voluntary movement, and some aspects of speech. The prefrontal cortex is the part of the frontal lobe right behind the forehead. It is associated with complex cognitive skills such as being able to differentiate among conflicting thoughts, determine good and bad, identify future consequences of current activi-



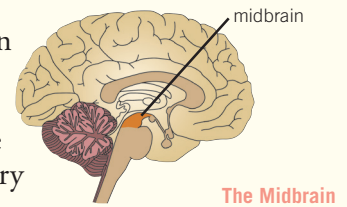
The Forebrain

ties, and suppress impulses. As the adolescent brain develops, the prefrontal cortex becomes increasingly connected with the seat of emotions, the limbic system, allowing reason and emotion to be better coordinated. The prefrontal cortex has also been linked to personality.

The limbic system, the set of brain structures that form the inside border of the cerebrum, accounts for about one-fifth of the brain's volume. The limbic system serves three functions: First, in cooperation with the brain stem, it regulates temperature, blood pressure, heart rate, and blood sugar. Second, two parts of the limbic system, the hippocampus and the amygdala, are essential to forming memories. Third, the limbic system is the center of human emotions. The amygdala is thought to link emotions with sensory inputs from the environment. Nerve impulses to the amygdala trigger the emotions of rage, fear, aggression, reward, and sexual attraction. These emotions trigger the action of the hypothalamus, which regulates blood pressure and body temperature.

### The Midbrain

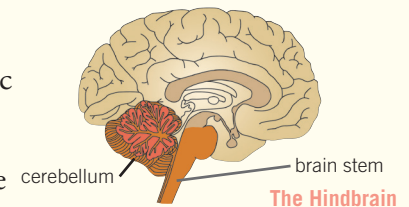
The **midbrain** is the topmost section of the brain stem and the smallest region of the brain. It is associated with some, but not all, reflex actions, as well as with eye movements and hearing. The midbrain also contains several structures necessary for voluntary movement.



The Midbrain

### The Hindbrain

The **hindbrain** is the part located at the upper section of the spinal cord. The hindbrain includes the brain stem and the cerebellum. The brain stem, sometimes called the “reptilian brain,” is the most basic area of the brain and controls breathing, heartbeat, and digestion. Next to the brain stem is the cerebellum, which is responsible for many learned physical skills, such as posture, balance, and coordination. Actions such as throwing a baseball or using a keyboard take thought and effort at first, but become more natural with practice because the memory of how to do them is stored in the cerebellum.



The Hindbrain

## Brain Development

**National Institute of Mental Health. Teenage Brain: A work in progress (Fact Sheet): A brief overview of research into brain development during adolescence.**

<http://www.nimh.nih.gov/health/publications/teenage-brain-a-work-in-progress-fact-sheet/index.shtml>

**American Academy of Child and Adolescent Psychiatry. Facts for Families: The Teen Brain: Behavior, Problem Solving, and Decision Making**

[http://www.aacap.org/cs/root/facts\\_for\\_families/the\\_teen\\_brain\\_behavior\\_problem\\_solving\\_and\\_decision\\_making](http://www.aacap.org/cs/root/facts_for_families/the_teen_brain_behavior_problem_solving_and_decision_making)

**Harvard Magazine. A Work in Progress: The Teen Brain**

<http://harvardmagazine.com/2008/09/the-teen-brain.html>

For additional resources, please refer to *The Teen Years Explained: A Guide to Healthy Adolescent Development*. Science-based and accessible, this guide is a practical and essential resource for parents and all people who work with young people.

*“Add this book to the ‘must-read’ list.”*  
—Karen Pittman,  
*Forum for Youth Investment*



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