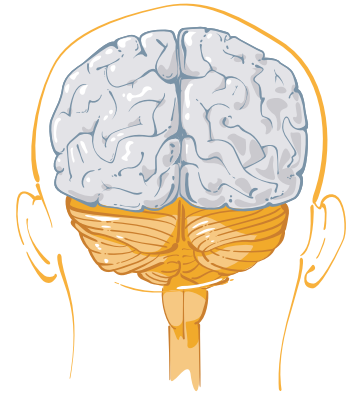


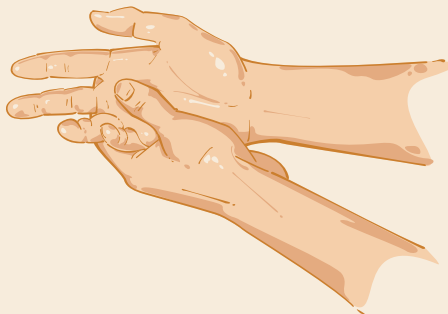
WHAT IS A SEIZURE?

A seizure is a sudden surge of electrical activity in the brain that usually affects how a person feels or acts for a short time. Some seizures are hardly noticed—perhaps a feeling of "pins and needles" in one thumb for a few seconds. During other seizures, the person may become unconscious, fall to the floor, and jerk violently for several minutes. Between these extremes is an astonishing range of feelings and actions.

Many people (including some people with seizures) think that the only real seizures are ones with strong, uncontrolled movements. They think that having a strange feeling in the stomach, blanking out for a few seconds, or jerking one arm a few times is nothing important, at most a minor "spell." But in fact, any change in feeling or behavior that results from an uncontrolled discharge of electricity in the brain is a seizure.



Auditory Hallucination



Pins and Needles

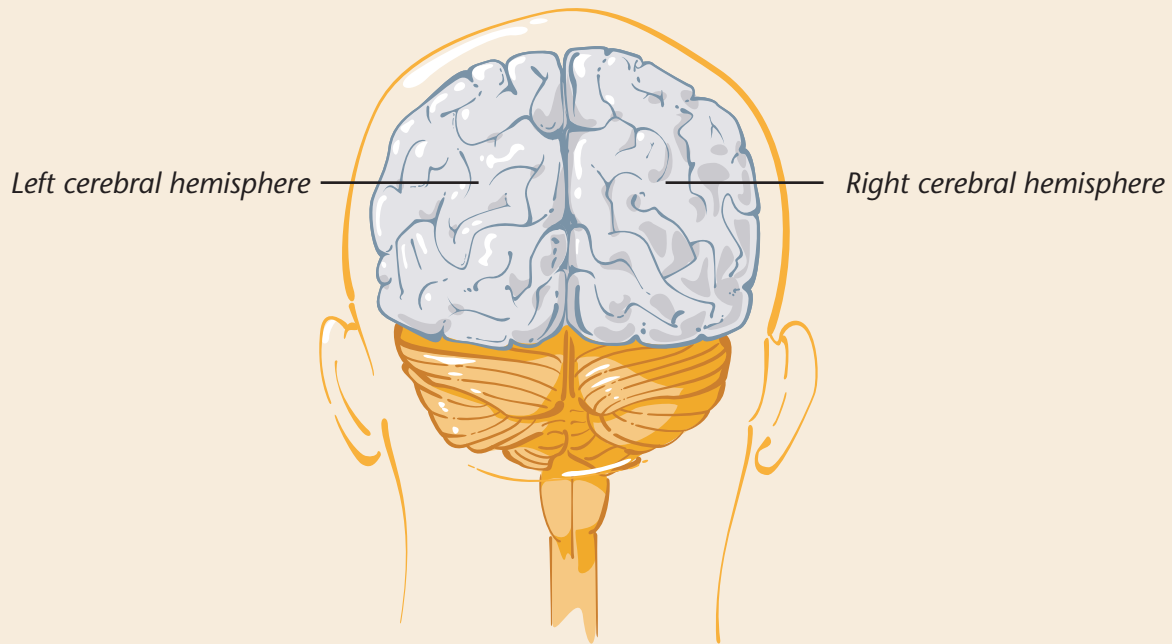


Disagreeable Odor

Seizures are not a disease in themselves. Instead, they are a symptom of many different disorders that can affect the brain. That's why anything that might be a seizure should be discussed with a doctor. To understand seizures, it will help to understand how the brain works and how it is organized.

Brain Anatomy

The large upper part of the brain is divided into left and right halves, called cerebral hemispheres (suh-REE-brul HEM-is-feers).



Each hemisphere contains four lobes: frontal, parietal (puh-RI-uh-tul), occipital (ok-SIP-ih-tul), and temporal (TEM-puh-rul). Each of these lobes contains many distinct areas that control different functions. The precise location of each of these areas is somewhat different in each person but the general pattern is the same.

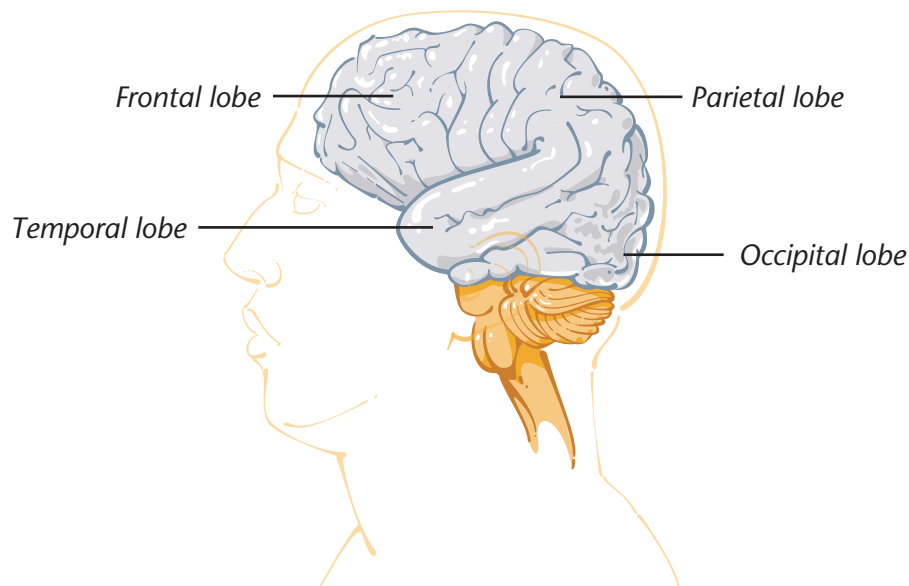
The lobes in each hemisphere control the opposite side of the body. The left side of our brain controls the movements of our right arm and leg, for instance, and things that appear to our left when we look straight ahead are seen and recognized by the lobes of the right side of our brain.

Frontal lobe:

The front (or "anterior") part of the frontal lobe is called the prefrontal cortex. In this part of the brain, we plan for the future, solve complex problems, and express and control our emotional behavior.

The back (or "posterior") part of the frontal lobe is involved in movement. The section called the premotor cortex coordinates complex, skilled movements. It's also where we store sequences of movements, so we can unlock the door, open it, and shut it behind us without having to think about each step.

One area in the lower part of this section enables us to speak. Behind the premotor cortex is the motor cortex. It contains the nerve cells that control our muscles when we want to move.

**Temporal lobe:**

The left and right temporal lobes are separated from the other lobes by a large groove. In most people, the two temporal lobes have somewhat different functions. The left temporal lobe generally enables us to understand language and to speak in a way that makes sense. The right temporal lobe usually helps us to remember things we see and to understand the emotions involved with speech. Other parts of the temporal lobes involve smells, emotions, and memory. The inside (mesial) part of the temporal lobe is often the source of seizures.

Parietal lobe:

The parietal lobe includes sensory areas, responsible for feelings of temperature, touch, pressure, and pain from the skin. It also contains association areas, which allow us to make sense of the things we see and hear. This is where sounds become words with patterns that we understand as speech. The parietal lobe is seldom the source of seizures

Occipital lobe:

The occipital lobe's primary job is vision. The occipital lobe is the first part of the brain to receive images from the eyes. Seizures usually do not start in the occipital lobe, but if they do, the person often sees flashing bright lights on the side opposite the lobe where the seizure is occurring.

Cerebellum:

The cerebellum is the round object with the heavily wrinkled surface that sits just below the occipital and temporal lobes. It controls our balance and coordination. It may help to regulate our thinking, too.

Cerebral cortex:

The cerebral cortex is the outer layer of the brain, 2 to 6 millimeters thick. It covers all the lobes of the two cerebral hemispheres and is connected between them by the corpus callosum. The bumps and grooves on the surface of our brains let us pack a lot more cerebral cortex inside our skulls than we could if the surface of the brain were smooth. That's good, because the cells in the cerebral cortex are where we do our thinking.

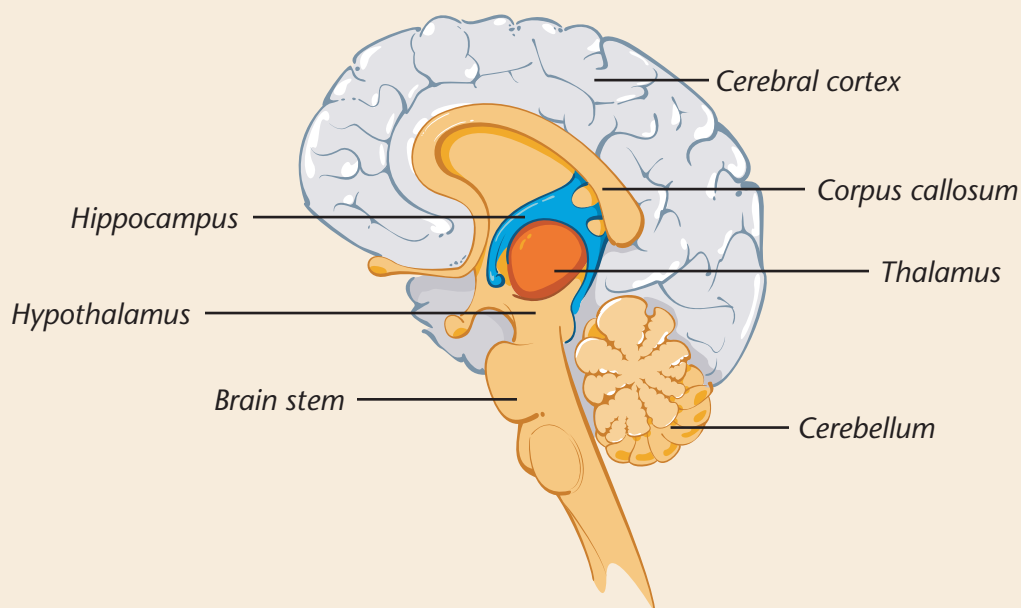
The cerebral cortex is made up of "gray matter"—neurons and supporting cells called glia (GLEE-uh). The neurons analyze and process information and then send signals through the nerve fibers called axons. These make up the "white matter" that lies beneath the cerebral cortex. The fibers of the white matter act like telephone wires, connecting various parts of the brain and carrying messages between the brain and the rest of the body.

Brain stem:

The brain stem controls sleep-wake cycles, breathing, and heartbeat. The lower part of the brain stem connects to the spinal cord and is not directly involved in epilepsy. The upper part of the brain stem does include some areas, such as the thalamus, that are important in certain kinds of epilepsies.

Corpus callosum:

The corpus callosum (KOR-puhs kuh-LO-sum) is a large bundle of white fibers that connects the left and right halves (hemispheres) of the brain. When seizures that start on one side of the brain spread to the other side, the surge of electricity passes through the corpus callosum.



Hypothalamus:

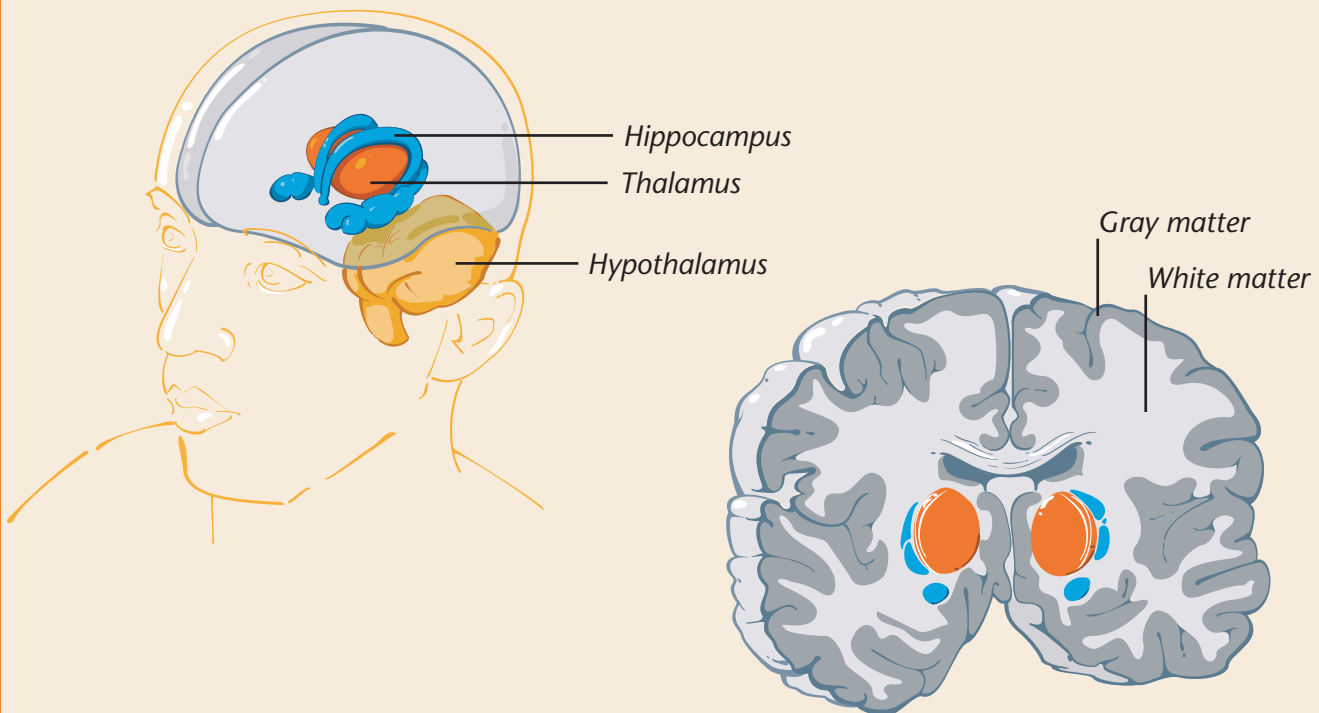
The hypothalamus (HI-po-THAL-uh-mus) is a small but important structure at the base of the brain. It controls many of our hormones through its influence over the pituitary gland. In turn, parts of the temporal lobe influence the hypothalamus. This connection may explain why seizures are often related to our emotions and to hormonal cycles.

Thalamus:

A large mass of gray matter in the posterior part of the forebrain that relays sensory impulses to the cerebral cortex.

Hippocampus:

The hippocampus is a seahorse-shaped structure located on the inside of each temporal lobe. It's important for memory. The cause of a person's epilepsy may damage it, so locating information becomes difficult. Scientists are debating whether seizures themselves also injure it.

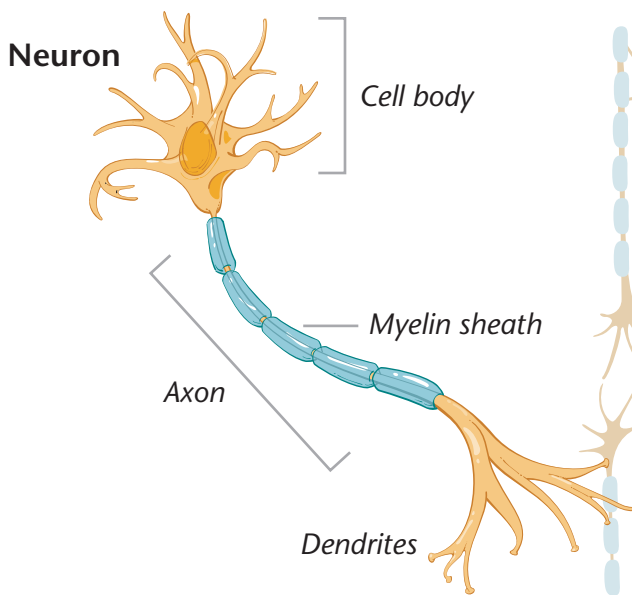


Gray matter forms the cerebral cortex and consists largely of nerve cells (neurons) and supportive cells (glial cells). The nerve cells work like computer chips, analyzing and processing information and then sending signals through the nerve fibers.

White matter lies beneath the cerebral cortex and is composed of nerve fibers. These fibers act like telephone wires, connecting different areas of the brain, spinal cord, muscles, and glands.

How the Brain Works

The human brain has about 100 billion nerve cells, also called neurons. Neurons carry signals around the brain and between the brain and the rest of the body. Each neuron produces electrical signals, but chemicals called neurotransmitters are responsible for spreading them.



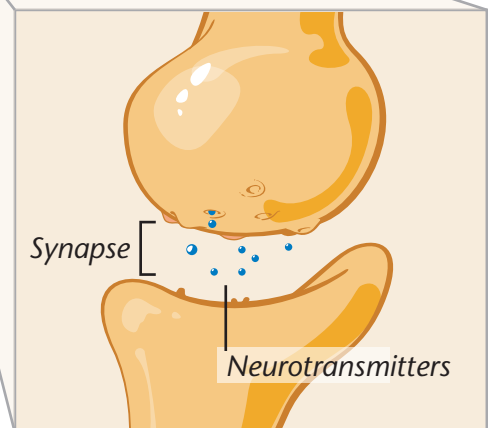
The electrical signal arises in the neuron's cell body and travels down the axon. At the end of the axon is a space, called the synapse (SIN-apse), between the axon of the first neuron and the dendrites of the next neuron.

At the end of the axon, a neurotransmitter is released. This chemical crosses the synapse and triggers receptors on the dendrites of the next neuron. The next neuron is stimulated to "fire"—producing an electrical signal—and the spread continues.

Not all neurotransmitters are the same. The ones that cause neurons to fire are called excitatory (ek-SI-tuh-TOR-ee) because they excite or increase brain activity. But other neurotransmitters cause neurons to stop firing.

These are called inhibitory (in-HIB-ih-TOR-ee) because they inhibit (block) firing, so there is less electrical activity in the brain.

According to one theory, epilepsy is caused by an imbalance between neurotransmitters that cause neurons to fire and those that cause them to stop firing.



Types of Seizures

Doctors classify seizures into two large categories, generalized and partial. These two categories include many individual types, usually identified by the kind of behavior the seizure produces.

GENERALIZED SEIZURES begin with an electrical discharge that involves both sides of the brain at once.

Tonic-clonic seizures:

These seizures are commonly called grand mal seizures or convulsions. They usually occur first in childhood or early adulthood. Each seizure has two parts, a tonic phase and a clonic phase. "Tonic" refers to an increase in the natural tension or "tone" of muscles, which causes stiffening. "Clonic" comes from the word "clonus" [KLOH-nus], which means rapidly alternating tightening and relaxation of a muscle—in other words, repeated jerking. A person having a tonic-clonic seizure first stiffens and then jerks.



Tonic-clonic seizures begin with loss of consciousness. The person stiffens, falls, and may cry out—not in pain but just because air is being forced through the vocal cords. Then the arms and legs begin to jerk in rhythm. The seizure usually lasts a minute or two. During that time, the person may drool; bite his tongue, cheek, or lip; or lose control of his bladder or bowels.

After the seizure, the person is usually confused and tired. He may fall asleep, though some may become agitated.

Tonic seizures:

In a tonic seizure, the body, arms, or legs make sudden stiffening movements. These seizures usually last less than 20 seconds and are more common during sleep. If the person is awake, he usually will remain conscious but may fall.

Atonic seizures:

"Atonic" means "without tone"— in these seizures, the muscles lose all strength instead of becoming stiff. The person remains conscious but may fall to the ground without warning. In a milder form, the person's head may droop or he may drop things. These seizures last only seconds and the person recovers right away. They usually begin in childhood, often in people who also have other types of seizures.

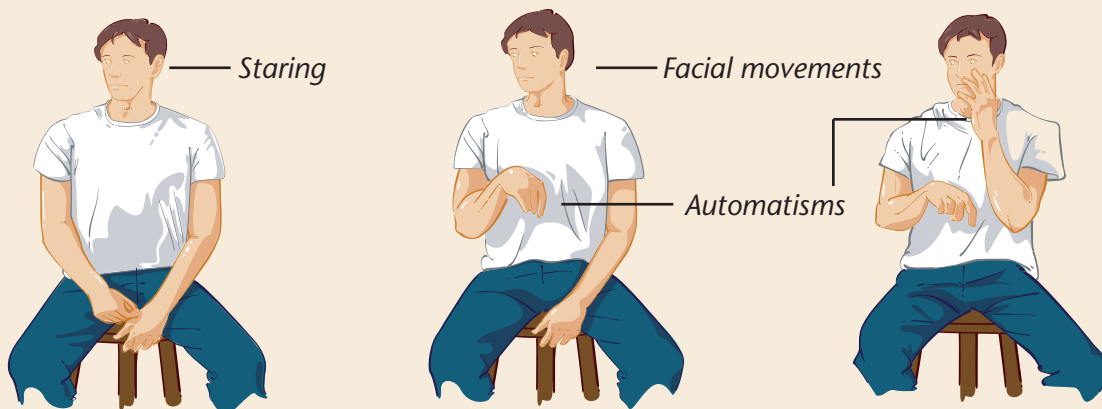
Myoclonic seizures:

"Myo" means "muscle" and a myoclonic jerk is a brief, shock-like jerk of a group of muscles. People who do not have epilepsy may experience a jerk like this while falling asleep. That's considered normal. Myoclonic seizures in epilepsy involve sudden jerks of the arms, shoulders, neck, body, or upper legs, affecting both sides at the same time. The person may fall. These seizures usually begin in childhood. Often they are part of a pattern of epilepsy that may also include other types of seizures.

Absence seizures:

Absence seizures are brief episodes of staring, which usually last less than 15 seconds. Another name for them is petit mal (PET-ee mahl). During the seizure, the person is not aware of what's happening and afterward usually does not realize that it has occurred. Besides staring, often the person will blink his eyes or make slight movements of his mouth or hands. There is no warning before the seizure, and the person is completely alert as soon as it's over.

Absence seizures usually affect children who are otherwise normal. They disappear by the late teens in a majority of these children.



PARTIAL SEIZURES are seizures that begin with an electrical discharge from a limited area

Simple Partial seizures:

The specific area of the brain where each of these seizures begins determines what the seizure will look or feel like. Simple partial seizures that start in the motor cortex of the frontal lobe may include involuntary movements. Seizures beginning in certain areas of the temporal lobe may feature an odd smell or taste. Seizures in other areas can produce bodily changes like sweating or goose bumps, or emotions like fear or happiness with no outside cause. What all these seizures have in common is that the person remains alert and can remember what happened.

Sometimes the electrical discharges spread to other parts of the brain. Then another type of seizure will follow the simple partial seizure. When this happens, the simple partial seizure that came first is called an aura.

Complex Partial seizures:

These seizures usually begin in a small area of the temporal lobe or frontal lobe, but they quickly involve areas that affect alertness and awareness. Then the person is no longer aware of what's happening. He will stare blankly and usually will make meaningless movements like lip smacking or picking at his clothing. He may repeat words or walk around. Some people having complex partial seizures need to be prevented from doing dangerous things like running into traffic, or embarrassing things like taking their clothes off.

Complex partial seizures usually last from 30 seconds to 2 minutes. Afterward, most people are tired and confused—some just for a few minutes, but others for hours. These seizures occur in people of all ages.

Sometimes the electrical activity spreads out through the whole brain. The seizure that follows, often a tonic-clonic seizure, will look the same as a seizure that was generalized from the beginning.

After a Seizure

The period immediately after a seizure—called the postictal period—varies depending on the type, duration, and intensity of the seizure, as well as other factors.

Some patients may feel some discomfort from muscle soreness, headache, and pain in the tongue or cheek if those areas were bitten. The person may be confused or tired. Their skin may appear pale or bluish.

For some patients, the postictal symptoms might be more troublesome than the seizure itself. Antiepileptic drugs may not alter the seizures but may minimize the postictal symptoms.

