

A small number of people have what is known as reflex epilepsy, in which seizures are set off by specific stimuli. These can include flashing lights, a flickering computer “monitor”, sudden noises, a particular piece of music, or the phone ringing. Some people even have seizures when they think about a particular subject or see their own hand!

What are other terms for reflex epilepsy?

Other terms for reflex epilepsy that you may come across include:

- epilepsy with reflex seizures
- sensory precipitation epilepsy
- stimulus sensitive epilepsy

There are also many terms for specific types of reflex epilepsy.

What causes reflex epilepsy?

The seizure stimulus is not the underlying cause of the epilepsy. Rather, it sends a particular message to a sensitive, seizure-prone area of the brain, excites the neurons there, and causes a seizure. Because this sensitive area is different for each person, no two people’s seizure stimuli are exactly the same.

Different types of reflex epilepsy may be caused by different things. Photosensitive epilepsy has a genetic component, although a single gene for it has not been identified. However, reflex epilepsy may also be caused by focal brain abnormalities

What are the features of reflex epilepsy?

There are many different types of reflex epilepsy, depending on the area of the brain that is affected. Seizure stimuli may be very specific, or they may be broad categories. They can include:

- flashing or flickering lights, including computer monitors or video games. This is called photosensitive epilepsy. It is the most common childhood form of reflex epilepsy, and the child may eventually outgrow it.
- the sight of a particular pattern; this is called visual pattern reflex epilepsy
- thinking about certain things
- performing a certain task, such as typing; this is called praxis-induced epilepsy
- reading
- language-related stimuli such as writing, listening to speech, singing, or reciting
- certain passages of music; this is called musicogenic epilepsy
- certain sounds; this is called audiogenic epilepsy
- surprises or startles
- eating
- making certain movements or being in a certain position
- touching a particular “trigger zone” on the body
- immersion in hot water, such as a bath

Visual sensitive epilepsy

Visual sensitive epilepsy can be caused by flickering light, television, blinking, or specific patterns. Visual sensitive epilepsy is the most common form of reflex epilepsy.

Pure photosensitive epilepsy

About 40% of people with seizures that are provoked by light have pure photosensitive epilepsy, the most common reflex epilepsy. In children with this syndrome, flickering light provokes generalized tonic-clonic seizures. This syndrome usually begins when the child is a teenager, and affects girls more often than boys. Television is the most common seizure stimulus, but any source of flickering light, such as light flickering through trees, can provoke a seizure.

The slower the flicker, the more likely it is to cause seizures. Conventional cathode-ray television sets flicker at the same rate as the current they are connected to. In North America, this is 60 Hz (60 cycles per second), and about 15% of people with photosensitive epilepsy are sensitive to it. In Europe, the current is slower and alternates at 50 Hz; about 50% of people with photosensitive epilepsy are sensitive to television that flickers at this rate. If a child sits very close to the television screen, she may see the individual lines on the screen, which flicker at half the speed of the picture. LCD televisions and monitors and newer plasma-screen televisions with progressive scan should not flicker, although some users report problems.

The colour of the flickering light is also a factor; one study found that rapidly alternating red and blue-green light could cause seizures even when the overall light level did not change. Flickering red light is more likely to cause seizures than light of other colours.

One of the most famous outbreaks of reflex seizures occurred on December 16, 1997 in

Japan, when nearly 700 people (mostly children) were treated for seizure symptoms after watching an episode of the Pokemon cartoon series. The official report identified the sequence that caused the seizures as “a low luminance, 12 Hz alternating red/blue stimulus.” As a result of this incident, some countries now forbid television stations to broadcast patterns that are likely to cause seizures.

Photosensitive seizures and spontaneous seizures

Children with juvenile myoclonic epilepsy and other idiopathic epilepsy syndromes may also have photosensitive seizures and spontaneous seizures, meaning that they can have both unprovoked seizures and seizures triggered by light. This condition usually begins in childhood or adolescence.

Pattern-sensitive seizures

About 30% of people with reflex epilepsy have pattern-sensitive seizures. In this syndrome, striped patterns may cause absence, myoclonic, or tonic-clonic seizures. These patterns may be seen in many places, including curtains, wallpaper, clothing, escalator steps, or in a television screen when it is seen close up. Because they are so common, the child and her parents may not make the association between the pattern and the seizures.

Self-induced seizures

About 40% of people with photosensitive epilepsy can induce their own seizures. If they are sensitive to flicker, they may induce seizures by waving a hand in front of their eyes or staring at a vertically rolling television image. If they

are sensitive to patterns, they may be drawn to television screens or venetian blinds. Some people can induce seizures by slowly rolling their eyes up and fluttering their eyelids. Some people find that this feeling is pleasant and relieves stress; they often do not want to give up their seizures. Treating them can therefore be difficult.

Idiopathic photosensitive occipital lobe epilepsy

Idiopathic photosensitive occipital lobe epilepsy is a rare syndrome that usually begins around puberty. Children with this syndrome have partial seizures that originate in the occipital lobe, which often become secondarily generalized. The seizures may be triggered by any of the stimuli described above. They begin with visual phenomena, usually bright, colourful rings or spots in the child's peripheral vision. They may be steady or flashing, and may be rotating or moving slowly. Some children have severely blurred vision or even blindness during the seizure. The child's eyes and head may turn to one side. She may feel nausea or stomach pain, or may vomit. Some children have head pain during the seizure. Headaches after the seizure are common, and feel different than the head pain during the seizure.

Seizures induced by thinking

Seizures induced by thinking are rare. They begin when the child is 15 years old on average. Most people with this type of seizure are men. In this syndrome, activities that involve complex thought, such as card games, board games, mental arithmetic, or making complex decisions, trigger seizures.

Praxis-induced seizures

Praxis-induced seizures are similar to seizures induced by thinking. However, they involve using a part of the body to perform a task. Typing is one example of a stimulus for this type of seizure. This syndrome causes myoclonic, absence, or generalized tonic-clonic seizures.

Reading and language-induced epilepsy

Primary reading epilepsy

Primary reading epilepsy usually begins when the person is between 12 and 25 years old. In this condition, seizures are provoked only by reading, and people do not have seizures at other times. Usually, while reading, the person's jaw clicks or jerks and, if she keeps reading, she may have a generalized tonic-clonic seizure. Other seizure types may also occur. People with this syndrome often have a family history of epilepsy, and cases of reading epilepsy that run in families have been reported. Primary reading epilepsy may be a specific form of language-induced epilepsy (see below).

Secondary reading epilepsy

Secondary reading epilepsy is very similar to primary reading epilepsy, except that people with this condition may also have unprovoked seizures.

Language-induced epilepsy

In language-induced epilepsy, stimuli such as writing, typing, listening to speech, singing, or reciting may trigger seizures. People with this syndrome have jaw jerks with abnormal EEG activity.

Some symptomatic epilepsies may also result in reading- or language-induced seizures.

Other forms of reflex epilepsy

Musicogenic epilepsy

In musicogenic epilepsy, the seizure stimulus is music. People with this syndrome often have very specific stimuli, so that their seizures are triggered by only one particular piece of music. However, researchers have not found any common features in the various pieces of music. Some people with this condition also have unprovoked seizures.

Startle epilepsy

In startle epilepsy (audiogenic), seizures may be provoked by loud noises or sudden surprises. Developmental delay and neurological problems are often seen with this syndrome.

Seizures in response to eating

Seizures in response to eating have been seen in young children as well as adults. They are usually related to symptomatic partial epilepsy. It is unclear exactly what happens in this type of seizure.

Proprioceptive-induced seizures

Proprioceptive-induced seizures appear to be provoked by certain movements or by having the body or limbs in a particular position.

Seizures induced by somatosensory stimulation and touch-evoked seizures

People who have damage in the sensory cortex of the brain may have partial seizures triggered by somatosensory stimulation (tapping or

rubbing a particular “trigger zone” region of the body).

This syndrome is different than touch-evoked seizures, which are generalized seizures that usually occur in babies and toddlers without damage to the brain. These seizures may be part of a fairly benign, idiopathic myoclonic epilepsy syndrome.

Hot water epilepsy

Hot water epilepsy is common in India but rare in North and South America, Europe, and Japan. In this syndrome, children (usually boys) have complex partial or generalized tonic-clonic seizures when hot water is poured over their head or they are immersed in hot water, such as in the bath.

There are other reflex seizures that do not fall into a defined category, such as those provoked by looking at a specific object such as one’s own hand.

How many other children have reflex epilepsy?

About 6% of people with epilepsy have reflex seizures. They are more common in children than adults, and more common in girls and women than in boys and men.

How do you know that a child has reflex epilepsy?

Reflex epilepsy is defined as reliably having seizures in response to a particular stimulus. If you suspect that your child has reflex epilepsy, it can help your child’s doctor make a diagnosis if you keep a record of:

- what your child was doing when the seizure occurred
- whether seizures often seem to happen under the same circumstances
- suspected stimuli

Your child will probably have an EEG. During the EEG, she may be tested with the possible seizure stimulus. For example, if she may have photosensitive epilepsy, she will be shown flickering light or specific patterns to confirm whether she has seizures in response to them. Note, though, that it is possible to have an abnormal EEG in response to flickering light without actually having reflex epilepsy.

How is reflex epilepsy treated?

If your child's seizure stimulus can easily be avoided, or if she is aware of subtle symptoms that may indicate she is about to have a seizure, she may not need to take anti-epileptic drugs. However, some seizure stimuli, such as visual patterns or thinking, can be hard to avoid in daily life. As well, some children with reflex epilepsy also have spontaneous seizures. In these cases, anti-epileptic drugs can control the seizures.

The most important way to control reflex epilepsy is to avoid or modify the stimulus. Your child's treatment team will help to develop a strategy for her to avoid her seizure stimuli.

If your child has photosensitive epilepsy, for example, she may try the following strategies:

- Avoid sources of flashing lights.
- Cover one eye and turn away from the flashing light if she notices any twitching or

jerking in her face, eyelid, or another body part.

- Wear sunglasses or polarizing eyeglasses.
- Watch a small television set in a well-lit room.
- Use a remote control to avoid approaching the television.
- Avoid looking at possible seizure stimuli with both eyes at once; cover one eye, changing eyes occasionally.

You may also wish to consider an LCD television or a plasma-screen television with progressive scan, although these are more expensive than conventional cathode-ray televisions. If you live in a country that has 50 Hz electrical current, it is possible to buy cathode-ray televisions whose screen refreshes at 100 Hz instead of 50 Hz. Note, also, that many computer monitors can be set to refresh at different rates; if your child has seizures in response to the computer screen, you may be able to change the refresh rate of the screen to help prevent seizures.

If your child has primary reading epilepsy, the following strategies may be helpful:

- Avoid reading for long periods.
- Take short breaks to think about something else.
- Use audio texts instead of reading.
- If her seizures happen in response to patterns or eye movement, mask part of the text.

If the child has self-induced seizures, they may be harder to treat. People with self-induced seizures may enjoy them and do not want to stop

having them. If this is the case, she may need a formal psychological evaluation and counselling.

More information

- [Drug Therapies for Epilepsy](#)

What is the outlook for a child with reflex epilepsy?

The outlook for a child with reflex epilepsy is quite variable, depending on the cause of

seizures and whether the child also has spontaneous seizures. The outlook is good if the seizures are controlled fairly easily, either by avoiding seizure stimuli or with medication. About one-quarter of children with photosensitive epilepsy will eventually lose their photosensitivity, usually when they are in their twenties.

