



# Your Questions Answered

## EPILEPSY

**Q** Can having high or low blood sugar cause a seizure?



**DR. ORRIN DEVINSKY RESPONDS:**

**A** Substantial changes in blood sugar—either low blood sugar (hypoglycemia) or high blood sugar (hyperglycemia)—can affect the excitability of nerve cells (neurons), allowing seizures to occur more easily. However, no definitive evidence shows that minor changes in blood sugar (e.g., >50 and <200 mg/dL) outside of the normal range provoke seizures.

Changes in blood sugar occur most frequently in people with diabetes. However, less common causes of hypoglycemia include the use of certain medications, excessive alcohol consumption, some critical illnesses, insulin overproduction, and endocrine deficiencies. Hyperglycemia may also be caused by certain medications (such as beta-blockers), illegal amphetamine drug use, and critical illness.

Sudden lowering of the blood sugar, usually from excess insulin administration (and, rarely, from a tumor in the pancreas), can cause a tonic-clonic seizure in anyone, whether or not they have a history of epilepsy. This kind of seizure (also called a grand mal seizure) involves the entire body, loss of consciousness, and violent muscle contractions. Other symptoms of hy-

poglycemia include sweating, fatigue, headache, anxiety, nausea, dizziness, alterations in vision, hunger, tremor, and confusion. Oral or intravenous glucose can be used to treat hypoglycemia, depending on the severity of the disorder. People who have diabetes with recurrent hypoglycemia should have their treatment regimen adjusted.

Having two or more seizures as the result of blood-sugar changes is not enough to diagnose someone with epilepsy, because these are considered “provoked” epileptic seizures as opposed to the “unprovoked” seizures associated with epilepsy.

Among people with epilepsy, fasting (which lowers blood sugar) or excess consumption of high glycemic foods has not been clearly shown to increase seizure activity. In fact, fasting induces a state of ketosis—an abnormally high concentration of chemical compounds called ketones, which are produced when fatty acids are broken down for energy—that can actually prevent seizures in many people with epilepsy.

Ultimately, we don’t know for sure if blood sugar plays a role in seizure control in people with epilepsy. However, several studies are under way and looking to enroll patients. See [clinicaltrials.gov](http://clinicaltrials.gov) under search words “glucose” and “seizure” for more information.

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## BRAIN INJURY

**Q** Does heading the ball in soccer damage the brain?



**DR. MICHAEL L. LIPTON RESPONDS:**

**A** In some cases where the ball travels at high speed, heading the soccer ball can cause concussion, which is a mild form of traumatic brain injury (TBI). Concussion is diagnosed when symptoms—such as confusion, disorientation, amnesia, dizziness, headache, and others—accompany a blow to the head. Most people recover fully from a concussion over days to weeks, although some may have persistent symptoms. These can include problems with cognitive function, such as thinking and remembering.

Studies of the link between soccer heading and cognitive function (such as memory, attention, and information processing speed) have had mixed results. Some experts have looked at the studies and argued that heading is in fact associated with poorer cognitive function in soccer players at the high school, adult-amateur, and professional levels. However, many of these studies combine heading the ball with other causes of head injury, such as colliding with another player or the goalpost, or hitting the ground. As a result, the role of heading alone, without recognized concussion, remains unclear and controversial, as noted in the American Academy of Neurology’s 2013 guideline update on concussion in sports

**DO YOU HAVE A QUESTION TO ASK THE EXPERTS?**

Send it to [neurologynow@lwwny.com](mailto:neurologynow@lwwny.com)

([neurology.org/content/80/24/2250](http://neurology.org/content/80/24/2250)).

In a 2013 paper published in *Radiology*, we reported a preliminary study that suggests excessive heading (more than a threshold of 885 to 1,550 times during the previous year, measured using a validated questionnaire) leads to changes in the brain and in cognitive function similar to those seen in people with concussion, even when the players have never experienced an actual concussion. Players reporting less heading were relatively unlikely to have changes in brain structure or cognitive performance (compared with those reporting above the threshold identified).

These results suggest that heading may be generally safe within limits. However, this is a preliminary study of a relatively small number of players. Thus, no specific recommendations can be made yet. For this reason, we are starting two large studies of heading in amateur soccer players to better understand

the effects of heading. These studies will look at the brain with magnetic resonance imaging (MRI) as well as detailed measurements of cognitive function and concussion-related symptoms. If you are in the New York City area and are interested in joining the study, please email [soccerstudy@einstein.yu.edu](mailto:soccerstudy@einstein.yu.edu).

Go to <http://bit.ly/NbvqJU> to watch a video interview with Dr. Gary Gronseth about the American Academy of Neurology's new guideline on concussion in sports.

*Michael L. Lipton, M.D., Ph.D., Fellow of the American College of Radiology, is associate director of the Gruss Magnetic Resonance Research Center at Albert Einstein College of Medicine and Director of MRI Services at Montefiore Medical Center, both in Bronx, NY.*



## Suspect Concussion?

# Remove from Play

Access the sports concussion guideline, resources, and app at [aan.com/concussion](http://aan.com/concussion).