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# Febrile seizures

## Possible outcomes

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**WHAT DID THE RESEARCHERS DO?** The investigators wanted to learn more about whether a common condition called “febrile seizures” was harmful to the brain.<sup>1</sup> They also looked at whether they could increase the risk of developing epilepsy later.

Febrile seizures are defined as seizures that occur in children with a high fever (over 101°F). They are common in children under the age of 5.<sup>2</sup> The study (called the FEBSTAT study) looked at children with the most severe form of febrile (fever) seizures, known as febrile status epilepticus (FSE). FSE is a febrile seizure lasting for more than 30 minutes. They studied 199 children who were between 1 month and 5 years of age. A febrile seizure was defined as a seizure that occurred with a fever of greater than 101°F, where there was no other identified cause of the seizure. The child could not have had seizures without fever prior to enrollment. They also excluded children who had any other known brain problem. Children were recruited from 5 hospitals in New York, Illinois, North Carolina, and Virginia. They received a brain wave study (EEG) as well as an imaging study of the brain (MRI) within 72 hours of the FSE. Blood samples were taken to determine whether the children had a virus causing their fever. Doctors were particularly interested in looking for specific viruses (the human herpesvirus 6 and 7) which are known to cause febrile seizures. These viruses have been found in the brains of patients who underwent surgery for severe epilepsy.<sup>3</sup> The children with FSE were compared to 96 children who were in a different study of febrile seizures. Unlike the FSE children, the comparison children had only had a brief febrile seizure with no unusual features.

**WHAT DID THE RESEARCHERS FIND?** Researchers found a number of differences between the children who had experienced the prolonged febrile seizures (FSE) compared to those who had only experienced a simple febrile seizure. More of the children with FSE had abnormal development before the FSE (6.8% vs 0%). Slowed development might have been an indication that children with abnormal brains

were at higher risk for developing FSE. Also, children with FSE had a much higher likelihood of having an abnormal imaging study (MRI). These abnormalities were mostly seen in a deep part of the brain (the “hippocampus”). This is the same area that is often found to be injured in adult epilepsy patients. Overall, 11.5% of the children with FSE showed MRI changes suggesting a recent injury to the hippocampus. This was not seen in any of the children with the milder febrile seizures. Another difference was that the children with FSE were more likely to have a hippocampus that was probably abnormal from birth. This was seen in 20 of the children with FSE, but only 2 with the milder febrile seizures.

**WHAT DOES THIS MEAN FOR CHILDREN WITH FEBRILE SEIZURES?** This study seems to indicate that prolonged febrile seizures could damage the brain and be a cause of future epilepsy. Fortunately, the more common mild febrile seizures were not shown to cause damage. Children with slowed development or mild abnormalities on MRI before the FSE may be at higher risk for these severe febrile seizures.

**WHAT IS THE NEXT STEP?** The FEBSTAT study is still ongoing. The researchers hope to continue following the children for many years. They are very interested in finding out whether the children who had the early signs of damage to their hippocampus will eventually develop epilepsy. They are also concerned that the injury to the hippocampus might affect memory, since this is the main function of that area of the brain. Children will be followed closely with testing to see their outcome.

### REFERENCES

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# About febrile seizures and epilepsy

**WHO GETS FEBRILE SEIZURES?** Febrile seizures are electrical discharges in the brain that cause generalized body shaking, in the setting of a high fever. They are a common condition in children between the ages of 1 and 5, but are also seen in younger and older ages. Febrile seizures occur in 2%–5% of all children.

**UNDER WHAT CIRCUMSTANCES DO FEBRILE SEIZURES OCCUR?** These are seizures that are provoked by a fever of over 101°F. Usually, the seizure occurs when the fever is rising rapidly.

**WHAT ARE THE TYPES OF FEBRILE SEIZURES?** Febrile seizures are defined as “simple” if they last less than 15 minutes, are not more severe on one side or the other, occur only once in a 24-hour period, and occur in a child who has not had seizures without fever and does not have an underlying metabolic disorder or brain infection.<sup>1</sup>

Children who are prone to febrile seizures often have more than one. They may have a febrile seizure each time they have a childhood illness that causes a high fever. Thirty percent of children with a first febrile seizure will have a recurrence. If the first febrile seizure occurs before the age of 12 months, 50% will have recurrence. Repeated bouts of febrile seizure are still considered “simple” if they fit the description above.

Seeing any seizure is extremely worrying for a parent. Fortunately, simple febrile seizures have not been found to be associated with increased risk of learning disability, behavior problems, or death.

**WHAT ARE COMPLEX FEBRILE SEIZURES?** Febrile seizures are considered to be complex if they last longer than 15 minutes, are stronger on one side than the other (focal), or occur more than once in a 24-hour period. About a third of febrile seizures have one or more complex features.

**WHAT IS THE CONNECTION BETWEEN FEBRILE SEIZURES AND LATER DEVELOPMENT OF EPILEPSY?** Overall, about 6% of children who experienced febrile seizures will develop epilepsy. Epilepsy is a condition in which recurrent seizures occur without a major trigger and without fever at a later age.<sup>2</sup>

- Single simple febrile seizures are not associated with development of epilepsy.
- Repeated bouts of simple febrile seizures lead to a very slight increase in epilepsy risk in children with febrile seizure under the age of 12 months or in children with a family history of epilepsy.
- Complex febrile seizures carry a higher risk of developing epilepsy later in life. Other risk factors include a family history of epilepsy, an underlying neurologic disorder preceding the febrile seizure, or the occurrence of 3 or more febrile seizures.

**WHAT IS THE CONNECTION BETWEEN FEBRILE SEIZURES AND LATER DEVELOPMENT OF SPECIFIC TYPES OF EPILEPSY?** Epilepsy that does not respond well to standard treatments is often caused by a scar in the brain. This scar can serve as the focal point for seizure onset. Patients with treatment-resistant temporal lobe epilepsy are often found to have a scar in a deep part of the temporal lobe. The scar is known as “mesial temporal sclerosis” (MTS), and people with this scar are said to have “mesial temporal lobe epilepsy.”

For a long time, doctors have known that there is a connection between febrile seizures and MTS. When they looked back they found that many patients with MTS had a history of febrile seizures. Surprisingly, when they looked forward in time, studies have failed to show that children with febrile seizures had a higher rate of developing MTS. Yet scientists still feel that there might be a connection that is just difficult to prove. It might be that only the very severe forms of febrile seizures lead to MTS. It also may take a long time to develop. This can make it harder to see a link. Discovering a connection is considered to be very important. If a connection is proven, we might be able to prevent later development of epilepsy in some children at risk.

## FOR MORE INFORMATION

AAN Patients and Caregivers site  
<http://patients.aan.com/golhome>  
Citizens United for Research in Epilepsy (CURE)  
<http://www.CUREepilepsy.org>  
Epilepsy Foundation  
<http://www.epilepsyfoundation.org>  
Epilepsy Institute  
<http://www.epilepsyinstitute.org>

People Against Childhood Epilepsy (PACE)  
<http://www.paceusa.org>

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