EEG tests and epilepsy

An EEG may be done in hospital in an outpatient clinic by a highly trained specialist called a clinical neurophysiologist. Sometimes it may be done at home. You will be shown how to do this.

Your doctor might ask you to have an EEG (electroencephalogram) test if:

- They think you might have epilepsy\(^1\) or
- You have epilepsy, and they need to know more about it\(^3\) or
- They are unsure whether or not your seizures are epilepsy\(^3\) or
- You are being considered for epilepsy surgery\(^4\) or
- They want to withdraw your epilepsy medicines\(^5\)

Sometimes an EEG is done to check whether someone is in non-convulsive status epilepticus.\(^6\) Non-convulsive status epilepticus can change a person’s level of awareness or cause confusion, but might not be recognised as a seizure without an EEG.

The results of an EEG can help doctors to make the right diagnosis and decide on the best treatment. They should always be interpreted by someone who specialises in reading EEG results. This is because reading an EEG incorrectly is one of the most common reasons for people to be given the wrong diagnosis.\(^7\)

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What does an EEG test do?

Your brain constantly produces tiny electrical signals. During an EEG test, small sensors, called electrodes, are placed on your scalp. They are attached using a special glue or paste. These are connected by wires to an EEG recording machine. The electrodes pick up the electrical signals from your brain and record them on a computer.

The electrodes only pick up the electrical signals. They don’t affect your brain and they don’t cause you any pain.

The electrical signals look like wavy lines and these wavy lines show your brainwave patterns. The EEG test can only show your brainwave patterns at the time the test is carried out. At different times, your brainwave patterns may be different.

Most people’s brainwave patterns look similar to other people’s. Sometimes the EEG test shows that a person has different brainwave patterns to other people. These are caused by unusual electrical activity in their brain. They can sometimes, but not always, show that the person has epilepsy.8

What information does an EEG test give?

An EEG test gives information about the electrical activity that is happening in your brain at the time the test is carried out.

With many types of epilepsy, you only have unusual electrical activity in your brain when you are having a seizure. The rest of the time your brain activity is normal. So, if your EEG test doesn’t show any unusual activity, it usually means that there is no epileptic activity in your brain at the time the test is being done. This doesn’t prove that you don’t have epileptic activity in your brain at other times. And it doesn’t mean that you don’t have epilepsy.

People with some types of epilepsy have unusual electrical activity in their brain all the time, even when they are not having a seizure. When they have an EEG test, the results can show certain brainwave patterns that doctors recognise. This information is very helpful for doctors when they are making a diagnosis.

A small number of people have unusual EEG test results, even though they never have seizures and they don’t have epilepsy.9 These could be

caused by other medical conditions, problems with their vision, or brain damage.\(^\text{10}\) So, an EEG that shows unusual brainwave patterns doesn’t always mean that you have epilepsy.

**Can an EEG test show what type of seizures I have?**

When an EEG test picks up unusual electrical activity, it shows the areas of your brain where it is coming from. And it can also show up some types of seizure. But it might not show up some *focal* (partial) seizures unless they involve a lack of awareness.\(^\text{11}\)

**Can an EEG test show if there is any damage in my brain?**

An EEG test only gives information about the electrical activity in your brain. It doesn’t show if there’s any damage or physical abnormalities in your brain.

**Will an EEG test cause me to have a seizure?**

There’s a very small risk that you could have a seizure during an EEG test. This could be caused by looking at a flashing light or breathing deeply.\(^\text{12}\) These activities are usually part of the test.

Your doctor might ask you to reduce your epilepsy medicine\(^\text{13}\) or have less sleep than usual before you have some types of EEG tests. This would also increase the risk that you would have a seizure around the time of having the test.\(^\text{14}\)

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Will I have to give my consent (permission) for an EEG test to be done?

You will usually have to give your consent to having an EEG test done. This is because there is a risk of having a seizure during the test. A video recording is usually taken as part of the EEG test. Your consent will also be needed for this.

Depending on your hospital, you might be asked to give your consent:

- By your consultant when they refer you to have an EEG or
- By post, if you are sent a consent form with the appointment letter or
- At the hospital, just before the test is carried out

If you give your consent, but then change your mind, you can withdraw your consent at any time.15

Will having a seizure during an EEG test affect my right to drive?

If you hold a driving licence, having a seizure could mean that you have to stop driving until you have been seizure free for 12 months.

If you are concerned about the risk of having a seizure, talk to the doctor who has asked you to have the test.

Will I have to have more than one EEG test?

There are several ways an EEG test can be done.

If you have an EEG test that doesn’t show any unusual electrical activity in your brain, your doctor might ask you to have another. It can be helpful, if possible, to have an EEG test at times when you are more likely to have a seizure. For example, this might be early in the morning. For some women, it might be around the time of having a period.16

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Standard EEG tests

You will usually have a standard EEG test at an outpatient’s appointment at the hospital. During the test, you sit or lie down. You may be asked to breathe deeply for some minutes and also to look at a flashing light. These activities can change the electrical activity in your brain, and this will show on the computer. This can help the doctor to make a diagnosis.

You will be asked to keep as still as possible during the test. Any movement can change the electrical activity in your brain, which can affect the results.

Routine EEG recordings usually take 20 to 40 minutes, although a typical appointment will last about an hour, including some preparation time at the beginning and some time at the end. Other types of EEG recording may take longer. You can go home as soon as the test has been done.

Sleep EEG tests

Your doctor might ask you to have an EEG test while you are asleep. This could be because your seizures happen when you are asleep. Or you may have had a standard EEG test when you were awake, but it didn’t show any unusual electrical activity. When you are asleep, your brainwave patterns change and may show more unusual electrical activity. There are also some types of seizure that mainly happen during sleep.

A sleep EEG test is usually done in hospital, using a standard EEG machine. Before the test, you may be given some medicine to make you go to sleep. The test lasts for one to two hours and you usually go home once you have woken up.

Sleep EEGs can be particularly useful when epilepsy is suspected in children under 5. This is because there are some types of epilepsy which are common in young children, where seizures mainly happen in sleep. Examples are the epilepsy syndromes autosomal dominant.

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For some older people, a sleep EEG can also be useful as brainwave patterns related to focal seizures are more likely to be seen in sleep. Focal seizures are the most common type of seizure in older people.\(^{22}\)

## Sleep-deprived EEG tests

A sleep-deprived EEG test is done when you have had less sleep than usual. When you are tired, there is more chance that there will be unusual electrical activity in your brain. Your doctor might ask you to have this test if you have had a standard EEG test, but it didn’t show any unusual electrical activity.\(^{23}\) A sleep-deprived EEG can show up subtle seizures, including absence, myoclonic or focal (partial) seizures.\(^{24}\)

Before you have a sleep-deprived EEG test, your doctor may ask you not to go to sleep at all the night before. Or they may ask you to wake up much earlier than you usually do.

The beginning of the sleep-deprived EEG test is the same as a standard EEG test. You may then fall asleep or doze while the EEG is still recording the activity in your brain. The test lasts for a few hours and you usually go home once you have woken up.

## Ambulatory EEG tests

Ambulatory means designed for walking. So you can have an ambulatory EEG test while you are moving around. An ambulatory EEG test is designed to record the activity in your brain over a few hours, days or weeks. This means there is more chance that it will pick up

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unusual electrical activity in your brain, than during a standard or sleep EEG test.\textsuperscript{25}

An ambulatory EEG uses electrodes similar to those used on a standard EEG test. However, the electrodes that are attached to your head are plugged in to a small machine that records the results. You can wear the machine on a belt, so you are able to go about your daily business.\textsuperscript{26} You don't usually stay in hospital while the test is being done.

Your doctor will ask you to keep a diary of your activities, such as sleeping and eating, while you are wearing the ambulatory EEG. They will also ask you, or somebody who is with you, to keep a detailed record of any seizures you have. They will then be able to match up what has been happening with the results of your brainwave activity on the EEG test results.

**Video-telemetry tests**

**Hospital video-telemetry**

During a video-telemetry test (vEEG), you need to stay in hospital. A vEEG involves wearing an ambulatory EEG (see above). At the same time, all your movements are recorded by a video camera. The test is usually carried out over a few days. Sometimes your epilepsy medicine is reduced or withdrawn.\textsuperscript{27} This is to increase the chances that you will have a seizure that can be recorded.

After the test, doctors can watch the video to see any seizures that you had. They can also look at the EEG results for the time you were having the seizure. This will tell them about any changes to your brainwave patterns at the time of the seizures.

**Home video-telemetry**

Home video-telemetry can be done at home in a similar way to an ambulatory EEG (see above). You will be shown how to set up the equipment, which will include a video recorder.

\textsuperscript{25} The role of outpatient ambulatory electroencephalography in the diagnosis and management of adults with epilepsy or nonepileptic attack disorder: A... - PubMed - NCBI. Available at: https://www.ncbi.nlm.nih.gov/pubmed/26515156 [Accessed December 22, 2016].


You will usually have had other types of EEG tests before you are considered for a vEEG. Here are some examples of why your doctor might ask you to have a vEEG:

- It’s not clear what type of seizures you have or
- Your epilepsy medicine isn’t working well or
- There’s a possibility that your seizures are not caused by epilepsy, but something else or
- You’re being assessed for epilepsy surgery

**Invasive EEG-telemetry**

Some people who are being considered for surgery will have invasive EEG-telemetry (iEEG). A neurosurgeon will do an operation to place the EEG electrodes directly onto the surface of the brain or into the brain. The electrodes are called ‘strip’ or ‘grid’ or ‘stereo’ electrodes.\(^{28}\)

The reason for iEEG is to find out where exactly your seizures are coming from. Another part of this test is called ‘cortical mapping’. Cortical mapping is done to see exactly which part of your brain is responsible for things like your memory or speech. It is done to reduce the risk of complications after surgery.

If you have any other questions before an EEG test, you could ask your family doctor, epilepsy specialist, epilepsy specialist nurse or the person who will carry out the test.

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About this information
This information is written by Epilepsy Action’s advice and information team, with guidance and input from people living with epilepsy, and medical experts. If you would like to know where our information is from, or there is anything you would like to say about the information, please contact us at epilepsy.org.uk/feedback

Epilepsy Action makes every effort to ensure the accuracy of information but cannot be held liable for any actions taken based on this information.

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Epilepsy Helpline
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