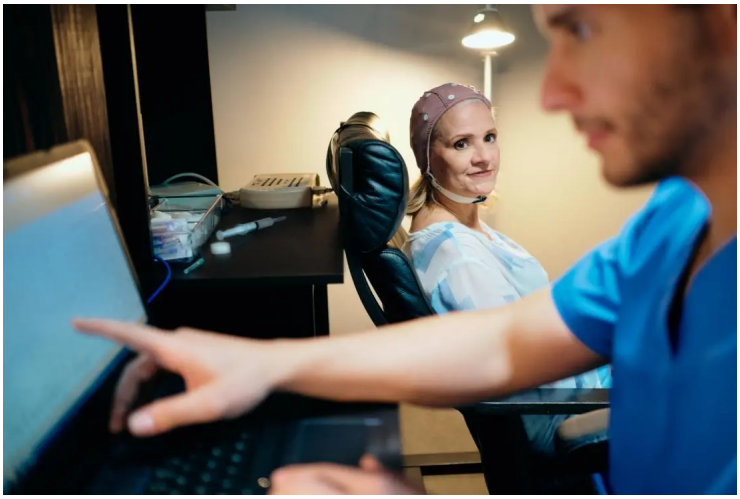
Using EEG data to diagnose Parkinson's disease

By Lauren Sharkey on May 27, 2019

Currently, diagnosis of Parkinson's disease relies on a neurologist's professional opinion. Researchers behind a new study believe that an EEG may be a more effective alternative.



New research suggests that an EEG test could help diagnose Parkinson's disease.

Parkinson's disease affects more than 10 million people worldwide, according to the Parkinson's Foundation, but no scan has been proved to definitively diagnose it.

Instead, a neurologist will assess a person by asking them to carry out certain tasks. These may include writing or drawing, walking, and speaking.

They will also examine the face and limbs to check for signs of tremors and facial expression difficulties.

As diagnosis is currently rather subjective, researchers have been trying to find an easier and more scientific method. A team from the University of Oregon, in Eugene, and the University of California, San Diego, has studied the possibilities of an EEG.

An EEG records electrical activity produced by the brain via small sensors attached to the scalp. Attempts to use EEG readings for Parkinson's disease diagnosis have not always produced the results that researchers have been looking for.

Nicole Swann, Ph.D., the principal investigator of the new study and an assistant professor at the University of Oregon's Department of Human

Physiology, says that this is because, in the past, sine waves were the focal point. These are beta waves filtered to appear rounder.

A search for sharpness

But it is the angles and sharpness of brain waves that could hold the key to detecting Parkinson's, according to the new study's findings, which appear in the journal *eNeuro.*

While working on his doctorate at the University of California, San Diego, fellow study author Scott Cole, Ph.D., realized a potential link between the disease and sharp brain waves.

Using EEG readings taken from 15 Parkinson's patients and 16 healthy individuals, the team honed in on the unfiltered waves.

"The raw signals go up and down like sine waves but with more asymmetry," explains Swann, adding, "The steepness — the slant — turns out to be important in Parkinson's patients."

Indeed, the team noticed that Parkinson's patients who were not taking medication had a sharper peak at the top of their brain wave, compared with the bottom.

Finding that a noninvasive method such as an EEG could be a promising diagnostic tool may have important consequences for the future of the disease. The team is hoping that doctors and researchers can use the test to track changes related to Parkinson's in the brain over the years.

"We don't know yet whether this approach will be better, but it could provide easily obtained brain measurements that would be helpful and possibly used in tandem with clinical observations and other EEG measurements," notes Swann.

Changing the course of treatment

The EEG method could also have an effect on treatment. Currently, doctors can prescribe medication or implant an electric stimulator into the brain.

"If there were real-time measures of how effective treatments are at

be adjusted in real time," says co-author and University of California neuroscientist Bradley Voytek, Ph.D.

"In the case of an invasive brain stimulator, this might mean only applying electric stimulation when it's needed."

“In the case of pharmacology, it would mean adjusting a drug’s dose, much like continuous glucose monitoring done by an implant can signal a pump to adjust insulin levels as needed.”

For the researchers, a bigger study examining EEG data, medical histories, and self-reports from patients is on the cards.

If the results prove to be consistent, people with Parkinson’s could eventually carry out their own EEGs at home, sending the data straight to a neurologist for immediate analysis.

The only issue with this, notes Voytek, is that obtaining the right brain waves is not easy to do in a home environment. Further research will prove whether this, too, can be changed.

Parkinson's Disease Neurology / Neuroscience Seniors / Aging

What to know about EEG tests

Medically reviewed by Seunggu Han, M.D. — By Shannon Johnson on May 16, 2019

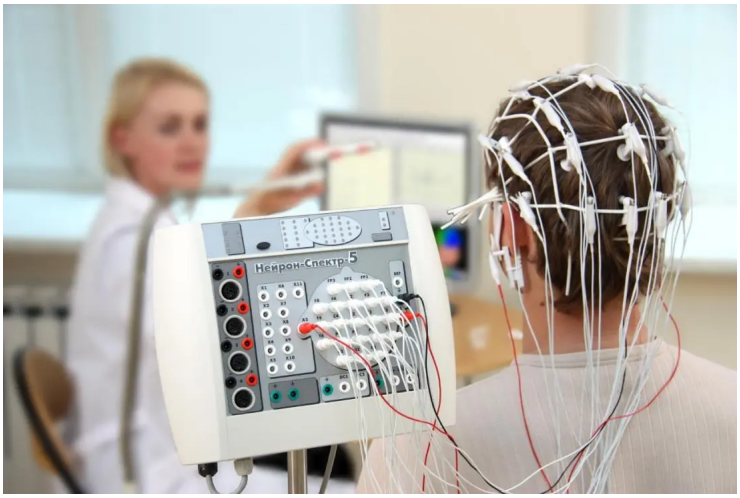
An electroencephalogram, or EEG, is a test that helps doctors diagnose problems with the brain’s electrical activity, such as seizures. An EEG test uses a special cap with electrodes to detect the electrical activity of the brain.

The EEG test is one of the best diagnostic tools for epilepsy and other seizure disorders. Doctors may use an EEG alongside imaging scans, such as CT scans or MRI scans, and laboratory tests to diagnose epilepsy.

Doctors also use EEG tests to look at how other brain disorders affect the patterns of electricity, or brain waves, in the brain.

In this article, we take a close look at EEG tests, including their uses and possible results. We also explain how healthcare professionals carry out the test and how to prepare for it.

Uses



An EEG test can help with diagnosing and assessing a range of conditions.
Image credit: Baburov, 2009.

Brain cells communicate with one another using electrical signals. Certain brain-related disorders can disrupt these signals. An EEG test measures changes in the brain's electrical activity.

Doctors primarily use EEG tests to diagnose different types of seizure disorder. The tests can detect the presence of a seizure and identify where in the brain it has started.

EEGs can also help doctors evaluate other conditions, including:

- confusion
- dementia
- head injuries
- infections
- tumors
- sleep disorders
- degenerative diseases
- metabolic disturbances that affect brain function

Procedure and what to expect

During an EEG test, a skilled EEG technician will place an electrode cap on the person's head. This cap contains between 16 and 25 flat metal discs called electrodes, which measure the electrical activity of the brain.

The EEG test is not invasive, painful, or harmful, and it has no lasting effects.

According to the Epilepsy Foundation, the procedure usually lasts approximately 20 to 40 minutes. Including the preparation time, the entire test may take 1 to 1.5 hours. The person will relax in a chair or lie on a bed during the test.

The EEG technician will measure the person's head, and they might use a wax crayon to mark where the electrodes should go. They will rub a paste called conductive gel between the electrodes and the scalp to make sure that the electrodes receive a strong signal from the brain. Doing this helps ensure that the recording will be of high quality.

During the test, the room will be quiet and dark. The technician may ask the individual to perform various commands, such as blinking the eyes, looking at flashing lights, or breathing deeply, because these behaviors might bring on abnormal electrical signals.

Sometimes, a doctor will record an EEG on video so that they can compare the electrical signals with what is happening to the body.

If the person has a seizure during the EEG, the technician will respond appropriately to help them.

After the procedure, the technician will remove the electrodes, and the person can usually go home unless their doctor advises against it. It is easy to wash the EEG gel out of the hair.

Preparation

Hair styling creams or gels can affect the procedure.

Doctors will usually advise a person to avoid caffeine for 8 hours before an EEG test. A person should also not use styling creams or gels in their hair before undergoing this procedure.

If a person takes any medication for a seizure disorder, they should speak to their doctor about whether it is safe to take before the test.

A doctor may ask a person to limit their sleep before an EEG so that they are sleep-deprived during the test. An EEG test during sleep or following sleep deprivation has a better chance of showing irregular brain activity.

Normal ranges

The EEG test records electrical activity and looks for any abnormalities.

Doctors can recognize the changes that indicate seizure-related brain activity, which they refer to as epileptiform brain activity. The EEG test can sometimes detect this activity even when a person is not currently having a seizure. An EEG may involve deep breathing or flashing lights, both of which can bring on epileptiform activity.

A trained professional will look at the output from the electrical recordings and interpret whether the results are typical or whether there are signs of abnormal activity, including seizures.

Having normal EEG results does not always rule out epilepsy as it does not show what happens to the brain at other times. Also, it is possible to have abnormal findings on an EEG and not have epilepsy. Some types of epilepsy are more difficult than others to detect using just an EEG on the scalp.

Interpreting the results

A doctor can help with interpreting EEG results.

EEG tests demonstrate what is happening in the brain at the time of the test. If a person has a seizure during an EEG, this interrupts normal brain activity, and the technician can see abnormal brain waves. These patterns help diagnose epilepsy.

During an EEG, the technician will place the electrodes in a particular arrangement called the 10-20 system. They will place each electrode either 10% or 20% of the distance between specific points on the head. Each electrode has a number, and the technician will put the electrodes with odd numbers on the left side of the head and those with even numbers on the right.

Each electrode also has an assigned letter, which will be either F for frontal lobe, P for parietal lobe, O for occipital lobe, T for temporal lobe, or Z for the midline. The different lobes of the brain are responsible for particular functions, such as language, memory, or speech.

Therefore, when a technician or doctor looks at the EEG results, they can identify the part of the brain in which the abnormal electrical activity is occurring.

In a partial or focal seizure, only some electrodes will detect abnormal activity. In a generalized seizure, any unusual activity will show up on all of the electrodes.

The various types of brain wave on an EEG have different names, and doctors categorize them by their frequency, which is the number of waves per second. Examples include alpha waves, delta waves, and spike waves. Certain types of wave occur at specific times or in particular areas of the brain.

Together, all of the information on abnormal brain waves that an EEG test provides can help doctors identify a seizure disorder or another disorder of the brain.

Summary

An EEG test, along with other diagnostic tests, can help identify if a person has epilepsy or another seizure disorder. It can also provide doctors with more information about other disorders relating to the brain.

An EEG is typically brief and often takes place in an outpatient setting. An EEG technician will monitor the person during the test.

A doctor will review the results of the EEG once the test is complete. A person can follow up with their doctor regarding the results of the test and ask them any questions they may have.

Last medically reviewed on May 16, 2019

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