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EDITORIAL

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### Application of Digital EEG (Electroencephalogram) Sensors in Neurosciences

The use of cutting-edge technology has led to notable breakthroughs in neurosurgery, the medical specialty focused on treating nervous system problems. Wearable headsets that use Digital Electroencephalography (EEG) sensors represent one of the biggest developments in this industry. The way neurosurgeons monitor and treat patients with neurological disorders has been changed by digital EEG devices. A non-invasive neurophysiological method for recording brain electrical activity is called electroencephalography (EEG). Analog recording techniques are used in traditional EEG, which has limitations for data processing and storage. On the other hand, digital EEG sensors have brought about a number of benefits by translating electrical brain signals into digital data for immediate analysis and long-term storage. Digital device design technology includes wired/wireless communications and electrode connections. There are wet (e.g., soft gel based, or with saline solution) and dry EEG devices. They are devices are available with several other sensors along with the measurement of brain's electrical activity. The ancillary sensors with EEG sensor



Because they give neurosurgeons vital tools for preoperative screening, intraoperative monitoring, and postoperative assessment, digital EEG sensors have considerably revolutionized the discipline of neurosurgery. Neurosurgeons can assess the degree of a brain injury and pinpoint the cause of seizures with the use of these sensors. Surgeons can accurately identify the damaged regions and

are: ECG sensor (to record the heart's response), EOG sensor (to measure human eye movements), PPG (to monitor blood volume changes), and EMG sensor (for muscle activity data). EEG headsets are also available to associate with the brain-computer interface (BCI) applications. Through BCI, we can help people with disabilities. These neurogadgets are also being created to help persons with impairments, such those who have limb paralysis. Brain-wave activity may be immediately ascertained from real-time EEG readings. EEG data have been used to diagnose and forecast a wide range of aberrant brain disorders and cognitive deficits. Electrical activity of brain can be rapidly evaluated from multi-channel-based headsets comprised of electrodes containing sensors. Researchers have applied these digital devices for cognitive neuroscience, behavioral neuroscience, and in neurophysiology. Commercially, the EEG devices are available with 14-channel wireless headset, or with 32-channel saline wireless EEG head cap system. The software provides performance metrics and raw EEG data.

arrange the surgical approach by tracking the patient's brain activity prior to surgery. Digital EEG sensors can be used to track the patient's brain activity in real time during surgery. In order to eliminate the seizure focus, patients with drug-resistant epilepsy frequently undergo surgery. An important factor in accurately locating the epileptogenic zone is the use of digital EEG sensors. The possibility of a successful operation and seizure management is increased when the location causing the seizures is identified by continuous monitoring before to and during surgery. Functional brain mapping, which makes use of digital EEG sensors, aids in pinpointing important regions in charge of speech, movement, and sensory perception. This is crucial to know when organizing surgery for brain tumors or epileptogenic foci that are close to these areas. Neurosurgeons can improve their patients' quality of life by maintaining crucial processes. They are expected to support the evaluation of the patient's recuperation, look for any problems, and confirm that the surgical intervention has been effective in reducing neurological diseases.

Digital EEG sensors' real-time monitoring capabilities enable quick surgical corrections, reducing the chance of problems and enhancing patient outcomes. Certain expectations are placed on the Digital EEG devices, stating that they should assist neurosurgeons in customizing their treatment plans to the specific brain anatomy and pathology of each patient, leading to more efficient and individualized care. Digital EEG sensors help to enhance patient outcomes and quality of life by guaranteeing that surgery is properly focused and that vital functions are retained. Caricato et al. (2020) evaluated the performance of wireless headset for ICU patients

whose continuous brain electrical activity monitoring is mandatory. The 8-electrode EEG headset was found easy to position it as compared to the conventional EEG devices. This simplified EEG system could work even without an EEG specialist present, albeit there are a few drawbacks to consider. When compared to conventional methods, it was quicker to place and could be utilized for ongoing EEG monitoring. It might be very helpful in an emergency situation as part of the diagnostic procedure.

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