

# [Wearable electroencephalography essay](https://assignbuster.com/wearable-electroencephalography-essay/)

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## Introduction

Wearable Electroencephalography is the resultant evolution of ambulatory Electroencephalogram EEG. Whereby, it is a typical noninvasive technique for taking measurements of brainwaves of a person. The technique is applied in diagnosis related to sleep disorder, epilepsy, and brain computer interfaces. It is made possible by placing the electrodes on the scalp whereby it senses the microvolt signals generated from neuronal activity that is being synchronized in the brain. The ambulatory EEG is bulky whereas the wearable Electroencephalography is small and can be worn on the head.   
In this paper we are going to focus on the wearable EEG technology unearthing the portable EEG systems requirements and then relating them to the wearable EEG technology core applications which include: brain computer interface, epilepsy and sleep disorder diagnosis. The paper will dwell majorly on epilepsy.   
The EEG technology works by way of sensing electric signals relayed by a scalp connected to electrodes. These signals are then amplified and then stored. The signals will then be retrieved by way of a differential architecture which removes the common mode interference signals from the electrode pair and record. This forms the EEG channel. The modern ambulatory EEG systems carry up to 24 channels and wireless systems carry 8 channels.   
The future trends of EEG promises more on better ways of sampling frequencies, channels of recording, electronics of low power consumption, improved ways of data compression and modern electrode technology. Increasing the sampling resolution is another possible trend on this technology.   
Epilepsy is a prevalent and severe disorder of neurological nature are characterized by recurring seizures that notably affect one‘ s life quality. And as such many individuals who suffer from this condition have often been misdiagnosed. It is as a result of this that wearable EEG comes in as a diagnostic tool to solve the problem on epileptic persons.   
A standard EEG examination on epilepsy takes 20 to 30 minutes and thus is restricted to only record inter seizures epileptic discharges (IEDs). Monitors lasting up to 24 hours raise the probability of detecting IED related to sleep or sleep wake alteration. This is also important in recording seizures. The ambulatory outpatient EEG monitors helps in overcoming the inpatient EEG limitations.   
However, outpatient ambulatory has a number of pitfalls despite of its benefits over the inpatient ambulatory. This includes-: matters in making sure that electrodes stay connected for the recording duration, portability, the wire compliance can limit movement of the patient, transmission and storage of data needs a lot of power hence it limits the lifetime of the battery, and EEG of human analysis consumes time.   
A research that was carried out in the United States confirms that 70 million people suffer from sleep. This is largely attributed to road accidents. This therefore has made sleep diagnosis complicated and also posed economic limitations. Thus the need to monitor multiple body functions required a small and economical device. In this case a wearable EEG device.   
The EEG technology originated from medical instrumentation and it is believed that signals are not only used in indicating abnormal health states. It is for this reason that it is used in brain computer interfaces. The rational progression where a person influences the computer operation based on their thinking is closing the loop: with the aid of a computer EEG monitors a person and applies it to generate a feedback affecting the environment of the user. This is the research concept behind augmented cognition. However the relevant methods are still at research stage. But in the end the future of brain computer interface relies on wearable EEGs.   
The current technology limitations points to the research necessary to make wearable EEG systems viable. The main research areas includes: current electrode technologies and lower power consumption electronics.   
The research therefore focuses on pointing out the systems level tradeoffs and optimizations as well as coming up with an electronic design technique to mitigate these limitations. In relation to the insight and motivation from neurologists we are channeling our energies on how to optimize the system electronic aspect to lower the consumption of power.   
In the data compression tradeoffs the paper investigates the optimal data reduction skills to make use of, as a foundation for future accomplishment. The following principles guide the compressions exercise; reduction of recording quality, use of data compressions algorithm on the raw signals and not transmitting continuous data.   
In conclusion I wish to echo the sentiments of neurologist on the need for wearable EEG as a solution to curb this menace on epilepsy. Therefore if the wearable EEG will be satisfactorily developed they will play a major role in the medical field in the future.

## Reference

Gilliam, F, Kuzniecky, R & Faught, E 1999, Ambulatory EEG monitoring, Neurophysiol.