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The EEG report is structured to include demographics of the patient studied and reason for the EEG

Patrick L. Purdon

Associate Bioengineer, Department of Anesthesia, Critical Care and Pain Medicine, Massachusetts

Correspondence to: Patrick L. Purdon, Department of Anesthesia, Critical Care and Pain Medicine, Massachusetts General Hospital, 55 Fruit Street, GRB-444, Boston, Massachusetts Tel: 617 726 7487; E-mail: patrickp@nmr.mgh.harvard.edu

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EDITORIAL NOTE

The electroencephalogram (EEG) is a widely used non-invasive method for monitoring the brain. It is based upon placing metal electrodes on the scalp which measure the small electrical potentials that arise outside of the head due to neuronal action within the brain. Its key benefits compared to other brain imaging techniques are that it has a very high time resolution – able to track events within the brain with millisecond accuracy – and that it is in principle portable allowing real-world neuroimaging to be performed outside of clinical and lab environments. As a result it is a very widely used sensing modality for a range of health and wellbeing applications ranging from epilepsy diagnosis to emotional monitoring.

To overview the EEG, it is first necessary to consider, at a high level, the origin of the signal within the brain, the set up of the recording instrumentation and the typical signals that are obtained. This section introduces these topics to give a general background to the more detailed considerations of different electrode and amplifier types Research into the precise cerebral origin of EEG signals that manifest outside of the head is still ongoing . It is clear that the brain has a large number of electrical sources present in it: each neuron has intrinsic electrical properties as action potentials are generated by voltage-gated ion-channels in the cellular membranes, and synapses operate based upon the flow of sodium and potassium ions.

The scalp EEG is a very large-scale sum of this electrical activity from large populations of neurons and glial cells operating in synchrony and with volume conduction effects affecting the size of the brain area to be considered. For practical use, the EEG can be viewed as an emergent property of these populations and networks: a voltage waveform with its own characteristic shapes and properties appears on the scalp due to the neuronal action within the brain, and it is not necessary to consider the detailed cellular origins to make meaningful use of these EEG signals.

Although a wide range of choices are available when performing a modern EEG recording, the conventional set up that first comes to mind when discussing the EEG . This illustrates a user with a head cap on which has holes to hold a number electrodes next to the scalp. Each electrode has a long wire which allows it to be connected to recording instrumentation. On each electrode a conductive gel is placed in order to ensure that a good contact is made between the metal of the electrode and the scalp. In conventional EEG this gel is critical to getting a good electrical contact with the head, and it can act as a mechanical buffer to ensure that the connection is maintained even during and after head movements.

The EEG is a very widely used technology for neuroimaging. It is unique amongst sensing methods in that it can monitor the brain portably, over a long period of time, and with a high time resolution for capturing rare and transient events. As a result it has seen substantial use in medical diagnoses and increasingly in out-of-the-lab brain monitoring.