# Study Shows Electrical Fields Influence Brain Activity

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Neuronal activity is measured by EEG. Now it appears that electrical fields influence behavior of brain cells.

(PhysOrg.com) -- Most scientists have viewed electrical fields within the brain as the simple byproducts of neuronal activity. However, Yale scientists report in the July 15 issue of the journal *Neuron* that electrical fields can also influence the activity of brain cells.

The finding helps explain why techniques that influence electrical fields such as transcranial magnetic stimulation and deep brain stimulation are effective for the treatment of various neurological disorders, including depression. The study also “raises many questions about the possible effects of electrical fields, such as power lines and cell phones, in which we immerse ourselves,” said David McCormick, the Dorys McConnell Duberg Professor of Neurobiology at Yale School of Medicine, a researcher of the Kavli Institute of Neuroscience and senior author of the study.

The chemical process that triggers tiny charges in the membranes of neurons causes much of the brain’s electrical activity. Electroencephalograms, or EEGs, detect these fluctuations when they occur in large numbers of neurons together. These internal electrical signals contain information about certain cognitive and behavioral states but, until now, it had not been shown whether they actually change the activity of the brain itself.

McCormick and Flavio Frohlich, a postdoctoral research associate, introduced slow oscillation signals into brain tissue and found that the signal created a sort of feedback loop, with changes in electrical field guiding neural activity, which in turn strengthened the electrical field.

“It’s like asking whether the roar of the crowd in the football stadium also influences you to cheer as well. And in turn, your cheering encourages others to cheer along with you.” McCormick said.

The ability of electric fields generated by the brain to influence its own activity appears to be particularly prominent during epileptic seizures. However, the influence of electric fields is not limited to these pathological states. The study of Frohlich and McCormick demonstrates that the electrical fields also influence brain function during normal activities such as sleep.

McCormick said the findings change the way in which we view brain function and may be of significant clinical value in controlling epilepsy, depression and other neural dysfunctional states.

Provided by Yale University