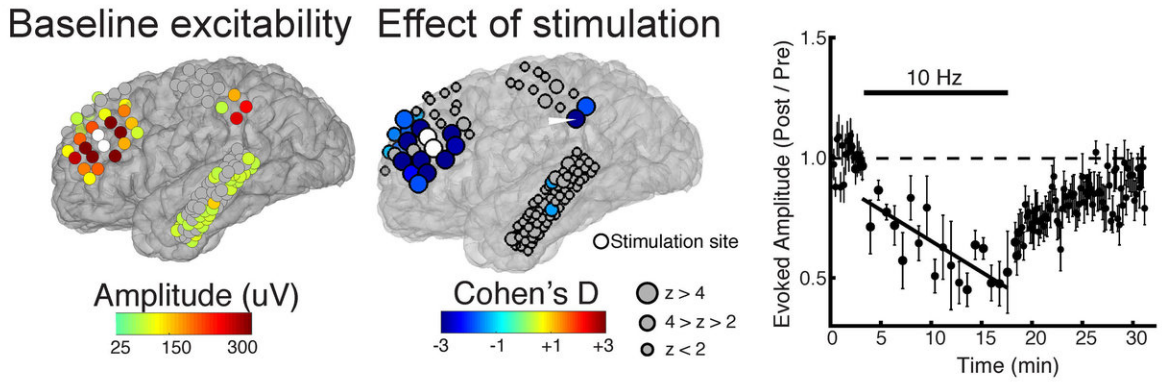
Personalizing therapeutic brain stimulation

May 21 2018



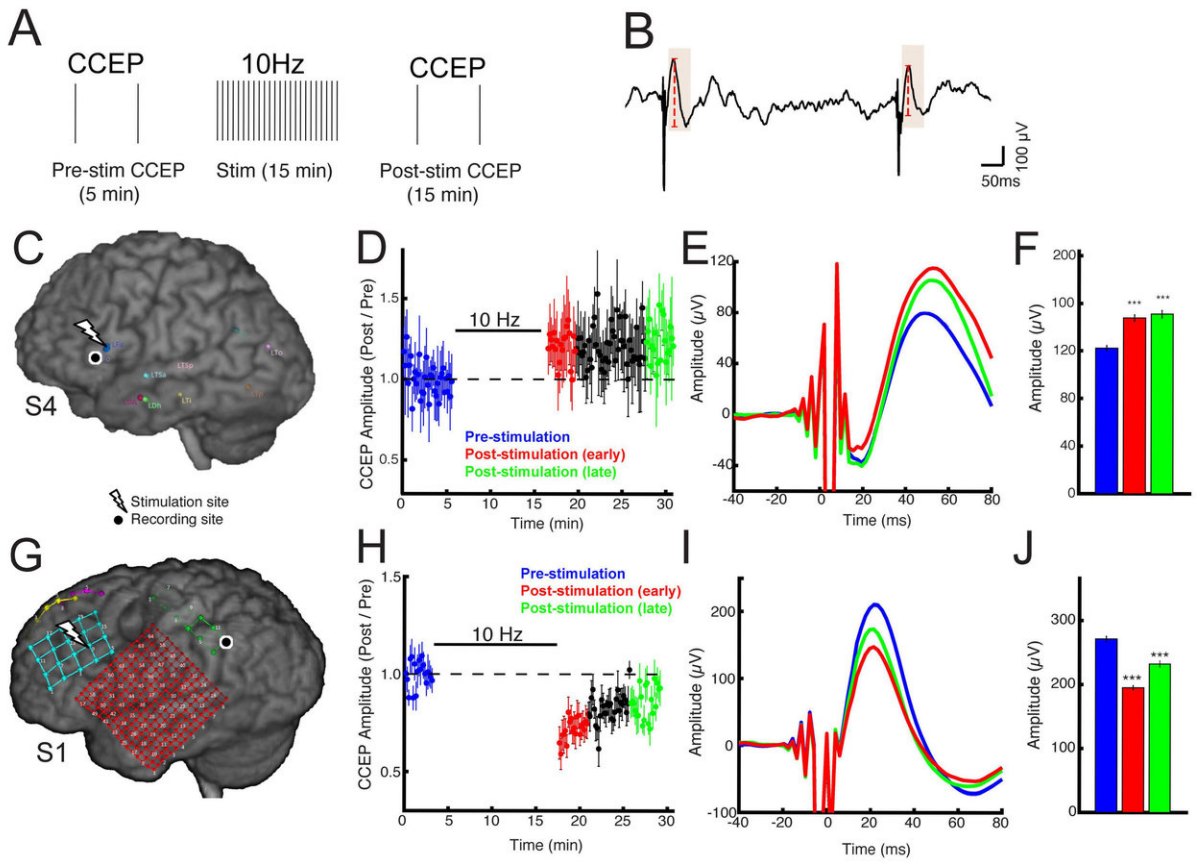
Baseline excitability can predict regions of change following stimulation. Left panel: Single subject baseline excitability. Middle: Regions of change after 10Hz stimulation. Right: Example of brain dynamics during and after 10Hz stimulation (arrowhead). Credit: Corey Keller

A study of epilepsy patients with implanted electrodes provides an unprecedented view of the changes in brain activity created by electrical stimulation. These findings, published in *JNeurosci*, have the potential to improve noninvasive stimulation approaches toward the treatment of neuropsychiatric disorders.

Repetitive transcranial magnetic stimulation (rTMS) is increasingly used in patients with disorders such as depression that do not respond well to medication or psychotherapy. Although the effects of stimulation on the

motor cortex have been characterized in animal models and humans, its effects on other brain areas—including the prefrontal cortex, the target of rTMS in depression—are unclear.

Corey Keller and colleagues mimicked rTMS of the prefrontal cortex in four epileptic patients who were previously implanted with brain electrodes to manage their condition. This allowed the researchers to study changes in the neural activity of specific regions with a resolution that is not possible with noninvasive brain stimulation and imaging. Comparing participants' brain excitability before and after the rTMS treatment, the team found that they were able to accurately predict which brain regions would be affected by the stimulation. This research could inform the development of individualized stimulation protocols.



Repetitive stimulation elicited changes in the cortico-cortical evoked potentials 651 (CCEPs) that outlasted the stimulation by at least five minutes. Credit: Keller et al., *JNeurosci* (2018)

More information: Induction and quantification of excitability changes in human cortical networks, *JNeurosci* (2018). DOI: 10.1523/JNEUROSCI.1088-17.2018