Neurological Biomarker Enables Personalized rTMS Depression Therapy

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Technology description

Repetitive transcranial magnetic stimulation (rTMS) is an FDA-cleared non-invasive brain stimulation treatment modality for major depressive disorder (MDD). Its efficacy has been demonstrated for a range of patients, including those that have failed conventional antidepressant treatment in the past. However, the use of rTMS remains limited (with typically <50% of patients responding to treatment) because of a lack of understanding of its mechanism, an inability to predict who will respond to treatment, inability to track targeted brain changed over the course of treatment, and lack of an ability to adapt stimulation based on measurement of brain signals (also called closed-loop stimulation). Successfully overcoming these challenges will greatly improve the efficacy of the treatment, allow it to be adapted to individual patients, and reduce the huge costs associated with MDD and its treatment to insurance companies, employers and society at large.
Researchers in Professor Amit Etkin’ s laboratory have developed a quantitative method to predict how clinically depressed patients will respond to repetitive transcranial magnetic stimulation (rTMS) therapy. Using a biomarker detected by fMRI and EEG testing of rTMS patients, this method can significantly predict variation in patient outcomes. Because the biomarker provides a diagnostic for patient improvement, it may in the future allow for customized treatment and personalized predictions at the start of treatment. The biomarker can be measured with functional magnetic resonance imaging (fMRI), and electroencephalography (EEG), and thus likely near infrared spectroscopy (NIRS), and magneto electroencephalography (MEG).

Application area

Enhanced depression diagnosis and treatment
Predicts rTMS response before the start of therapy, which may permit more accurate estimates of duration and patient outcome. May enable technicians to modify in-progress treatment regimens, including rTMS stimulation frequency and intensity during a session as well as the overall duration of therapy.

Advantages

May reduce the cost of rTMS depression therapy by personalizing treatment, making treatment more efficient, effective and predictable. May allow for flexible treatment strategies, as patient response can be measured and modified over short cycles (1-2 hours between treatments) or long cycles (3-12 months between treatments)

Institution

Stanford University

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