

# Brain activity can predict success of depression treatment

April 11 2018

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McLean Hospital and Harvard Medical School researchers believe they have uncovered a method that could be useful in predicting a depressed patient's treatment prognosis, prior to starting treatment.

In the paper "Pretreatment Rostral Anterior Cingulate Cortex Activity in Relation to Symptom Improvement in Depression: A Randomized Clinical Trial," currently available online and scheduled to appear in the June 2018 edition of *JAMA Psychiatry*, the investigative team details its work in identifying whether certain markers in the brain could allow clinicians to identify patients with a high or low likelihood of responding to certain treatments for depression.

The study was jointly first-authored by Diego A. Pizzagalli, PhD, and Christian A. Webb, PhD. "Our work shows that we could predict a patient's [response](#) to an antidepressant by looking at the activation level of the rostral [anterior cingulate cortex](#) (ACC) region of the brain by using a non-invasive monitoring system to test brain activity called an electroencephalogram—also known as an EEG," said Diego A. Pizzagalli, director of the McLean Imaging Center as well as the hospital's Center For Depression, Anxiety and Stress Research and Laboratory for Translational and Affective Neuroscience. Webb, assistant professor at Harvard Medical School and director of the Treatment and Etiology of Depression in Youth Laboratory, noted that this is the first study to "demonstrate the 'incremental predictive validity' of this neural marker, that is, the fact that activity in this brain region predicts the likelihood of [treatment response](#) above and beyond the contribution of a range of low-cost and easily administered clinical and demographic characteristics previously shown to predict treatment outcome."

For this study, the team built upon Pizzagalli's previous work showing that EEG recordings of rostral ACC activity could predict the eventual response. "In that prior study, we saw that the higher the activity before the start of the treatment, the better the clinical response months later," noted Pizzagalli, who is also a professor of psychiatry at Harvard Medical School.

For the new study, more than 300 patients were tested at four sites in the United States—using sertraline for the treatment group. "We showed that the rostral ACC marker predicted clinical response eight weeks later, even when statistically controlling for demographics and clinical variables previously linked to treatment response," said Pizzagalli. "For those with the marker of good response, a clinician could tell patients that they have a high chance of benefitting from the intervention, and they should stay engaged in treatment," he explained. Conversely, he said, for patients with the marker of low response, "clinicians could decide to start with more aggressive treatment at the outset, such as a combination of pharmacology and psychotherapy, and importantly, monitor these patients more closely."

Soon, Webb, Pizzagalli, and their colleagues plan to deploy these approaches on patients at McLean Hospital to determine whether they can lead to [treatment](#)-specific predictions. "Our vision is to determine if an optimal combination of markers—including brain-based but also clinical and demographic characteristics—might allow us to predict response to drug A but not drug B or psychotherapy, for example," Webb explained.

Also, if an ACC marker predicts better response, researchers might develop cognitive training that specifically targets this region, which could increase brain activation to accelerate or boost response to more traditional intervention. Pizzagalli and his team hope to engage in further research into this concept by testing [patients](#) with major depressive disorder.

Provided by McLean Hospital

Citation: Brain activity can predict success of depression treatment (2018, April 11) retrieved 23 April 2024 from

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