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EEG in Brain Region May Predict Success of Antidepressants

By Rick Nauert, PhD

New research offers hope that a noninvasive intervention can predict which individuals will or will not respond to drug treatment for depression. Currently, 10 to 30 percent of individuals fail to respond to an initial course of care.

Investigators found that an electroencephalogram or EEG can detect electrical activity in a brain region that corresponds to a patient's response to an antidepressant.

The paper appears in *JAMA Psychiatry*, and 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 an EEG," said Pizzagalli.

Pizzagalli is director of the **McLean Hospital Imaging Center**. Webb is an assistant professor at Harvard Medical School and director of the Treatment and Etiology of Depression in Youth Laboratory.

In the study, researchers discovered that certain markers in the brain could allow clinicians to identify patients with a high or low likelihood of responding to certain treatments for depression. Webb said that this is the first study to show that activity in this brain region predicts the likelihood of treatment response above and beyond what was suggested by clinical and demographic characteristics.

For this study, the team built upon Pizzagalli's previous work showing that EEG recordings of 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.

For the new study, more than 300 patients were tested at four sites in the United States, using sertraline (brand name Zoloft) for the treatment group. "We showed that the brain 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.