

Patterns of brain activity in response of emotional faces may help diagnose bipolar disorder

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A photograph of a woman laughing.
Credit: Anthea Sieveking, Wellcome Images.

(Medical Xpress) -- Software programmed to recognise patterns of activity in the brain could help doctors diagnose mental illnesses more accurately in the future, according to research funded by the Wellcome Trust. In a study published in the journal 'Bipolar Disorders', researchers at UCL (University College London) showed that patterns of brain responses to happy faces and to neutral faces are different in people with bipolar disorder or unipolar disorder (major depressive disorder) and healthy individuals.

Bipolar disorder, also known as manic depression, refers to severe episodes of mood disturbance ranging from depression to elation. The disorder can seriously affect a person's ability to function normally. According to the Royal College of Psychiatrists, approximately one in every 100 adults will experience [bipolar disorder](#) at some point in their life.

There are currently no known biological markers for the disorder, making it difficult to diagnose accurately. Almost two-thirds of people with the disorder are misdiagnosed as having unipolar disorder, leading to inadequate treatment, potentially worsening symptoms and increasing

suicide risk.

Recent neuroimaging studies have shown differences in activity in the brains of people with bipolar disorder, particularly when they are responding to emotional stimuli, such as happy faces. Other studies have used pattern-recognition software to distinguish between healthy [individuals](#) and people with a specific disorder; however, these studies have largely been based on static magnetic resonance imaging (MRI) scans of brain structure and focused on a single patient population.

Now, Dr Janaina Mourao-Miranda, a Wellcome Trust Research Career Development Fellow at UCL, has used functional MRI to study patterns of activity in the brains of individuals. This technique shows how [brain activity](#) changes over time while an individual takes part in a test.

In the study, Dr Mourao-Miranda and colleagues studied the brain activity in 18 individuals with bipolar disorder and 18 with unipolar disorder, all currently undergoing an episode of depression, and 18 healthy 'control' subjects.

The individuals all took part in a test in which they were asked to distinguish between happy faces and neutral faces. Using pattern recognition software, the researchers looked at whether it was possible to identify which individuals had bipolar or unipolar disorder and which individuals were healthy.

Dr Mourao-Miranda explains: "We know from previous studies that individuals undergoing an episode of bipolar disorder or unipolar disorder respond differently to happy faces when compared to healthy individuals. They seem to be less sensitive to happy emotions. We wanted to see if it was possible to capture these differences in brain activity and use them as a way of diagnosing an

individual's condition."

The researchers found that the pattern recognition software was able to distinguish between responses to happy faces and to neutral faces much more accurately in the healthy controls than in both sets of individuals undergoing an episode of bipolar disorder or unipolar disorder. This is evidence that the patients have abnormal responses to happy faces when compared with neutral stimuli.

In particular, the accuracy of the programme in distinguishing between responses to the two stimuli was significantly lower for bipolar than unipolar disorder, suggesting malfunctions in the brain's circuitry supporting positive emotional stimuli (e.g. happy faces) in bipolar disorder that, in turn, might represent vulnerability to manic states and reflect biological processes that can distinguish bipolar from unipolar depressed individuals.

Although the study has limitations, the researchers believe that further research could lead to a tool that can be used to accurately distinguish between people with bipolar and unipolar disorder.

Coauthor Professor Mary Phillips, from the Clinical and Translational Affective Neuroscience Program at the University of Pittsburgh, adds: "Pattern recognition approaches offer the potential to help clinicians not only discriminate healthy from unwell individuals but also discriminate among patients with different psychiatric illnesses," she says.

"This approach can ultimately help improve diagnosis of those psychiatric illnesses that are often extremely difficult to accurately diagnose using current clinical criteria. This can be important for determining the best course of treatment for a patient.

"These approaches may also have wider future use in identifying abnormal patterns of [brain](#) activity in patient populations that can predict their likely response to different treatments and the risk of future psychiatric illness in individuals."

More information: Mourao-Miranda J et al. Pattern recognition analyses of brain activation

elicited by happy and neutral faces in unipolar and bipolar depression. *Bipolar Disord* 2012 (epub ahead of print).

Provided by Wellcome Trust

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