Using 'mood maths' to understand more about bipolar disorder

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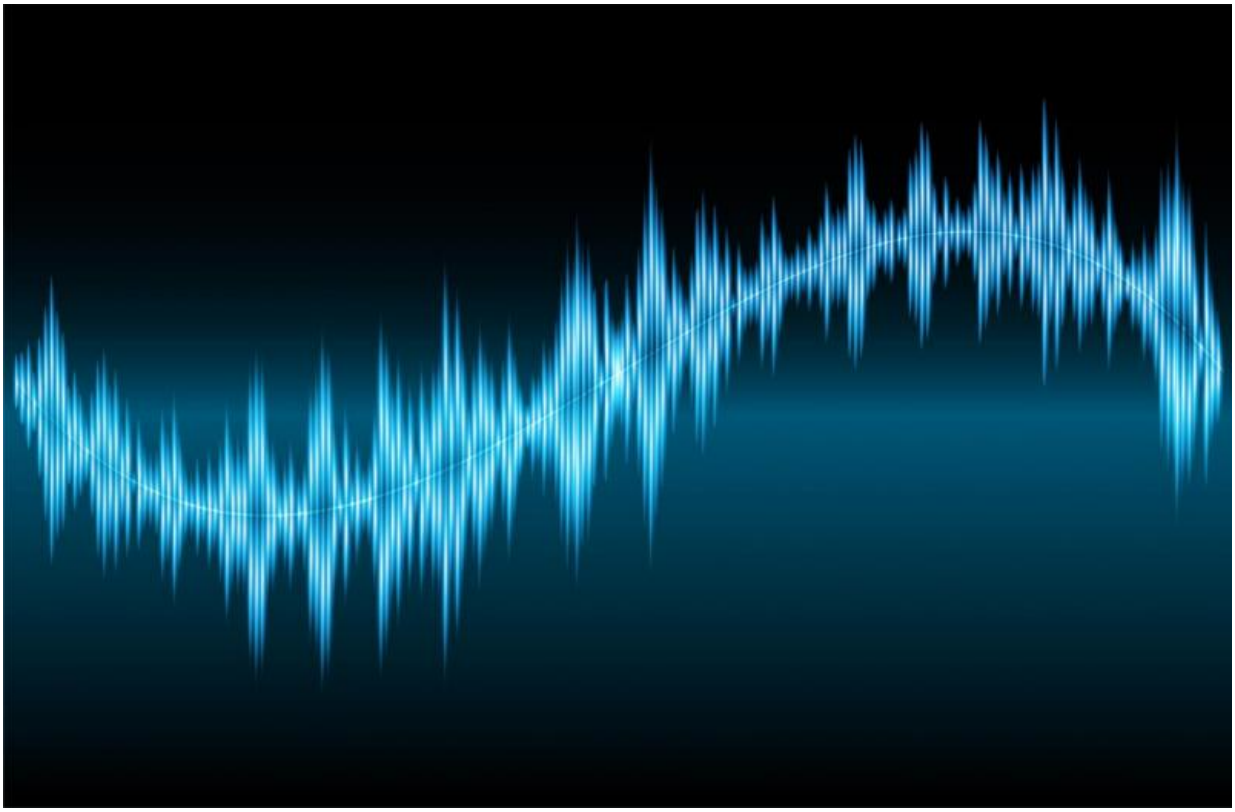

Bipolar disorder – formerly known as manic depression – is a chronic, recurrent mental illness characterised by extreme swings in mood. The condition is thought to affect at least one in every 100 adults worldwide

and has the highest rate of suicide among psychiatric disorders.

But despite its prevalence and severity, little is known about the processes underlying the disorder, while treatments remain limited. Researchers at Oxford University have set out to address this by using mathematical modelling to better understand the 'mood dynamics' of people with bipolar disorder.

In a new paper published in *Journal of the Royal Society Interface*, academics investigate how the subjective experience of mood can be understood using oscillators that 'map' the fluctuations in mood reported by participants via the QIDS (Quick Inventory of Depressive Symptomatology) questionnaire system.

Michael Bonsall, Professor of Mathematical Biology in the Department of Zoology at Oxford, says: "Bipolar disorder affects a huge number of people across the globe, so it's really important that we find new ways to understand it from both scientific and clinical points of view.

"For the last four or five years, we've been working on what we call "mood maths" – using mathematical modelling to tell us more about the variation in mood experienced by people with bipolar disorder. Collecting mood scores over time allows us to ask how important previous mood state is on current mood – how is mood dependent on recent events?

"And although episodes of depression or mania in people with bipolar disorder can be very infrequent, the inter-episode "average" mood can go up and down a lot.

"We want to be able to build mathematical structures that will allow us to drill down from the subjective idea of mood to how individual neurones in the brain are interacting."

Using the oscillators in tandem with data reported by 25 participants with bipolar disorder, the researchers were able to show, in mathematical terms, what drives these fluctuations in mood.

Professor Bonsall says: "In the future, we may be able to use maths in conjunction with self-reported data such as the QIDS score to help ascertain the efficacy of particular treatments for bipolar disorder. Eventually, that may even involve working out what is best for individual patients.

"That makes a study of this type really powerful."

More information: M. B. Bonsall et al. Bipolar disorder dynamics: affective instabilities, relaxation oscillations and noise, *Journal of The Royal Society Interface* (2015). DOI: 10.1098/rsif.2015.0670

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