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Brain scans may provide clues to suicide risk

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Bipolar disorder is characterized by transitions between depression and mania. Credit: Wikipedia

Researchers at the University of Illinois at Chicago and the University of Utah Health have identified brain circuitry differences that might be

associated with suicidal behavior in individuals with mood disorders. The study, published in *Psychological Medicine*, provides a promising lead toward tools that can predict which individuals are at the highest risk for suicide.

Suicide rates are rising steadily among young adults, especially those with mood disorders such as depression. More than half of individuals who are lost to suicide saw a health professional within the past 30 days, but they did not necessarily seek care for mood problems. Emergency departments and urgent care clinics might ask screening questions about mood and follow up depending on the patient's answers if necessary. Yet suicide rates continue to rise.

"At present, we have very few tools to identify individuals who may be at high risk for suicide-related behavior," said Scott Langenecker, professor of psychiatry at U of U Health and senior author on the study. "Right now, we go on self-report and clinician judgment. Those are good, but they're not great."

Previous studies have identified brain circuits associated with mood disorders: the cognitive control network (CCN), which is involved in executive function, problem-solving and impulsivity; the salience and emotional network (SEN), which is involved in emotion processing and regulation; and the default mode network (DMN), which is active when individuals are engaged in self-focused thought. However, these studies have focused primarily on depression.

"This is one of the first studies to try to understand brain mechanisms that may be relevant to suicide risk," said Jonathan Stange, assistant professor of psychiatry at UIC and first author on the study.

The *Psychological Medicine* study used resting-state functional MRI (fMRI), which captured brain images while participants were rested and

calm, to assess the connectivity of these circuits in 212 young adults at UIC and the University of Michigan.

"For risk factors involved in suicide, the tasks we have to measure are pretty nonspecific and inexact," Langenecker said. "If we go to the level of the resting-state networks, we're actually asking the brain to tell us which brain networks and connections are most relevant."

The study population included individuals with mood disorders and a history of suicide attempts, those with mood disorders and a history of suicidal thoughts, those with mood disorders and no history of suicidal behavior or thoughts, and healthy controls. All study participants with mood disorders were in remission.

Compared with other study participants—even those with mood disorders and a history of suicidal thoughts—those with a history of suicide attempts showed less connectivity in the CCN and between the CCN and DMN, neural circuitry associated with cognitive control and impulsivity.

These differences could present a target for treatment, for example, with neuromodulatory approaches. "If we could figure out how to improve connectivity within this brain circuit, we might be able to reduce suicide risk in the future," Stange said.

Stange and Langenecker emphasize that this work is still in its early stages. This was a small study, with only 18 participants with mood disorders and a history of suicide attempts, and it will have to be replicated in a new sample and validated in larger samples, they said. In addition, the researchers note it is not yet clear whether individuals with mood disorders and at risk for suicide have a different disease from those without such risk, or whether all individuals with mood disorders are at varying degrees of risk for suicide. A better understanding of this

could affect how well resting-state fMRI tools could work. Because study participants with mood disorders were in remission, Stange cautions that the images they saw may not represent what the brain looks like during an acute suicidal episode. He also notes that the study was retrospective.

A longitudinal study, where researchers measure brain circuits at the start then check with participants regularly to see how they are doing, will provide a better idea of which risk factors to monitor clinically and when to intervene.

"Ultimately, that's what we really care about," Stange said. "It's not just figuring out what happened in the past, but what can we do with this information to try to prevent suicide from happening."

The study is titled "Using Resting State Intrinsic Network Connectivity to Identify Suicide Risk in Mood Disorders."

More information: Jonathan P. Stange et al. Using resting-state intrinsic network connectivity to identify suicide risk in mood disorders, *Psychological Medicine* (2019). DOI: 10.1017/S0033291719002356

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