

Functional MRI study finds correlated shifts in brain connectivity associated with overthinking in adolescents

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A new study from The Ohio State University Wexner Medical Center and College of Medicine, University of Utah and University of Exeter

(UK) substantiates previous groundbreaking research that rumination (overthinking) can be reduced through an intervention called rumination-focused cognitive behavioral therapy (RF-CBT). In addition, the use of functional MRI (fMRI) technology allowed researchers to observe correlated shifts in the brain connectivity associated with overthinking.

Study findings are published online in the journal *Biological Psychiatry Global Open Science*.

"We know adolescent development is pivotal. Their brains are maturing, and habits are forming. Interventions like RF-CBT can be game-changers, steering them towards a mentally healthy adulthood. We were particularly excited that the treatment seemed developmentally appropriate and was acceptable and accessible via telehealth during the early pandemic," said corresponding author Scott Langenecker, Ph.D., vice chair of research in the Department of Psychiatry and Behavioral Health at Ohio State, who started this project while at the University of Utah.

RF-CBT is a promising approach pioneered by Ed Watkins, Ph.D., professor of experimental and applied Clinical Psychology at the University of Exeter. It has been shown to be effective among adults with recurrent depression.

"We wanted to see if we could adapt it for a younger population to prevent the ongoing burden of depressive relapse," said Rachel Jacobs, Ph.D., adjunct assistant professor of psychiatry and [behavioral sciences](#) at Northwestern University who conducted the [pilot study](#) in 2016.

"As a clinician, I continued to observe that standard CBT tools such as cognitive restructuring didn't give young people the tools to break out of the painful mental loops that contribute to experiencing depression again. If we could find a way to do that, maybe we could help young

people stay well as they transition to adulthood, which has become even more important since we've observed the mental health impact of COVID-19," Jacobs said.

In the trial, 76 teenagers, ages 14–17, with a history of depression were randomly assigned to 10–14 sessions of RF-CBT, while controls were allowed and encouraged to receive any standard treatment. Teens reported ruminating significantly less if they received RF-CBT. Even more intriguing, fMRI illustrated shifts in [brain connectivity](#), marking a change at the neural level.

Specifically, there was a reduction in the connection between the left posterior cingulate cortex and two other regions; the right inferior frontal gyrus and right inferior temporal gyrus. These zones, involved in self-referential thinking and emotional stimuli processing, respectively, suggest RF-CBT can enhance the brain's ability to shift out of the rumination habit. Notably, this work is a pre-registered replication; it demonstrates the same brain and clinical effects in the Utah sample in 2023 that was first reported in the Chicago sample in 2016.

"For the first time, this paper shows that the version of rumination-focused CBT we have developed at the University of Exeter leads to changes in connectivity in brain regions in adolescents with a history of depression relative to treatment as usual," Watkins said.

"This is exciting, as it suggests the CBT either helps patients to gain more effortless control over rumination or makes it less habitual. We urgently need new ways to reduce rumination in this group in order to improve the mental health of our [young people](#)."

Next, the researchers will focus on demonstrating the efficacy of RF-CBT in a larger sample with an active treatment control, including continued work at Ohio State, Nationwide Children's Hospital,

University of Exeter, University of Utah and the Utah Center for Evidence Based Treatment.

Future directions include bolstering access to teens in clinical settings and enhancing the ways we can learn about how this treatment helps youth with similar conditions.

"Our paper suggests a science-backed method to break the rumination cycle and reinforces the idea that it's never too late or too early to foster healthier mental habits. Our research team thanks the youths and families who participated in this study for their commitment and dedication to reducing the burden of depression through science and treatment, particularly during the challenges of a global pandemic," Langenecker said.

More information: Rumination-Focused Cognitive Behavioral Therapy Reduces Rumination and Targeted Cross-network Connectivity in Youth With a History of Depression: Replication in a Preregistered Randomized Clinical Trial, *Biological Psychiatry Global Open Science* (2023). [DOI: 10.1016/j.bpsgos.2023.08.012](https://doi.org/10.1016/j.bpsgos.2023.08.012)

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