

# Could mind games help treat teen depression? Brain imaging study shows promise

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Susan Whitfield-Gabrieli, professor of psychology and director of the Biomedical Imaging Center. Credit: Ruby Wallau/Northeastern University

In the midst of a devastating mental health crisis affecting thousands of

American teens, Northeastern University psychology professor Susan Whitfield-Gabrieli says a non-invasive remedy for depression and anxiety offers hope.

In a brain imaging study conducted at Northeastern's Biomedical Imaging Center, teenagers using mindfulness [meditation](#) guided by neurofeedback were able to calm a network of regions of the brain associated with depression, anxiety, ADHD and other disorders.

At the same time that region, known as the default mode network (DMN) grew less active, the central executive network (CEN) associated with goal-setting, problem-solving and sustained attention increased in function.

"Mindfulness helps with anxiety and depression," says Whitfield-Gabrieli, whose research was published Wednesday in *Molecular Psychiatry*.

The study of nine people ages 17 to 19 is "proof of concept" that [young people](#) can be trained in mindfulness meditation—and that it produces results, she says.

Larger scale studies need to be done showing the efficacy of mindfulness meditation in teens and younger students, but Whitfield-Gabrieli says she and her collaborators at Massachusetts General Hospital and Columbia University are optimistic about the results from Northeastern.

So far, other therapeutic remedies for depression and anxiety, including medical and talk therapy, have a [success rate](#) of approximately 30% to 50%, Whitfield-Gabrieli says.

She says that's not nearly enough to deal with an epidemic of adolescent

mental health disorders. "We need personalized interventions that target the brain networks known to be associated with clinical symptoms," Whitfield-Gabrieli says.

A report released in February by the Centers for Disease Control and Prevention says teen girls were experiencing record rates of sadness and more than 40% of high school survey respondents said they had felt so sad or hopeless that they could not engage in their regular activities for at least two weeks during the previous year.

"We need to catch these kids before they fall," Whitfield-Gabrieli says. "Why not have mindfulness meditation as part of the school curriculum?"

The neurofeedback didn't involve electrodes but had students lie in [functional magnetic resonance](#) imaging scanners that focused on specific regions of their brains.

The default mode network regions associated with depression and anxiety are activated when people worry about the future and hash over the past, Whitfield-Gabrieli says, adding that she calls engaging this area of the brain "mental time travel."

When the [default mode network](#) regions are activated, the central executive network regions associated with the ability to manage tasks and regulate moods show less activity, Whitfield-Gabrieli says.

The activity in the different areas of the brain rises and falls in a type of dance or synchrony that is more pronounced the more psychopathology is present, she says.

The goal of the researchers was to use fMRI signals to moderate the activity, and it worked, Whitfield-Gabrieli says.

"As soon as the person starts doing the mindfulness meditation, the DMN drops," she says.

To make the exercise even more engaging for the teens, the researchers converted it into a game.

When the participant got the DMN to reduce activity, they'd get a signal to move a ball up towards a target circle. But if that region of the [brain](#) started getting more active, the ball would drop.

"They are literally just moving the ball with their mind. They love it," Whitfield-Gabrieli says.

"Mindfulness meditation forces you to attend to the present moment. You are no longer caught in the past or the future," she says.

There's no reason not to incorporate mindfulness meditation and guided breathwork into school curricula now, Whitfield-Gabrieli says.

She says eventually she would like to see neurofeedback work with other biomarkers such as [heart rate](#) to develop interventions for when people fall into vulnerable states of repetitive negative thinking.

In the near future, a smart phone might be able to pick up on the signals and request the user to "do mindfulness meditation now," exercise or remember to take an antidepressant, she says.

"People are realizing more and more the amazing effective and global impact [mindfulness meditation](#) can have."

**More information:** Jiahe Zhang et al, Reducing default mode network connectivity with mindfulness-based fMRI neurofeedback: a pilot study among adolescents with affective disorder history, *Molecular Psychiatry*

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