

Research points to potential brain marker of stress and its effects on problem solving

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Stress response is the body's normal physiological reaction to a situation that it perceives as threatening. However, stress can also impact important aspects of thinking, including problem solving. Researchers

from the University of Missouri School of Medicine and the MU Thompson Center for Autism and Neurodevelopmental Disorders have discovered a potential indicator of how stress affects the brain and alters its ability to problem solve. These findings could ultimately understand and optimize treatment for patients suffering from stress-related illnesses.

The results come from two companion studies involving 45 healthy college-age individuals who were genetically tested for the presence of at least one copy of a variation in the [serotonin transporter gene](#) (SERT), which is associated with greater susceptibility to stress. Participants were given a series of tests while being monitored by magnetic resonance imaging (MRI). The first test involved verbal processing tasks where participants were asked in two sessions (stress and no-stress control) how many items from a category they could name in a minute. Researchers found that stress did not impact overall performance for either gender or gene group, but [effects of stress](#) on performance did relate to changes in the [brain](#)'s overall functional connectivity in all participants, suggesting the brain could provide a biomarker for the effects of stress on cognition.

"This may begin to help us understand what is going on in the brain when stress is affecting cognition," said supervising investigator David Beversdorf, MD, professor of radiology, neurology and psychology at the MU School of Medicine and the MU Thompson Center. "If we can develop an intervention that affects the brain's networks, we may be able to mitigate the cognitively impairing effects of stress."

In the other study, the same participants completed [problem solving](#) tasks in two sessions (stress and no-stress control) during MRI testing. Researchers discovered changes to the connections involving a section of the brain called the [middle temporal gyrus](#) related to changes in performance during stress in participants. This relationship depended on

the presence or absence of the stress-related variant of the SERT gene, indicating a potential specific brain marker associated with susceptibility to stress during problem solving.

"When you look at the relationship of the imaging changes in the brain and the performance changes resulting from stress, the left middle temporal gyrus appears to be a critical hub, and this relationship depends on an individual's genetic susceptibility to stress," Beversdorf said. "The next step is to look at this in specific patient populations. Is this effect greater in PTSD populations or test anxiety patients? And if we can understand how to mitigate those effects, it could be very helpful to these patients."

The study, "Effects of stress on functional connectivity during verbal processing," was recently published in the journal *Brain Imaging and Behavior*. The companion study, "Effects of stress on [functional connectivity](#) during problem solving," published in the journal *NeuroImage*.

More information: Neetu Nair et al, Effects of stress on functional connectivity during problem solving, *NeuroImage* (2019). [DOI: 10.1016/j.neuroimage.2019.116407](https://doi.org/10.1016/j.neuroimage.2019.116407)

Neetu Nair et al. Effects of stress on functional connectivity during verbal processing, *Brain Imaging and Behavior* (2019). [DOI: 10.1007/s11682-019-00221-5](https://doi.org/10.1007/s11682-019-00221-5)

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