Medical Xpress

Stress activates brain regions linked to alcohol use disorder differently for women than men, finds study

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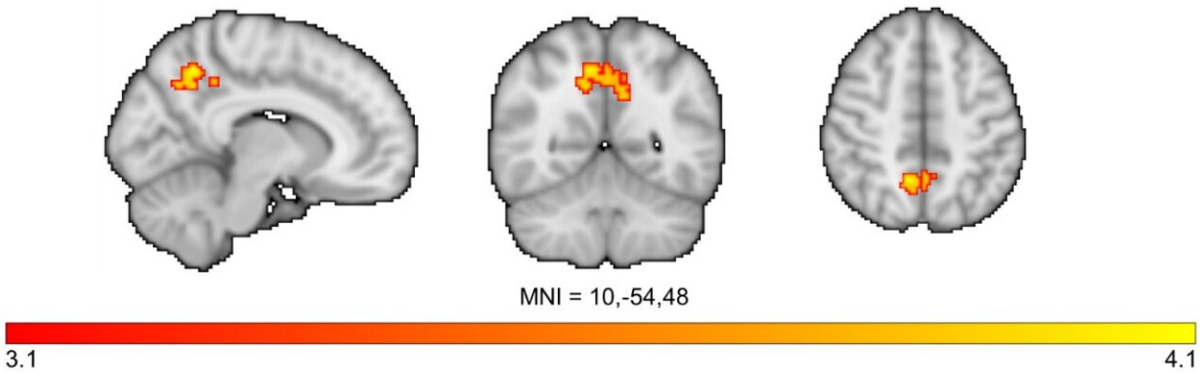

Main Effect of Medication (Ibudilast > Placebo) on Whole Brain Activation to Stress vs. Control. Participants treated with ibudilast had greater activation than those treated with placebo during stress relative to control conditions in the precuneus and posterior cingulate cortex (whole-brain cluster corrected at Z > 3.1, p Alcohol: Clinical and Experimental Research (2024). DOI:10.1111/acer.15301

When exposed to stress, people with alcohol use disorder engage parts of the brain associated with both stress and addiction, which may cause them to drink or crave alcohol after a stressful experience, suggest the authors of a study published in *Alcohol: Clinical and Experimental Research*.

The brain imaging study of people with alcohol use disorder also found that women's brains respond differently to stressors than men's brains, showing greater activation of the amygdala and areas of the brain related to alcohol use disorder. The findings may improve understanding of the neural mechanisms associated with alcohol use disorder, including among women, whose rates of alcohol use disorder, binge drinking, and alcohol use have increased sharply in recent years.

Stress frequently triggers drinking as well as relapse in people with alcohol use disorder. Prior research has shown that alcohol use disorder and stress cause changes to overlapping areas of the brain in a way that can inhibit a person's ability to cope with stress and lead to continued alcohol use.

For this study, researchers sought to examine how the brains of people with moderate to severe alcohol use disorder respond to acute stressors. Functional magnetic resonance imaging (fMRI), used to identify parts of the brain engaged during the performance of different tasks, examined which brain regions are activated during a stress condition. While undergoing the fMRI, participants were given a set of tasks in the form of math problems of varying complexity, along with negative feedback and social pressure to improve their performance.

In both men and women, exposure to the stress condition activated neurocircuits in the brain associated with stress. During the stress condition, the brains of women showed increased activation of the amygdala, which is responsible for the body's reaction to threats.

There was also greater activation in women compared to men in areas of the brain responsible for emotional regulation and self-referential processing. Activation in these areas might signal, for example, participants' thinking about their performance, comparing their performance to others, and regulating their emotions related to poor

performance.

Female participants reported higher levels of anxiety than the male participants prior to the scan. Male participants, however, reported greater stress following the stressor than women did and also showed less activation in areas of the brain related to self-referential processing and emotional regulation, suggesting that female participants' greater use of higher-order regulatory processing in response to the stressor may have led to their feeling less stress than men following the scan.

Twenty-five participants, 15 men and 10 women, aged between 18 and 65, with an average age of 43, were included in the study. There were no significant demographic, substance use, alcohol use, or clinical differences between men and women in the study. This study was part of a larger medication trial where some participants were taking an anti-inflammatory medication that may have affected the neural and behavioral responses to stress. Future studies might measure biological indicators of stress, such as cortisol levels.

More information: Erica N. Grodin et al, Sex differences in neural response to an acute stressor in individuals with an alcohol use disorder, *Alcohol: Clinical and Experimental Research* (2024). DOI: 10.1111/acer.15301 onlinelibrary.wiley.com/doi/10.1111/acer.15301

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