

Effects of alcoholism on the brain's reward system may be different in women than in men

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A collaborative study between researchers at Massachusetts General Hospital (MGH) and Boston University School of Medicine (BUSM) has

found evidence implying that alcoholism may have different effects on the reward system in the brains of women than it does in men.

In their paper published in *Psychiatry Research Neuroimaging*, the team reports that reward system structures are larger in alcoholic women than in nonalcoholic women, and their report confirmed earlier studies that found the same structures were smaller in alcoholic men than in nonalcoholic men. The study, which enrolled currently abstinent individuals with a history of long-term [alcohol](#) use disorder, also found a negative association between the length of sobriety and the size of the fluid-filled ventricles in the center of the [brain](#), suggesting possible recovery of the overall brain from the effects of alcoholism

"Until now, little has been known about the volume of the reward regions in alcoholic women, since all previous studies have been done in men," says co-author Gordon Harris, PhD, of the 3D Imaging Service and the Center for Morphometric Analysis in the Martinos Center for Biomedical Imaging at MGH. "Our findings suggest that it might be helpful to consider gender-specific approaches to treatment for alcoholism."

The brain's reward system is a group of structures - including the amygdala and the hippocampus - that reinforce beneficial experiences, are involved in memory and complex decision-making and have been implicated in the development of substance use disorders. Since there are known difference between the psychological and behavioral profiles of women and men with alcoholism - women tend toward having higher levels of anxiety, while men are more likely to exhibit anti-social characteristics - the current study was designed to investigate whether the alcoholism-associated reward system differences previously observed in men would also be seen in women.

The study enrolled 60 participants with histories of long-term alcoholism

- 30 women and 30 men - and an equivalent group of nonalcoholic volunteers. The alcoholic participants had been abstinent for time periods ranging from four weeks to 38 years. Participants completed detailed medical histories and neuropsychological assessments with the BUSM researchers before having MRI brain scans at the Martinos Center that were analyzed both in terms of the total brain and of the structures in the reward network.

Replicating the results of earlier studies, the average sizes of [reward](#) region structures of alcoholic men were 4.1 percent smaller than those of nonalcoholic men, but the average sizes of the same structures were 4.4 percent larger in alcoholic than in nonalcoholic women. While factors such as the duration and intensity of heavy drinking appeared to reinforce these gender-specific effects, the research team notes that the current study cannot determine whether these differences preceded or resulted from the development of alcoholism. Among participants with alcoholism - both [women](#) and men - each year of sobriety was associated with a 1.8 percent decrease in the size of the ventricles, suggesting recovery from the damaging effects of alcoholism on the brain.

"We're planning to take a more detailed look at the impact of factors such as the severity of drinking and the length of sobriety on specific brain [structure](#), and hope to investigate whether the imaging differences seen in this and previous studies are associated with gender-based differences in motivational and emotional functions," says co-author Marlene Oscar-Berman, PhD, a professor of Psychiatry, Neurology, and Anatomy & Neurobiology at BUSM.

More information: Kayle S. Sawyer et al, Gender dimorphism of brain reward system volumes in alcoholism, *Psychiatry Research: Neuroimaging* (2017). [DOI: 10.1016/j.psychresns.2017.03.001](https://doi.org/10.1016/j.psychresns.2017.03.001)

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