

# Childhood adversity may affect processing in the brain's reward pathways

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New research shows that childhood adversity is associated with diminished neural activity in brain regions implicated in the anticipation of possible rewards.

Scientists at Harvard University used [functional magnetic resonance imaging](#) (fMRI) to monitor brain activity as participants played a game involving cues that predicted monetary rewards and penalties.

"We found that, in comparison to community controls, young adults who had experienced childhood adversity showed weaker responses to reward-predicting cues in left hemisphere regions of the basal ganglia, a part of the brain that is important for orchestrating goal-directed actions," says Diego Pizzagalli, the John and Ruth Hazel Associate Professor of the Social Sciences in the Department of Psychology at Harvard.

The research is published in the current issue of the journal *Biological Psychiatry*, and was conducted by Pizzagalli and Karlen Lyons-Ruth, associate professor of psychology at Harvard Medical School. The lead author is Daniel Dillon, a postdoctoral researcher working with Pizzagalli, and co-authors were Avram Holmes, Jeffrey Birk, and Nancy Brooks, all in the Department of Psychology in Harvard's Faculty of Arts and Sciences.

"In the group that had childhood adversity, two structures in the left basal ganglia were not responsive to reward cues, which differed from what we saw in the control group," says Dillon. "There weren't any

differences between the controls and maltreated participants in response to cues that predicted either penalties or no incentive outcomes. In other words, the group that had experienced childhood adversity only showed a weaker response to the reward cues."

Participants also rated their experiences of positive and negative arousal in response to the cues while in the MRI scanner. Relative to controls, the participants who had experienced childhood adversity rated the reward cues as less positive, consistent with the weaker brain response to these cues.

Most of the study participants did not currently meet criteria for any psychological disorder, but childhood adversity, such as emotional, physical, or sexual maltreatment, is known to increase the risk for psychopathology, particularly depression. Many previous studies have suggested that the link between childhood adversity and depression might be related to dysfunction in [brain regions](#) that are involved in regulating stress, which would contribute to the excessive sadness and negativity that characterizes depression.

By contrast, according to the researchers, this study highlights another potential link: by weakening the brain's response to rewards, childhood adversity may contribute to other important symptoms of depression, such as apathy, low motivation, and a reduced ability to experience pleasure.

By identifying specific regions of the brain impacted in certain types of psychological disorders, the researchers hope to contribute to the development of more effective treatments for these disorders.

"Eventually, we hope that this type of research will help fine-tune these interventions in much more personalized and hopefully effective ways," says Pizzagalli.

The 13 maltreated individuals who participated in the study were young adults who had been followed since childhood as part of a study from the Cambridge Health Alliance, led by Lyons-Ruth. The participants had experienced childhood abuse that met state guidelines for maltreatment, but most were not currently experiencing any symptoms of depression, posttraumatic stress, or other disorders.

Pizzagalli underlined the fact that while childhood adversity increases the risk for depression, it is not a one-to-one relationship: Other mitigating factors, such as genetics and social support, can counteract the risk.

"This is a serious problem, and we are just starting to grasp what the potential neurobiological consequences will be," says Pizzagalli. "It's not a direct pathway: Somebody who was exposed to early adversity will not necessarily develop depression. But an important first step to improving treatment is to try to understand what the changes in the brain might be, so that we can know how and when to intervene."

Source: Harvard University ([news](#) : [web](#))

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