

FORGET ABOUT ERASING BAD MEMORIES. RESEARCHERS HAVE LOCATED THE RECEPTOR THAT ENABLES OUR BRAINS TO OVERRIDE OR “UNLEARN” TRAUMATIC PAST EXPERIENCES.

Getting Over It

NEW IDEAS / BY CATRINEL BARTOLOMEU /

PRINT SHARETHIS

When faced with traumatic events that threaten survival — car wrecks, landing a plane in the Hudson, 9/11 — our brains often form stubborn memories that linger long after the threat is gone. These unshakable recollections can express themselves as anxiety, phobias, and post-traumatic stress disorder (PTSD), which plagues more than 5 million Americans and has no targeted pharmaceutical

treatment. In early March, a team of Canadian researchers [announced](#) that they'd made progress on this front. By first isolating the part of the amygdala in rats' brains where fearful memories are housed, they were able to inject a diphtheria toxin into fear-storing neurons and effectively delete bad memories. Although the application is not at all safe for use in humans, the promise of erasing a painful past is alluring. But researchers from the Salk Institute for Biological Studies take a radically different stance: We don't need to annihilate bad memories to get over them. A normal brain is able to take in new information that overrides or “unlearns” traumatic experiences, and the Salk researchers have found the neurotransmitter receptor that turns this ability on and off.



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GLOBAL RESET
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RISK
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INTELLIGENCE
SCIART
EDUCATION
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IDENTITY

“Imagine you had a car accident on a road you travel daily,” says Jian Xu, Ph.D, first author on the study, published in the March 25 issue of the *Journal of Neuroscience*. “At first, every time you passed that spot you’d be pretty scared, but if you drove that route every day and nothing bad happened, you’d probably get over it,” he says. A healthy brain’s ability to shuffle traumatic experiences to the background in the presence of new, nonthreatening information is a process known as “fear extinction” or “unlearning,” and it appears to be controlled by the metabotropic glutamate receptor 5 (mGluR5) — a prominent neurotransmitter receptor known to be involved in several forms of behavioral learning.

POPULATION
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MEDIA
GROWTH
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TIME
ECONOMICS

To test their theory, Xu and his colleagues conditioned two groups of mice, one lacking the genes for mGluR5 and a control group, to fear a tone by pairing it with a shock to the foot. Afterward, the groups were then reverse conditioned through exposure to the sound sans shock. The normal mice quickly stopped fearing the tone. The mutated mice, however, were unable to shake off their fear, suggesting that the presence of the mGluR5 receptor is indeed linked to the ability to unlearn past traumas.

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MATH
LITERACY
CONSENSUS
RESILIENCE
NETWORKS
SCARCITY

In the second set of experiments, the researchers further demonstrated the effects of mGluR5 on the ability to unlearn, this time by training the mice to find a hidden platform in an underwater maze. The mice lacking mGluR5 were only slightly slower than normal mice in learning the position of the platform, but when scientists moved the platform to a new location, the mutant mice had a much harder time finding and remembering the new site. “They were so convinced that the [platform] was in the old place,” says Xu. “They were kind of reluctant to search elsewhere, almost stubborn. The thinking is that once they form a memory, it is hard to override it.”

ETHICS
VISUALIZATION
PRIZES
DEMOCRACY
MUSIC
STRUCTURE
CARBON
DIPLOMACY
RELIGION
WATER
PANDEMICS
GLOBALIZATION

The discovery that mGluR5 is integral to both extinguishing fearful memories and acquiring new ones could open the door to developing pharmaceuticals to treat PTSD. “You could hypothetically develop a drug that will isolate the receptor,” says Xu. “It could make it easier for a patient to form new memories and override traumatic events.” Currently, PTSD is treated with a combination of exposure therapy, in which patients relive traumatic events in safe environments, and SSRIs or tricyclic antidepressants. Now that they’ve identified this pathway, the team Xu is a part of will focus on eliminating mGluR5 in specific regions of the brain, he says, probably starting with the amygdala. As for the promise of erasing bad memories, Xu thinks it’s not a good idea. “It’s more appropriate to remember [a traumatic] event,” he says. “You just don’t want it to affect your daily life.”