

# Scientists report link between traumatic brain injury, post-traumatic stress disorder

February 15 2012, By Stuart Wolpert

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(Medical Xpress) -- UCLA life scientists and their colleagues have provided the first evidence of a causal link between traumatic brain injury and an increased susceptibility to post-traumatic stress disorder.

Their new study, published Feb. 15 in the journal *Biological Psychology*, also suggests that people who suffer even a mild [traumatic brain injury](#) are more likely to develop an anxiety disorder and should take precautions to avoid stressful situations for at least some period of time.

The motivation behind the study, which was conducted in rats, was the observed correlation of traumatic [brain injury](#), or TBI, and PTSD, particularly in military veterans returning from service overseas, said Michael Fanselow, a UCLA professor of psychology and the senior author of the study.

The reasons for this correlation are unknown. It could be simply that the events that cause brain injury are also very frightening and that the link between TBI and PTSD could be merely incidental. Fanselow and his colleagues, however, hypothesized that the two "could be linked in a more mechanistic way."

Using procedures to separate the physical and emotional traumas, the scientists trained the rats using "[fear](#) conditioning" techniques two days after they experienced a concussive brain trauma — ensuring the brain injury and the experience of fear occurred on different days.

"We found that the rats with the earlier TBI acquired more fear than control rats (without TBI)," said Fanselow, a member of UCLA's Brain Research Institute. "Something about the brain injury rendered them more susceptible to acquiring an inappropriately strong fear. It was as if the injury primed the brain for learning to be afraid."

To learn why this occurred, the researchers analyzed a small piece of brain tissue, the amygdala, which is the brain's critical hub for fear learning.

"We found that there are significantly more receptors for excitatory neurotransmitters that promote learning," said Maxine Reger, a UCLA graduate student of psychology in Fanselow's laboratory and the lead author of the study.

"This finding suggests that brain injury leaves the amygdala in a more excitable state that readies it for acquiring potent fear," Fanselow said.

The research was funded by the National Institutes of Health, the U.S. Department of Defense and the UCLA Brain Injury Research Center.

Co-authors of the study were David Hovda, a professor of neurosurgery and of molecular and medical pharmacology at the David Geffen School of Medicine at UCLA and director of the UCLA Brain Injury Research Center; Andrew Poulos, a postdoctoral fellow in Fanselow's laboratory; Floyd Buen, a former graduate student in Hovda's laboratory; and Christopher Giza, an associate professor of neurosurgery at the Geffen School of Medicine.

The research was a collaboration between Fanselow's laboratory, which studies neural mechanisms of anxiety disorders, and Hovda's laboratory, which investigates brain injury.

"One of UCLA's great strengths is the spirit of collaboration that allows scientists from very different departments to combine their very different expertises to answer important but difficult questions," Fanselow said.

**More information:** The article is "Concussive Brain Injury Enhances Fear Learning and Excitatory Processes in the Amygdala" by Maxine L. Reger, Andrew M. Poulos, Floyd Buen, Christopher C. Giza, David A. Hovda, and Michael S. Fanselow (doi:10.1016/j.biopsych.2011.11.007). The article appears in *Biological Psychiatry*, Volume 71, Issue 4 (February 15, 2012)

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