

# Mild traumatic brain injury may alter brain's neuronal circuit excitability and contribute to brain network dysfunction

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Even mild head injuries can cause significant abnormalities in brain function that last for several days, which may explain the neurological symptoms experienced by some individuals who have experienced a head injury associated with sports, accidents or combat, according to a study by Virginia Commonwealth University School of Medicine researchers.

These findings, published in the May issue of the *Journal of Neuroscience*, advance research in the field of traumatic brain injury (TBI), enabling researchers to better understand what brain structural or functional changes underlie posttraumatic disorders - a question that until now has remained unclear.

Previous research has shown that even a mild case of TBI can result in long-lasting neurological issues that include slowing of cognitive processes, confusion, chronic headache, posttraumatic stress disorder and depression.

The VCU team, led by Kimberle M. Jacobs, Ph.D., associate professor in the Department of Anatomy and Neurobiology, demonstrated for the first time, using sophisticated bioimaging and electrophysiological approaches, that mild injury can cause structural disruption of axons in the brain while also changing the way the neurons fire in areas where they have not been structurally altered. Axons are nerve fibers in the brain responsible for conducting electrical impulses. The team used models of mild [traumatic brain injury](#) and followed morphologically identified neurons in live cortical slices.

"These findings should help move the field forward by providing a unique bioimaging and electrophysiological approach to assess the evolving changes evoked by mild TBI and their

potential therapeutic modulation," said co-investigator, John T. Povlishock, Ph.D., professor and chair of the VCU School of Medicine's Department of Anatomy and Neurobiology and director of the Commonwealth Center for the Study of Brain Injury.

According to Povlishock, additional benefit may also derive from the use of this model system with repetitive injuries to determine if repeated insults exacerbate the observed abnormalities.

Provided by Virginia Commonwealth University

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