

Researchers chart a new way to look at concussion

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A Portland State University research team studying concussion has published an interactive diagram showing the many facets of mild traumatic brain injury (TBI) - from sleep problems to mood disorders to the increased danger of dementia—and how they connect with and affect each other.

The diagram and its accompanying web-based presentation are part of a new article the team published in *Frontiers in Neurology*. The article is a follow-up to a paper the team published last fall calling for the use of systems science as a new way of understanding the puzzling and complex nature of TBI.

"This paper is a big step forward beyond that initial effort," said lead author and PSU systems scientist Erin Kenzie. "Our causal-loop diagram shows how specific variables and processes interact to influence [concussion](#) recovery. By analyzing patterns in the feedback dynamics, we can better understand how recovery might be facilitated or impeded."

Kenzie said standard medical research can examine certain variables of TBI in isolation, but is not designed for capturing the big picture. That's why she and her team are pursuing a systems approach, which has helped scientists understand other complex conditions such as cardiovascular disease, obesity, drug abuse and depression.

"Recovery from concussion, and TBI more generally, is dependent on a wide variety of factors that interact with each other. For this project, we

zoomed out to the systems level to sketch out how the variables interact," she said. "We want to better understand why some people seem to recover quickly from concussion, while others suffer more lasting symptoms and deficits."

Kenzie said this preliminary model will help researchers identify new areas for research, contribute to a new classification [system](#) for TBI and enable clinicians to consider concussion from a new perspective.

The interactive platform walks users through the model and allows them to zoom in, pan, see connections, view supporting citations for each link in the model, and insert their own comments.

"We'd love to see users get engaged and provide feedback," Kenzie said. "We hope this sparks a discussion about how to make sense of complex medical challenges like TBI."

The article and the diagram are the culmination of four years of research, which has been funded by the Brain Trauma Foundation and the Department of Defense.

More information: Erin S. Kenzie et al, The Dynamics of Concussion: Mapping Pathophysiology, Persistence, and Recovery With Causal-Loop Diagramming, *Frontiers in Neurology* (2018). [DOI: 10.3389/fneur.2018.00203](#)

Provided by Portland State University

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