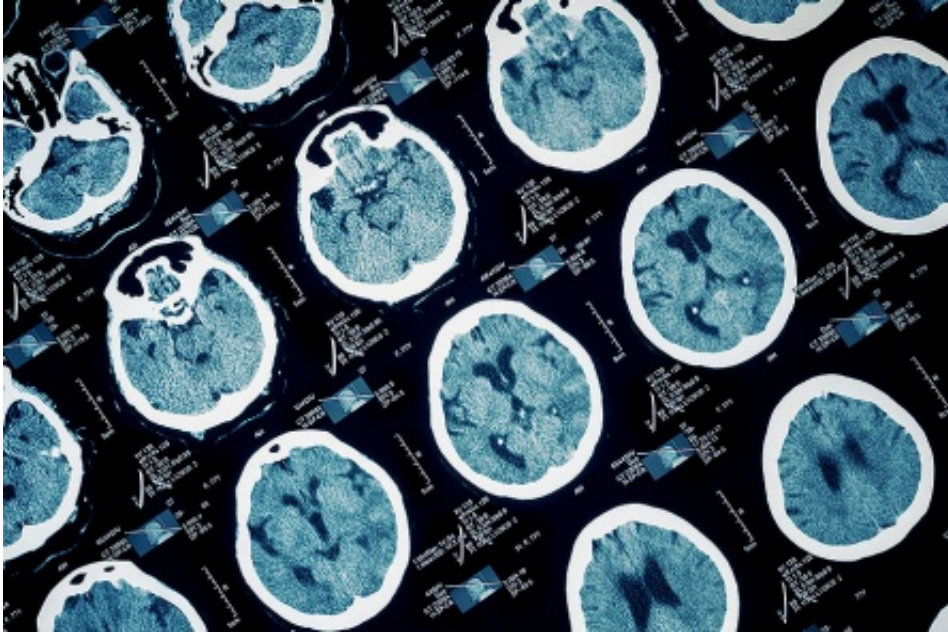


# How are CTE and behavior linked?

December 5 2014, by Ellen Goldbaum

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A lack of longitudinal studies on CTE hinders scientists' ability to understand how the brain disease is linked to behavioral health symptoms

Aggression, violence, depression, suicide. Media reports routinely link these behavioral symptoms with chronic traumatic encephalopathy (CTE), the neurodegenerative brain disease, in former football players.

But just how CTE and behavioral changes are related is an extremely complex and, as yet, poorly understood issue, write University at Buffalo researchers in a new research paper.

Published last month in the *Journal of Neuropsychiatry and Clinical Neurosciences*, the UB paper traces the reporting of neuropsychiatric symptoms now associated with CTE back to the 1928 publication by H.S. Martland in the *Journal of the American Medical Association* titled "Punch Drunk."

That publication chronicled behavioral problems in individuals, presenting as "cuckoo, goofy, or slug nutty," following one or more blows to the head. Martland discussed the similarity of these symptoms to other brain disorders that involved encephalitis, inflammation of the brain.

Since then, the UB researchers write, discussion of these symptoms has evolved as new technologies have helped identify specific brain changes that occur after blows to the head result in forces being transferred to the brain.

The UB researchers conclude that the "paucity" of longitudinal, prospective studies on CTE and the absence of "research-accepted diagnostic criteria for identifying individuals who are considered at risk for CTE" are a hindrance to establishing and understanding the causal relationship between CTE and behavioral health symptoms.

"According to the research community, there is a need for more empirical evidence," says Daniel Antonius, PhD, lead author and assistant professor in the UB Department of Psychiatry in the School of Medicine and Biomedical Sciences. "In order for a causal relationship between CTE and behavioral changes to be established, this phenomenon needs to be systematically studied in a large sample of contact and non-contact sports athletes over a long period of time, ideally starting early in their careers."

So far, Antonius notes, peer-reviewed literature on CTE consists

primarily of case review studies about specific individuals and post-mortem research. "We did a thorough review of the literature and what stood out is that case studies predominate," he says. "Case studies are illuminating and important but they cannot be used to properly establish clinical criteria for diagnosing a medical or psychiatric condition."

Research that led to this publication was partially supported by grants from the National Football League Charities, the Buffalo Sabres Foundation, the Robert Rich Family Foundation, the Ralph Wilson Foundation and the Program for Understanding Childhood Concussion and Stroke.

In order to better understand CTE and behavioral symptoms, it also is necessary to develop an appropriate animal model. But Antonius notes that current animal models for [traumatic brain injury](#) (TBI), with which CTE has significant overlap, provides insight into the difficulties of developing such a model.

"Trying to develop an animal model is an important starting point," he says, "but with TBI, for example, people have had animal models they've been studying for decades and they still do not have a perfect model. Like CTE, traumatic brain injury involves so many factors, including brain deficits and abnormalities affecting different areas of the brain, as well as various behavioral manifestations. Coming up with an [animal model](#) will be difficult and take years."

The authors of the paper are involved in a multidisciplinary research and treatment study at UB called the Healthy Aging Mind Project, organized last year, to help former professional athletes maintain quality of life while also studying how they age.

Developed by John Leddy, MD, UB professor of orthopaedics and Barry S. Willer, PhD, UB professor of psychiatry, both of whom are co-

authors with Antonius, the Healthy Aging Mind Project is based in UB's Concussion Management Clinic, which Leddy directs. The project receives funding from the Ralph C. Wilson Foundation Team Physician Fund among other organizations.

The project involves researchers in the UB medical school from the departments of Psychiatry and Orthopaedics and Sports Medicine as well as UB medical students, residents and post-doctoral researchers and faculty from the UB School of Social Work, School of Nursing and School of Public Health and Health Professions.

"We wanted to work with former professional football and hockey players, and other athletes, to see what happens to their minds and brains, and mental health, as they age while helping them and their families identify treatment and counseling opportunities," says Antonius, who led the behavioral health committee within the Healthy Aging Mind project. Other groups in the project are studying lifestyle, physical health, and cognition among participants as well as developing imaging protocols.

In addition to conducting research on brain function in aging athletes, the UB project has a strong service component designed to provide education, assistance and, where possible, treatment for these athletes.

Provided by University at Buffalo

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