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Criteria Developed for Diagnosing CTE Symptoms in Living People

For the first time, researchers have developed standards for diagnosing the clinical disorder associated with CTE—a major step forward in understanding the degenerative brain disease.

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A new study co-authored by a School of Public Health researcher presents the first expert consensus criteria developed for traumatic encephalopathy syndrome (TES), the clinical disorder associated with chronic traumatic encephalopathy (CTE).

CTE is a degenerative brain disease associated with a history of repetitive head impacts, including those sustained in contact and collision sports such as football and boxing. Currently, the disease can only be diagnosed after death through a neuropathological examination of brain tissue. There has been no accepted approach or agreed upon criteria for the diagnosis of CTE and its clinical manifestations during life until now.

Published in the journal *Neurology*, the National Institute of Neurological Disorders and Stroke (NINDS)-funded paper provides a new way for researchers to diagnose TES and gain a better understanding of CTE, including its prevalence, causes, and risk factors of the disease, and its differentiation from similar disorders, such as Alzheimer's disease.

"This is an important step towards diagnosing CTE in life," says Yorghos Tripodis, research associate professor of biostatistics and a co-author of the paper. "In the short term, it will help is in finding biomarkers which are related to specific clinical symptoms of CTE. In the long term, we will be able to design interventions for reducing the risk of the disease."

As part of the ongoing multi-center NINDS-funded DIAGNOSE CTE Research Project, the "First NINDS Consensus Workshop to Define the Diagnostic Criteria for TES" was held in Phoenix, Ariz. in April 2019. It was attended by a multidisciplinary panel of 20 clinician-scientists and seven observers from 11 academic institutions across the country, with expertise in neurology, neuropsychology, psychiatry, neurosurgery and physical medicine and rehabilitation.

The workshop initiated an eight-month process of four rounds of drafting, reviewing, commenting, voting and revising the criteria until a consensus was achieved amongst the panelists. The new paper describes that

process and provides researchers with detailed criteria for diagnosing study participants with TES and with a "provisional level of certainty" for the individual having CTE brain pathology.

The consensus process was led by Douglas Katz, professor of neurology at the School of Medicine and first author of the new paper.

"It was an honor to work with such an esteemed group of experts," says Katz. "Despite the different disciplines and areas of expertise of the panelists, the collegiality and collaborative spirit demonstrated by all those involved led to a consensus and diagnostic criteria we believe will benefit the field."

To be diagnosed with TES under these new criteria, an individual must have: substantial exposure to repetitive head impacts from contact sports, military service, or other causes (e.g., a minimum of five years of organized American football, with two or more of those years played at the high school level or beyond); and a progressive course of cognitive impairment (specifically in episodic or "short-term" memory and/or executive functioning, such as planning, organization, judgment, and multi-tasking) or neurobehavioral dysregulation (including explosiveness, impulsivity, rage, violent outbursts, and emotional lability) or both. Moreover, the criteria require that other neurologic, psychiatric, or medical conditions cannot be fully responsible for these clinical problems, although other neurologic and psychiatric conditions may be diagnosed together with TES.

The authors stress that these criteria are not meant to be used by health care providers to make a clinical diagnosis of CTE. Robert Stern, director of clinical research for the BU CTE Center and corresponding author of the paper, says these criteria will continue to be revised and updated as new research information becomes available.

"It is expected that biomarkers, such as PET scans and blood tests currently being studied in the DIAGNOSE CTE Research Project, will be

integrated into the criteria to improve diagnostic accuracy in the next few years, resulting in the appropriate use of the criteria to diagnose patients in the clinic," says Stern. "The publication of these NINDS Consensus Diagnostic Criteria for TES is a major step in achieving the goal of diagnosing CTE in life and in promoting research to better understand, treat, and ultimately prevent CTE."

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