

ANSWERING QUESTIONS ABOUT Chronic Traumatic Encephalopathy (CTE)



This handout provides a brief summary of what researchers currently know and don't know about chronic traumatic encephalopathy, or CTE. Research on CTE is growing, and more studies are needed to help answer many remaining questions. CDC will update this handout as more information on CTE becomes available.

What is CTE?

CTE is a brain disease that can only be diagnosed after death. It has been linked to specific changes in the brain that affect how the brain works. The research to-date suggests that CTE is caused in part by repeated traumatic brain injuries, including [concussions](#), and repeated hits to the head, called subconcussive head impacts.¹ However, understanding among researchers about the causes of CTE is currently limited. Researchers do not know the number and types of head impacts that increase the risk for CTE. It is possible that biological, environmental, or lifestyle factors could also contribute to the brain changes found in people with CTE diagnosed after death.^{2,3} More studies are needed to learn about the causes of CTE, its symptoms, and how it affects the brain.⁴ In addition, research on the role of genetics, a person's medical history, and other factors (such as environmental or lifestyle factors) is needed to better understand the risk factors for CTE.

What are Subconcussive Head Impacts?

Subconcussive head impacts are bumps, blows, or jolts to the head. Unlike concussions, which cause symptoms, subconcussive head impacts do not cause symptoms. A collision while playing sports is one way a person can get a subconcussive head impact.

Occasional hits to the head do not cause CTE

Occasional hits to the head, such as the bumps and tumbles that children experience when learning to walk, do not cause CTE.

How is CTE Diagnosed?

To diagnose CTE, doctors check the brain of a person after he or she dies. Doctors look for changes in the brain that happen in people with CTE.⁵ Through this process, doctors confirm whether the person had CTE or another disease, such as Alzheimer's disease, or no disease at all.⁵ Given the limited understanding of CTE and its causes, doctors cannot diagnose CTE in a living person.



How Common is CTE?

Researchers do not know how many people in the United States have CTE. Most studies on CTE have focused on a small group of people who experienced head or brain injuries over many years. People in this group had their brains donated for research, and according to reports from family members, they often had problems with thinking, emotions, or behavior while they were alive.⁶⁻⁸

CTE has been diagnosed in people with and without a history of head or brain injuries.³ However, most people with a history of head or brain injuries do not develop CTE.

The National Institutes of Health (NIH) is looking for answers on CTE

NIH funded [research studies](#) to learn how to diagnose CTE while a person is alive. Developing ways to diagnose CTE during life will help researchers learn more about its causes, and may also lead to treatments in the future.^{10,11}



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What are the Signs and Symptoms of CTE?

Researchers are not certain what symptoms are directly linked to CTE. Family members have reported noticing changes in thinking, feeling, behavior, and movement among people who are later diagnosed with CTE after death.⁴ Some people diagnosed with CTE first had problems with depression or anxiety. Some later developed memory and other thinking problems. Over time, some of these people had mood or personality changes. Family members of people who were later diagnosed with CTE have reported that their family member had problems that became serious enough to get in the way of normal daily activities (such as social or work-related activities).⁴⁻⁶

The symptoms described by family members are similar to those of other health problems (e.g., Alzheimer's Disease, Parkinson's Disease), so having these symptoms does not mean a person has CTE.

In addition, while there is increasing media attention on suicide among former professional athletes, the link between CTE and suicide is unclear.⁹

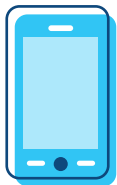
If you or a family member or friend have any questions or concerns, it is important to talk to a doctor. Treatments are available to help with many of these symptoms.



Resources:

To learn more about CTE and other brain diseases:

- Visit the NIH website at <https://www.ninds.nih.gov/Current-Research/Focus-Research/Traumatic-Brain-Injury/NIH-Chronic-Traumatic-Encephalopathy>



If you or someone you know needs to speak with a trained counselor:

- Call the Substance Abuse and Mental Health Services Administration National Helpline at **1-800-662-HELP (4357)**, or text “**home**” to **741741**.
- Call the National Alliance on Mental Illness Helpline at **1-800-950-NAMI (6264)**.
- Contact the National Suicide Prevention Lifeline at **1-800-273-TALK (1-800-273-8255)**, or visit <https://suicidepreventionlifeline.org>.

The Veterans Crisis Line connects veterans, their family, or friends with qualified, caring responders:

- Call the confidential, toll-free hotline at **1-800-273-8255**, or text to **838255**.

References:

1. Montenegro PH, Corp DT, Stein TD, Cantu RC, Stern R. Chronic traumatic encephalopathy: historical origins and current perspective. *Ann Rev Clin Psychol*. 2015;11:309-330. doi:10.1146/annurev-clinpsy-032814-112814.
2. Iverson, G., Gardner, J., McCrory, P., Zafonte, R., Castellani, R. (2015). Critical review of chronic traumatic encephalopathy. *Neuroscience and biobehavioral reviews*,56, 276-293.
3. Iverson GL, Keene CD, Perry G, Castellani RJ. The Need to Separate Chronic Traumatic Encephalopathy Neuropathology from Clinical Features. *J Alzheimer Dis*. 2018;61(1):17-28. doi: 10.3233/JAD-170654.
4. Skene BM, Sullan MJ, DeKosky ST, Jaffee MS, Bauer RM. Research gaps and controversies in chronic traumatic encephalopathy: a review. *J M Neurol*. 2017;74(10):1255-1262. doi:10.1001/jamaneurol.2017.2396.
5. McKee C, Cairns NJ, Dickson DW, et al. The first NINDS/NIBIB consensus meeting to define neuropathological criteria for the diagnosis of chronic traumatic encephalopathy. *Acta Neuropathol*. 2016;131(1):75-86. doi:10.1007/s00401-015-1515-z.
6. Stern R, Daneshvar DH, Baugh CM, et al. Clinical presentation of chronic traumatic encephalopathy. *Neurology*. 2013;81(13):1122-1129. doi:10.1212/WNL.0b013e3182a55f7f.
7. McKee C, Stern R, Nowinski CJ, et al. The spectrum of disease in chronic traumatic encephalopathy. *Brain*. 2013;136(pt 1):43-64. doi:10.1093/brain/aws307.
8. McKee C, Josco ML, Huber BR. Repetitive head impacts and chronic traumatic encephalopathy. *Neurosurg Clin N Am*. 2016;27(4):529-535. doi:10.1016/j.nec.2016.05.009.
9. Iverson GL. Chronic traumatic encephalopathy and risk of suicide in former athletes. *Br J Sports Med*. 2014;48(2):162-164. doi:10.1136/bjsports-2013-092935.
10. The DI GNOSIS-CTE Research Project (DI GNOSIS-CTE). <https://clinicaltrials.gov/ct2/show/NCT02798185>. Accessed on October 23, 2018.
11. Edlow BL, Keene CD, Perl DP, et al. Multimodal Characterization of the Late Effects of Traumatic Brain Injury: Methodological Overview of the Late Effects of Traumatic Brain Injury Project. *J Neurotrauma*. 2018 Jul 15;35(14):1604-1619. doi: 10.1089/neu.2017.5457. Epub 2018 May 3.