

Definition: progressive degenerative disease of the brain found in people with a history of repetitive brain trauma (subconcussive impacts)

What is a sub-concussive impact

- Different than concussion
- A concussion is where the brain is violently shaken and the brain cells get damaged, therefore not functioning properly
- A subconcussive impact is below the concussion threshold
 - Tackles on the football field, headers in soccer, collisions in hockey, body checks in lacrosse
 - They damage the wiring in our brain making it harder for brain areas to communicate
 - Contributes to CTE if a lot of sub-concussive impacts are accumulated
- CTE is not caused by a single injury, it is caused by repetitive trauma
- Contact sports where the head is hit a lot, athletes in these are in danger

CTE has been found in...	Source of head impacts
Boxers	Punches to the head
Tackle football players	Hits to the helmet
Soccer players	Headers and collisions
Ice hockey players	Fighting, checking
Military veterans	Blast injuries, combat
Victims of domestic abuse	Repeated violence

- CTE can only be diagnosed after death
 - Doctors must conduct an autopsy to look for signs of brain tissue degeneration
- CTE has also been seen in bull riding

Football

- Caused by the tackling (constant hits to the head and poor tackling technique)
- Autopsies of football players (CTE was found in 87 percent of the players)
 - High school - 29 percent
 - University/College players - 87 percent
 - Semi-pro - 71 percent
 - CFL - 88 percent
 - NFL - 99 percent

- Aaron Hernandez (NFL player) who was convicted of first-degree murder killed himself in prison
 - He had advanced CTE (stage 3 out of 4)
 - This was a factor in the crimes he committed
 - Researchers described it as the most severe case of CTE seen in a person his age
 - He had migraines and problems with memory

- High school player Zac was killed from all the head trauma that was inflicted on him from football. He recorded his journey throughout the football season and the ordeal in a journal
 - They let him play after two concussions
 - His brain was donated to science
 - The symptoms of CTE were seen in him

- CTE causes poor judgment, inhibition of impulses, or aggression, anger, paranoia, emotional volatility, and rage behaviours.

- The symptoms of CTE generally do not present until years or decades after the brain trauma occurred or after one stops actively playing contact sports
 - Occasional hits and injuries here and there won't cause CTE (ex. Tripping and falling as a kid and accidentally hitting head on objects)

- Age of first exposure to head impacts
 - Athletes who begin playing contact sports at younger ages are at greater risk for CTE. Several published studies show that exposure to head impacts before age 12 is associated with worse outcomes than starting after age 12.

Soccer

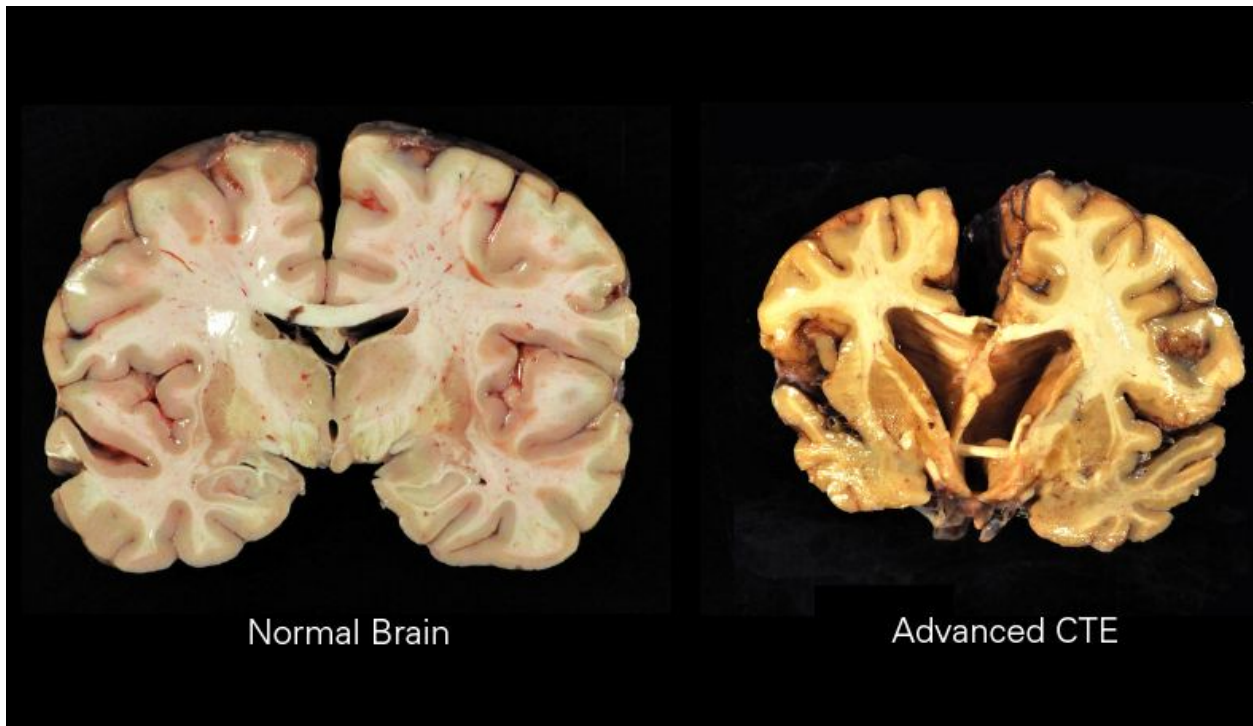
- The risk of CTE while playing recreational soccer is low
- The risk was higher back in the day due to the heavy leather balls they used
- The American Youth Soccer Organization has eliminated heading all together for players under the age of 10 and limited heading during practice for those between 11 and 13.
- In 2017, Ling et al. presented a study in the UK in which 12 retired football players with dementia were followed for a long period to death, 6 of whom underwent neuropathological examination. Of these, four had CTE which was also associated with other neuropathological changes consistent with the diagnosis of mixed dementia.

Rugby vs Football

- CTE in rugby is less prevalent due to the style of play
- In football, the players wear helmets. This gives them the misconception and confidence that they can use their heads to tackle.
- In rugby, no helmets are used so they use proper shoulder tackling techniques
 - This reduces the prevalence of CTE in rugby compared to football
- The Seattle Seahawks have started to implement this shoulder tackling technique

Hockey

- In 2013, 10 former players launched a class-action suit against the NHL for their negligence regarding head injuries.
- Stan Mikita a former Blackhawk had CTE
- The NHL has taken steps to combat this issue
 - Stricter penalties for targeted hits to the head
 - Concussion protocols have improved
 - The game has also changed, it has shifted from a slower physical game to a faster game which emphasizes more skill
 - There are less targeted hits to the head



- Documentaries and interviews
- <https://www.imdb.com/title/tt3322364/> - Concussion
- https://www.youtube.com/watch?v=WjLek_JeqIs
- <https://www.youtube.com/watch?v=SvfpMp2gWdM>
- <https://www.youtube.com/watch?v=SedClkAnclK> - League of Denial
- https://www.youtube.com/watch?v=oc_1kNImlgQ
- <https://www.youtube.com/watch?v=9TrCZcsSyA8>
- https://youtu.be/T_VSicTCMXI - Hockey

Sources

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