MIND BLASTING EFFECTS

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| COGS 11: Minds and Brains
Thursday, July 26, 2018
OVERVIEW

- Chronic Traumatic Encephalopathy (CTE)
  - Cerebellum
  - Tau Protein
- 3 Real Life Instances
  - Football
  - Wrestling
  - Battlefield Trauma
- Legacy/Relevance
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CHRONIC TRAUMATIC ENCEPHALOPATHY

- Neurodegenerative disorder
- Commonly confused with Alzheimer's disease
- Found in those who suffer repetitive brain damage - blows or "blasts"
- Initial symptoms - Impulsivity, memory problems, impaired judgment/decision-making
- Advanced symptoms - Dementia, speech abnormality, tremors
- Caused by damage to protein "tau"
- Cerebellum affliction
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Do You Know?
CEREBELLUM

- Vulnerable to damage during explosions
- Reduced glucose metabolism
  - Effects not fully known
- Develops tiny leaks in blood-brain barrier
- Increase in phosphorylated tau protein
- Increased inflammation due to active microglia
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WHAT IS RESPONSIBLE FOR BRAIN DAMAGE?
TAU PROTEIN

- Microtubule associated protein
- Lines up against the nerve cells to regulate it
- Over production- destructs and damages brain cells essential for learning and memory
- It's typically found in the Central Nervous System, elsewhere-- uncommon
In a **Healthy** Brain....

- It's concentrated within axons of neurons, and sticks to microtubules
- The protein helps to maintain the shape of the cell, and transports nutrient

In an **Unhealthy** Brain...

- When the head takes a mild hit..
- The axons stretch!
- Then, tau somehow becomes phosphorylated.
- It eventually, falls off the microtubules and starts to clump together.

Researchers and scientists are still trying to figure out how this is occurring! Also, similar to Alzheimer's disease.
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CTE in NFL

- Former NFL player Junior Seau shot himself - an autopsy was performed and was found he suffered from CTE
- Awareness of CTE in NFL
- Led to NFL + General Electric to research on diagnosing and treating brain trauma
THE STUDY

Since 2008, McKee and colleagues a "brain bank" at the Center for the Study of Traumatic Encephalopathy (CSTE), based at Boston University School of Medicine, have collected and studied the brains and spinal cords of athletes, military veterans, and civilians who sustained mild, repetitive brain traumas. At least 65 of these brains showed signs of CTE, including 33 out of 34 NFL players. "We have individuals with no recognized concussions but thousands of sub-concussive blows in our brain bank," said Robert Cantu, co-director of the CSTE.
The study showed ... The protein TAU was concentrated in areas that control memory, emotions and other functions ...
BOXING AND WRESTLING DAMAGE

- Wrestlers take blows to the head which can lead to brain damage.

- Effects include memory problems, headaches, and nausea.

- Repeated head trauma eventually leads to CTE.
DAMAGE TO THE BRAIN

- Contact sports like boxing can lead to several brain degeneration.

- Damage to the frontal lobes, temporal lobes, hippocampus, amygdala, and brainstem.

- Just like with football, tau is also present in the brain.
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BATTLEFIELD TRAUMA

- Many military veterans have shown many symptoms of CTE, usually caused by brain blast from explosions.

- The damage is observed to be evenly distributed in the brain (unlike NFL players and Wrestlers).

- Soldiers have been reported to have had emotional and cognitive problems.
WHAT HAPPENS TO THE BRAIN?

• Military blasts were recreated with mice.
• Observed damage to axons and capillaries.
• Also showed a lot of tau protein present.
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CLOSING STATEMENTS

- Malignant disposition of CTE
- Debilitating nature of damaged tau protein
- Disruption of cognitive function in key areas
- Relatively less understood field
  - Grossly under-diagnosed, misinterpreted
  - No living diagnosis
- Tau-specific bio-markers
- First theory on CTE
- Concern of youth in contact sports
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