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BACKGROUNDER

Baycrest longitudinal study examines the cognitive and psychosocial function of retired professional hockey players

Overview

The relationship between repeated concussions and neurodegenerative disease in athletes has received significant attention, particularly research in post-mortem samples. The objective of this study was to assess brain health in former professional hockey players during life. This is a comprehensive, longitudinal study, including measures of cognition, emotional well-being, and structural and functional brain imaging. Study volunteers also donate blood for genetic analysis and cerebrospinal fluid for analysis of proteins related to neurodegenerative disease. Study volunteers may also choose to donate their brain at death for neuropathological analysis.

Cognitive and Psychosocial Function in Retired Professional Hockey Players is the first peer-reviewed, scientific publication from this study, describing cognitive, emotional, and behavioral functioning in 33 alumni and 18 age-matched comparison subjects (aged 34–71) in relation to age, concussion history, and genetic status. The study was published in *The Journal of Neurology, Neurosurgery, and Psychiatry.*

What we found

- The alumni athletes who participated in the study were generally healthy and free from cognitive deficits.
- The alumni athletes reported elevated emotional, behavioural and cognitive challenges relative to the comparison group. However, this was not related to their history of concussion.
- Although the alumni athletes were not cognitively impaired, their scores on tests of executive (problem solving) and intellectual function were lower than those of the comparison group. Performance on these measures in the alumni was related to the number of previous concussions sustained.
- Endorsement of emotional stress (e.g., depression, anxiety) was related to possession of the *APOE* ϵ4 allele. This genetic variant has been associated with the brain's recovery from injury and with increased incidence of dementia.
- In general, aging is associated with changes in cognition, particularly memory, attention, and executive functioning. The researchers found the expected aging effects, but these were no different in the alumni versus the comparison participants. In other words, there was no evidence of "accelerated aging" in the alumni.

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What we learned

- These alumni athletes were generally healthy with subtle objective cognitive impairment, although their subjectively assessed cognitive and emotional impairment was high.
- These results do not speak to the diagnosis of chronic traumatic encephalopathy (CTE), which can only be confirmed at the time of death through autopsy.
- There was only limited evidence for the effects of concussion on cognitive functioning in this sample. We did not find evidence that concussion history related to the subjective emotional, behavioral, and cognitive symptoms, although this could reflect limitations in the retrospective assessment of concussion. Other factors, such as the stress associated with participation in and retirement from high-contact professional athletics cannot be ruled out as contributing to these findings. There may be a genetic predisposition for these effects (i.e., presence of an APOE ϵ4 allele), although larger samples are required to confirm this finding.
- These findings provide benchmarks for the degree of cognitive and behavioral impairment in retired professional athletes and a point of comparison for future neuroimaging and longitudinal studies.
- Longitudinal testing is required to determine any change in functioning or dementia that may occur with advancing age.

Next steps

- The investigators are preparing papers from this same sample describing brain imaging findings, including both brain structure and function.
- Alumni are invited to return every four years to assess any changes that may occur with age.
- Alumni who have not participated in this study are encouraged to enroll. The Rotman Research Institute at Baycrest is also interested in testing healthy men who were not professional ice hockey players.
- More information about this research can be found at www.AthletesBrainResearch.com.

Supporters

- The NHL Alumni Association helped to recruit many former professional athletes to participate in the study, but had no other role in the study.
- Grants from The Canadian Institutes of Health Research, the Ontario Neurotrauma Foundation, the Ministry of Research and Innovation of Ontario, Baycrest Health Sciences, The Women Friends of Baycrest, and an Alzheimer's Society of Canada Research Program Post-Doctoral Fellowship awarded to Dr. Esopenko made this study possible.
- This research was conducted independently by the researchers at Baycrest's Rotman Research Institute and their collaborators, with no influence on study design, data collection or interpretation by any outside agents.

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About Baycrest's Rotman Research Institute

The Rotman Research Institute at Baycrest Health Sciences is a premier international centre for the study of human brain function. Through generous support from private donors and funding agencies, the institute is helping to illuminate the causes of cognitive decline in seniors, identify promising approaches to treatment, and lifestyle practices that will protect brain health longer in the lifespan.

About Baycrest Health Sciences

Headquartered on a 23-acre campus and fully affiliated with the University of Toronto, Baycrest Health Sciences combines a unique holistic healthcare approach for aging adults with one of the world's top brain research institutes (the Rotman Research Institute). Baycrest is home to the federally and provincially-funded Canadian Centre for Aging and Brain Health Innovation, a solution accelerator focused on driving innovation in the aging and brain health sector, and the developer of a free online memory assessment, Cogniciti, for Canadians 40+ who are concerned about their memory. As a hospital with exemplary standing, practitioners and researchers at Baycrest work towards revolutionizing the aging experience. Baycrest is a recognized leader in offering unique hands-on opportunities to help train the next generation of healthcare professionals.

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