

High School Football and Late-Life Risk of Neurodegenerative Syndromes, 1956-1970

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Abstract

Objective: To assess whether athletes who played American varsity high school football between 1956 and 1970 have an increased risk of neurodegenerative diseases later in life.

Patients and Methods: We identified all male varsity football players between 1956 and 1970 in the public high schools of Rochester, Minnesota, and non-football-playing male varsity swimmers, wrestlers, and basketball players. Using the medical records linkage system of the Rochester Epidemiology Project, we ascertained the incidence of late-life neurodegenerative diseases: dementia, parkinsonism, and amyotrophic lateral sclerosis. We also recorded medical record–documented head trauma during high school years.

Results: We identified 296 varsity football players and 190 athletes engaging in other sports. Football players had an increased risk of medically documented head trauma, especially if they played football for more than 1 year. Compared with nonfootball athletes, football players did not have an increased risk of neurodegenerative disease overall or of the individual conditions of dementia, parkinsonism, and amyotrophic lateral sclerosis.

Conclusion: In this community-based study, varsity high school football players from 1956 to 1970 did not have an increased risk of neurodegenerative diseases compared with athletes engaged in other varsity sports. This was from an era when there was a generally nihilistic view of concussion dangers, less protective equipment, and no prohibition of spearing (head-first tackling). However, the size and strength of players from previous eras may not be comparable with that of current high school athletes.

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For more than a century, head trauma has been linked to subsequent risks of neurodegenerative disease later in life¹ and, specifically, to dementia/Alzheimer disease,¹ Parkinson disease (PD),² and amyotrophic lateral sclerosis (ALS).³ These conditions have been reported to be substantial among those engaged in contact sports.⁴ Recent publicity has focused on the dangers of American football, especially as played at the professional and college levels, with later risk of the dementia of chronic traumatic encephalopathy.⁵

Football is arguably America's most popular sport and is played in nearly every high school. Football is a collision sport, where concussions commonly occur and subconcussions may be routine, at least at the college and professional levels.⁶ This may have implications for brain health later in life, with

theoretical risks of dementia and other neurodegenerative disorders. The importance of the topic has societal implications, with some authorities questioning the wisdom of youth football.⁷ On the other hand, high school sports have certain redeeming features, most notably the benefits of fitness training, which not only favors cardiovascular health but may also have a neuroprotective effect against later neurodegenerative diseases, including dementia and PD.^{8,9}

We previously investigated long-term neurologic outcomes of a cohort of high school football players from 1946 to 1956 and found no increased risk of dementia, PD, or ALS compared with non-football playing high school classmates or with the general population.¹⁰ The goal of the present study was to extend the investigations to another cohort of varsity high school football players



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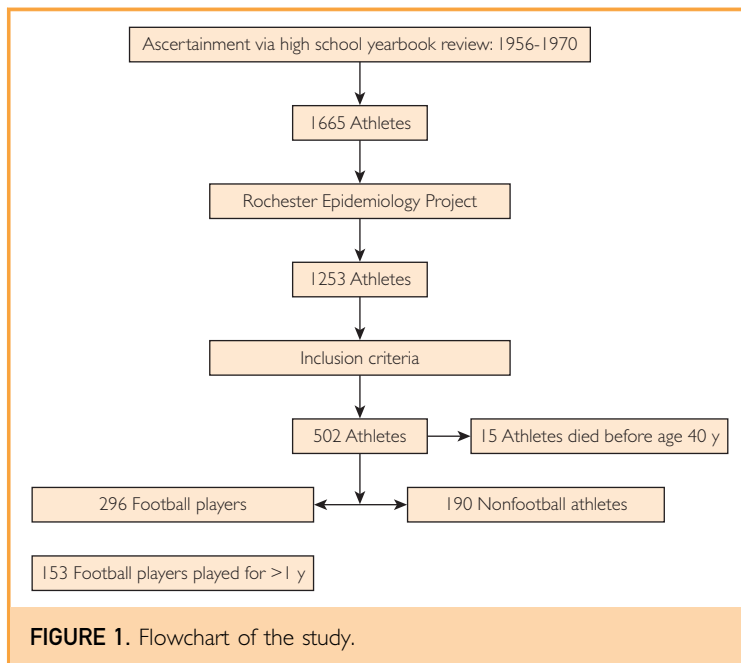


FIGURE 1. Flowchart of the study.

from the next era, 1956 to 1970. This was a time when the rules, the regulations, and the physical ability of the football players were evolving to mirror more closely those of the present era. Still, in this era, football-related concussions were often minimized or dismissed as “getting your bell rung.” In the present study, a cohort of high school football players was compared with a cohort of non-football-playing male high school athletes (swimmers, basketball players, and wrestlers) to assess the long-term neurologic outcomes of dementia, parkinsonism, and ALS.

METHODS

Study Design

This study design mirrored a previous investigation of a cohort of varsity high school football players who played between 1946 and 1956.¹⁰ In the present study, we used the same method and reviewed all yearbooks of the 2 public high schools in Rochester, Minnesota, between 1956 and 1970: Mayo High School and Rochester High School (now called John Marshall High School). All information contained in the yearbooks is in the public domain and was freely accessible at the History Center of Olmsted County in Rochester. We used these yearbooks to document the

rosters of varsity football teams plus the comparison cohort of male high school classmates participating in varsity basketball, swimming, or wrestling. The yearbooks contained relevant demographic information, including sport and activity participation. Soccer, tennis, boxing, and hockey were not consistently available sports during these study years, and female sports programs were not consistently offered in these schools.

We identified 2 different groups of male high school athletes in the yearbooks: students who played varsity football and students who never played football but were varsity swimmers, basketball players, or wrestlers. Athletes who played other sports in addition to football were included in the football group (Figure 1).

We used the medical records linkage system of the Rochester Epidemiology Project (REP), which provided access to the medical records of each included individual. The REP is a unique medical records linkage system that encompasses the care delivered to all the residents of Olmsted County, Minnesota. Individuals visiting any of the county care providers generate records in the system. This is an active medical records linkage system that spans from the early 1900s to the present. Further details on the REP have been reported elsewhere.¹¹⁻¹³ The REP includes a tool that allows searching for individuals by name and year of birth. We searched for each person on the compiled lists using his or her full name and the approximate year of birth (assuming that students graduated at age 18 ± 2 years) as in the previous study.¹⁰ The institutional review boards of Mayo Clinic and Olmsted Medical Center approved the study.

We limited the study cohort to individuals who had a constant and prolonged medical presence in the REP and received their medical care at Mayo Clinic, Olmsted Medical Center, or other Olmsted County facilities. We included only students with updated medical records to 2005 or later. We excluded students who had left the county or who did not have continuous evidence of medical records up to at least 2005 in the REP.

Neurologic Outcomes

We reviewed the entire medical record of each student and compared the long-term

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