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Descriptive Epidemiology of Game-Related Youth Flag Football Injuries

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Context: Flag football is promoted as a safer alternative to tackle football. This may be 1 reason why participation rates have risen by 39% over the past 3 years. Despite rising participation, epidemiologic research on sport-specific injuries and associated relative risk is lacking.

Objective: To prospectively document the epidemiology of injuries in youth flag football.

Design: Descriptive epidemiology study.

Setting: Regional and national youth flag football tournaments.

Patients or Other Participants: Athletes (N = 1939; 1744 boys and 195 girls), ages 6 to 12 years. An athletic trainer prospectively monitored the athletes for sport-related injury and exposures.

Main Outcome Measure(s): Athlete risks of injury and injury rates were calculated overall and by sex. Injury characteristics were reported for the total population and by sex.

Results: Forty-seven injuries to unique individuals were recorded in 1939 athletes with a total of 9228 athlete-exposures (AEs). The overall risk of injury was 2.4% (95% CI = 1.79%, 3.21%), with an overall injury rate of 5.1 per 1000 AEs (95% CI = 3.75, 6.77). Of the 47 injuries, 36 occurred in boys (8365 AEs), and 11 occurred in girls (863 AEs). A higher risk in girls was evidenced by both the injury risk ratio (2.73; 95% CI = 1.41, 5.30) and injury rate ratio of 2.96 (95% CI = 1.51, 5.82). The most common injury sites were the head/face/neck (n = 15, 31.9%), followed by the ankle/foot (n = 9, 19.1%). The most frequent types of injury were contusion (55.3%), sprain/subluxation (14.9%), and general trauma (10.6%); 74.5% of all injuries resulted from direct impact.

Conclusions: Although the competition injury rate for youth flag football was lower than the values from studies reporting comparable tackle football data, the frequencies by body part, type, and mechanism were similar. Given that most injuries were related to some form of impact and predominantly contusions, adopting minimal protective equipment or padding may reduce the numbers of these injuries.

Key Words: injury rate, incidence, injury risk, injury mechanism, youth injuries, youth sport

Key Points

- This was the largest prospective study to date in terms of both number of athletes and athlete-exposures in youth flag football.
- The types, mechanisms, and locations of game injuries in youth flag football players are described.
- Understanding the frequency and nature of injuries that occur in youth flag football may inform preventive measures through equipment adoption or rule changes.
- Additional education related to technique is important as a potential means to reduce injury in the sport of flag football.

Football participation is popular among US youths (between ages 6 and 12 years), with previously reported participation numbers of 1 million playing tackle football, and 900 000 playing flag football.[1] The Sports and Fitness Industry Association indicated that flag football participation has now surpassed tackle football participation in youths aged 6 to 12 years.[2] This finding equates to approximately 3.3% of all youths playing flag football, compared with 2.9% playing tackle football.[2] With the recent media attention on the potential long-term and deleterious effects of exposure to head impacts, efforts have been made to promote flag football as a safer alternative to tackle football.[3] This emphasis on safer alternatives to tackle football is most evident at the youth level.

Youth sports participation is associated with social, psychological, and physical benefits that help establish lifelong health.[4–8] With physical inactivity being in the causal pathway for premature mortality worldwide,[9] children should be encouraged to form healthy physical activity habits early in life. However, athlete safety should also be a central focus in physical activity and youth sports, particularly in collision and contact sports. The authors of a recent systematic review[10] found the concussion incidence of youth football to be 0.78 per 1000 athlete-exposures (AEs). Both the concussion incidence and cumulative, repetitive head impact exposures are current predominant concerns given the mounting evidence for adverse long-term consequences

Table 1. Operational Definitions

Term	Definition
Injury	A reportable injury was defined as an injury that occurred due to participation in an organized competition requiring medical attention by a certified athletic trainer or physician, regardless of time loss.
Athlete-exposures (AEs)	Opportunity for injury was defined as 1 athlete participating in 1 coach-directed session (game or practice).[30,31] In this study, all AEs were game related.
Injury risk	The number of athletes who sustained an injury divided by the number of athletes involved and expressed as a percentage.
Incidence/injury rate	The number of new cases (incidence) divided by the number of AEs expressed per 1000 AEs.
Risk ratio	Compares the risk of an injury in 1 group (see Injury risk definition above) divided by the risk of injury in a second group (in this case, boys versus girls).
Rate ratio	A relative difference measure used to compare the incidence rates of events occurring at any given point in time. In this instance, it compares the incidence rate in 1 group compared with another (ie, boys versus girls).
Body part	The specific area of the body injured, grouped into classifications of head/face/neck, shoulder, elbow/forearm, wrist/hand, trunk/back, hip, thigh, knee, lower leg, and ankle/foot.
Injury type	The classification of the type of injury that occurred, grouped in categories of sprain/subluxation, strain/tendinopathy, fracture, concussion, contusion, laceration, and general trauma.
Injury mechanism	How the injury occurred, grouped into classifications of direct impact, stretch, torsion, shear, and unknown.
Player position	The position the athlete was playing at the time of injury, classified into wide receiver/back, rush, defender, corner, running back, center, quarterback, or unknown.
Player activity	The action the player was taking at the time of the injury, classified as running the ball, going for a pass, throwing the ball, going for the ball, or going for the flag.

later in life.[11,12] Speculation has arisen that youths are at increased risk for brain injury; however, examination of white matter changes in the brain did not support this contention in tackle football.[13]

Perhaps for the reasons mentioned earlier, youth participation in flag football has risen 39% over the past 3 years, more than any other sport.[2] By contrast, participation in youth tackle football has decreased in recent years, partly due to concern over the risk of sustaining a concussion.[14,15] The American Academy of Pediatrics classifies tackle football as a collision sport and flag football as a limited-contact sport.[16] Although contact in flag football may be less frequent than in tackle football, it is not without consequence. Limited evidence is available on the epidemiology of sport-specific injuries and relative risks. The current objective epidemiologic evidence on the flag football injury incidence negates any suggestion that it is a safer alternative to tackle football in the immediate or long-term duration. Researchers[17] of only 1 study have directly compared tackle and flag football. In this large-scale study that assessed 3794 players (3525 tackle and 269 flag), the overall injury rates were 2.60 per 1000 AEs in tackle football and 5.77 per 1000 AEs in flag football. The *hazard ratio* (which compares the probability of events between 2 groups) for tackle football versus flag football was 0.45 (95% CI = 0.25, 0.80; $P = .0065$). Specifically, in terms of concussion, tackle football had a rate of 0.68 per 1000 AEs, whereas flag football had a rate of 1.33 per 1000 AEs. The rate ratio for concussions in tackle football to flag football per exposure was 0.51 (95% CI = 0.16, 1.7), meaning participants were 2 times less likely to sustain a concussion in tackle football than in flag football.

It is important to note that with the increasing participation rates in flag football, clinicians (and other stakeholders) need data-driven evidence on the prevalence of injuries in these athletes and the potential risks of injury unique to the sport. Understanding the frequency and nature of injuries that occur in youth flag football may inform preventive measures through equipment adoption or rule changes Therefore, our aim was to explore and describe the injury epidemiology associated with youth flag football participation.

METHODS

We conducted a prospective epidemiologic study at 1 regional and 2 national-level youth flag football tournaments between December 2021 and February 2022. The tournaments involved both male and female athletes of ages 6 to 12 years. All injury and exposure data were observed and collected by 1 certified athletic trainer (AT; K.D.B.F.) with experience in injury epidemiology. Injury documentation was entered on site into an electronic medical record. The AT was present for all games during the tournaments and evaluated all injuries on the field or the sideline. The AT was located in a central medical tent visible and with access to all fields. Injuries were captured when athletes were seen directly by the AT, when the AT was called onto the field of play, and when athletes reported to the medical tent. Because the teams traveled to the tournament location, injury follow-up was not possible, so all injuries were acute in nature. This study was approved by the Institutional Review Board of Emory University. Operational definitions are presented in Table 1.

Statistical Analysis

Injury counts and rates were examined by body part, type of injury, mechanism of injury, player position, and player activity. Risk ratios and injury rate ratios with 95% CIs were estimated using the Fisher exact estimation and test due to the small number of injuries. The P value for statistical significance was set a priori at $< .05$. Statistical analyses were performed using OpenEpi[18] and SPSS (version 27; IBM Corp).

RESULTS

A total of 1939 athletes (1744 boys and 195 girls) of ages 6 to 12 years participated in this study. A total of 47 injuries to unique individuals in 1939 athletes with 9228

Table 2. Summary of Injury and Exposure Data

Group	No. of Athletes	Athlete-Exposures	No. of Injuries	Value (95% CI)			
				Risk, %	Rate (per 1000 Athlete-Exposures)	Risk Ratio	Rate Ratio
Boys	1744	8365	36	2.1 (1.45, 2.85)	4.3 (3.0, 5.96)	2.73 (1.41, 5.30)	2.96 (1.51, 5.82)
Girls	195	863	11	5.6 (2.85, 9.87)	12.75 (6.38, 22.69)		
Total	1939	9228	47	2.4 (1.79, 3.21)	5.09 (3.75, 6.77)		

AEs were recorded (Table 2). The overall injury risk was 2.4% (95% CI = 1.8%, 3.2%) with an injury rate of 5.1 per 1000 AEs (95% CI = 3.7, 6.8). Of the 47 injuries, 36 occurred in boys (8365 AEs) and 11 in girls (863 AEs). Girls displayed a significantly higher risk for both the injury risk ratio (2.73; 95% CI = 1.41, 5.30) and injury rate ratio (2.96; 95% CI = 1.51, 5.82) based on the Fisher exact test. No other differences were noted between boys and girls.

Head/face/neck injuries accounted for the largest proportion (n = 15, 31.9%) of all reported injuries (girls = 6, 54.5%; boys = 9, 25.0%), followed by the ankle/foot (19.1%), thigh (10.6%), and wrist/hand (10.6%). The most common types of injury overall were contusion (55.3%), sprain/subluxation (14.9%), and general trauma (10.6%; Table 3).

Almost three-quarters (74.5%) of all injuries were from direct impact to the player (boys = 77.8%, girls = 63.6%), followed by torsion in boys (13.9%) and stretch in girls (18.2%). No overuse injuries were reported. More injuries occurred during defensive team activities (46.8%) than during offensive activities (40.4%), with "going for the flag" cited as the most frequent defensive player activity for both boys (38.9%) and girls (27.3%). The most often injured position defensively was defender (40.4%) and offensively was wide receiver (25.5%). Offensively, most injuries to girls occurred while going for a pass (45.5%), which was the same for boys (16.7%), followed by running the ball (13.9%) and going for the ball (5.6%).

DISCUSSION

This is the largest study to date to prospectively describe the incidence of youth flag football injuries by observing 1939 athletes across 3 tournaments. Despite the increasing participation rates, a paucity of research exists on flag football injuries, particularly at the youth level. The minimal information available is sourced from aggregated data on emergency department visits or the National Electronic Injury Surveillance System database, which may not accurately portray on-field injury epidemiology.[19,20] The authors[17] of only 1 study to date have directly compared youth tackle and flag football. A strength of our study was that all injury data were collected by a certified AT; ATs have been shown to be highly reliable sources of injury reporting.[21]

The overall game-related injury rate in this study was 5.1 per 1000 AEs. This injury rate appears to fall within the range of the game-only injury rates in youth tackle football, from 4.3 to a high of 36.2 per 1000 AEs (Figure 1), as well as close to the overall rate of injury of 5.77 per 1000 AEs reported in youth flag football.[17,22–27] It was interesting to note that the tackle football study with the lowest injury incidence rate of 4.3 was the single investigation in which injury information was obtained from coaches. A similar potential for underreporting was present in the youth flag football study by Peterson et al,[17] in which injury reporters included coaches, parents, and ATs. By contrast, other studies,[17,23–25] including ours, all relied on certified ATs. Thus, injuries may be underreported by coaches and not a true reflection of actual injury incidence. If the Radelet et al data[22] are removed from the comparison due to different data-collection methods (depending on coaches instead of certified ATs), then our injury rate (5.1) was less than the lowest tackle injury rate (8.8), providing objective epidemiologic evidence that flag football is a safer alternative. Although no individual type of injury or body part injured was statistically different between males and females, there was a statistically significant difference ($P < .001$) for both overall injury risk and injury rate between boys (2.1%, 4.3) and girls (5.6%, 12.8), respectively, with girls being 3 times more likely to be injured. This finding is similar to that of Collins et al,[28] who noted that females had a higher match injury rate than males in adolescent rugby. These data contribute to the body of literature also showing that females have a higher injury risk in same-sex sports such as lacrosse,[29,30] soccer,[31,32] and baseball or softball.[31,33] Future research is warranted to determine why females are at increased risk of injury not only in these previously reported sports but also in flag football.

Injuries to the head/face/neck accounted for almost one-third (31.9%) of all reported injuries. Most of these injuries were contusions (10), nose epistaxis (2), or laceration (1). Only 1 concussion injury (female) was described. Consistent findings of the head/face/neck being the most often injured have been shown in youth tackle football[23,24] and in patients with football injuries who presented to emergency rooms.[33] Head/face/neck injuries were followed by ankle/foot (19.1%), thigh (10.6%), and wrist/hand (10.6%) injuries. Contusion was the predominant type of injury, accounting for more than half of all injury types, followed by sprains and general trauma, similar to the results of Kerr et al[23,34] among youth tackle athletes. Boys and girls did not differ in the body parts injured or types of injury.

An interesting finding from this study was that all hip- and trunk-related contusion injuries involved impact of a hard plastic flag attachment fixture against the body surface when a player fell to the ground (Figure 2). This result highlights a possible design flaw in the equipment as a direct contributor to athlete injury. Either using compressible or deformable material that collapses when impact occurs between the player and the ground or moving the attachment of the flags so that they are not located near the bony portions of the hip may decrease the incidence of hip and trunk contusion injuries. Similar equipment-related correlations with injuries were observed when flag football players wore shorts that contained pockets; hand and finger injuries increased.[35,36] The simple uniform change of eliminating pockets reduced the number of finger and thumb

Table 3. Injury Characteristics

Variable	Injuries by Group, No (%)		
	Boys	Girls	Total
Body Part			
Ankle/foot	8 (22.2)	1 (9.1)	9 (19.1)
Lower leg	1 (2.8)	1 (9.1)	2 (4.3)
Knee	3 (8.3)	1 (9.1)	4 (8.5)
Thigh	4 (11.1)	1 (9.1)	5 (10.6)
Hip	1 (2.8)	1 (9.1)	2 (4.3)
Trunk/back	4 (11.1)	0 (0.0)	4 (8.5)
Shoulder/upper arm	0 (0.0)	0 (0.0)	0 (0.0)
Elbow/forearm	1 (2.8)	0 (0.0)	1 (2.1)
Wrist/hand	5 (13.9)	0 (0.0)	5 (10.6)
Head/face/neck	9 (25.0)	6 (54.5)	15 (31.9)
Total	36 (100.0)	11 (100.0)	47 (100.0)
Type of Injury			
Sprain/subluxation	6 (16.7)	1 (9.1)	7 (14.9)
Strain/tendinopathy	1 (2.8)	2 (18.2)	3 (6.4)
Fracture	3 (8.3)	0 (0.0)	3 (6.4)
Concussion	0 (0.0)	1 (9.1)	1 (2.1)
Contusion	21 (58.3)	5 (45.5)	26 (55.3)
Laceration	1 (2.8)	1 (9.1)	2 (4.3)
General trauma	4 (11.1)	1 (9.1)	5 (10.6)
Total	36 (100.0)	11 (100.0)	47 (100.0)
Mechanism of Injury			
Direct impact	28 (77.8)	7 (63.6)	35 (74.5)
Torsion	5 (13.9)	1 (9.1)	6 (12.8)
Stretch	1 (2.8)	2 (18.2)	3 (6.4)
Shearing	1 (2.8)	0 (0.0)	1 (2.1)
Insidious onset	1 (2.8)	1 (9.1)	2 (4.3)
Total	36 (100.0)	11 (100.0)	47 (100.0)
Injury by Player Activity			
Offense			
Running the ball	5 (13.9)	0 (0.0)	5 (10.6)
Going for a pass	6 (16.7)	5 (45.5)	11 (23.4)
Throwing the ball	1 (2.8)	0 (0.0)	1 (2.1)
Going for the ball	2 (5.6)	0 (0.0)	2 (4.3)
Total	14 (38.9)	5 (45.5)	19 (40.4)
Defense			
Going for the flag	14 (38.9)	3 (27.3)	17 (36.2)
Going for the ball	2 (5.6)	0 (0.0)	2 (4.3)
Going for a pass	2 (5.6)	1 (9.1)	3 (6.4)
Total	18 (50.0)	4 (36.4)	22 (46.8)
Unknown	4 (11.1)	2 (18.2)	6 (12.8)
Total	36 (100.0)	11 (100.0)	47 (100.0)
Injury by Player Position			
Wide receiver/back	10 (27.8)	2 (18.2)	12 (25.5)
Rush	1 (2.8)	1 (9.1)	2 (4.3)
Defender	16 (44.4)	3 (27.3)	19 (40.4)
Corner	1 (2.8)	0 (0.0)	1 (2.1)
Running back	2 (5.6)	0 (0.0)	2 (4.3)
Center	2 (5.6)	2 (18.2)	4 (8.5)
Quarterback	1 (2.8)	0 (0.0)	1 (2.1)
Unknown	3 (8.3)	3 (27.3)	6 (12.8)
Total	36 (100.0)	11 (100.0)	47 (100.0)

injuries.[36] As a direct result of this finding, players are not allowed to wear shorts with pockets during play.[37]

In a sport considered to have less contact, it was interesting to note that 75% of all injuries were due to direct contact with either another player or the ground, evenly split between offense and defense. Direct impact was the primary mechanism of injury in both boys (77.8%) and girls (63.6%), followed by torsion in boys (13.9%) and stretch in girls (18.2%). In youth tackle football, 80% of injuries in youth tackle football were due to contact,[23] and in nontackle football, most injuries still occurred from contact with another player.[20] Among collegiate-aged flag football athletes, 50% of all injuries were attributed to contact with another player, 18% to contact with the ground, and 8% to contact with another object; therefore, 76% of all injuries were contact in nature.[38] This factor may be one of the most critical areas to address for injury prevention. If three-quarters of all injuries are related to contact, considering some form of protective equipment, especially for youths, may be beneficial. Although all injuries in our research would be classified as minor, implementing even minimal protective equipment or padding may significantly reduce the most common injury, contusions.

Most injuries occurred through the player activity of going for the flag, highlighting the need for education of both coaches and players on technique. Many youths launch themselves toward the offensive player in an attempt to pull the flag, often resulting in injury. Tackle football organizations have implemented various forms of coach and player education modules to teach better tackling technique and reduce the injury risk.[39,40] Coach education on proper tackling technique has been shown to reduce injuries in high school[41] and youth[42] tackle football. The development of similar flag football technique education may have a similar effect in reducing the injury risk in flag football and perhaps also in those players advancing to tackle football.

Our work was not without limitations. First, only information on game-related injuries was collected. Most sports report higher game injury rates than practice injury rates; therefore, not monitoring season-long practice exposures may have played a role in the lack of reported overuse injuries. In addition, most sports generally produce more injuries during practices in terms of frequency, even though injury rates during practices are generally lower (given increased exposures). Hence, it is possible that some athletes sustained an injury in a practice and did not participate in the tournaments. Although we focused on game-related injuries, because injuries most likely occurred in practices, and some of these practice-injured athletes may not have participated in the tournaments, the overall frequency of injuries in this age group may be underreported. Future research would benefit from longitudinal data collection of players across entire seasons. A second limitation was the lack of complete anthropometric and demographic data on participants aside from sex and age. Age, height, and body mass index have not been shown to influence the injury incidence in youth tackle football,[24,34,43] yet determining if this also holds true for youth flag football would be helpful. Given that girls represented only about 10% of the total study population, this lack of balance between sexes was also a possible limitation. The smaller sample size for girls means that the CIs were wider than those for boys, creating more uncertainty. Thus, the estimates for boys were more likely to be closer to the true rates than those for girls. In this case, as the sample size did not reflect dropouts etc, the female participants most likely represented the population of females playing flag football and not a biased group. However, the smaller sample size in 1 group increases the risk of not observing differences and committing a type II error. We did observe a higher injury risk in girls than in boys. Finally, injuries may have been underreported. Although the AT was present and available to all fields and athletes and coaches were instructed by the tournament

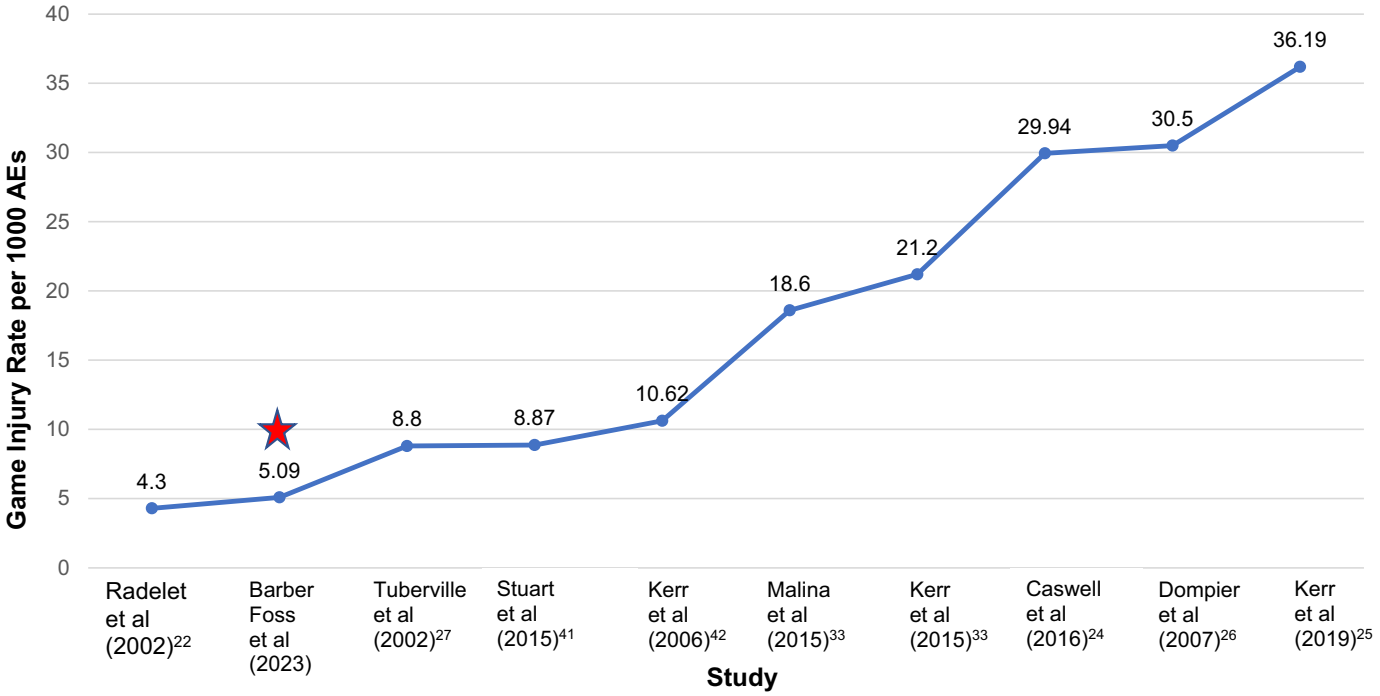

Figure 1. Comparison of the current study game injury rate in flag football with rates previously reported for youth tackle football. [a] In the Radelet et al study,[22] the injury reporting was retrospective by coaches. Abbreviation: AE, athlete-exposure.

Figure 2. Flag attachment point. The circle highlights the hard plastic attachment point of the flags to the belt.

directors to report all injuries to the AT, some injuries may not have been recorded.

Although the injury incidence rate for youth flag football was lower than that for youth tackle football, the body parts affected, types of injury, and mechanisms were similar between youth flag and youth tackle football. Despite being considered a noncontact sport, 76% of all injuries were the result of contact mechanisms. Additional rule changes and equipment modifications should be evaluated to minimize the injury risk in flag football at the youth level.

REFERENCES

1. State of play 2017: trends and developments. Aspen Institute. Published December 10, 2017. Accessed September 8, 2023. https://www.aspeninstitute.org/publications/state-of-play-2017-trends-and-developments/
2. 2019 SFIA topline participation report. Association SFI. Updated 2019. Accessed December 1, 2021. https://sfia.org/
3. Drape J, Belson K. The future of football has flags. The New York Times. Published November 20, 2018. Accessed October 21, 2019. https://www.nytimes.com/2018/11/20/sports/football/flag-football-nfl.html
4. Pareja-Galeano H, Garatachea N, Lucia A. Exercise as a polypill for chronic diseases. *Prog Molec Biol Transl Sci.* 2015;135:497–526. doi:10.1016/bs.pmbts.2015.07.019
5. Fiuza-Luces C, Garatachea N, Berger NA, Lucia A. Exercise is the real polypill. *Physiology (Bethesda)*. 2013;28(5):330–358. doi:10.1152/physiol.00019.20136
6. Dohle S, Wansink B. Fit in 50 years: participation in high school sports best predicts one's physical activity after age 70. *BMC Public Health*. 2013;13:1100. doi:10.1186/1471-2458-13-1100
7. MacDonald J, Myer GD. 'Don't let kids play football': a killer idea. *Br J Sports Med*. 2017;51(20):1448–1449. doi:10.1136/bjsports-2016-096833
8. Faigenbaum AD, Myer GD. Exercise deficit disorder in youth: play now or pay later. *Curr Sports Med Rep*. 2012;11(4):196–200. doi:10.1249/JSR.0b013e31825da961

9. Kokkinos P, Sheriff H, Kheirbek R. Physical inactivity and mortality risk. *Cardiol Res Pract*. 2011;2011:924945. doi:10.4061/2011/924945
10. Pankow MP, Syrydiuk RA, Kolstad AT, et al. Head games: a systematic review and meta-analysis examining concussion and head impact incidence rates, modifiable risk factors, and prevention strategies in youth tackle football. *Sports Med*. 2022;52(6):1259–1272. doi:10.1007/s40279-021-01609-4
11. Sariaslan A, Sharp DJ, D'Onofrio BM, Larsson H, Fazel S. Long-term outcomes associated with traumatic brain injury in childhood and adolescence: a nationwide Swedish cohort study of a wide range of medical and social outcomes. *PLoS Med*. 2016;13(8):e1002103. doi:10.1371/journal.pmed.1002103
12. Andruszkow H, Deniz E, Urner J, et al. Physical and psychological long-term outcome after traumatic brain injury in children and adult patients. *Health Qual Life Outcomes*. 2014;12(1):26. doi:10.1186/1477-7525-12-26
13. Barber Foss KD, Yuan W, Diekfuss JA, et al. Relative head impact exposure and brain white matter alterations after a single season of competitive football: a pilot comparison of youth versus high school football. *Clin J Sport Med*. 2019;29(6):442–450. doi:10.1097/JSM.0000000000000753
14. Murphy AM, Askew KL, Sumner KE. Parents' intentions to allow youth football participation: perceived concussion risk and the theory of planned behavior. *Sport Exerc Perform Psychol*. 2017;6(3):230–242. doi:10.1037/spy0000102
15. Kuhn AW, Yengo-Kahn AM, Kerr ZY, Zuckerman SL. Sports concussion research, chronic traumatic encephalopathy and the media: repairing the disconnect. *Br J Sports Med*. 2017;51(24):1732–1733. doi:10.1136/bjsports-2016-096508
16. Rice SG; American Academy of Pediatrics Council on Sports Medicine and Fitness. Medical conditions affecting sports participation. *Pediatrics*. 2008;121(4):841–848. doi:10.1542/peds.2008-0080
17. Peterson AR, Kruse AJ, Meester SM, et al. Youth football injuries: a prospective cohort. *Orthop J Sports Med*. 2017;5(2):2325967116686784. doi:10.1177/2325967116686784
18. Dean AG, Sullivan KM, Soe MM. OpenEpi: open source epidemiologic statistics for public health. Updated April 6, 2013. Accessed March 1, 2022. www.OpenEpi.com
19. Harmon KJ, Proescholdbell SK, Register-Mihalik J, Richardson DB, Waller AE, Marshall SW. Characteristics of sports and recreation-related emergency department visits among school-age children and youth in North Carolina, 2010–2014. *Inj Epidemiol*. 2018;5(1):23. doi:10.1186/s40621-018-0152-0
20. Zendler JM, Jadischke R, Frantz J, Hall S, Goulet GC. Emergency department visits from 2014 to 2018 for head injuries in youth non-tackle football compared with other sports. *Orthop J Sports Med*. 2021;9(1):2325967120975402. doi:10.1177/2325967120975402
21. Yard EE, Collins CL, Comstock RD. A comparison of high school sports injury surveillance data reporting by certified athletic trainers and coaches. *J Athl Train*. 2009;44(6):645–652. doi:10.4085/1062-6050-44.6.645
22. Radelet MA, Lephart SM, Rubinstein EN, Myers JB. Survey of the injury rate for children in community sports. *Pediatrics*. 2002;110(3):e28. doi:10.1542/peds.110.3.e28
23. Kerr ZY, Cortes N, Ambegaonkar JP, et al. The epidemiology of injuries in middle school football, 2015–2017: the Advancing Healthcare Initiatives for Underserved Students Project. *Am J Sports Med*. 2019;47(4):933–941. doi:10.1177/0363546518825361
24. Caswell SV, Ausborn A, Diao G, et al. Anthropometrics, physical performance, and injury characteristics of youth American football. *Orthop J Sports Med*. 2016;4(8):2325967116662251. doi:10.1177/2325967116662251
25. Turbeville SD, Cowan LD, Asal NR, Owen WL, Anderson MA. Risk factors for injury in middle school football players. *Am J Sports Med*. 2003;31(2):276–281. doi:10.1177/03635465030310022001
26. Dompier TP, Powell JW, Barron MJ, Moore MT. Time-loss and non-time-loss injuries in youth football players. *J Athl Train*. 2007;42(3):395–402.
27. Stuart MJ, Morrey MA, Smith AM, Meis JK, Ortiguera CJ. Injuries in youth football: a prospective observational cohort analysis among players aged 9 to 13 years. *Mayo Clin Proc*. 2002;77(4):317–322. doi:10.4065/77.4.317
28. Collins CL, Micheli LJ, Yard EE, Comstock RD. Injuries sustained by high school rugby players in the United States, 2005–2006. *Arch Pediatr Adolesc Med*. 2008;162(1):49–54. doi:10.1001/archpediatrics.2007.1
29. Barber Foss KD, Le Cara E, McCambridge T, Hinton R, Kushner A, Myer GD. Epidemiology of injuries in men's lacrosse: injury prevention implications for competition level, type of play, and player position. *Phys Sportsmed*. 2017;45(3):224–233. doi:10.1080/00913847.2017.1355209
30. Barber Foss KD, Le Cara E, McCambridge T, Hinton RY, Kushner A, Myer GD. Epidemiology of injuries in women's lacrosse: implications for sport-, level-, and sex-specific injury prevention strategies. *Clin J Sport Med*. 2018;28(4):406–413. doi:10.1097/JSM.0000000000000458
31. Powell JW, Barber-Foss KD. Injury patterns in selected high school sports: a review of the 1995–1997 seasons. *J Athl Train*. 1999;34(3):277–284.
32. Powell JW, Barber-Foss KD. Sex-related injury patterns among selected high school sports. *Am J Sports Med*. 2000;28(3):385–391. doi:10.1177/03635465000280031801
33. Hoge C, Sabbagh R, Morgan M, Grawe BM. Epidemiology of youth and high school American football-related injuries presenting to United States emergency departments: 2010–2019. *Phys Sportsmed*. 2022;50(4):332–337. doi:10.1080/00913847.2021.1931980
34. Kerr ZY, Marshall SW, Simon JE, et al. Injury rates in age-only versus age-and-weight playing standard conditions in American youth football. 2015;3(9):2325967115603979. doi:10.1177/2325967115603979
35. Kaplan Y, Myklebust G, Nyska M, Palmanovich E, Victor J, Witvrouw E. Injuries can be prevented in contact flag football! *Sports Traumatol Arthrosc*. 2016;24(6):2002–2008. doi:10.1007/s00167-014-3266-0
36. Kaplan Y, Myklebust G, Nyska M, Palmanovich E, Victor J, Witvrouw E. The prevention of injuries in contact flag football. *Knee Surg Sports Traumatol Arthrosc*. 2014;22(1):26–32. doi:10.1007/s00167-012-2335-5
37. Flag football equipment. NFL FLAG. Accessed April 4, 2022. https://nflflag.com/flag-football-rules/flag-football-equipment
38. Kaplan Y, Myklebust G, Nyska M, Palmanovich E, Victor J, Witvrouw E. The epidemiology of injuries in contact flag football. *Clin J Sport Med*. 2013;23(1):39–44. doi:10.1097/JSM.0b013e3182694870
39. USA Football tackling systems. USA Football website. Accessed May 2, 2022. https://usafootball.com/development-training/tackling-systems/
40. NFL Way To Play. NFL Football operations. Accessed May 2, 2022. https://operations.nfl.com/inside-football-ops/nfl-way-to-play/nfl-way-to-play/
41. Kerr ZY, Dalton SL, Roos KG, Djoko A, Phelps J, Dompier TP. Comparison of Indiana high school football injury rates by inclusion of the USA Football "Heads Up Football" player safety coach. *Orthop J Sports Med*. 2016;4(5):2325967116648441. doi:10.1177/2325967116648441
42. Kerr ZY, Yeargin S, Valovich McLeod TC, et al. Comprehensive coach education and practice contact restriction guidelines result in lower injury rates in youth American football. *Orthop J Sports Med*. 2015;3(7):2325967115594578. doi:10.1177/2325967115594578
43. Malina RM, Morano PJ, Barron M, Miller SJ, Cumming SP, Kontos AP. Incidence and player risk factors for injury in youth football. *Clin J Sport Med*. 2006;16(3):214–222. doi:10.1097/00042752-200605000-00005

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