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Public attitudes and knowledge about youth sports participation and concussion risk in an urban area

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Abstract

Background: Every year, millions of children in the United States participate in youth full-contact sports, which carry concussion risks—the long-term sequelae of which are not well understood. We examined the attitudes and knowledge of adults in Chicago about youth sports participation, concussion risk, and whether physicians should counsel against youth participation in full-contact sports.

Methods: An anonymous paper survey featuring 13 attitudinal, 13 demographic, and 9 knowledge questions was distributed to a convenience sample of adults ≥ 18 years in hospital waiting areas and four Chicago parks. Participants were asked to hypothetically consider themselves the parent of a 10-year-old child regarding attitudes towards full-contact sports participation.

Results: Between June 13 and July 27, 2016, 1091 partial or complete valid surveys were collected. Almost half (46%) of respondents would not allow a hypothetical 10-year-old son to play tackle football. The majority (74%) of respondents agreed that it was appropriate for

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physicians to counsel *against* youth participation in full-contact sports. Respondents obtained information about concussions from, on average, 2–3 sources, although only 34% received information from physicians. Respondents demonstrated a high concussion knowledge level (average: 6.75 of 9 questions). However, only 39% of respondents correctly answered that the following statement was false: “After a mild concussion, ther e are usually visible changes on medical imaging”.

Conclusions: Overall, respondents are well-informed about concussions. They are divided about the participation of youth in full-contact sports and are amenable to physician counseling against youth participation in full-contact sports.

Keywords

concussion; football; youth sports; physician counseling; public attitudes

1. Introduction

For the past decade, the topic of sports-related concussions has received significant coverage in news, sports, and entertainment media.[1–12] In 2006, 13-year-old Zachery Lystedt from Maple Valley, Washington, suffered a life-threatening brain injury after he returned to play in a football game following a hard hit earlier in the game·[13] In May 2009, Washington state enacted the Zackery-Lystedt Law, the first comprehensive youth-sport concussion-safety law. By 2014, all 50 states and the District of Columbia had passed such legislation which has resulted in an up-trend in the number of reported concussions.[14] However, the actual incidence of concussions at all levels of play in children and adolescents is not well-documented,[15–19] and is believed to err towards vast under-reporting.[20] During this same time period, the public has remained divided about the appropriateness of tackle football for children,[21–23] although there has been a decline in the number of children between the ages of 6–17 playing tackle football—from 3.96 million played in 2009 to 3.25 million in 2014[21].

There is no consensus about best practices for concussion management or return-to-play/return-to-learn policies in children and adolescents.[24,25] Studies have documented that recovery time for youth athletes may be longer than previously thought,[26–28] and that children recover from concussions differently than adults.[29] Physician management recommendations emphasize that prevention by educating athletes, coaches, and parents is paramount,[30] and research has begun to show that subsets of parents (i.e. those present at school meetings) are amenable to the educational interventions mandated by the Zackery-Lystedt laws.[31] And yet, according to a 2014 study, parents remained largely unaware of the differences between adults and children in concussion recovery, and uneducated about school-specific policies on sports-related concussions.[32] Both baseline testing and caregiver education about concussion risk and management have been identified as important interventions that have not been universally adopted and that need further expansion.[33]

We designed an observational study to examine the attitudes and knowledge of a convenience sample of adults in the Chicago area regarding full-contact youth sports participation and concussions, and the role of physicians in counseling and educating about these topics. Specifically, we examined: 1) How does the public currently feel about youth

participation in full-contact sports participation and youth tackling and checking rules?; 2) Does the public support physician counseling against youth participation in full-contact sports?; 3) From what sources does the public obtain concussion information?; and 4) What demographic factors, if any, are associated with greater public opposition to youth participation in contact sports and greater public support for physician counseling against contact-sport participation? Our aim was to assess community needs for physician involvement in youth sports decisions.

2. Methods

A 35-question survey (13 attitudinal, 13 demographic, and 9 knowledge questions) was developed and then tested in the University XX Pediatric Clinics with 7 individuals who agreed to take the survey and participate in one-on-one cognitive interviews. Based on their feedback, the survey was revised to clarify question wording (and is available from the corresponding author). Adult individuals ≥ 18 years who were English-speaking, whether or not they had children, were invited to complete an anonymous survey at one of three locations: the University XX pediatric clinics, the University XX Sky Lobby (a lounge for family and friends waiting for adult patients undergoing outpatient procedures), and several Chicago city parks (coordinated with city-sponsored events like volleyball and movies). Permission to recruit was obtained at all facilities. Potential respondents were informed that survey participation was voluntary and answers were anonymous. Participants were offered a pencil that read: “PLAY SMART: [XX] Summer Research” for participation in the main survey. Upon completing the 9 knowledge questions at the end, survey respondents received a brain eraser (except if a child <3 years was present, in which case respondents received a sticker). The survey, took less than 10 minutes to complete. The data were uploaded daily into a secure computer database, and a second coder checked the validity of the transferred data. The study was given exempt status and waiver of written informed consent by the University XX Institutional Review Board. Verbal consent was obtained.

To accommodate the diversity of ages and parenting stages of our intended sample, respondents were asked to consider hypothetically what their reaction would be if they had a 10-year-old child who wanted to play tackle football (son) or ice hockey (son and daughter, asked separately). Questions about children having suffered concussions were limited to those individuals taking the survey who were actual parents of children over the age of 14 years (high school or beyond), the age at which ice hockey permits full checking and the age above which most football concussions occur.[34] Questions about sports and sources of information provided lists of options but also left room for “other” responses.

For data analysis, many variables were collapsed (all collapsed variables can be seen in Supplemental Table 1). Questions using a 4-option Likert scale were collapsed into two. Seven age groupings for initiation of tackling and checking were collapsed into 3 groups: “< 15 years,” “> 15 years,” and “Never.” For questions about the type of sports the respondent (or the respondent’s child) played in high school, we classified sports as “contact sports” as designated by the American Acad emy of Pediatrics (AAP) in its Guidelines on Medical Conditions Affecting Sports Participation.[35] In demographics, respondents were offered 6 education options which were grouped into 3: “High School Degree or Less”; “Some

College" and "Bachelor's Degree or More." Respondents were offered 7 options to self-identify their ethnicity: Asian, Black, Hispanic/Latino, Native American, White, Mixed Race, or Other. Due to the low numbers of non-Black, non-White respondents, Asian, Hispanic/Latino, Native American, Mixed Race and Other were all classified as "Other." To further examine associations regarding attitudes towards sports participation and counseling, multivariate logistic regressions with backwards elimination were performed including all independent variables with p-value ≤ 0.10.

In analyzing concussion knowledge score across the population, individuals who had filled out none of the True/False knowledge questions were excluded. We analyzed percent correct for individual questions and overall score.

Data were analyzed using SPSS 24. Descriptive statistics and comparative statistics (Chi-squared tests, independent samples t-tests, and ANOVA tests) were performed using a significance level $p<0.05$.

3. Results

We surveyed a convenience sample of 1098 individuals between June 14-July 27, 2016. Seven were excluded from analysis due to whole-survey inconsistency (n=2), failure to meet age inclusion criteria (n=4), or missing pages (n=1). Demographics of the eligible 1091 respondents can be found in Table 1. The majority (65%) were female, 63% had a Bachelor's degree or more, and 59% self-identified as White. The average age of surveyed individuals was 43.3 years. Slightly more than one quarter of respondents had no children; the remaining had, on average, 2.6 children.

Participants recruited from different sites differed demographically. Participants from the parks were more educated (84% had a college degree or more), less likely to be a parent (37%), and younger (mean age of 37 years). Participants recruited from the pediatric clinic were more likely to be female (72%) and more likely to be black (35%). Participants recruited from the Sky Lobby waiting area were oldest (mean age of 49 years).

Survey respondents played a variety of sports in high school. Twenty-four percent (256/1091) of the population played no high school sports. Of the 494 (45%) who played at least one contact sport, 136 (28%) played football, 231 (47%) played basketball, 129 (26%) played soccer, 24 (5%) played ice hockey, and 238 (48%) played other contact sports. Of the 417 individuals with children 14 or older, 278 (67%) of their children played at least one contact sport in high school. Of these 278 children, 136 (49%) played football, 103 (37%) played soccer, 182 (65%) played basketball, 17 (6%) played ice hockey, and 162 (58%) played other contact sports.

Individuals utilized various sources of concussion information, as seen in Table 2. Almost half (46%) of the population used the news media as a main source of information, whereas 36% utilized sports media, followed by 34% of the population who stated that physicians were a concussion information source. On average, participants reported using 2–3 different types of information sources.

When asked to imagine that they were the parent of a 10-year-old son, 448 (46%) of respondents would allow this child to play football (see Table 3). Among parents of children who previously or currently had a child play football in high school, 26% responded that, if asked today, they would not allow their 10-year-old son to participate in tackle football. Attitudes towards ice hockey participation were more lenient, with 70% and 61% of respondents allowing a 10-year-old son or daughter to play ice hockey, respectively. Attitudes towards full-contact tackling in football practice and checking in ice hockey practice, however, largely mirrored one another, with 66% and 65% of the population believing tackling and checking should be limited or prohibited in practice, respectively.

Demographic factors influenced attitudes towards participation. Male gender, lower educational attainment, and Black race correlated with greater willingness to allow a 10 year old boy to play tackle football ($p<0.05$ for all). Location of recruitment did not correlate with attitude towards football participation (data not shown). In contrast, not having children, age younger than 45 years, and self-identifying as White correlated with greater willingness for children to play ice hockey ($p<0.05$ for all). There were two demographic factors that led to discordant attitudes about ice hockey participation. First, male respondents were more willing than female respondents to allow sons to play ice hockey (75% versus 68%, $p = 0.013$), but gender did not have a significant effect on respondents' willingness to allow daughters to play ice hockey (65%, of males versus 60%, of females would allow daughters to play, $p = 0.108$). Second, respondents recruited from the parks were more likely to allow daughters to play ice hockey (72% in the parks versus 58% in the Sky lobby, and 58% in Pediatric Clinic, $p < 0.0001$), but site of recruitment did not influence attitudes allowing sons to play ice hockey (75% in the parks versus 70% in the Sky lobby versus 67% in Pediatric Clinic, $p = 0.093$). However, survey location in girls' ice hockey and respondent gender in boys' ice hockey did not remain significant when multivariate logistic regressions were performed ($p = 0.41$ and $p = 0.34$ respectively).

Most respondents (74%) agreed that it would be appropriate for physicians to counsel against youth full-contact sports participation. For all demographic traits measured, including race, gender, education, parental status, experience as a sports coach, the majority supported this counseling. There were some statistical differences. For example, women were more likely to support counseling against full contact sports participation than men (79% versus 67%, $p < 0.0001$), whereas youth sports coaches agreed less frequently than non-sports coaches (79% versus 64%, $p < 0.0001$). Location of recruitment did not correlate with attitude toward counseling.

Concussion knowledge was measured with nine true-false statements (see Table 4). The average overall score on the knowledge section was 75% (6.75/9). Only one question was answered incorrectly by more than 50% of respondents; 39% correctly identified the following statement as false: "After a mild concussion, there are usually visible changes on medical imaging." Two other questions garnered low numbers of correct responses: 58% and 61% correctly recognized that the following statements were false, respectively: " Children recover from concussions more quickly than adults," and "High School students who have suffered a concussion are usually able to resume full activities within 2–3 days."

Education and ethnicity were associated with the most significant differences in concussion knowledge score ($p < 0.0001$), but at most, these amounted to a difference of 1 or 2 questions. Male gender, being a youth sports coach, and being an avid sports spectator correlated with, on average, improved concussion knowledge score by at most one question ($p<0.05$). Knowledge score greater than the mean correlated with not allowing a 10-year-old child to play tackle football (42% versus 51% of those who scored below the mean, $p = 0.004$).

4. Discussion

Our respondents were evenly divided about whether they would allow their 10-year-old son to play tackle football, with 46% permitting. In contrast, our respondents were more tolerant of boys' (70%) and girls' (61%) ice hockey. However, respondents had similar attitudes towards limiting or prohibiting checking in ice hockey practice (66%) and tackling in football practice (65%). An online national poll conducted in June 2016 found that most respondents think that concussions/head injuries are a major (65%) or minor (29%) problem in sports.[36] This wide-ranging concern about concussion risk in youth sports may partly explain why the majority of our respondents stated that it was appropriate for physicians to counsel *against* youth participation in full-contact sports for every demographic factor evaluated. It is also consistent with the January 2018 proposal by Illinois State Representative Carol Sente that Illinois become the first state to ban tackle football participation for those less than 12 years old.[37] Although five states proposed legislation in 2018, none passed.[38] Our respondents demonstrated a high knowledge level about concussions, scoring an average of 75% correct on the knowledge section. No demographic factors could differentiate respondents by more than 1 or 2 questions. This is consistent with other studies that found that demographic factors did not correlate with concussion knowledge.[39, 40] The only question that the majority answered incorrectly was identifying that mild concussions do *not* usually present with visible changes on medical imaging. This is consistent with the results of a cross-sectional web-based survey of a nationally representative panel of US parents which found that 39% definitely and 44% possibly expected that a child taken to the emergency room for possible mild concussion would get an MRI, CT scan or other radiograph.[41] In particular, our findings should alert healthcare professionals of the need to educate the public about the "silent nature" of this injury; that is, that the symptoms of concussions often do not present visibly or on imaging, and that symptom resolution requires rest.

Research finds that many youth athletes do not report their injuries,[16,18,20] making it even more important that those involved in supervising youth sport participation know what to look for and what to ask children about in order to identify symptoms, even if the child does not recognize the injury as a concussion. A significant percentage of our respondents (39%) also did not realize the need for more than 2–3 days' rest after a child suffers a concussion. This echoes Turner et al.'s 2017 study demonstrating a continued lack of familiarity with concussion protocols, and a need for more engagement by parents with medical or other professionals about return-to-play recommendations.[42] In a preliminary study of middle school, high school, and collegiate student-athletes, Zuckerman and colleagues found that socioeconomic status had no impact on the outcomes of symptom duration and missed

practice. However, for individuals with private insurance, the return to school was slower than for those with public insurance.[43] Further work is necessary to ensure that all children get appropriate treatment. This will require educating parents, coaches, and physicians that they must actively restrict youth athlete return-to-play until the child has fully recovered, given the increased risk of repeat concussions and the morbidity associated with recurrent head trauma suffered while still symptomatic from an initial concussion.[44]

Although our respondents obtained information about concussions from a variety of sources (averaging 2 to 3 sources), only 34% had received any information from physicians. Mannings and colleagues found that only 28.7% of parents had ever received educational materials on concussions and only 25.2% had discussed the meaning of concussion with a physician or health care provider.[40] Gaps in knowledge about concussion signs and symptoms, prevention and treatment reveal a unique opportunity for pediatricians to fill this knowledge gap and incorporate concussion education into conversations with patients and their families, particularly when completing pre-participation sports exams (which are required for high school student athletes throughout the United States).[45] There is also a definite role for physicians outside of the doctor-patient relationship. Physicians ought to engage more with the media to improve science communication in the popular press, and they can volunteer to talk at school education programs (since all states passed youth-sports concussion-safety laws between 2009 and 2014, which include a required education program[24]).

There were several limitations to this study. First, the study enrolled a convenience sample of adults at health care or park facilities. We chose these sites to increase the diversity of the sample. We chose to go beyond the pediatric clinic where most of the adults are mothers, in order to better understand the views of both men and women. However, location of recruitment had no impact on attitudes about physician counseling against participation in contact sports, nor on attitudes towards youth participation in tackle football or boys' in ice hockey. Individuals recruited at the parks expressed greater willingness for girls to play ice hockey, but this demographic factor did not remain significant when all significant factors were evaluated in logistic regression. Second, our convenience sample may not be representative of Chicago, let alone the US public. The sample had an overrepresentation of women (65%) and of individuals with a Bachelor's Degree or greater (63%). Whereas Latinos represent approximately 30% of the Chicago population,[46] this sample included only 6% Latinos, and the survey was available only in English.. Third, individuals who agreed to complete the survey may have been more interested in (and possibly more knowledgeable about) the issue of concussions than an average member of the US population. Fourth, a significant number of the surveys had incomplete answers to at least one question. Sometimes, this was intentional (e.g., a decision not to answer hockey questions because the respondent had no knowledge of hockey) and at other times it may have been unintentional or due to time constraints (e.g., someone was called back for the appointment). However, we did not discern a pattern that would suggest bias in responses.

5. Implications

A convenience sample of the lay public in Chicago expressed evenly divided attitude towards allowing their own children to play full-contact sports, but a majority of adults agreed that it would be appropriate for physicians to counsel against it. While these data were gathered in Chicago, they seem to reflect national trends in public—and governmental—attitude towards youth sport participation. Furthermore, they reveal an ongoing desire among the lay public for counseling about sports participation, as well as a need for education about concussion risk and injury management in the pediatric population. There are untapped opportunities for physicians to educate and counsel parents and student athletes in the clinic, at school programs, and through involvement with public media. Our data suggest most parents will be receptive to it.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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References:

1. Laskas JM. Concussion New York, NY: Random House; 2015.
2. Landesman P Concussion [DVD] Columbia Pictures; 2015.
3. Belson KAJ Tarpley Retires From N.F.L. at Age 23, Citing Concussions The New York Times 4 7, 2016 https://www.nytimes.com/2016/04/08/sports/football/aj-tarpley-buffalo-bills-retires-concussion.html. Last accessed February 22, 2018.
4. Belson K Where the N.F.L. Concussions Settlement Stands Now The New York Times 4 19, 2016 https://www.nytimes.com/2016/04/20/sports/football/where-the-nfl-concussions-settlement-stands-now.html?mtrref=www.google.com&gwh=07F3A58B413A194A84176CFB528B1077&gwt=pay. Last accessed February 22, 2018.
5. Belson K How an Insurance Dispute Affects the N.F.L. Concussions Settlement The New York Times 5 14, 2016 https://www.nytimes.com/2016/05/14/sports/football/how-an-insurance-dispute-affects-the-nfl-concussions-settlement.html?mtrref=www.google.com&gwh=C79555B89C5A82CFB95AB4CEDA9A2253&gwt=pay. Last accessed February 22, 2018.
6. Bieler D In stunning admission, NFL official affirms link between football and CTE The Washington Post 3 15, 2016 https://www.washingtonpost.com/news/early-lead/wp/2016/03/14/in-stunning-admission-nfl-official-affirms-link-between-football-and-cte/?utm_term=.bcf4d5fe52d2. Last accessed February 22, 2018.
7. Bonesteel M Do cheerleaders really suffer more concussions than football players? The Washington Post 5 10, 2016 https://www.washingtonpost.com/news/early-lead/wp/2016/05/10/do-cheerleaders-really-suffer-more-concussions-than-football-players/?utm_term=.05d6ad2f3601. Last accessed February 22, 2018.

8. Schwarz A, Bogdanich W, Williams J. N.F.L.'s Flawed Concussion Research and Ties to Tobacco Industry The New York Times 3 24, 2016 https://www.nytimes.com/2016/03/25/sports/football/nfl-concussion-research-tobacco.html. Last accessed February 22, 2018.
9. Stein A Football concussions send shocks through families The Chicago Tribune 1 4, 2016 http://www.chicagotribune.com/lifestyles/health/sc-concussion-athlete-families-health-1223-20151217-story.html. Last accessed February 22, 2018.
10. Nowinski C Head Games: Football's Concussion Crisis from the NFL to Youth Leagues East Bridgewater, MA: Drummond Publishing Group; 2006.
11. Carone DA. The Role and Ramifications of the Media's Reporting on Concussions: Positive and Negative Implications. In: Echemendia R, Iverson GL, eds. The Oxford Handbook of Sports-related Concussion East Bridgewater, MA: Drummond Publishing Group; 2014 DOI: 10.1093/oxfordhb/9780199896585.001.0001.
12. Fainaru-Wada M League of Denial: The NFL, Concussions and the Battle for Truth New York, NY: Crown Archetype; 2013.
13. Sharing Progress: The Push for Concussion Protection Laws in all 50 States PlaySmart/PlaySafe Updated 9 14, 2016 https://www.playsmartplaysafe.com/focus-on-safety/sharing-progress/the-push-for-concussion-protection-laws-in-all-50-states/. Last accessed February 22, 2018.
14. Yang J, Comstock D, Honggang Y, Harvey HH, Xun P. New and Recurrent Concussions in High-School Athletes Before and After Traumatic Brain Injury Laws, 2005–2016. Am J Public Health 2017; 107(12):1916–1922. DOI: 10.2105/AJPH.2017.304056. [PubMed: 29048967]
15. Kaut KP, DePompei R, Kerr J, Congeni J. Reports of head injury and symptom knowledge among college athletes: implications for assessment and educational intervention. Clin J Sport Med 2003;13(4):213–221. DOI: 10.1097/00042752-200307000-00004. [PubMed: 12855923]
16. Register-Mihalik JK, Guskiewicz KM, McLeod TCV, Linnan LA, Mueller FO, Marshall SW. Knowledge, Attitude, and Concussion-Reporting Behaviors Among High School Athletes: A Preliminary Study. J Athl Train 2013;48(5): 645–653. DOI: 10.4085/1062-6050-48.3.20. [PubMed: 23848520]
17. Bakhos LL, Lockhart GR, Myers R, Linakis JG. Emergency department visits for concussion in young child athletes. Pediatrics 2010;126(3):e550–6. DOI: 10.1542/peds.2009-3101. [PubMed: 20805145]
18. Jinguji TM, Krabak BJ, Satchell EK. Epidemiology of youth sports concussion. Phys Med Rehabil Clin N Am 2011;22(4):565–75. DOI: 10.1016/j.pmr.2011.08.001. [PubMed: 22050936]
19. Kerr ZY, Cortes N, Caswell AM, Ambegaonkar JP, Hallsmith KR, Milbert AF, Caswell SV. Concussion Rates in US Middle School Athletes, 2015–2016 School Year. Am J Prev Med 2017; 53(6): 914–918. DOI: 10.1016/j.amepre.2017.05.017. [PubMed: 28739314]
20. Rivara FB, Schiff MA, Chrisman SP, Chung SK, Ellenbogen RG, Herring SA. The Effect of Coach Education on Reporting of Concussions Among High School Athletes After Passage of a Concussion Law. Am. J. Sports Med 2014; 42(5):1197 DOI: 10.1177/0363546514521774. [PubMed: 24569704]
21. Farrey T Youth football participation increases in 2015; teen involvement down, data shows ESPN.com Updated 4 17, 2016 http://www.espn.com/espn/otl/story/_/id/15210245/slight-one-year-increase-number-youth-playing-football-data-shows. Last accessed February 22, 2018.
22. Murray M Poll: Most parents support their kids playing football MSNBC.com. Updated 1 30, 2015 http://www.msnbc.com/msnbc/poll-most-parents-support-their-kids-playing-football. Last accessed February 22, 2018.
23. Fedor A, Gunstad J. Would You Let Your Child Play Football? Attitudes Toward Football Safety. Appl Neuropsychol Child 2016; 5(2): 107–109. DOI: 10.1080/21622965.2014.999770. [PubMed: 25671347]
24. Rose SC, Weber KD, Collen JB, Heyer GL. The diagnosis and management of concussion in children and adolescents. Pediatr Neurol 2015; 53(2):108–118. DOI: 10.1016/j.pediatrneurol.2015.04.003. [PubMed: 26088839]
25. King D, Brughelli M, Hume P, Gissane C. Assessment, management and knowledge of sport-related concussion: Systematic review. Sports Med 2014; 44(4):449–471. DOI: 10.1007/s40279-013-0134-x. [PubMed: 24403125]

26. Field M, Collins MW, Lovell MR, Maroon J. Does age play a role in recovery from sports-related concussion? A comparison of high school and collegiate athletes. J Pediatr 2003;142(5):546–553. DOI: 10.1067/mpd.2003.190. [PubMed: 12756388]
27. Lax ID, Paniccia M, Agnihotri S, et al. Developmental and gender influences on executive function following concussion in youth hockey players. Brain Inj 2015; 29(12):1409–1419. DOI: 10.3109/02699052.2015.1043344. [PubMed: 26362811]
28. Williams RM, Puetz TW, Giza CC, Broglio SP. Concussion recovery time among high school and collegiate athletes: a systematic review and meta-analysis. Sports Med (Auckland, N.Z.) 2015; 45(6): 893–903. DOI: 10.1007/s40279-015-0325-8.
29. Karlin AM. Concussion in the Pediatric and Adolescent Population: "different population, different concerns." PMR 2011; 3(10 Suppl 2):S369–79. DOI: 10.1016/j.pmrj.2011.07.015.
30. Patel DR, Shivdasani V, Baker RJ. Management of Sports-Related Concussion in Young Athletes. Sports Med 2005; 35(8): 671–684. DOI: 10.1097/01.mop.0000236385.26284.ec. [PubMed: 16076229]
31. Macdonald I, Hauber R. Educating Parents on Sports-Related Concussions. J Neurosci Nurs 2016; 48(6): 297–302. DOI:10.1097/JNN.0000000000000212. [PubMed: 27824798]
32. LaBond V, Barber KR, Golden IJ. Sports-Related Head Injuries in Students: Parents' Knowledge, Attitudes, and Perceptions. NASN Sch Nurse 2014; 29(4): 194–199. DOI: 10.1177/1942602X14527827. [PubMed: 25141456]
33. Leitch H, Ayers E, & Andrews A. A Review of Concussion Management in the Young Adult; the Importance of Baseline Testing and Caregiver Education. J Natl Med Assoc 2015; 107(3):60–65. DOI: 10.1016/S0027-9684(15)30053-5.
34. Dompier TP, Kerr ZY, Marshall SW, Hainline B, Snook EM, Hayden R, Simon JE. Incidence of Concussion during Practice and Games in Youth, High School, and Collegiate American Football Players. JAMA Pediatr 2015: 169(7):659–665. DOI: 10.1001/jamapediatrics.2015.0210. [PubMed: 25938704]
35. Committee on Sports Medicine and Fitness, American Academy of Pediatrics. Medical Conditions Affecting Sports Participation. Pediatrics 2001;107(5):1205–1209. DOI: 10.1542/peds.2008-0080 [PubMed: 11331710]
36. Dyck JJ. Citizen Attitudes about Sports, Concussions and CTE: HIGHLIGHTS and TOPLINE UMASS Lowell Center for Public Opinion 2016 https://www.uml.edu/docs/CPOR-Concussion-HIGHLIGHTS_tcm18-248453.pdf. Last accessed February 22, 2018.
37. Perez AJ. Illinois rep wants age limit on tackle football over brain injury concerns USA Today 1 25th, 2018 https://www.usatoday.com/story/sports/2018/01/25/illinois-representative-age-limit-tackle-football-brain-injury-concerns/1067652001/. Last accessed February 22, 2018.th
38. Caro De & Kalpen, LLP Youth Tackle Football—Proposed Legislation Available online at: https://brainlaw.com/youth-tackle-football/. Last accessed June 11, 2018.
39. Lin AC, Salzman GA, Bachman SL, et al. Assessment of Parental Knowledge and Attitudes Toward Pediatric Sports-Related Concussions. Sports Health: A Multidisciplinary Approach 2015; 7(2):124–129. DOI: 10.1177/1941738115571570.
40. Mannings C, Kalynych C, Joseph MM, Smotherman C & Kraemer DF. Knowledge assessment of sports-related concussion among parents of children aged 5 years to 15 years enrolled in recreational tackle football. J Trauma Acute Care Surg 2014; 77(3):S18–S22. DOI: 10.1097/TA.0000000000000371. [PubMed: 25153049]
41. Zamarripa A, Clark SJ, Rogers AJ, Wang-Flores H, Stanley RM. Pediatric concussion management in the Emergency Department: A National Survey of Parents. J Peds 2017; 181: 229–234. DOI: 10.1016/j.jpeds.2016.10.071.
42. Turner RW, Lucas JW, Margolis LH, Corwell BN. A Preliminary study of youth sport concussions: Parents' health literacy and knowledge of return-to-play protocol criteria. Brain Injury 2017; 31(8): 1124– 1130. DOI: 10.1080/02699052.2017.1298003. [PubMed: 28506094]
43. Zuckerman SL, Zalneraitis BH, Totten DJ, Rubel KE, Kuhn AW, Yengo-Kahn AM, Bonfield CM, Sills AK & Solomon GS. Socioeconomic status and outcomes after sport-related concussion: a preliminary investigation. J Neurosurg Pediatr 2017; 19:652–661. DOI: 10.3171/2017.1.PEDS16611. [PubMed: 28338445]

44. Quintana LM. Second Impact Syndrome in Sports. World Neurosurg 2016; 91:647–649. DOI: 10.1016/j.wneu.2016.04.035. [PubMed: 27108028]

45. Caswell SV, Cortes N, Chabolla M, Ambegaonkar JP, Caswell AM, Brenner JS. State-specific Differences in School Sports Preparticipation Physical Evaluation Policies. Pediatrics 2015; 135(1): 26– 32. DOI: 10.1542/peds.2014-1451. [PubMed: 25535257]

46. Ennis SR, Rios-Vargas M, & Albert NG. The Hispanic Population: 2010 (2010 Census Briefs) 5 2011 http://www.census.gov/prod/cen2010/briefs/c2010br-04.pdf. Last accessed February 22, 2018.

Table 1.

Demographics of survey respondents (N = 1091)

Respondents	*n* (%*)
Gender ($N^{\wedge}$ = 1023)	
Female	663 (65)
Male	360 (35)
Ethnicity** ($N^{\wedge}$ = 1031)	
White	610 (59)
Black	246 (24)
Hispanic/Latino	62 (6)
Asian	52 (5)
Mixed Race	44 (4)
Other	12 (1)
Native American	5 (<1)
Education ($N^{\wedge}$ = 1034)	
Less Than HS Diploma/GED	19 (2)
HS Diploma/GED	92 (9)
Some College	187 (18)
Associate Degree	85 (8)
Bachelor's Degree	320 (31)
Graduate Education	331 (32)
Number of children ($N^{\wedge}$ =963)	
0	270 (28)
1	136 (14)
2	261 (27)
3	155 (16)
>3	141 (15)
Youth Sports Team Coach ($N^{\wedge}$ = 1024)	
Yes	272 (27)
No	752 (73)
Avid Spectator of Professional Sports ($N^{\wedge}$ = 1028)	
Yes	568 (55)
No	460 (45)
Personal history of concussion from sports participation ($N^{\wedge}$ = 1018)	
Yes	113 (11)
No	905 (89)

Among parents with at least one child > 14 years ($N^{\wedge}$=417): History of

Respondents	*n* (%*)
child concussed from sports participation	
Yes	83 (20)
No	334 (81)
Self-reported concussion knowledge level ($N^{\wedge}$=1042)	
Minimal	222 (21)
Moderate	582 (56)
Significant	225 (22)
Expert	13 (1)
Location of Survey ($N^{\wedge}$ = 1085)	
Pediatric Clinic	309 (29)
Sky Lobby	492 (45)
Chicago Parks	284 (26)
	Mean (SD)
Average Age (in years) ($N^{\wedge}$ = 978)	43.3 (14.4)
Average Number of Children (number) ($N^{\wedge}$ = 693)	2.6 (1.4)
Average Age of Youngest Child (in years) (range: <1 year-57 years)	14.4 (12.3)
Average Age of Oldest Child in years (range: <1 year-60 years)	17.4 (14.6)

Abbreviations: SD =standard deviation

^ n is provided when total is less than entire sample due to partial non-responders

* Percentages may not add up to 100% due to rounding

Table 2.

Utilization of concussion information sources by survey respondents, from most to least frequent (may provide more than one answer) ($N^{\wedge}$ = 995)

	***N* (%)**
News Media	462 (46)
Sports Media	354 (36)
Physicians	339 (34)
Medical professional health sites on the web (e.g. AAP)	283 (28)
Concussion-specific internet education site	225 (23)
Coaches	224 (23)
Government health sites on the web (e.g. CDC)	205 (8)
Other internet sites	172 (17)
School program for parents	147 (15)
Other**	106 (11)
None	40 (4)
Average number of information sources used	**2.6**

^ n is provided when total is less than entire sample due to partial non-responders

** 20 individuals identified the Will Smith Movie, *Concussion*, as their primary source of information, with several referring only to “Will S mith” as their source of information about concussions.

Table 3.

Attitudes towards youth participation in full contact sports

Attitudes	*Total* *n* (%*)
Youth participation in tackle football (N^=1068)	
Would allow	488 (46)
Would not allow	580 (54)
Age at which tackling should be permitted (N^=1063)	
< 15 yrs.	453 (43)
≥15 yrs.	421 (40)
Never	189 (18)
Full contact tackling in practice (N^=1064)	
Should always be permitted to ensure proper technique	127 (12)
Should be permitted at most practices at coach's discretion	230 (22)
Should be limited	499 (47)
Should be prohibited	208 (20)
Participation in male ice hockey (N^=1074)	
Would allow	754 (70)
Would not allow	320 (30)
Participation in female ice hockey (N^=1061)	
Would allow	651 (61)
Would not allow	410 (39)
Checking in ice hockey practice (N^=1010)	
Should always be permitted to ensure proper technique	151 (15)
Should be permitted at most practices at coach's discretion	203 (20)
Should be limited	387 (38)
Should be prohibited	269 (27)
Appropriate for physicians to counsel against youth participation in full-contact sports (N^=934)	
Agree	695 (74)
Disagree	239 (26)

*Percentages may not add up to 100 due to rounding

^N varies due to partial non-responders

Table 4.

Knowledge questions (N =1021)

	% Correct
You can suffer a concussion only in sports-related activities. (FALSE*)	97
You must lose consciousness to have suffered a concussion. (FALSE*)	93
You can develop dementia even if you never had a concussion. (TRUE*)	90
A student-athlete can return to play on the same day if the concussion is very minor. (FALSE*)	87
Eventually all children who suffer a sports-related concussion fully recover. (FALSE*)	78
If you've suffered one concussion, you are more likely to suffer another. (TRUE*)	75
High School students who have suffered a concussion are usually able to resume full activities within 2–3 days. (FALSE*)	61
Children recover from concussions more quickly than adults. (FALSE*)	58
After a mild concussion, there are usually visible changes on medical imaging. (FALSE*)	39
Average Overall Score on Knowledge Section:	75

*Correct Answer