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Concussion reporting, return to learn, and return to play experiences in a sample of private preparatory high school students

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Abstract

Objective: The objective of this study is to describe concussion reporting and return to learn and play among high school students.

Methods: Self-reported survey data of 1,999 New England private preparatory high school students who played sports or engaged in recreational activities were collected in 2018. Descriptive and bivariate statistics are presented.

Results: Three in ten respondents (31.4%) reported ever sustaining a concussion and 22.0% did not report at least one concussion to an adult. The most common reasons for not reporting included wanting to keep playing their sport (58.0%) and not thinking the injury was that serious (53.6%). Girls and students in higher grades took longer to return to school and sports. A quarter of students reported pretending to have a faster recovery in order to return to school or sports.

Conclusion: Private school students who play sports or engage in recreational activity may be at risk of sustaining concussions and may not report their symptoms due to a lack of understanding the seriousness of concussion, not wanting to fall behind in school, or out of desire to continue playing their sport. Teachers, coaches, and parents can stress reporting as the first step in recovery.

Keywords

Private school; high school; concussion; reporting; return to learn; return to school

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Declaration of interest

The authors report no declarations of interest.

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Introduction

A 2017 national survey demonstrated that 15.1% of high school students (approximately 2.5 million) in the United States reported having at least one sport- or recreation-related concussion in the past 12 months, while 6.0% (approximately 1 million) reported two or more concussions (1). In addition, research demonstrates that compared to adults, youth may be more vulnerable to sustain a concussion due to certain neurological and physiological factors (2–4), and recovery from concussion may also take longer (5–8). Sustaining a concussion during childhood may also increase the risk for adverse outcomes affecting self-regulation, social participation, graduation from high school, employment as an adult, and enrollment in postsecondary education (9–15).

However, high school athletes may underreport symptoms and concussions (16), suggesting that this statistic likely underestimates the true occurrence – and sequelae – of concussions. There are a variety of possible reasons for this occurrence, such as not being familiar with certain symptoms of a concussion (e.g., sleep disturbances and mood changes) and thus not recognizing they had sustained a concussion (17–19), the desire to continue to play (20,21), and not understanding the seriousness of a concussion (22). However, an athlete's willingness to report concussion symptoms is essential for proper management and recovery, as not receiving proper treatment may have long-term social and health implications. Most of the research that has been conducted on concussion prevalence and reporting has focused on public school students. For example, only 15% of participating high schools that contribute data to the National High School Sports-Related Injury Surveillance Study's High School Reporting Information Online (High School RIO) are private, a common source of sports-related concussion data (23). Less is known about the experience of private high school students and the barriers they might face in reporting their concussions, despite the fact that there are documented differences in resources, socioeconomics, student make-up, and location between public and private schools (24), which may impact their injury experiences. Additionally, some private high schools also mandate that students participate in a sport- or recreation-related activity (25), which may potentially increase exposure for injury and concussion. Studies have also shown that private high school students and other students who attend selective high schools may face a high level of academic pressure, which may contribute to students not reporting a concussion or ongoing concussion symptoms in order to return to school sooner (26,27).

A previous study (28) examined self-reported concussion experiences in a sample of private high school students. These results revealed that a higher percentage of male students, those who played contact sports, and students who played multiple seasons of school sports reported a concussion. However, not much is known about reporting behavior and return to learn (RTL) and return to play (RTP) in private high school students. The current concussion protocol is a graduated RTL and RTP step guide (29,30). According to a recent consensus statement on concussion in sport, a general guideline is to initiate RTL successfully before RTP (30). However, more research is needed to have a better understanding of these recommendations, especially by student athletes. While most students will only need informal academic adjustments, if any, while they recover from their concussion, other students with more severe ongoing symptoms will need formal academic accommodations

to help them through their recovery, such as a Response to Intervention Protocol (RTI), 504 Plan, or an Individualized Education Plan (IEP) (https://www.cdc.gov/headsup/basics/return_to_school.html). After successfully returning to school, student athletes should only return to play with approval of a health-care provider in a gradual symptom-guided increase in activity (29,30). Using the same sample as the previous study, the purpose of this study was to describe concussion reporting and RTL and RTP post-concussion in a sample of private high school students who play a sport or engage in a recreational activity. These outcomes were also stratified by sex, contact level of their primary sport, and grade. Based on the findings from these data, we hope to 1) fill in a knowledge gap regarding the concussion experience of youth attending private schools, and 2) inform messaging related to changing the culture around concussions to improve reporting behaviors, RTL, and RTP in private high school athletes.

Methods

Self-reported survey data were collected as part of a project from Pink Concussions, a nonprofit organization whose mission is to improve pre-injury education and post-injury medical care for women and girls affected by TBI (31). The project aimed to explore behaviors and environments related to concussions in order to learn about reporting behaviors, RTL, and RTP among a convenience sample of private preparatory high school students. Eight schools from the New England Preparatory School Athletic Council (NEPSAC) were selected to participate in this study. These schools are located in Connecticut, New Hampshire, Massachusetts, and Rhode Island. Two additional schools of similar size and socioeconomic status in New York were included in the sample but are not part of NEPSAC. Six of the ten schools are day schools, three are boarding schools, and one school is a mix of day and boarding. All schools in the sample, and in NEPSAC more widely, have at least one full-time certified athletic trainer on staff. Internal Review Board (IRB) approval was obtained from the Connecticut Children's Medical Center (#18–018). Due to minimal risk in taking the survey, written parental consent was waived. Parents were notified of the survey in advance and were allowed to opt out of their child(ren) taking the survey. If the student missed the first opportunity to take the survey, another day was offered.

Sample

Data were collected from 2,122 male and female private high school students (14–18 years old) between April and May, 2018. One hundred and twenty-three students (5.8%) were excluded from the final analysis because they did not report playing a sport or engaging in a recreational activity, or they did not answer all the concussion-related questions for a final sample size of 1,999.

Instrumentation

The survey questions for the analysis included:

- Demographics
  - What is your gender?
  - What grade are you in?

  - What is your primary sport?

- Concussion experience
  - Have you ever had a concussion? A definition of concussion was provided: “a concussion is a blow to the head followed by a variety of symptoms that may include any of the following: headache, dizziness, loss of balance, blurred vision, ‘seeing stars,’ feeling in a fog or slowed down, memory problems, poor concentration, nausea, or throwing up. Getting ‘knocked out’ or being unconscious does not always occur with a concussion.”
- Reporting behavior
  - Of your concussions, how many did you hide (not report) to parents/medical/coach/athletic trainer?
  - What were some of the reasons for not reporting your concussion? Please check all that apply. Options included: I didn’t know I had a concussion; I thought I had a concussion but thought it wasn’t serious; I knew I had a concussion but I didn’t want to let my team down; I knew I had a concussion but I wanted to keep playing; I knew I had a concussion but I felt pressure from my coach to play; I knew I had a concussion but I felt pressure from my teammates to play; I knew I had a concussion but I felt pressure from my parents to play.
- Return to Learn
  - How long did it take to return to full academic workload? If you had several concussions, pick the one with the longest recovery time.
  - Have you ever pretended to have a faster recovery from a concussion to return to school work sooner than you needed to?
- Return to Play
  - How long did it take until you could return to your sport and play in games? If you had several concussions, pick the one with the longest recovery time.
  - Have you ever pretended to have a faster recovery from a concussion to return to sports faster than you should have?

The survey was field tested in 2017 with 365 students for understanding and readability.

Procedure

Students were asked if they were willing to complete an anonymous online survey during an advisory period on a school day. The student’s advisor emailed the link to the survey at the beginning of the advisory period. Participation was voluntary and no incentives were offered. The survey took on average 3 min to complete. Among the 10 schools, an average of 68% of all students enrolled in that academic year completed the survey.

Variable definitions

Contact level of primary sport played—Each primary sport listed by respondents was classified into a 3-level ordinal variable by level of contact based on the potential for physical contact (32–35). The levels include: “contact sports” (such as football and hockey), “limited contact sports” (such as baseball and volleyball), and “non-contact sports” (such as cross-country, running, and tennis). Other primary sports not listed in Table 1 include over 30 sports such as dance, ultimate frisbee, martial arts, etc. Due to the low percentage for each of these individual sports (each sport was between 3.4% and 0.05%), they were collapsed together to form an “other” category.

Reporting behavior—The number of concussions not reported by a student was categorized into a binary variable (none and one or more).

RTL and RTP—Questions asking how long it took a student to return to academics or playing a sport were categorized into a 3-level ordinal variable (<1 week, 1–3 weeks, and >3 weeks) based on previous research (36–39).

Data analysis

All data were analyzed using SAS 9.4 (SAS Institute Inc., Cary, North Carolina, USA) and IBM SPSS Statistics Subscription. Descriptive statistics were calculated for each question. Questions about reporting behavior, RTL, and RTP were then stratified by demographics (sex, contact level of primary sport, and grade) where Pearson chi-square tests (χ^2; for sex) and Mantel-Haenszel chi-square tests (χ^2_{MH}; to test for linear associations for contact level of primary sport and grade of school) were run. Bonferroni post hoc proportion tests were also performed if the Pearson chi-square results were significant, $p < .05$, to determine where the differences lie for each individual group. Effect sizes were also computed for each chi-square using Cramer’s V and interpreted in accordance with Cohen (40) in order to determine the associations’ practical significance. An r of 0.1 represents a small effect size, an r of 0.3 represents a medium effect size, and an r of 0.5 represents a large effect size (40).

Results

The sample was relatively evenly split between boys (47.6%) and girls (52.4%) (Table 1). About one-third (32.9%) of the survey respondents were freshmen, 24.2% sophomores, 21.7% juniors, and 21.2% seniors. The student athletes reported playing a variety of sports, with soccer (14.2%), lacrosse (10.2%), and tennis (9.4%) being the most popular individual primary sports. About 46.0% of students’ primary sport was a contact sport, 22.7% were limited contact sports, and 31.3% were non-contact sports. Three in ten (31.4%) students reported ever sustaining a concussion in their lifetime. Among the 628 students who reported ever sustaining a concussion, 22.0% stated that they had hidden/not reported at least one concussion from their parents, medical providers, coaches, or athletic trainers. When asked for their reasons for not reporting at least one of their concussions, 58.0% wanted to keep playing, and more than half (53.6%) thought that the injury was not that serious. Three in ten (31.2%) student athletes did not report a concussion because they did not want to let their team down, while 19.6% did not know they had a concussion.

Among respondents who reported ever sustaining a concussion, 42.7% said that it took less than a week to return to full academic workload and 44.1% said that it took 1–3 weeks. Only 13.2% said it took longer than 3 weeks. About half (50.6%) of student athletes who reported sustaining a concussion stated that it took 1–3 weeks to return to their sport and play in games. Smaller proportions reported that it took less than a week (23.3%) or more than 3 weeks (26.1%). About a quarter of respondents who had ever sustained a concussion reported that they had pretended to have a faster recovery from a concussion in order to return to school (23.6%), or to return to sports (26.3%).

Table 2 presents the bivariate associations of concussion reporting by sex, contact level of primary sport, and grade of student. The difference between male (24.4%) and female (18.8%) student athletes in the proportion who hid/did not report at least one concussion to their parents, medical providers, coaches, or athletic trainers approached significance ($p = .09$). There was a statistically significant linear effect of the proportion of student athletes who did not report a concussion by contact level of primary sport played ($p < .0001$). Specifically, the proportion of students who did not report one or more concussions increased with greater level of contact. However, the effect size for this association was low (Cramer's V = 0.18). There was also a statistically significant linear effect of students' grade in school with not reporting a concussion ($p = .0009$). The higher the grade, the higher the percentage of students who did not report one or more of their concussions. However, the effect size for this association (Cramer's V = 0.14) again indicates that there is low practical significance. Among those who did not report at least one concussion to their parents, medical providers, coaches, or athletic trainers, none of the reasons for doing so were statistically significantly in relation to sex, contact level of sport played, or grade in school (data not shown).

Length of time that the student athlete was able to return to a full academic workload after sustaining a concussion was significantly associated with sex ($p < .0001$) (Table 2). A higher percentage of male students (47.7%) reported returning to a full academic workload in less than a week compared with female students (36.2%), and a lower percentage of male students (7.7%) reported returning longer than 3 weeks compared with female students (20.3%). However, the effect size for the association between returning to school and sex was small (Cramer's V = 0.19). There was a statistically significant linear effect of grade on the length of time it took to return to a full academic load after concussion ($p = .0021$). Specifically, the higher one's grade in school, the smaller the percentage that endorsed a quick return to school (<1 week) and the larger the percentage that endorsed a slower return to school (>3 weeks). The Cramer's V for this relationship was 0.09, indicating a small level of practical significance. Contact level of primary sport ($p = .65$) was not statistically significantly associated with length of time to return to a full academic workload after concussion.

Length of time that the respondent was able to return to their sport and play in games after sustaining a concussion was significantly associated with sex ($p = .03$). Post-hoc analysis determined that a greater percentage of female students (31.2%) than male students (22.2%) were only able to return to their sport after more than 3 weeks. However, the association between sex of student athlete and returning to sport had a low-level practical significance

(Cramer's V = 0.10). There was also a statistically significant linear association between grade in school and length of time it took to return to sport ($p = .0028$). Similar to the time it took to return to school, the higher one's grade in school, the smaller the percentage that endorsed a quick return to sport (<1 week) and the larger the percentage that endorsed a longer return to sport (>3 weeks). The effect size for this association was small (Cramer's V = 0.07), indicating a low level of practical significance. The linear relationship between contact level of primary sport and the time it took to return to sport and play in games was not statistically significant ($p = .20$).

Sex of the respondent was significantly associated with pretending to have a faster recovery from concussion to return to school ($p = .001$). A greater proportion of female students (29.7%) than male students (18.8%) reported engaging in this practice. However, this relationship had a low level of practical significance (Cramer's V = − 0.13). Contact level of primary sport ($p = .36$) and grade of student ($p = .09$) did not have a statistically significant linear relationship with pretending to recover faster from a concussion in order to return to school.

Finally, contact level of primary sport played had a statistically significant linear association with pretending to have a faster recovery from a concussion to return to sports ($p = .0003$). Specifically, the greater the level of contact of the primary sport, the higher the percentage of students who said they pretended to have a faster recovery so they could return to their sport. However, the effect size for this relationship was small (Cramer's V = 0.15). Sex ($p = .41$) and grade of student ($p = .86$) were not significantly associated with pretending to have a faster recovery from a concussion to return to sports.

Discussion

More than three in ten respondents in this sample of private high school students reported at least one concussion, and 22.0% of these student athletes reported hiding at least one concussion from their parents, medical providers, coaches, or athletic trainers. This percentage was higher among those who played contact sports as their primary sport and older students. Hiding or not reporting potential concussion symptoms is a phenomenon that has been reported among other young athletes (41–44); however, the proportion of students in this study who indicated that they did not report their concussions is similar to or lower than in other studies (between 21.4%–51.2%) (16,44–46). The most common reasons for not reporting a concussion across sex, contact level of primary sport, and grade in school included wanting to keep playing their sport (58.0%), and not thinking the injury was that serious (53.6%), which is similar to past research (16). In addition, 19.6% of respondents did not report their concussion because they did not know they had a concussion. Previous research has shown that individuals tend to be familiar with certain symptoms of a concussion (e.g., headache, dizziness, loss of consciousness) but not others (e.g., changes to sleep and mood) (17–19). This highlights the importance of providing concussion education to children, parents, teachers, coaches, and health-care providers so that student athletes and those responsible for helping to identify when a concussion has been sustained can correctly identify concussion symptoms. This may aid in decreasing the percentage of students who do not realize they have sustained a concussion after the injury has occurred. Previous

research has found that the desire to continue playing and the fear of being removed from a game can often be a barrier to concussion symptom reporting among high school athletes (20). When given hypothetical scenarios, collegiate athletes admitted that underreporting of symptoms was more likely in high stakes than low stake situations and thought that their teammates would support such underreporting as well (21). Similarly, a study that involved Australian University students who were studying exercise and sports science reported that while they viewed it was not safe to play with a concussion, they contradicted their belief by saying that they would risk playing or training following a concussion (47). A qualitative study conducted with a group of young hockey players found that they were also likely to "under-appreciate" the health risks posed by a concussion (22). Several players spoke of "shaking off" a hard hit and failing to recognize that they might have sustained a concussion. The results of this previous research, in conjunction with those presented in the current study, present a picture of young athletes who may be hesitant to report potential concussions or concussion-related symptoms, either for fear of missing out of playing time, or failure to understand the seriousness of such an injury.

While the vast majority of students were able to return to a full academic workload in less than a week or between 1 and 3 weeks after their concussion, girls took longer to return to school and sports than boys. Girls were less likely to return to school and sports in less than a week, and more likely to return in more than 3 weeks than their male counterparts. There is strong evidence to suggest that girls take longer to recover than boys after sustaining a concussion (48), and some preliminary evidence that they may have higher rates of concussion in sex comparable sports (49,50). Additionally, we found that older students were more likely to take longer to return to school and sports than younger students. Previous research on the association between age and returning to school after a concussion has been mixed. Some studies have found that age is not associated with a lengthier return to school or sports (51,52) while others have found that indeed older children and teens are more at risk of prolonged recovery and post-concussive syndrome than younger children (53–55). These results suggest an unmet need to ensure that any student – particularly girls and older students – who sustains a concussion is quickly identified, encouraged to report their symptoms, and appropriately shepherded through return to school and return to play protocols. Teachers, parents, and coaches may need to be on alert for any difficulties the student may be facing in their recovery process. Additionally, RTL is an important area for optimal outcomes for children as it impacts their long-term care and outcomes and should be made a priority before RTP (29,30). However, children need to be involved in activities which include sports and recreation that contribute to their health and outcomes, provided approval from a health-care provider.

About a quarter of students reported pretending to have a faster recovery from their concussion in order to return to school or sports. More girls than boys reported pretending to have a faster recovery to return to school than boys. Additionally, student athletes who played limited contact and contact sports were more likely to pretend to have a faster recovery in order to return to sports than those who played a non-contact sport. There may be a risk of a second injury, and more serious sequelae, if a young athlete is returned to practice or the playing field before the first concussion has appropriately healed (56–59). Additionally, returning to school before concussion symptoms have abated may also prolong

the recovery period (60,61). These results suggest that enforcement of RTP and RTL protocols would result in improved outcomes for youth.

While there are many benefits to playing sports (62–64), there is also risk for injury and concussions. Knowing the signs and symptoms of a concussion and reporting potential injuries to parents, coaches, and health-care providers is important in order to receive treatment and to mitigate possible long-term consequences. Promoting evidence-based strategies that may reduce this risk is critical to preventing concussions in sports. Examples of concussion prevention strategies for sports include implementation of contact restrictions that limit collisions and rule changes to make the sport safer (e.g., moving the kickoff line in football to reduce the number kickoff returns, prohibiting body checking in youth ice hockey under the age of 13, and delaying heading instruction until age 11 for soccer). Educational initiatives also show promise for reducing concussion risk, such as the use of a player safety coach in football (65) and comprehensive toolkits that increase concussion knowledge, attitudes, and practices (66). Additionally, changing the culture around concussion safety in sports is an additional way to decrease concussion risk, by changing attitudes, behaviors, and intentions, which in turn affects reporting behavior (67,68). For example, coaches and parents can advocate children follow the rules of play and promote sportsmanship to aid in player safety. In addition, referees upholding the rules of their sport may also reduce player injuries (69).

Limitations

There are several limitations to this study. First, data for this study come from a convenience sample of independent private high schools in the Northeastern United States and may not represent other private high school students. Second, concussion experience, the length of time it took to return to school and play, and reporting behavior are all self-reported and may be subject to recall, social desirability bias, or a misunderstanding of concussion symptoms. Related, the return-to-school and return-to-play questions were phrased as returning to school or sport faster than they “should have.” This is a subjective measure and therefore may differ between students. Third, reported concussions were not validated through an external source (e.g. medical records). Fourth, there are several factors that are unique to this sample of schools that may impact the reporting of concussions. For example, all schools in this study have at least one full-time athletic trainer on staff. Previous research has found that this is not typical (70). However, other research has also shown that athletic trainer or other health-care provider presence was more prevalent for games, boys’ sports, and Varsity sports, which may explain some of our findings (71). The presence of athletic trainers at a school has been shown to increase concussion reporting behavior among students (72,73). Furthermore, each school in this sample has had a concussion management policy in place for at least 6 years, which includes a concussion education component for students, coaches, and parents. Thus, students in this study may have been particularly educated and sensitized to the issue of concussions, which may have influenced their recall and reporting of concussions. Fifth, the median age of first concussion for this sample of students was 10 years old, and no students reported sustaining their first concussion after the age of 15. Therefore, it is likely that many, if not all, of the first concussions reported by the student athletes in this sample occurred before they entered high school and may not be connected to

the sports that they currently play. Sixth, while there were mixed results between contact level of primary sport played and reporting behavior, RTL, or RTP in this study, it is possible that this is simply an effect of the student's concussion having had occurred outside of their current sport context. It is therefore possible that other studies that examine more recent concussions might find an association. Seventh, a previous study demonstrated that 32% of this sample also reported having sustained at least two or more sports-related concussions (28). There might be a recall bias in remembering the exact details of the event, and we cannot be sure for the students that have had multiple concussions, which concussion they are drawing their experiences from. Finally, it is important to note while our analysis found many statistically significant associations between concussion reporting behavior, length of time before return to school and play, and demographic/student factors, none showed a practically significant relationship as judged by their effect sizes. Often with larger sample sizes, one can find statistically significant differences with what appears to be minor disparities. In order to attempt to determine what the practical differences are, effect sizes can be calculated. Our findings of statistical significance without large effect sizes should caution the reader to make sweeping conclusions about the differences found. While there were significant differences in this study, these relationships deserve additional examination in diverse populations to determine if the differences stand.

Conclusions

Private high school students who play sports or engage in recreational activity may be at risk of sustaining concussions. They may choose to not report their injuries or symptoms due to a lack of understanding of the seriousness of concussion, not wanting to fall behind in school, or out of desire to continue playing their sport and not let their team down. Sex, contact level, and grade also affect these outcomes. Parents, teachers, coaches, and athletic trainers can stress the importance of concussion and symptom reporting and encourage a culture of safety.

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Table 1.

Description of the sample and key measures of private high school students who play a sport or engage in a recreational activity, United States, 2018 (n = 1,999).

	Frequency	Percent
Sex		
Male	952	47.6
Female	1,047	52.4
Grade in school		
Freshman	658	32.9
Sophomore	483	24.2
Junior	434	21.7
Senior	424	21.2
Primary sport		
Soccer	283	14.2
Lacrosse	203	10.2
Tennis	187	9.4
Basketball	158	7.9
Crew	118	5.9
Hockey	116	5.8
Volleyball	103	5.2
Cross Country	97	4.9
Squash	97	4.9
Baseball	78	3.9
Other*	559	28.0
Contact level of primary sports played		
Contact	919	46.0
Limited Contact	454	22.7
Non-contact	626	31.3
Ever experienced a concussion		
Yes	628	31.4
No	1,371	68.6
Of your concussions, how many did you hide (not report) to parents/medical/coach/athletic trainer?[b]		
None	490	78.0
One or more	138	22.0
What were some of the reasons for not reporting your concussion?[a,b]		
I wanted to keep playing	80	58.0
I thought it wasn't that serious	74	53.6
I didn't want to let my team down	43	31.2
I didn't know I had a concussion	27	19.6
I felt pressure from my coach, teammates, and/or parents to play	20	14.5
Other	16	11.6

	Frequency	Percent
How long did it take to return to full academic workload?[b]		
<1 week	268	42.7
1–3 weeks	277	44.1
>3 weeks	83	13.2
How long did it take until you could return to your sport and play in games?[b]		
<1 week	146	23.3
1–3 weeks	318	50.6
>3 weeks	164	26.1
Have you ever pretended to have a faster recovery from a concussion to return to school?[1]		
Yes	148	23.6
No	480	76.4
Have you ever pretended to have a faster recovery from a concussion to return to sports?[b]		
Yes	165	26.3
No	463	73.7

[*] Other sports include field hockey, softball, golf, swimming, dance, football, sailing, fencing, track and field, alpine racing, skiing, snowboarding, equestrian, horseback riding, polo, spin/cycling, water polo, Ninja Warrior, wrestling, ultimate frisbee, boxing, martial arts, figure skating, diving, gymnastics, triathlon, table tennis, flag football, rugby, skateboard, weight lifting, and water aquatics. These sports range from 3.4% to 0.05% of the sports or recreational activities played by private high school students.

[a] Only includes students who reported they had at least one concussion.

[b] Only includes students who reported they hid at least one concussion.

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Table 2.

Bivariate associations of concussion reporting by sex, contact level of primary sport, and high school grade level of private high school students who play a sport or engage in a recreational activity.

	Of your concussions, how many did you hide (not report) to parents/medical/coach/athletic trainer?						
	None		One or more		test statistic (X^2 or X_{mh}^2)	p-value	effect size (Cramer's V)
	N	%	N	%			
Sex					2.82	0.09	0.07
Male	266	75.6	86	24.4			
Female	224	81.2	52	18.8			
Contact level of primary sport					18.18	< 0.0001[b]	0.18
Contact	248	71.5	90	28.5			
Limited contact	110	84.6	20	15.4			
Non-contact	132	87.4	19	12.6			
Grade					11.13	0.0009[b]	0.14
Freshman	151	83.4	30	16.6			
Sophomore	125	82.2	27	17.8			
Junior	101	76.5	31	23.5			
Senior	113	69.3	50	30.7			

	How long did it take to return to full academic workload?								
	<1 week		1–3 weeks		> 3 weeks		test statistic (X^2 or X_{mh}^2)	p-value	effect size (Cramer's V)
	N	%	N	%	N	%			
Sex							23.47	< 0.0001	0.19
Male	168	47.7[a]	157	44.6	27	7.7[a]			
Female	100	36.2	120	43.5	56	20.3			
Contact level of primary sport							2.45	0.65	0.04
Contact	151	43.5	146	42.1	50	14.4			
Limited contact	57	43.9	57	43.9	16	12.3			
Non-contact	60	39.7	74	49.0	17	11.3			
Grade							9.43	0.0021[b]	0.09
Freshman	85	47.0	82	45.3	14	7.7			

	How long did it take to return to full academic workload?								
	<1 week		1–3 weeks		> 3 weeks		test statistic (X^2 or X_{mh}^2)	p-value	effect size (Cramer's V)
	N	%	N	%	N	%			
Sophomore	65	42.8	68	44.7	19	12.5			
Junior	56	44.4	58	43.9	18	13.6			
Senior	62	38.0	69	42.3	32	19.6			

	How long did it take until you could return to your sport and play in games?								
	< 1 week		1–3 weeks		> 3 weeks		test statistic (X^2 or Xmh^2)	p-value	effect size (Cramer's V)
	N	%	N	%	N	%			
Sex							6.81	0.03	0.10
Male	89	25.3	185	52.6	78	22.2			
Female	57	20.7	133	48.2	86	31.2[a]			
Contact level of primary sport							1.63	0.20	0.10
Contact	68	19.6	189	54.5	90	25.9			
Limited contact	38	29.2	51	39.2	41	31.5			
Non-contact	40	26.5	78	51.7	33	21.9			
Grade							4.83	0.028[b]	0.07
Freshman	47	26.0	97	53.6	37	20.4			
Sophomore	36	23.7	79	52.0	37	24.3			
Junior	27	20.5	63	47.7	42	31.8			
Senior	36	22.1	79	48.5	48	29.5			

	Have you ever pretended to have a faster recovery from a concussion to return to school?						
	Yes		No		test statistic (X^2 or Xmh^2)	p-value	effect size (Cramer's V)
	N	%	N	%			
Sex					10.32	0.001	−0.13
Male	66	18.75	286	81.3[a]			
Female	82	29.7[a]	194	70.3			
Contact level of primary sport					0.85	0.36	0.05
Contact	79	22.8	268	77.2			
Limited contact	28	21.5	102	78.5			

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	Have you ever pretended to have a faster recovery from a concussion to return to school?						
	Yes		No		test statistic (X^2 or Xmh^2)	p-value	effect size (Cramer's V)
	N	%	N	%			
Non-contact	41	27.2	110	72.9			
Grade					2.82	0.09	0.09
Freshman	33	18.2	148	81.8			
Sophomore	37	24.3	115	75.7			
Junior	37	28.0	95	72.0			
Senior	41	25.2	112	74.9			

	Have you ever pretended to have a faster recovery from a concussion to return to sports?						
	Yes		No		test statistic (X^2 or X_{mh}^2)	p-value	effect size (Cramer's V)
	N	%	N	%			
Sex					0.68	0.41	0.03
Male	97	27.6	255	72.4			
Female	68	24.6	208	75.4			
Contact level of primary sport					13.24	0.0003[b]	0.15
Contact	110	31.7	237	68.3			
Limited contact	30	23.1	100	76.9			
Non-contact	25	16.6	126	83.4			
Grade					0.03	0.86	0.04
Freshman	46	25.4	135	74.6			
Sophomore	39	25.7	113	74.3			
Junior	39	29.6	93	70.5			
Senior	41	25.2	122	74.9			

Cells have expected counts less than 5. Thus, values are suppressed.

[a] Significantly different than the other category at $p < 0.05$ level.

[b] Significant linear trend at $p < 0.05$ level.

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