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Education is necessary but not sufficient for addressing disparities in concussion knowledge, attitudes, and perceptions

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ABSTRACT

Introduction: Concussion leads to immediate cognitive, physiological, psychological, and emotional consequences that, if left untreated, may persist resulting in longer-term effects. Concussion education programs provide students with the knowledge necessary for them to make an informed decision to seek care should an injury occur.

Methods: In this observational cohort study, youth participating in public middle or high school athletics in a suburban county in Pennsylvania were asked to complete a survey to assess their concussion knowledge, attitudes, and perceptions before and after concussion education.

Results: All students increased scores from pre- to posteducation (mean difference, 0.08 to 0.67). Students from noncontact sports, higher grades, and higher Child Opportunity Index (COI) schools tended to have higher scores both before and after concussion education compared to students from contact sports, lower grades, or lower COI schools.

Discussion: Disparities were identified before and after the educational intervention between sport participation, grade level, and schools with different COI. Although concussion education was successful, with students showing improvement in all questions related to concussion knowledge, attitudes, and perceptions, this study identifies a need for the development of more equitable educational support systems. Understanding these differences may provide opportunities for targeted educational strategies, which might result in improved outcomes for younger athletes, those participating in contact sports, and those from lower COI schools.

Keywords: concussion, disparities, education, public school, youth athletes

INTRODUCTION

Concussion is a prevalent injury in school-aged youth, with up to 3.9% of all children in the United States in 2021 diagnosed with concussion at least once during childhood (1). Among athletes sustaining an injury, 12%–48% fail to report their injury to a medical professional (2,3). Concussion may lead to immediate cognitive, physiological, psychological, and emotional consequences, which, if left undiagnosed or untreated, can result in persisting symptoms that add to the various demands of being a student, athlete, and child. Even when treated appropriately, some individuals still suffer from persisting symptoms beyond the normal expected recovery time of 1 month (4). Although concussion may not be entirely preventable, among those who sustain an injury there is strong evidence that those who report their injury and seek medical attention sooner are more likely to have better outcomes compared to those who do not report their injury and seek medical care early (5,6).

To encourage injury reporting, appropriate referral, and timely management, national organizations like the Centers for Disease Control and Prevention (CDC) have developed programs, such as the "Heads Up" initiative, to establish a national resource for concussion education for different groups of stakeholders (7). These programs are especially important in primary and secondary school settings because nearly two-thirds of high schools do not employ a full-time athletic trainer, and nearly a third lack an athletic trainer with training in concussion care (8). All 50 states in the United States have passed concussion legislation for children, many of which require or encourage concussion education prior to engagement in school-based sports and activities (9). Concussion education programs provide students, parents, coaches, schools, and clinicians with the knowledge necessary to make informed decisions should injuries occur (10). While evaluating program delivery and effectiveness, several studies have demonstrated increased intent to report a concussion as a result of educational programs focused on attitude, subjective norms, perceived behavioral control, and enjoyment (11–15). This relationship is partially described by the theory of planned behavior, which accounts for the interplay between attitudes about reporting a concussion, perceived social approval of reporting

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a concussion, and understanding procedurally how to report a concussion (16,17). Understanding this model enables researchers and educational program designers to identify and target behavior within the context of these psychological pillars.

Recent literature examining social determinants of health has illuminated racial disparities in the utilization of the emergency department (ED) for concussion, with Black children less likely to receive a concussion diagnosis than non-Hispanic White children, and varying levels of symptom recognition between different racial and ethnic groups (18–20). Specifically, patients presenting to specialty care for concussion are less likely to be Hispanic or have public insurance, and those with non-sports-related injuries are less likely to receive concussion-specific assessments and care (21–23).

When examining a school-based concussion education program, it is important for stakeholders to consider various barriers to access for students within their school, systemic or otherwise, particularly those related to social determinants embedded within the school and surrounding community. In a study of 411 youth athletes, Bretzin and colleagues (24) reported that no significant demographic factors were related to youth concussion nondisclosure, but sport—particularly football and boys lacrosse—was significantly associated with higher nondisclosure rates in youth 8–14 years old. Race and socioeconomic status did not significantly influence disclosure rates in their cohort, but other studies found access to and likelihood of receiving concussion education was significantly lower in urban compared to suburban schools and low-income families (<$35,000) compared to higher income families (>$75,000) (19,25).

Race, ethnicity, and insurance status are individual factors that are often used as proxies for systemic structural factors that relate to resource availability and utility for a child or family. Geographic location has also been identified as a factor that may influence the type of care delivered because concussed children in rural areas have higher health care costs and lower utilization of services compared to children living in urban areas (26). The Child Opportunity Index (COI), developed from census data, is a robust composite measure of community-level infrastructure relating to resource availability and quality, and other geographic and neighborhood factors that contribute to healthy childhood development (27).

We hypothesized that individuals participating in contact sports, in higher grades, or from schools with a very high COI would have greater preeducation concussion perceptions than their peers participating in noncontact sports, in lower grades, or from lower COI schools. Also, we expected there would be no differences in posteducation concussion perceptions or assessment across sport, grade, or COI school level.

METHODS

Participants

Youth participating in public middle school or high school athletics in a suburban county in Pennsylvania were asked to complete a questionnaire assessing their concussion knowledge before and after an educational intervention on concussion. Any student participating in an organized interscholastic sport was required to participate in the concussion educational session as a part of a countywide standard. Because this was a county-required standard educational session and no health or other personally identifiable information was collected, this study was given institutional review board exemption from the Children's Hospital of Philadelphia (IRB 21-018839), and informed consent was not required for participation. Students were not excluded based on previous concussion history or other personal factors.

Instrumentation

Knowledge, Attitudes, and Perceptions Survey

The survey consisted of six questions rated on a 1–5 scale (1 being the lowest and 5 being the highest) related to concussion knowledge, perceptions, and reporting attitudes in the following order: 1) How would you rate your understanding of concussion? 2) I am able to explain what a concussion is. 3) I am familiar with the signs and symptoms of a concussion. 4) I would be able to know if I had a concussion. 5) If I had symptoms of a concussion, I would pull myself out of a practice/game and let my coach know. 6) I think concussion reporting is important.

Ten-Question Assessment

The 10-question assessment was designed to gauge individual student understanding immediately following the educational program and to promote retention of the information included in the program. Responses were scored 0–10 out of a maximum 10 points. This assessment was unique from the pre- and posteducation survey in that it objectively measured knowledge retention, whereas the knowledge, attitudes, and perception survey was designed to gauge subjective responses.

Procedure

After the initial preeducation knowledge, attitudes, and perception survey, participants completed a 20- to 30-minute educational session presented by a pediatric concussion nurse practitioner with experience in concussion education and clinical care (L.M.C.), followed by a 10-question assessment. The educational program focused on concussion definition, recognition of signs and symptoms, and how to respond to a concussion, as well as whom to report to and reasons to report a concussion. The program also included the use of case studies and mock scenarios to actively engage students about injuries that they or their peers might sustain, as well as how to maintain brain health throughout the year. The educational program was also translated and offered in Spanish and Ukrainian.

COI scores for each school were obtained from a publicly available database using the school ZIP code from the address provided on each school website (27). High COI and very high COI were scored 60–80 and >80, respectively (27). Sport was dichotomized into "contact" and "noncontact" sports, with participants included in the contact sport group if they played any contact sport at any point during the year, regardless of additional noncontact participation. Contact sports were defined using a previously established sport classification provided by Rice et al (28), where contact and collision sports were grouped together including basketball, cheerleading, football, lacrosse, soccer, and wrestling. Noncontact sports included baseball, bowling, cross-country, diving, field hockey, golf, softball, swimming, tennis, track and field, volleyball, and rowing.

Data Analysis

Descriptive statistics were performed with means and standard deviations reported for continuous variables and counts with percentages for categorical variables. The normality of continuous variables was assessed using histogram, skewness index, and the Shapiro-Wilk test.

Table 1

Description of the Study Cohort.

Entire Cohort, *n*	3133
Current grade, *n* (%)	
7th to 8th grade	75 (2%)
9th grade	1019 (33%)
10th grade	795 (25%)
11th grade	698 (22%)
12th grade	545 (17%)
Unknown	1
Sports, *n* (%)	
Contact sports	1982 (63%)
Noncontact sports only	1149 (37%)
Unknown	2
Assessment score, mean (SD)	
Completed	8.23 (1.58)
Unknown	1
Overall COI levels, *n* (%)	
High	352 (11%)
Very high	2781 (89%)

COI, Child Opportunity Index; SD, standard deviation.

Analyses on the knowledge, attitudes, and perceptions survey were conducted at two levels. At the individual level, differences in six survey domains, along with assessment score, were compared by sport and grade using the Mann-Whitney Wilcoxon test and Kruskal-Wallis test, respectively. Bivariate linear regression analyses were conducted to examine whether the overall COI was associated with preeducation knowledge, posteducation knowledge, and assessment score. The mean difference (MD) was compared between two COI levels, and the corresponding 95% confidence interval (CI) was reported. High COI was set as the reference group in regression analyses. The average change in knowledge, attitudes, and perceptions from pre- to posteducation was assessed using paired Wilcoxon signed-rank tests.

At the school-level analysis, the pre- and posteducation knowledge, attitudes, and perceptions were averaged for schools. The pre- and posteducation comparison was performed using paired *t* test. The pre- and posteducation differences were also visualized using scatterplots; the survey domains were plotted against the overall COI, and linear regression lines were fitted for pre- and posteducation, correspondingly, with 95% CI added. All analyses were performed using R 4.2.1 (R Foundation for Statistical Computing, Vienna, Austria). Significance was set *a priori* at a *P* value of 0.05.

RESULTS

A total of 3133 students from nine different public schools completed the educational program. Characteristics of the student sample that completed the educational session are included in Table 1. A left skewed distribution was seen for the six-question survey where all participants scored above 3 (maximum score of 5), and a left skew was seen for COI where more students were represented from very high COI schools than high.

Preeducation Differences

Prior to the educational intervention, we found differences across grades 7–12 in five of the six survey measures: understanding of concussion, explaining what a concussion is, familiarity with signs and symptoms, ability to know if I had a concussion, and pulling myself out of a practice/game if I thought I had a concussion and telling my coach ($P < 0.05$). Importantly, scores trended upward, with each grade having more foundational knowledge than the previous (Table 2).

By sport, we found differences preeducation between groups, with the noncontact sports only group scoring higher on all six survey items compared to the contact sports group ($P < 0.05$) (Table 3).

Regarding COI, we found differences preeducation between students from high and very high overall COI schools, with very high overall COI students scoring higher in three measures: ability to explain what a concussion is (MD, 0.15; 95% CI, 0.05–0.26; $P < 0.05$), familiarity with signs and symptoms (MD, 0.17; 95% CI, 0.07–0.27; $P < 0.01$), and ability to know if they had a concussion (MD, 0.14; 95% CI, 0.03–0.24; $P < 0.05$) (Table 4).

Posteducation Differences

After the educational session, we found improvements across grades 7–12 in four of the six survey measures: understanding of concussion, explaining what a concussion is, familiarity with signs and symptoms, and ability to know if I had a concussion

Table 2

Knowledge and Perception on Concussion by Grade Level.

Survey Item, Mean (SD)		7th to 8th Grade, *n* = 75	9th Grade, *n* = 1019	10th Grade, *n* = 795	11th Grade, *n* = 698	12th Grade, *n* = 545	*P*[a]
Preeducation	How would you rate your understanding of concussion?	3.69 (0.97)	3.80 (0.90)	3.89 (0.86)	4.03 (0.81)	4.13 (0.76)	<0.001
	I am able to explain what a concussion is.	3.59 (1.14)	3.77 (0.99)	3.89 (0.96)	4.08 (0.85)	4.17 (0.80)	<0.001
	I am familiar with the signs and symptoms of a concussion.	3.77 (1.13)	3.96 (0.97)	4.10 (0.90)	4.25 (0.82)	4.38 (0.77)	<0.001
	I would be able to know if I had a concussion.	3.84 (1.10)	3.98 (1.03)	4.05 (0.94)	4.16 (0.89)	4.29 (0.84)	<0.001
	If I had symptoms of a concussion, I would pull myself out of a practice/game and let my coach know.	4.33 (0.98)	4.60 (0.77)	4.55 (0.80)	4.60 (0.74)	4.60 (0.79)	0.04
	I think reporting a concussion is important.	4.83 (0.53)	4.84 (0.48)	4.84 (0.47)	4.84 (0.45)	4.84 (0.46)	0.99
Posteducation	How would you rate your understanding of concussion?	4.49 (0.60)	4.59 (0.56)	4.56 (0.64)	4.61 (0.58)	4.69 (0.52)	0.002
	I am able to explain what a concussion is.	4.49 (0.69)	4.57 (0.61)	4.54 (0.68)	4.62 (0.57)	4.69 (0.55)	<0.001
	I am familiar with the signs and symptoms of a concussion.	4.59 (0.64)	4.72 (0.54)	4.69 (0.58)	4.76 (0.49)	4.81 (0.43)	<0.001
	I would be able to know if I had a concussion.	4.52 (0.79)	4.68 (0.56)	4.66 (0.61)	4.69 (0.54)	4.75 (0.51)	0.01
	If I had symptoms of a concussion, I would pull myself out of a practice/game and let my coach know.	4.75 (0.64)	4.88 (0.40)	4.84 (0.46)	4.83 (0.46)	4.84 (0.46)	0.09
	I think reporting a concussion is important.	4.88 (0.40)	4.94 (0.26)	4.92 (0.31)	4.92 (0.30)	4.93 (0.29)	0.17

[a]Kruskal-Wallis rank sum test.

SD, standard deviation.

Table 3

Knowledge and Perception of Concussion by Sports Type.

Survey Item, Mean (SD)		Contact Sports, *n* = 1982	Noncontact Sports Only, *n* = 1149	*P*[a]
Preeducation	How would you rate your understanding of concussion?	3.90 (0.87)	3.99 (0.83)	0.01
	I am able to explain what a concussion is.	3.88 (0.96)	4.02 (0.90)	<0.001
	I am familiar with the signs and symptoms of a concussion.	4.08 (0.93)	4.22 (0.86)	<0.001
	I would be able to know if I had a concussion.	4.04 (0.97)	4.18 (0.93)	<0.001
	If I had symptoms of a concussion, I would pull myself out of a practice/game and let my coach know.	4.51 (0.83)	4.71 (0.68)	<0.001
	I think reporting a concussion is important.	4.80 (0.51)	4.90 (0.39)	<0.001
Posteducation	How would you rate your understanding of concussion?	4.54 (0.61)	4.70 (0.51)	<0.001
	I am able to explain what a concussion is.	4.52 (0.65)	4.71 (0.53)	<0.001
	I am familiar with the signs and symptoms of a concussion.	4.68 (0.58)	4.82 (0.42)	<0.001
	I would be able to know if I had a concussion.	4.64 (0.60)	4.76 (0.50)	<0.001
	If I had symptoms of a concussion, I would pull myself out of a practice/game and let my coach know.	4.81 (0.50)	4.92 (0.33)	<0.001
	I think reporting a concussion is important.	4.91 (0.33)	4.97 (0.20)	<0.001

[a]Wilcoxon rank sum test.

SD, standard deviation.

($P < 0.05$). Interestingly, the upward trend remained consistent from grade to grade (Table 2).

By sport, both groups showed improved scores after the educational session. Preeducation differences, however, remained after the educational intervention between groups, with the noncontact sports only group scoring higher on all six survey items compared to the contact sports group ($P < 0.05$) (Table 3).

Following the educational intervention, we found differences between students from high and very high overall COI schools in one measure, with very high overall COI students continuing to score higher in familiarity with signs and symptoms (MD, 0.08; 95% CI, 0.02–0.14; $P < 0.05$) (Table 4).

Educational Assessment

Regarding the 10-question educational assessment performed immediately following the education session, we did not find an effect of grade on the differences between scores. Examining sport type, we found differences at the immediate posteducation assessment between contact and noncontact sports only, with the noncontact sports only group (MD, 0.35; 95% CI, 0.24–0.47; $P < 0.001$) scoring better than their contact sport peers (mean score, 8.10 ± 1.59). Regarding COI, we did not find that school COI influenced the differences between scores.

Individual Analysis

There were individual increases in each of the knowledge, attitudes, and perceptions questions from pre- to posteducation: How would you rate your understanding of concussion (MD, 0.67; 95% CI, 0.64–0.70; $P < 0.001$)? I am able to explain what a concussion is (MD, 0.66; 95% CI, 0.63–0.69; $P < 0.001$). I am familiar with the signs and symptoms of a concussion (MD, 0.60; 95% CI, 0.58–0.63; $P < 0.001$). I would be able to know if I had a concussion (MD, 0.60; 95% CI, 0.57–0.62; $P < 0.001$). If I had symptoms of a concussion, I would pull myself out of a practice/game and let my coach know (MD, 0.27; 95% CI, 0.24–0.29; $P < 0.001$). I think reporting a concussion is important (MD, 0.09; 95% CI, 0.08–0.10; $P < 0.001$).

School-Level Analysis

There were school-wide increases in each of the knowledge, attitudes, and perceptions questions from pre- to posteducation for all schools, which are illustrated in Figure 1.

DISCUSSION

In examining individual factors contributing to varying levels of concussion knowledge, attitudes, and perceptions, we found

Table 4

Child Opportunity Index (COI) Influence on Concussion Knowledge, Attitudes, and Perception.

Survey Item, MD (95% CI)		COI Very High	*P*
Preeducation	How would you rate your understanding of concussion?	0.09 (0.00 to 0.19)	0.15
	I am able to explain what a concussion is.	0.15 (0.05 to 0.26)	0.02
	I am familiar with the signs and symptoms of a concussion.	0.17 (0.07 to 0.27)	0.01
	I would be able to know if I had a concussion.	0.14 (0.03 to 0.24)	0.04
	If I had symptoms of a concussion, I would pull myself out of a practice/game and let my coach know.	0.00 (–0.09 to 0.08)	0.97
	I think reporting a concussion is important.	–0.01 (–0.06 to 0.04)	0.88
Posteducation	How would you rate your understanding of concussion?	0.04 (–0.02 to 0.11)	0.35
	I am able to explain what a concussion is.	0.03 (–0.03 to 0.10)	0.44
	I am familiar with the signs and symptoms of a concussion.	0.08 (0.02 to 0.14)	0.03
	I would be able to know if I had a concussion.	0.01 (–0.06 to 0.07)	0.94
	If I had symptoms of a concussion, I would pull myself out of a practice/game and let my coach know.	–0.03 (–0.08 to 0.02)	0.35
	I think reporting a concussion is important.	–0.02 (–0.05 to 0.02)	0.44

CI, confidence interval; MD, mean difference.

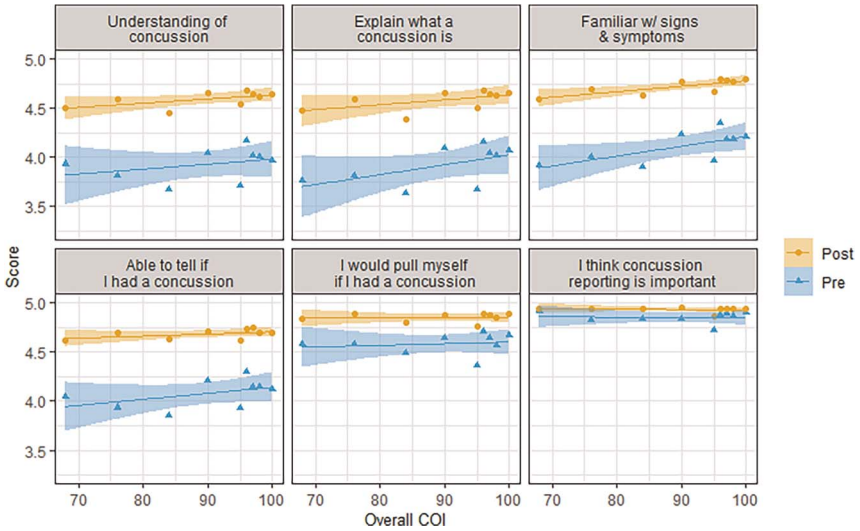

Figure 1. School-level Child Opportunity Index (COI) influence on knowledge, attitude, and perception. School-level aggregated data were used to assess the relationship of COI with concussion knowledge, attitude, and perception. Each dot in the scatterplot represents an average score of one survey item from a school.

preeducation disparities prior to education between students participating in different levels of contact sports, across grade levels, and from schools with varying COI. By participating in a simple 30-minute school-based concussion education intervention, middle and high school athletes improved their knowledge, attitudes, and perceptions about concussion. Despite overall increases in knowledge, attitudes, and perceptions scores across the board after the educational intervention, there remained a gap in improvement in posteducation scores between students based on contact level of the sport, grade level, and COI. This study shows improvement across all participants in the knowledge, attitudes, and perceptions across each of nine public schools, indicating immediate efficacy of the concussion education program, which replicates previously published data. This study also highlighted that, although all students received the same educational intervention, differences in knowledge, attitudes, and perceptions between groups prior to the intervention remained after the intervention. This finding indicates that concussion education, although beneficial, may not be adequate to close the gap in disparities observed in concussion knowledge, attitudes, and perceptions between populations. Additional approaches may be necessary to address observed differences, which likely reflect systemic and structural societal inequities impacting health.

In a scoping review of concussion education programs, Ramsay and Dahinten (29) found each of six education programs effective in improving knowledge about concussion, and that another five studies with specific interventions effectively improved attitudes and perceptions about concussion. Interestingly, there was little focus in any of these studies on the effect of gender, age, or other individual factors on concussion knowledge, attitudes, and perceptions. To help fill the knowledge gap, the current study provides insight into how sport contact level, grade, and school COI may influence the acquisition and retention of concussion knowledge, attitudes, and perceptions both before and after concussion education.

Examining sport type, we were surprised by the results indicating that athletes in noncontact sports had higher knowledge, attitudes, and perceptions, both before and after concussion education, with higher scores on the immediate posteducation assessment. Upon further consideration, we suspect this finding may be due to differential distribution of the sexes among contact and noncontact sports rather than contact versus noncontact sport participation, *per se*. From a systematic review of sex differences in sports-related concussion, females were found to be more likely to report concussion (30). Because sex was not captured as a part of the demographic information for this study, we cannot confirm, but we hypothesize that the differences seen in reporting between noncontact and contact athletes may reflect sex differences in sports participation, because the contact sports of football and wrestling are comprised almost exclusively of males.

Though somewhat intuitive, it is important to acknowledge the natural progression of knowledge, attitudes, and perceptions about concussion across youth and adolescence. We saw a consistent trend of increased knowledge, attitudes, and perceptions as grade increased, with senior students performing better than their peers in each of the lower grades. This may present an opportunity to target younger students in middle school and freshman grades to increase overall knowledge, but likely reflects a natural knowledge progression over adolescence such that the gap between older and younger students may always exist despite additional educational interventions.

Regarding COI, athletes from schools with high COI scored lower compared to their peers from schools with very high COI, specifically in ability to explain what a concussion is and familiarity with signs and symptoms of a concussion. Even after education, although there was no difference between groups in ability to explain what a concussion is, there was a notable disparity between students from very high and high COI schools, where the students from very high COI schools remained more familiar with the signs and symptoms of concussion than those from lower COI schools. These results highlight the importance of identifying systemic issues affecting knowledge, attitudes, and perceptions of concussion that may exist prior to an educational intervention to develop an intervention that truly addresses those barriers and may begin to close the gap between populations. This has the potential to directly affect concussion outcomes; research has shown that concussion education influences reporting behavior, which directly relates to outcomes (2,31). It is also likely that, although this study demonstrated

differences between students that are highly resourced (>60 on overall COI), these disparities may be further amplified as resource availability and opportunity become scarcer.

Our results indicate that concussion programs may provide opportunities to improve outcomes following pediatric concussion in a school setting by addressing attitudes about concussion reporting, perceived social norms about concussion reporting, and perceived behavioral control. However, further success of school-based concussion education programs in eliminating disparities in knowledge, attitudes, perceptions, and thus outcomes in pediatric concussion will likely require identifying and addressing the unique systemic barriers to acquiring concussion knowledge, attitudes, and perceptions for students within the schools and the communities that these schools serve. This will be necessary to not only improve but also work toward eliminating the disparities in the knowledge base of concussion for all children.

Limitations

This study examined the immediate influence of a concussion education program on the knowledge, attitudes, and perceptions of youth athletes participating in organized public-school sports. A major limitation of this study is that the concussion knowledge, attitudes, and perceptions assessment tool used in this intervention has not been previously validated. Future studies should aim to use a validated measure to understand preexisting systemic factors that may result in disparities in concussion knowledge to begin with, then obtain longitudinal measures to understand the impact of a concussion education program on knowledge retention and behavior change over the course of a season or school year, as well as capture concussion history to understand the influence of injury exposure on concussion knowledge, attitudes, and perceptions. Sex and gender are also factors that researchers should incorporate into future work; this study did not record these demographics of the students. Also, findings from this study may not necessarily translate to private schools, recreation, industry, or other non-school-based settings. Additionally, all included schools had a COI >60, so this comparison may not reflect disparities in concussion knowledge, attitudes, and perceptions for schools with a moderate to very low COI (i.e., 0–60). Last, future studies should aim to include more middle school and primary school children to better understand the continuum of knowledge, attitudes, and perception around concussion across different grades.

Conclusions

Our study provides an evaluation of a school-based educational intervention for short-term changes in students' knowledge, attitudes, and perceptions surrounding concussion. The concussion educational intervention was successful overall, with students showing improvement in all six questions related to concussion knowledge, attitudes, and perceptions for each of the nine included schools. Students from higher grade levels and those who participated in noncontact sports had higher scores on survey questions. Although improvements were noted across each school, disparities were found at pre- and posteducation timepoints, as well as when assessing immediate retention through the 10-question assessment between sports participation, grade levels, and schools with different COI, indicating that disparities in the knowledge base of concussion that existed before the educational intervention remained after the intervention, despite absolute improvements for all groups. Future studies should strive to understand the specific reasons why a concussion educational intervention is insufficient to eliminate differences in concussion knowledge, attitudes, and perceptions among students from different COI, and should include schools with moderate, low, and very low COI to better understand the scope of concussion knowledge, attitudes, and perceptions across the entire spectrum of opportunity.

CONFLICTS OF INTEREST AND SOURCE OF FUNDING

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DATA AVAILABILITY

The dataset generated and analyzed during the current study are available upon reasonable request from the corresponding author.

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