

[Primary Care]

Assessment of Parental Knowledge and Attitudes Toward Pediatric Sports-Related Concussions

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Background: Parents of young athletes play a major role in the identification and management of sports-related concussions. However, they are often unaware of the consequences of concussions and recommended management techniques.

Hypothesis: This study quantitatively assessed parental understanding of concussions to identify specific populations in need of additional education. We predicted that parents with increased education and prior sports- and concussion-related experience would have more knowledge and safer attitudes toward concussions.

Study Design: Cross-sectional survey.

Level of Evidence: Level 5.

Methods: Participants were parents of children brought to a pediatric hospital and 4 satellite clinics for evaluation of orthopaedic injuries. Participants completed a validated questionnaire that assessed knowledge of concussion symptoms, attitudes regarding diagnosis and return-to-play guidelines, and previous sports- and concussion-related experience.

Results: Over 8 months, 214 parents completed surveys. Participants scored an average of 18.4 (possible, 0-25) on the Concussion Knowledge Index and 63.1 (possible, 15-75) on the Concussion Attitude Index. Attitudes were safest among white women, and knowledge increased with income and education levels. Previous sports experience did not affect knowledge or attitudes, but parents who reported experiencing an undiagnosed concussion had significantly better concussion knowledge than those who did not.

Conclusion: Parents with low income and education levels may benefit from additional concussion-related education.

Clinical Relevance: There exist many opportunities for improvement in parental knowledge and attitudes about pediatric sports-related concussions. Ongoing efforts to understand parental knowledge of concussions will inform the development of a strategic and tailored approach to the prevention and management of pediatric concussions.

Keywords: brain concussion; knowledge; parents; pediatric sports injury; traumatic brain injury

Sports-related concussions (SRCs) continue to be a leading concern in youth sports.⁹ Because of biomechanical and structural differences as well as relative physiologic weaknesses compared with adults, pediatric athletes are particularly vulnerable to sustaining concussions during play.¹⁰ Pediatric athletes

experiencing concussions may experience more serious symptoms and longer recovery times.^{12,20} Although recent SRC prevention and education efforts have increased awareness among pediatric athletic and medical professionals, many pediatric SRCs still go unreported, undiagnosed, untreated, and mismanaged.^{11,16}

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Parents of young athletes play a major role in both identifying concussive symptoms and managing at-home recovery. However, they are often unaware of the short- and long-term consequences of concussions and do not comprehend new concussion management techniques that have emerged in recent decades.^{1,4,8,17-19} There are many lingering misconceptions about concussions; for example, parents who played sports as children were often taught that mild head injuries did not warrant medical evaluation or necessitate rest from athletic or academic involvement.¹⁹ Currently, conspicuous gaps in basic and translational research exploring the at-home recognition and management of pediatric SRCs are preventing the implementation of effective and comprehensive education programs and risk-reduction protocols.^{16,20}

This study aimed to assess parental knowledge and attitudes toward SRCs using a previously validated assessment tool. Additionally, this study sought to characterize the parent populations most deficient in concussion knowledge.

MATERIALS AND METHODS

Study Sample and Recruitment

Institutional review board approval was obtained from the supervising hospital before the study commenced. Participants were recruited at a freestanding level I pediatric trauma center and its 4 satellite orthopaedic clinics. Individuals were eligible for participation if they were English-speaking parents or primary caregivers of children brought to the hospital or one of its clinics for evaluation of musculoskeletal or mild traumatic brain injuries. Individuals were not eligible for participation if they were younger than 18 years and/or non-primary caregivers. Parents and caregivers whose children had a history of pervasive developmental disorder, chronic neurological condition, brain injury with intracranial hemorrhage requiring surgical intervention, severe congenital brain malformation, symptomatic chromosomal abnormality, and/or other major underlying medical conditions were also ineligible for participation. Parents and caregivers of children who had been previously seen for a concussion at the hospital or one of its clinics were excluded.

Data Collection

Consenting participants completed the survey in person via Qualtrics (Qualtrics) on an iPad (Apple) or laptop. This survey tested participants' knowledge of concussion signs and symptoms, treatment, and return-to-play guidelines, as well as their attitudes regarding medical diagnosis, follow-up, and postconcussion sports participation (online appendix, available at <http://sph.sagepub.com/content/by/supplemental-data>). After completion of the survey, a concussion information sheet was provided to all participants.

Data Analysis

Summary statistics (means, frequencies, standard deviations) were used to characterize population attributes, including

demographics and previous sports- and concussion-related experience. For the purposes of analysis, contact sports included those designated by the American Academy of Pediatrics.¹³ Participants' responses to the queries in Section III were summed to calculate Concussion Knowledge Index (CKI) and Concussion Attitude Index (CAI) scores for each participant.¹⁵ Summary statistics were calculated for CKI and CAI scores of the population. Student *t* tests and chi-square tests were used for between-group comparisons of CKI and CAI scores. For variables that were not normally distributed, Kruskal-Wallis tests were used to analyze scores. A result was considered significant if $P \leq 0.05$. All statistical analyses were performed using R v3.0.2 (R Foundation for Statistical Computing). Excluded data are detailed in the online appendix (available at <http://sph.sagepub.com/content/by/supplemental-data>).

RESULTS

Sample Characteristics

A total of 227 parents were surveyed between May and December 2013; 214 completed valid surveys and were included in the analysis (Table 1).

Concussion Knowledge Index and Concussion Attitude Index Scores

CKI scores ranged from 6 to 24, with respondents scoring an average of 18.4 (SD, 3.41). CAI scores ranged from 23 to 75, with respondents scoring an average of 63.1 (SD, 8.89).

Effect of Demographic Variables on CKI and CAI Scores

CKI scores did not differ significantly by sex, while CAI scores did ($P = 0.05$). CKI scores varied significantly among ethnic groups (χ^2 ; $P < 0.01$), with white parents scoring highest (Table 2). Household income was significantly associated with both CKI (χ^2 ; $P < 0.01$) and CAI (χ^2 ; $P = 0.01$) scores, and a positive association was observed between parental household income and CKI scores. Neither parent's employment status nor the type of school in which their child was enrolled had a significant effect on index scores. However, parental education level was significantly associated with both CKI (χ^2 ; $P < 0.01$) and CAI (χ^2 ; $P < 0.01$) scores (Table 2). Parents with bachelor's degrees scored highest on the CKI, while those with technical degrees scored highest on the CAI. Finally, CKI scores significantly differed according to marital status (χ^2 ; $P < 0.01$), with divorced parents scoring highest on the CKI (Table 2).

Effect of Previous Concussion- and Sports-Related Experience on CKI and CAI Scores

Having a child who had previously suffered a concussion did not appear to affect CKI or CAI scores. Parents who had been previously diagnosed with a concussion did not have significantly higher index scores. With regard to sports-related experience, the highest level of sport played by parent, parent participation in a contact sport, or child participation in a

Table 1. Characteristics of study sample

	n (%)
Sex	
Male	57 (26.6)
Female	157 (73.4)
Ethnicity	
Hispanic	41 (19.1)
White	126 (58.9)
African American	16 (7.5)
Asian	24 (11.2)
Native American	1 (0.5)
Other	6 (2.8)
Annual household income, \$	
<30,000	15 (7.0)
30,000-49,999	12 (5.6)
50,000-74,999	21 (9.8)
75,000-99,999	26 (12.2)
>100,000	140 (65.4)
Type of school child attends	
Public	129 (60.3)
Private	77 (36.0)
Home school	8 (3.7)
Highest education level	
Some high school	5 (2.3)
High school diploma/equivalent	17 (8.0)
Some college	34 (15.9)
Bachelor's degree	87 (40.7)
Technical degree	2 (0.9)
Graduate/professional degree	69 (32.2)
Employment status	
Employed, full-time	30 (14.0)
Employed, part-time	6 (2.8)
Unemployed	2 (0.9)
Retired	65 (30.4)
Homemaker	111 (51.9)
Marital Status	
Single	14 (6.5)
Married/partnered	188 (87.9)
Divorced/widowed	12 (5.6)

contact sport did not have a significant effect on parental index scores (Table 3).

DISCUSSION

Although recent initiatives have been implemented to improve the knowledge, attitudes, and behaviors toward SRCs among coaches and clinicians, there has been a startling lack of focus on the parents of pediatric athletes.^{2,3,16} Parents play a major role in both identifying concussive symptoms in their children and managing at-home recovery once diagnosis has been made. With young athletes often denying symptoms and relying on parents and coaches for medical advice, parental understanding of SRC prevention and management is critical in competitive and recreational environments.^{5,11,14} However, a number of previous studies have demonstrated deficiencies in parental understanding of SRCs. In one survey of parents of youth rugby players, only half had knowledge of guidelines and recommendations for SRC management, including return to play protocols.¹⁹ Other studies have demonstrated similar gaps in parental knowledge with an inability to recognize postconcussive symptoms in their children.^{4,6,18}

Though parents scored high on all indices, ranges of CKI and CAI scores were substantial and varied significantly in certain subgroups, demonstrating that much room for improvement in parent knowledge and attitudes exists. Our results also suggest that parents with lower income and education levels may benefit from additional education regarding SRCs. CKI scores also varied according to sex, ethnicity, employment status, and marital status. Though these differences may be driven by an overrepresentation of particular demographics in the surveyed sample, they have not previously been reported in the literature and warrant additional investigation.

Contrary to our expectations that parents with past sporting experience would have increased concussion knowledge, neither past participation in sports nor personal concussion history predicted parents' CKI or CAI scores. During their sports participation 2 to 3 decades ago, concussions were called "dings" or "getting your bell rung" and were perceived and treated as mild injuries. Since then, strategies for understanding and managing concussions have evolved significantly.¹⁹

Neither CKI nor CAI scores depended on whether a parent or his or her child had participated in a contact versus a noncontact sport. We expected that participation in contact sports would predict concussion knowledge, as athletes playing contact sports are at an elevated risk for SRCs compared with those playing noncontact sports.⁷

There are several limitations with this study. There is selection bias as the surveyed sample included mostly educated, married, white mothers from high-income households. A second limitation is the setting of the study; parents were surveyed in sports clinics during their child's visit for a sports-related injury. The fact that their children were being seen for sports-related injuries—including concussions—may have made parents increasingly aware of issues related to concussions, including signs, symptoms, and management information.

Table 2. Parental CKI and CAI scores according to demographics

	n	CKI ^a		CAI ^b	
		Mean	P Value	Mean	P Value
Sex ^c					
Male	57	18.1		61.2	
Female	157	18.5	0.48	63.8	0.05
Ethnicity ^d					
Hispanic	41	16.8		60.9	
White	126	19.3		63.8	
African American	16	17.4		64.8	
Asian	24	17.3		62.0	
Native American	1	14.0		69.0	
Other	6	17.8	<0.01	61.5	0.21
Annual household income, ^d \$					
<30,000	15	14.9		54.9	
30,000-49,999	12	16.5		60.3	
50,000-74,999	21	17.2		64.1	
75,000-99,999	26	17.6		60.0	
>100,000	140	19.3	<0.01	64.7	<0.01
Type of school child attends ^d					
Public	129	18.2		62.9	
Private	77	18.7		63.3	
Home school	8	18.6	0.35	64.3	0.45
Highest education level ^d					
Some high school	5	12.4		53.4	
High school diploma/equivalent	17	15.8		59.7	
Some college	34	18.5		62.6	
Bachelor's degree	87	19.0		64.6	
Technical degree	2	17.5		69.0	
Graduate/professional degree	69	18.8	<0.01	62.8	<0.01
Employment status ^d					
Employed, full-time	30	18.8		64.1	
Employed, part-time	6	16.8		63.2	
Unemployed	2	12.5		50.5	
Retired	65	18.8		63.1	
Homemaker	111	18.3	0.27	63.1	0.45
Marital status ^d					
Single	14	15.2		59.4	
Married/partnered	188	18.6		63.3	
Divorced/widowed	12	18.8	0.05	64.0	0.45

CAI, Concussion Attitude Index; CKI, Concussion Knowledge Index.

^aPossible CKI scores ranged from 0 to 25.

^bPossible CAI scores ranged from 15 to 75.

^cKruskal-Wallis test used for analysis.

^dStudent *t* test used for analysis.

Table 3. Parental CKI and CAI scores according to previous sports- and concussion-related experience

	n	CKI ^a		CAI ^b	
		Mean	P Value	Mean	P Value
Child had concussion? ^c					
Yes	24	18.6		19.8	
No	190	18.4	0.79	19.6	0.76
Parent had concussion? ^c					
Yes	19	18.2		19.3	
No	195	18.4	0.79	19.6	0.79
Parents' sporting level ^d					
Leisure/intramural	144	18.5		63.3	
Club	48	18.3		63.2	
College	16	18.1		62.1	
Professional	6	18.3	0.97	60.5	0.52
Child plays contact sport? ^c					
Yes	66	18.2		62.8	
No	148	18.5	0.57	63.2	0.77
Parent played contact sport? ^c					
Yes	51	18.9		62.6	
No	163	18.3	0.24	63.3	0.65

CAI, Concussion Attitude Index; CKI, Concussion Knowledge Index.

^aPossible CKI scores ranged from 0 to 25.

^bPossible CAI scores ranged from 15 to 75.

^cStudent *t* test used for analysis.

^dKruskal-Wallis test used for analysis.

CONCLUSION

Results suggest that parents with low income and education levels may benefit from additional concussion-related education. Parents with prior personal sports experience or those who personally sustained a concussion did not have significantly greater knowledge or safer attitudes toward SRCs compared with those without prior experience.

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