Youth sport parents’ familiarity and perceptions of concussion legislation

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Abstract
Objectives: In an effort to reduce the negative health consequences often associated with concussions among young athletes, all U.S. states and the District of Columbia enacted youth concussion legislation between 2009 and 2014. This study explored youth sport parents’ (1) familiarity with their state’s concussion legislation, and (2) perceptions about the need for additional legislative provisions not currently found in such laws.

Methods: Cross-sectional online survey data were obtained from parents (n = 430) of youth sport athletes from 22 U.S. states.

Results: Primary findings suggest that 67% of parents were moderately to extremely familiar with the removal from play requirement; 69.9% were moderately to extremely familiar with mandatory concussion training for coaches; and 75.1% were moderately to extremely familiar with the medical clearance requirement for athletes to return to play. In regard to perceptions, approximately half (50.2%) believed it is essential to mandate parent/guardian notification when a child suffers a potential concussion; and 42.8% believed it is essential to include a penalty/sanction for violating the statute. Based on the results of a multivariable logistic regression model, a significantly greater familiarity of concussion legislation was found among parents who were White/Caucasian, had advanced degrees, had higher household incomes, or were urban residents.

Conclusions: Our findings suggest that most youth sport parents have a sound understanding of concussion legislation and believe that the laws should be revised to improve best practices in preventing and managing concussions. Parents who face socio-cultural and economic barriers can benefit most from having access to credible information about their state’s concussion law.

Keywords
Traumatic brain injury, law, awareness, policy, injury prevention

Date received: 30 July 2021; accepted 3 January 2022

Each year, approximately 1.1–1.9 million children and adolescents in the U.S. sustain a sport or recreation-related concussion.1 In an effort to decrease the high incidence and potential severity of concussions among youth athletes, state-level legislation was adopted to improve awareness, diagnosis, and management of concussions. The first concussion statute, known as the Lystedt Law, was enacted by the state of Washington in 2009 after Zachery Lystedt, a middle-school football player, was permanently disabled following repeated head trauma he sustained after prematurely returning to a game.2 With the Lystedt Law serving as an impetus, all other states and the District of Columbia passed their own concussion statutes by 2014. Based on the framework of the Lystedt Law, all state concussion statutes share three common tenets which require: (1) concussion education for coaches, parents/guardians, and athletes; (2) removing an athlete

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with a suspected or diagnosed concussion from play; and (3) medical clearance from an appropriate healthcare provider before an athlete returns to play.3,4 Specific statutory language, however, varies among states which create inconsistencies in the implementation of the required mandates nationwide. For instance, only about a fifth of the state statutes have return-to-learn (RTL) provisions which are intended to help a concussed athlete safely reintegrate into school by offering various forms of academic accommodation (e.g. reduced workload, extra time for assignments and exams). Some states have recently amended their legislation to better reflect the latest scientific consensus regarding best practices in preventing and managing concussions.5,6

After the implementation of concussion legislation, research has focused on changes in concussion rates and related healthcare utilization,7–11 and implementation of concussion legislation and policies in schools.12–16 However, research examining the public’s (i.e. youth sport parents, coaches, athletes) awareness and perceptions about concussion legislation is limited. Exploring the public’s understanding of, and perceptions about, concussion legislation is important given that a lack of awareness was cited as one of the key inhibitors to compliance with such statutes.17 Understanding youth sport stakeholders’ awareness and perceptions of concussion legislation may be ultimately tied to the law’s intended outcomes of improving the identification and management of concussions, which in turn can prevent both the short- and long-term health issues. Additionally, increased awareness about the legislation may help facilitate teamwork among relevant stakeholders (i.e. athletes, parents, coaches, athletic administrators, medical personnel) in both clinical and non-clinical settings. For instance, parents who are familiar with the law’s return-to-play (RTP) provision are more likely to work with appropriate health care providers to obtain medical clearance before their child can safely return to sports (Figure 1).

Within the family environment, parental involvement is the primary source of a child’s health-seeking behaviors.18 For example, children who suffer a head injury may report to their parents and rely on them to recognize the injury, seek appropriate healthcare, and assist with their recovery. Given the vital role that parents play in caring for and promoting the health and wellbeing of their children who participate in youth sports, it is imperative they have an understanding of best practices in concussion safety as highlighted by the state legislation. Furthermore, parents should be familiar with concussion legislation since many schools and youth sport leagues’ concussion policies are developed based on state concussion statutes.10 Parents who are familiar with their state’s law may be (1) more aware of concussion management issues, (2) can help ensure their child’s schools and youth sport programs’ policies are reflective of the law and identify potential implementation-related barriers, (3) and can advocate for future legislative amendments in an attempt to improve the law’s effectiveness. To the best of our knowledge, however, no studies have examined youth sport parents’ understanding or perceptions about their state’s concussion statute. The primary aim of this exploratory study was to examine youth sport parents’ familiarity with concussion legislation in the state they reside. Additionally, we sought to understand parents’ perceptions about the need for additional legislation components currently not found in their state statute. To obtain further insights about our primary outcomes, we examined both parent and child factors associated with increased familiarity regarding concussion legislation.

**Methods**

**Instrument and measurement**

In an attempt to assess youth sport parents’ familiarity with and perceptions about concussion legislation, an online questionnaire, hosted by Qualtrics (Qualtrics, Provo, UT), was developed based on a comprehensive review of the literature.3,4,19,20 Additionally, to ensure accuracy of the legislative components, state-specific information on concussion statutes was obtained from the Youth Sports Traumatic Brain Injury Law Codebook.21 This Codebook contains longitudinal data that highlights key components of concussion legislation in each state. Based on a review of these resources, we included 34 *a priori* items (legislative components) in the questionnaire. To establish face validity, the initial survey was reviewed by a panel of experts (i.e. independent researchers, youth soccer coaches, and parents of youth sport participants). Utilizing the panel’s recommendations, the questionnaire was finalized after multiple rounds of revisions, including reorganizing questions and improving minor syntax issues.

The survey included nine Likert-type items (5-point: *not at all familiar* to *extremely familiar*) to assess youth sport parents’ familiarity with concussion legislation (Cronbach’s α = 0.94). These *a priori* items were selected based on uniform components of legislation that were shared by the largest number of states (22; AL, AR, CA, DE, FL, HI, IA, IL, IN, LA, MA, MO, NV, NJ, NM, PA, RI, SD, TN, TX, VT, & WV). Examples of the selected items include removal of an athlete from play; RTP requirement; medical clearance required for athletes to return to play; mandatory coach training; and distribution of a concussion safety information sheet to athletes and parents. Possible familiarity scores ranged from 9–45, with higher scores indicating stronger familiarity. Next, to explore parents’ perceptions about the need for additional legislative components, we developed eight *a priori* items (Cronbach’s α = 0.91) that were not a part of the selected
22 states’ law. These eight items were measured by a 5-point Likert scale (not a priority to essential). Examples include notifying parents of a suspected/diagnosed concussion, specifying eligible healthcare professionals for providing medical clearance to RTP, limiting certain types of high-risk activities, RTL policy, and imposing sanctions for non-compliance with the law. Possible scores ranged from 8–40, with higher scores indicating stronger perceptions about the need for additional legislative components. For explanatory variables (i.e. parent/child factors), 16 items regarding both parents’ and their child’s characteristics were provided at the beginning of the survey. Parent items included demographics, residing state, concussion education received, and previous coaching experience in youth sports. Regarding child items, demographics, type of sport(s) participation, sport program(s) involved, playing experience (years), and number of previously diagnosed concussion(s) were included.

Participants and procedures

Participants were selected as a sample of youth sport parents from organized interscholastic (e.g. middle/high school) and youth sport programs (e.g. public recreation, private club) who resided in the selected 22 states. We chose parents of youth sport athletes who participated in sports known for higher concussion rates (i.e. football, soccer, basketball, ice hockey, wrestling, and lacrosse).22,23 Parents with more than one child were instructed to respond only in reference to their oldest child (i.e. 5–19 years old). The study participants were recruited by Qualtrics Research Services (QRS), a contracted service that invites research participants from a pre-arranged pool of the U.S. population. The QRS identified target participants via screening procedures and invited only those who met our inclusion criteria. Study details were not provided until after the screening procedures to avoid self-selection bias. Only those who resided in the 22 states that shared the common legislative provisions included in the questionnaire were invited to participate. To ensure a diverse, representative sample nationwide, at least 15 but not more than 21 parent responses were collected from each of the 22 states. Prior to beginning the survey, participants were provided with written informed consent. The present study was approved by the institutional review board at the corresponding author’s institution. Data were collected for three weeks in January 2021.

Data analyses

Data obtained from the Qualtrics online platform were imported into SPSS 21.0 (SPSS Inc., Chicago, IL) for statistical analyses. Descriptive statistics were used to characterize the participant data (frequency and percentage) and their familiarity with and perceptions about concussion legislation (measures of central tendency and variability).

To examine explanatory factors that predict higher levels of familiarity, multivariable ordinal logistic regression analyses were conducted. To determine meaningful increases in the levels of familiarity, dependent variables were categorized into three ordinal levels based on 33 percentile increments within the overall range of scores. Odds ratios (ORs) in the model included gender (female vs. male), race/ethnicity (non-White/Caucasian vs. White/Caucasian), the highest level of education (high school/some college vs. advanced degrees), annual household income ($\leq 100,000 vs. $ \geq 100,001), location of residence (non-urban vs. urban), concussion education received (no vs. yes), coached
youth sport (no vs. yes), and child’s diagnosed concussions (none vs. ≥1).

Next, a multivariable linear regression model was developed to assess the combined influence of the parent and child factors on concussion legislation familiarity. Discrete variables were used for the highest level of education, annual household income, child’s age, child’s years of playing sports, and child’s number of diagnosed concussions. Additionally, dummy coding was used with baseline reference; these included implementation of legislation (2011 or earlier), gender (male), race/ethnicity (White/Caucasian), location of residence (urban), concussion education received (yes), and coached youth sport (yes). The threshold for statistical significance was defined as \( p < 0.05 \) for all analyses.

## Results

Among the 430 responding parents, most were mothers (62.1%), White/Caucasian (86.5%), had at least a Bachelor’s degree (50.5%), resided in an urban area (55.1%), and had an annual household income over $100,000 (54.7%). Approximately two-thirds of them had coached youth sports (64.6%) and received concussion education (63.4%). Of relevance to child characteristics, most were male (69.2%), 10–14 years old (42.8%), and had participated in organized sports for 1–3 years (51.9%). Most children were involved in basketball (29.7%), football (29.5%), and/or soccer (22.8%) within interscholastic sports (39.4%), followed by public recreation organizations (24.8%). Approximately two-thirds (65.5%) of parents had a child who had been diagnosed with a concussion 1–2 times (Table 1).

Table 2 shows the mean and standard deviation of participants’ familiarity with and perceptions about concussion legislation. Roughly, two-thirds (67%) of parents were moderately to extremely familiar with the legislation mandating removal from play when an athlete is suspected of a concussion (mean=3.82). While 61.6% of the respondents were moderately to extremely familiar with the requirement of the RTP policy, roughly 10% were not at all familiar with this mandate (mean=3.69). In regard to the medical clearance requirement for athletes to RTP (mean=4.05), nearly half of the parents (47.9%) were extremely familiar with this provision (27.2% moderately familiar). Similarly, 69.6% of respondents
Table 2. Familiarity and perceptions about concussion legislation.

| Familiarity and Perceptions about Concussion Legislation (5-Point Scale) | M (SD) |
|---------------------------------------------------------------|--------|
| **Familiarity about the legislation components (Range 1–5: Not familiar to extremely familiar)** |        |
| An athlete with a suspected concussion must be removed from play. | 3.82 (1.31) |
| A return-to-play policy is required for youth sports programs. | 3.69 (1.33) |
| A minimum 24-h waiting period is required before an athlete can return to play. | 3.74 (1.28) |
| Medical clearance is required from a health care professional for an athlete to return to play after sustaining a concussion. | 4.05 (1.17) |
| Medical clearance must be in a written format. | 3.88 (1.23) |
| Coaches are required to take mandatory concussion-specific training(s). | 3.89 (1.24) |
| In order for athletes to participate in a youth sport program, a parent or guardian is required to sign a concussion safety information sheet. | 3.99 (1.26) |
| In order for athletes to participate in a youth sport program, they (i.e. athletes) are required to sign a concussion safety information sheet. | 3.90 (1.22) |
| A concussion safety information sheet must be distributed periodically (e.g. annually) to athletes or their parents/guardians. | 3.84 (1.25) |
| **Perceptions about additional legislation components (Range 1–5: Not a priority to essential)** |        |
| Requiring a parent or guardian be notified of any suspected or diagnosed concussion. | 4.24 (95) |
| Specifying which health care professionals are eligible to provide medical clearance to return to play. | 4.08 (90) |
| Regularly updating concussion safety information sheet (for parents and/or athletes) with developments in concussion risks and/or treatment. | 4.15 (87) |
| Requiring a maximum amount of time an athlete can engage in full-contact activities to reduce the likelihood of concussions. | 3.98 (97) |
| Limiting certain types of high-risk physical activities (i.e. contact/collisions) during practices. | 3.97 (99) |
| Requiring the use of standardized forms (i.e. baseline cognitive test) for pre-sports participation. | 4.00 (96) |
| Requiring a RETURN-TO-LEARN policy for athletes before returning to school after a diagnosed concussion. | 4.07 (95) |
| Imposing a penalty/sanction should a youth sport coach and/or program fail to adhere to the concussion legislation. | 4.11 (97) |

were familiar (42.6% extremely familiar) with mandatory concussion training for coaches (mean = 3.89).

Additionally, most parents (74.2%) were moderately to extremely familiar with the statutory requirement of signing a concussion safety information sheet before their child can participate in youth sports (mean = 3.99), but significantly fewer parents (68.4%) were moderately to extremely familiar that their child must also sign the information sheet (mean = 3.90).

In regard to parents’ perceptions on additional provisions of youth sport concussion legislation, the vast majority indicated it is essential (50.2%) or a high priority (31.6%) to include statutory language that requires a parent/guardian be notified of any suspected or diagnosed concussion (mean = 4.24). A smaller portion (34%) of parents felt it is essential to require a maximum amount of time for full-contact activities, and limit high-risk activities during practices (mean = 3.98), respectively. In regard to an RTL policy, the larger percentage of parents believed it is essential (38.4%) or a high priority (37.9%) to mandate such a policy through legislation (mean = 4.07). A substantial number of parents strongly believed that imposing a penalty in cases of non-compliance with the law (mean = 4.11) is essential (42.8%) or a high priority (34.9%) (Table 2).

In Table 3, the results of the multiple ordinal logistic regression model suggest several factors were associated with a higher level of familiarity with state concussion legislation. Specifically, the odds of increased familiarity were present among White/Caucasian parents (vs. other racial/ethnic groups; OR = 2.36; 95% CI: 0.81–1.91), parents with a household income greater than $100,000 (vs. < $100,000; OR = 1.80; 95% CI: 0.44–1.16), and those residing in urban areas (vs. non-urban; OR = 1.81; 95% CI: 0.45–1.17). Also, the odds of familiarity with the legislation increased among parents with a Graduate/Professional degree (OR = 2.50; 95% CI: 1.02–1.98) compared to those with a high school diploma or some college experience (referent). Using the same referent group, parents who had an Associate’s or Bachelor’s degree reported higher odds of increased familiarity (OR = 1.72; 95% CI: 0.21–1.23). Finally, having had concussion education (vs. no education; OR = 1.95; 95% CI: 0.58–1.32) and previous experience coaching youth sports (vs. no coaching experience; OR = 1.70; 95% CI: 0.33–1.08) were both associated with increased odds of greater familiarity with their state legislation.

In the multivariable linear regression model, various parent and child factors were included in the analysis, but only a parent’s race/ethnicity (referent: White/Caucasian; p < 0.001), location of residence (referent: urban; p = 0.01), and child’s age (discrete variable; p = 0.049) emerged as the combined factors associated with increased familiarity regarding concussion legislation (Table 4).

**Discussion**

**Familiarity with concussion legislation**

To our knowledge, the present study was the first to explore youth sport parents’ familiarity and perceptions about
Table 3. Multivariable ordinal logistic regression model of factors predicting higher level of familiarity regarding concussion legislation components.

| Independent Variable          | Odds Ratio (95% CI) | p     |
|------------------------------|---------------------|-------|
| Gender                       |                     |       |
| Female                       | 1.00                |       |
| Male                         | 1.62 (0.26–0.98)    | 0.001 |
| Race/Ethnicity               |                     |       |
| Non-White/Caucasian          | 1.00                |       |
| White/Caucasian              | 2.36 (0.81–1.91)    | < 0.001 |
| Highest Level of Education   |                     |       |
| High school/some college     | 1.00                |       |
| Associate’s/Bachelor’s degree| 1.72 (0.21–1.23)    | 0.006 |
| Graduate/Professional degree | 2.50 (1.02–1.98)    | < 0.001 |
| Annual Household income      |                     |       |
| < $100,000                   | 1.00                |       |
| > $100,000                   | 1.80 (0.44–1.16)    | < 0.001 |
| Location of Residence        |                     |       |
| Non-urban                    | 1.00                |       |
| Urban                        | 1.81 (0.45–1.17)    | < 0.001 |
| Concussion Education Received|                     |       |
| No                           | 1.00                |       |
| Yes                          | 1.95 (0.58–1.32)    | < 0.001 |
| Coached Youth Sport          |                     |       |
| No                           | 1.00                |       |
| Yes                          | 1.70 (0.33–1.08)    | < 0.001 |
| Child’s Diagnosed Concussion(s)|                 |       |
| None                         | 1.00                |       |
| 1–2                          | 2.14 (0.11–2.16)    | 0.03  |
| ≥ 3                          | 2.42 (0.32–2.53)    | 0.011 |

Dependent variables were categorized into three ordinal levels based on levels of familiarity (i.e. 33 percentile increments). CI = confidence interval.

Table 4. Multivariable linear regression model of factors associated with familiarity regarding concussion legislation components.

| Independent Variable          | Coef. | t     | p     |
|------------------------------|-------|-------|-------|
| Implementation of legislation (2011 or earlier) | -0.068 | -1.092 | 0.276 |
| Gender (male)                | -0.089 | -1.295 | 0.197 |
| Race/ethnicity (White/Caucasian) | 0.417  | 6.528  | < 0.001 |
| Highest level of education   | 0.061  | 0.842  | 0.401 |
| Annual household income      | 0.039  | 0.596  | 0.552 |
| Location of residence (urban) | 0.164  | 2.586  | 0.01  |
| Concussion education received (yes) | 0.060  | 0.933  | 0.352 |
| Coached youth sport (yes)    | -0.010 | -0.147 | 0.883 |
| Child’s age                  | 0.124  | 1.978  | 0.049 |
| Child’s playing experience in years | -0.084 | -1.334 | 0.184 |
| Child’s number of diagnosed concussion(s) | 0.072  | 1.119  | 0.265 |

*Values within the parentheses indicate references (dummy coding). On growing scientific consensus, for instance, Arizona’s legislation was revised to include mandatory parent notification when an athlete has been removed from play (practice or game) due to a suspected concussion. Most recently, Illinois and Iowa revised their statutes to enhance both RTP and RTL protocols and implementation. These recent amendments show support for improving original state statutes to reflect the revised best practices and guidelines. Continued efforts to improve the legislation, however, are necessary to address gaps in other aspects of concussion prevention and management. For example, in the present study, the vast majority of parents felt strongly about adding an RTL policy to their state statute, a provision currently found in only about eight states. Given that youth athletes should be students first, safely reintegrating them back into the classroom/school should be prioritized as much as ensuring a safe return to sports. Moreover, whereas schools and youth sport leagues may implement RTP strategies as organizational policy, these policies may not be uniform in quality and scope without legislative mandates. A study by Lyons et al. noted, in Washington, where RTL procedures are not required by law, only 12% of schools had a formal RTL policy (67% had an informal policy), although nearly half of the respondents had a student in the classroom who was recovering from a concussion at some point. Furthermore, without legislative mandates, schools and youth sport organizations in some communities (e.g. low socioeconomic areas) may not be voluntarily developing RTL policies due to a lack of funding, resources, and/or partnerships. In sum, legislative mandates that require this important provision can provide accountability in policy development that, in turn,
promotes wide-scale adoption and implementation of RTL strategies.

Factors associated with increased familiarity about concussion legislation

Our logistic regression model suggests that a higher degree of familiarity with concussion legislation was found among certain demographic groups such as White/Caucasian, those with advanced degrees, higher income, and urban residents. These demographic patterns, as it relates to familiarity with concussion legislation, are not surprising given that health literacy is typically patterned by socioecological factors, particularly socioeconomic status. Specifically, a lower socioeconomic standing has been generally linked to lower health-related achievements and educational outcomes. As such, parents in lower socioeconomic communities may be less likely to understand and utilize health-related information (including concussion legislation and associated best practices) compared to those residing in higher socioeconomic communities. Such trends were also found in previous research that showed concussion knowledge deficits among parents of color and those residing in lower socioeconomic communities. Although addressing concussion-related knowledge deficits among people of color and parents with a lower socioeconomic standing may take a multifaceted approach, offering educational interventions that are tailored to specific subpopulations may be necessary. For example, parents whose primary language is not English, those with lower health literacy, or parents from a cultural background that are skeptical about the severity of concussions should examine the role of demographics and the availability of community-level resources on parents’ knowledge about concussion legislation and related best practices. Such efforts may help identify inequalities in concussion education programs and initiatives, as well as facilitate targeted interventions that can increase access to effective concussion safety information.

Limitations

Given that a larger percentage of parents had a child who participated in more than one sport and/or enrolled in multiple sport programs, parents’ familiarity and perceptions about concussion legislation could not be measured based on a sport with greater concussion risk (e.g., football vs. basketball) or sport program that may have had stronger concussion safety policies (e.g., interscholastic sports vs. recreational sports). As such, future studies examining familiarity and perceptions about concussion legislation should focus on a narrower subset of samples. Although we developed survey items based on the latest literature and publicly available data, it is conceivable that the questionnaire may not have accounted for the latest legislative alterations from our selected states. Additionally, despite being assured of confidentiality and anonymity, there may have been response bias among parents with some providing socially desirable responses (i.e., greater familiarity with the law), potentially resulting in overestimated results. It is also important to acknowledge that our selected states were implementing their legislation at varying levels, however, we did not account for a state-specific level variation in parents’ awareness and perceptions about the law.

Conclusions

Public awareness about youth concussion legislation is an important factor in achieving the intended outcomes of the law such as proper identification of concussion signs/symptoms, removing an athlete suspected of a concussion, and facilitating a safe return to play. Although concussion laws are relatively new in most states, most youth sport parents from the present study had a sound understanding of such laws. Our findings, however, also underscore the need for improving educational initiatives regarding certain provisions in the laws, such as the RTP and removal from play requirements. Such interventions are particularly necessary for families/stakeholders who face socio-cultural and economic barriers in accessing credible information about their state’s concussion statute. Additionally, our findings may have implications for state lawmakers when considering amendments to their current statutes as most parents supported revising the statutes to include broader coverage of best practices in the prevention, identification, and management of concussions. Future research should investigate factors that promote and inhibit the awareness of concussion legislation to improve implementation strategies at the youth sport level.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship and/or publication of this article.

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