Concussions in Community-Level Rugby: Risk, Knowledge, and Attitudes

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Background: Rugby is a popular collision sport where participants are at risk of sustaining concussions. Most research focuses on elite-level or youth divisions. Comparatively, little is known about adult community rugby. The aim of this research was to estimate the risk of sustaining a concussion during participation in community-level rugby and summarize the collective knowledge and attitudes toward concussions.

Hypothesis: Concussion symptoms will be reported frequently among community-level rugby players and a substantial proportion will report a willingness to continue participation despite the risk.

Study Design: Cross-sectional analysis.

Level of Evidence: Level 3.

Methods: An anonymous, voluntary survey was administered to all 464 senior rugby players registered in the province of Manitoba in 2015. Two primary domains were assessed: (1) concussion history from the preceding season including occurrence, symptomatology, and impact on daily activities and (2) knowledge and attitudes toward concussion risks and management.

Results: In total, 284 (61.2%) rugby players responded. Concussive symptoms were reported by 106 (37.3%). Of those, 87% were formally diagnosed with a concussion and 27% missed school and/or work as a result. The danger of playing while symptomatic was recognized by 93.7% of participants, yet 29% indicated they would continue while symptomatic. Furthermore, 39% felt they were letting others down if they stopped playing due to a concussion.

Conclusion: Concussive symptoms were common among the study cohort and had a notable impact on daily activities. A high proportion of players were willing to continue while experiencing symptoms despite recognizing the danger. The observed discord between knowledge and attitudes implicates a culture of "playing injured."

Clinical Relevance: Understanding the risk of injury may affect an individual's decision to participate in community-level rugby. Moreover, evidence of discord between the knowledge and attitudes of players may direct future research initiatives and league governance.

Keywords: rugby; sports-related concussion; mild traumatic brain injury; attitudes; knowledge

Rugby union is the most played full-contact team sport in the world.[11,14] The high speed and aggressive nature of the competition places participants at risk for various injuries, in particular, concussion.[12] The detrimental short- and long-term consequences of this form of mild traumatic brain injury have recently garnered considerable attention.[21]

Participation and overall popularity of rugby in North America is rapidly increasing, and this trend will likely continue with its inclusion in the 2016 Summer Olympics. Canada has seen the participation rate double between 2002 and 2014, with now over 26,000 actively registered participants.[17] However, most of the clinical evidence pertaining to concussions in rugby has

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been generated in traditional markets for the sport, such as Europe, Australasia, and South Africa. Little data are available to address the risks, knowledge, and attitudes toward concussion from North American participants. The few studies that are available focus primarily on youth, collegiate, or elite-level players.[2,3,10,14,18] Presently, there is a paucity of data pertaining to concussions in adult players participating at the community level. These players may have a different risk profile than their elite or younger counterparts, owing to experience levels, attitudes toward the game, and vigilance on the part of league organizers to recognize and manage injuries of this nature. In addition, players may have less timely access to medical resources and greater concerns with respect to the effect of injuries on occupational attendance and status.

This study aimed to estimate risk of concussions among community-level senior Canadian rugby union players participating in the traditional 15-a-side format. Furthermore, the authors aimed to explore risk differences between sexes and summarize the collective knowledge and attitudes toward concussion. These data may guide knowledge transfer, assist medical staff in understanding cultural attitudes toward concussion, and suggest areas where future regulations may mitigate the frequency or impact of this injury.

METHODS

The Health Research Ethics Board at our local institution granted approval for the study. A cross-sectional survey was conducted of all senior-level rugby players registered in the Canadian province of Manitoba. All rugby players registered to participate as a member of 1 of 10 male and 7 female teams comprising the Rugby Manitoba senior division during the 2015 season were included. Senior division players are 18 years of age or older, with occasional exceptions for underage player eligibility determined on a case-by-case basis by the local governing rugby union.

Survey Administration

The survey was administered in the spring of 2015; this coincided with a period specified for preseason practices in preparation for the 2015 season. Copies of the survey were provided to each coach and subsequently distributed to each player on the respective teams for completion (see Appendix 1, available at http://journals.sagepub.com/doi/suppl/10.1177/1941738117695777). Completed surveys were returned via the coach to the investigators in an anonymous manner.

Survey Design

The survey was based on one developed for a similar study of concussion in hockey and football players.[15] Relevant questions were modified to be appropriate for the sport of rugby. The questions were designed to elicit demographic information, concussion history from the preceding season of play, and knowledge and attitudes regarding concussion management.

Definition of Concussion

Players were asked to self-report any symptoms of concussion that they experienced during the prior season.[19] Any self-reported concussive symptoms occurring as a result of participation in a game or practice classified the player as having had a concussion. Risk of concussion was defined as the likelihood of experiencing 1 or more episodes of concussive symptoms occurring during a game or practice in the prior season of play. Players were further asked whether their symptoms were associated with a formal diagnosis of concussion, and if so, by whom.

Statistical Analysis

Raw data are presented using descriptive statistics. Continuous variables are presented as means with standard deviations, ordinal variables as median values with interquartile range, and categorical variables as frequencies and percentages. Comparisons of continuous data and nonparametric data were conducted using *t* statistic and chi-square tests, respectively. The alpha level for accepting statistical significance was set at 0.05. All analyses were performed using SPSS 22.0 (IBM Corp).

RESULTS

Participant Demographics and Impact of Concussion

A total of 464 surveys were administered to all senior division rugby players registered in the Province of Manitoba. Of those, 284 surveys were returned, for a response rate of 61.2%. Respondents had a mean age of 25.7 ± 7.0 years and reported participating in organized rugby for a mean period of 7.4 ± 6.6 years. A total of 277 individuals participated in the preceding season. Full demographics of the study population can be found in Table 1.

Of the respondents who participated in the prior season, 38.5% reported symptoms of a concussion that resulted from an event that occurred during a practice or game. A complete list of concussion symptoms queried can be found in Appendix 2 (available at http://journals.sagepub.com/doi/suppl/10.1177/1941738117695777). These players experienced a median of 5 symptoms (interquartile range [IQR], 2-9). Figure 1 highlights the 10 most commonly reported symptoms. Proportionally more female players reported symptoms than male participants (52% vs 30%; $P < 0.05$). Fifty percent of players who experienced signs and/or symptoms of a concussion were subsequently diagnosed with a concussion. The diagnosis was most often made by a physician (56.6%), followed by an athletic therapist (30.2%), and coach (7.5%). Within this subpopulation of players who experienced signs and/or symptoms of a concussion, 39.8% had to miss at least 1 rugby practice or game and 26.5% were forced to miss school or work. The impact of concussions on our study population is shown in Table 2.

Table 1. Demographics[a]

	Male (n = 171)	Female (n = 113)
Age ± SD, y	27.1 ± 8.1	23.6 ± 4.2[b]
Height ± SD, cm	180.3 ± 7.2	167.0 ± 7.6[b]
Weight ± SD, kg	92.9 ± 14.6	74.0 ± 14.1[b]
Experience ± SD, y	8.7 ± 7.5	5.4 ± 4.1[b]
Position, %		
Forward	52.6	56.8
Back	39.8	29.7
Both	7.6	13.5
Games per week ± SD	1.7 ± 6.1	1.2 ± 1.4
Games per season ± SD	16.0 ± 6.8	14.3 ± 4.6[b]
Practices per week ± SD	2.6 ± 9.3	1.8 ± 0.6

[a]Data presented as mean ± standard deviation unless noted otherwise.
[b]Significantly different from male subgroup ($P < 0.05$).

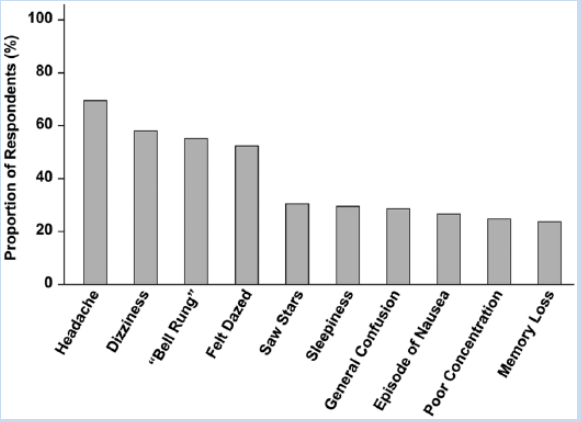

Figure 1. Proportional distribution of the 10 most common concussion symptoms reported by subjects. Proportion is representative of those who responded in the affirmative to having experienced a concussion in the preceding rugby season.

Concussion Knowledge

Three questions on the survey assessed specific knowledge of the dangers of a concussion. Between 89% and 94% of participants answered these questions correctly, which pertained to the dangers of playing while symptomatic, the elevated risk of concussion after an initial event, and the potential for delayed onset of symptoms (Figure 2). Furthermore, approximately half of participants received information on concussions before the start of the rugby season, and the World Rugby *Recognize and Remove* guidelines were familiar to 40.8% of participants.

Attitudes Toward Concussion

Figure 3 highlights the findings on players' attitudes toward concussion. A notable proportion of players stated that they would continue to participate in a match if they were experiencing concussive symptoms, and even more would return to play if symptoms subsided during the game or practice. Numerous players suggested that they have previously felt obliged to play through concussive symptoms, more so during the playoffs. Nearly 40% of players noted that they would feel as if they were letting people down if they stopped playing as a result of concussive symptoms, and a similar proportion stated that they believed tougher players would play though a concussion. Players worried primarily about letting their teammates down (89.4%), while a smaller proportion felt they were letting down their coaches or managers (64.4%) or themselves (64.4%). Conversely, only 1.8% stated they would feel like a teammate let them down if the teammate stopped participation due to a concussion.

DISCUSSION

The responses to the survey suggest that symptoms of concussions are commonplace in community-level senior rugby, and despite a near-ubiquitous appreciation for the dangers of concussion, many players are still willing to continue to play while experiencing symptoms. This has yet to be recognized in community-level adult competition in North America, as the

Table 2. Impact of concussions[a]

	Total % (n/N)	% Male (n/N)	% Female (n/N)
Experienced signs and symptoms of concussion	38.5 (106/275)	30.2 (51/169)	51.9 (55/106)
Diagnosed with a concussion	50.0 (53/106)	56.9 (29/51)	43.6 (24/55)
Missed time from school and/or work	26.5 (27/102)	21.6 (11/51)	31.4 (16/51)
Missed time from rugby	39.8 (41/103)	37.3 (19/51)	42.3 (22/52)

[a]Data limited to the subset of players who participated in the prior season (275 of 284 total participants).

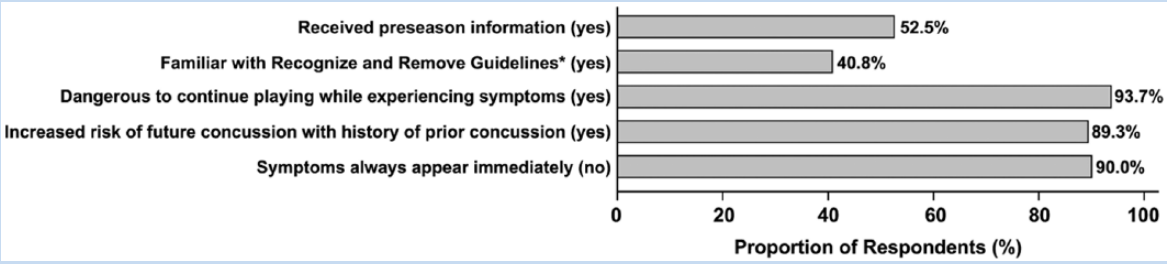

Figure 2. Participant responses to knowledge-based questions specific to concussion in the sport of rugby. *Guidelines as outlined by the World Rugby Organization.

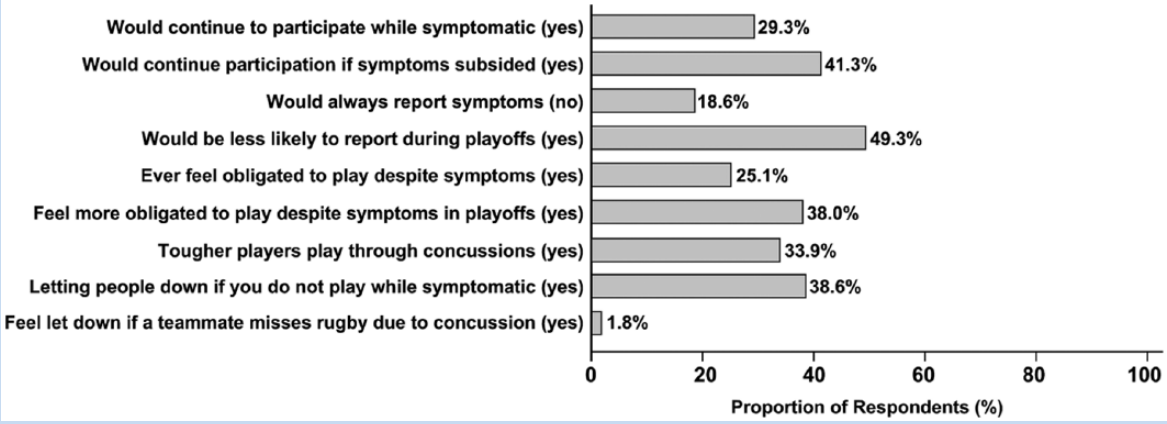

Figure 3. Participant responses to questions pertaining to attitudes and influences regarding concussion risk and management.

predominant focus has been on high school, collegiate, or elite-level players.[2,3,10,14,18]

The community-level athletes may represent a relatively vulnerable cohort. Unlike their professional and elite-level counterparts, their income or future potential earnings are not derived from the sport; instead, they are participating in a recreational capacity. These players often do not have direct access to multidisciplinary medical care and support services to aid with their return to work, study, and play rehabilitation. These data serve to raise awareness, inform decisions regarding willingness to participate, and direct future mandates that may enhance player welfare.

Impact of Concussions

More than one-third of the survey respondents reported experiencing symptoms of a concussion during the preceding season. Direct comparison with other studies is difficult, given the subjective nature of reporting, policies and guidelines for reporting, and age and skill level of participants. The studies that have reported the incidence of rugby-related concussion in other parts of the world vary widely, with a reported range from 3% to 45% per season.[7,9,20] The studies that have focused on North American players suggest concussions make up 11% to 25% of all rugby injuries.[3,10,14,18] These studies investigated

concussion in youth and collegiate-level athletes. A recent systematic review by Gardner et al[12] found only 3 studies that included community athletes, and they reported an incidence of 2.08 concussions per 1000 player match hours. Additional review of the literature identified only 1 North American study that evaluated concussions in senior community-level rugby players, and this was limited to those participating in the 7-a-side format.[16] Their reported incidence was 8.1 concussions per 1000 playing hours.

A substantial proportion of players who self-reported concussion symptoms experienced untoward effects during their daily activities. Twenty-seven percent of these individuals missed time from school and/or work as a direct result of the burden of their symptoms. The study population consisted largely of young adults who are at or near some of their most productive years, and thus, there is a realistic potential for substantial loss of productivity.

In this cohort, significantly more female players reported symptoms of a concussion during a single season when compared with their male counterparts. This study is in keeping with emerging evidence that suggests that women may be at greater risk and may take longer to recover.[1,4-6,8,13] Studies by Covassin et al[6] and Dick[8] have demonstrated that female athletes participating in soccer and basketball may have greater risk of sustaining concussion, but no significant difference was found between sexes for lacrosse and ice hockey. It is important to note that ice hockey and lacrosse have sex-based rule differences that minimize collisions for female competition, while soccer and basketball are not primarily contact-based. Conversely, rugby is one of the few collision sports that is played under the same set of rules for both men and women.

Knowledge-Attitude Discordance

Nearly all players had a general appreciation for the dangers of playing while experiencing symptoms and recognized the importance of seeking professional medical attention. While general knowledge of the dangers appeared to be high, rugby-specific knowledge was lower. Only 40.8% of participants were familiar with the World Rugby *Recognize and Remove* guidelines.[22] Furthermore, approximately half of participants reported receiving preseason information on concussions; however, the source, content, or rigor of the player education is not known. There is currently no formalized educational protocol in place for rugby participants in the senior league. It may be that the recent attention given to concussions in the media and in other athletic domains is beginning to have an impact on the overall awareness of concussion and the associated dangers.

Despite the general appreciation of the dangers, a substantial proportion of players indicated a willingness to continue participation while experiencing concussion symptoms. It appears that self-imposed pressure to not let down teammates is an important motivator for these players. A quarter of the respondents cited a history of feeling obligated to play through concussion symptoms during the previous season, and nearly 40% noted that they would feel as if they were letting their teammates down if they stopped playing while experiencing symptoms. These findings were amplified when players were asked about important matches. Additionally, one-third of players stated that they believed tougher players would play through a concussion.

This suggests a possible knowledge-attitude discord, which may stem from an underlying culture of being commended for "playing injured" or a desire to appear "tough." Despite this rather pervasive sense of obligation to continue, less than 2% of respondents claimed they would feel let down if a teammate left a match because of a concussion. This tendency for players to underreport symptoms requires further investigation and may warrant the institution of independent concussion spotters and standardized concussion protocols that mandate removal from play.

Strengths and Limitations

There are limitations that should be noted. Most important is that the survey had not been previously validated. Further, the retrospective nature of the survey and our reliance on subject recall introduces the potential for biased estimates. To mitigate this problem, we specifically chose not to utilize information on the concussion burden (rate and duration of symptomatic episodes) within 1 season and instead, focused on the probability of sustaining at least 1 concussion over the course of the season. Individuals may have an inaccurate recollection of the number or duration of symptomatic episodes but players may accurately recall if they had a single episode. This estimation of risk is less comprehensive than a rate per hours played and practiced.

Furthermore, the reliance on self-reporting of symptoms to formulate the primary estimates may bias the results if participants were to report nonspecific symptoms that are not attributable to a concussion. As an example, headache and/or dizziness could potentially result from an episode of dehydration rather than concussion. Additionally, players experiencing a migraine may report several of these symptoms.

A response bias probably affected our estimates if the nonrespondents differed in some meaningful way from those who chose to respond. In particular, estimates of the likelihood of sustaining a concussion during the season may be upwardly biased if those who did sustain a concussion were more likely to respond to the survey. It is plausible that a sex bias may also have contributed to the higher rate of concussive symptoms reported among female players, for example, due to the reporting of symptoms such as headache or dizziness that were associated with menses and unrelated to head injury. The external generalizability outside of the provincial rugby community may also be limited.

CONCLUSION

A substantial proportion of senior community rugby participants across a Canadian provincial registry reported experiencing symptoms of a concussion during the preceding season, with nearly half of female athletes reporting symptoms. This had a

notable impact on daily activities outside of rugby. Most players recognized the dangers of playing while symptomatic, yet many suggested they would be willing to continue. The observed discord between knowledge and attitudes suggests there may exist an underlying culture of "playing injured" in adult community-level rugby.

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Clinical Recommendations

SORT: Strength of Recommendation Taxonomy Grade
A: consistent, good-quality patient-oriented evidence
B: inconsistent or limited-quality patient-oriented evidence
C: consensus, disease-oriented evidence, usual practice, expert opinion, or case series

Clinical Recommendation	SORT Evidence Rating
Concussions are common injuries during rugby competition, and players may not voluntarily remove themselves from play despite recognition of the dangers of continuing. Better recognition of possible concussions and subsequent removal from play should be a top priority of rugby governing bodies.	B
Female rugby players report more concussive symptoms than male rugby players.	B
Community-level rugby participants may represent a particularly vulnerable cohort compared with their professional or elite-level counterparts and make up a large proportion of the total rugby playing population. Appropriate medical resources should be allocated to meet this need.	B

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