

Rugby union injuries in Scottish schools

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ABSTRACT

Background Rugby union is the most popular worldwide collision sport, yet concerns have been raised regarding the safety of the sport due to the physical, high impact nature and an increasing number of injuries.

Methods A prospective, cohort study of the incidence, pattern and severity of injuries in rugby players in six Scottish schools during the second half of the 2008–09 season. Definition of injury and severity of injury were taken from International Rugby Board (IRB) consensus guidelines. Injury report forms and exposure data for match play were completed by a nominated staff member.

Results Four hundred and seventy consent forms with survey information were returned. Of 37 rugby injuries in the study, 11 occurred during training. Head and face were the most injured body part and sprain/ligament injury the most common injury. Twenty injuries required attendance at Accident & Emergency with one admission. The tackle was the commonest phase of play causing injury. In the 193 matches played, the injury incidence during the match play was 10.8 injuries per 1000 player hours.

Conclusions This study confirms the feasibility of collecting relevant injury data in schools rugby in Scotland. The findings are consistent with other studies with respect to incidence and profile of injuries sustained.

Keywords injuries, rugby union, schools

Introduction

Rugby union is the most popular worldwide collision sport, played predominantly by males, and increasingly popular with female participants.¹ For over 30 years, concerns have been raised regarding the safety of the sport due to the physical, high impact nature. Despite this, all too often injuries to young athletes are dismissed as ‘a part of the game’, which if occurred as frequently in alternative circumstances, would be regarded more seriously.² Exercise for children from sporting activity is promoted extensively in Western countries, because of the many health benefits attributable to engaging in sport.³ However, just because of these positive aspects, the associated risk of injury as a consequence of participation should not be ignored.

There have been a number of descriptive epidemiological studies conducted to inform on the incidence of injury and the risk factors underlying these rates of youth injury in

rugby, but none in the UK in the past 10 years. Unfortunately, interpreting and comparing the results of worldwide studies in order to gain an accurate understanding of the epidemiology of the injuries can be difficult due to variation in reporting, study design and methods.

The purpose of this study was therefore to report on the current incidence of all (training and match) injuries in a sample of Scottish schools playing rugby union. It will also report on the nature of the injuries, their severity and comment on protective equipment worn by those playing the game.

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Methods

Ethical approval for the study was obtained via the School of Health in Social Sciences Research Ethics Committee, University of Edinburgh. (<http://www.ed.ac.uk/schools-departments/health/research>).

This study was a prospective, cohort study of the incidence, pattern and severity of injuries in rugby union players in a sample of Scottish schools. Six schools were approached to take part in the pilot study: four state schools, one predominantly day independent school and one predominantly boarding independent school. Each school had a data champion who was responsible for coordinating and collecting all the relevant injury and exposure data for that school. All secondary school children playing rugby aged 11 years and above were included in the study, and while the majority of matches was played by boys in teams of 13 or 15-a-side, 7-a-side matches at the end of the season and girls matches were also included.

The injury report form used in this study was based on current best practice in rugby injury reporting.⁴ The majority of forms were completed by non-medical staff, which is normal practice for many community-based epidemiological studies. The data champions at each school were fully briefed prior to commencement of the study, to ensure they fully understood the process and the information required on the injury report forms. The full injury report form we used is available as supplementary data at the *Journal of Public Health* website.

Consent and protective equipment survey

All six schools gave their consent to include their pupils in the study. All rugby playing pupils at the school were given information on the study, asked to sign the consent form and give baseline information on protective equipment worn when playing.

Injury definition

An injury was defined as ‘An injury occurring during rugby, training or playing, that results in a player being unable to take a full part in future rugby training or match play’. This is taken directly from the International Rugby Board (IRB) Consensus statement on injury definitions and data collection procedures for studies of injuries in rugby union, referring to what they call a ‘time-loss’ injury.⁴

Injury severity

Defined as ‘The number of days from the date of injury to the date of the player’s return to full participation in team training and availability for match selection’.

Nature of injury

This is defined as ‘the classification of injuries by location, type and injury event’. All this information was collected on the injury report forms.

Calculation of incidence of match injuries

To allow comparative analysis with other studies, we collected exposure data for all match injuries. The total match exposure time of players for a team is given by $NmPmDm/60$, where Nm is the number of matches played, Pm is the number of players in the team (which was between 7 and 15 in this study) and Dm is the duration of the match in minutes (which was between 7 and 70 min). The incidence of match injuries was then calculated per 1000 player hours of match play, which is the currently agreed method of calculating incidence for rugby epidemiology studies.⁴ We did not collect data on training time exposure because of the significant difficulties of defining rugby ‘training activities’ and therefore calculating training time exposure. It is still however important to record and comment on both match and training injuries.

Results

Gaining consent and baseline data

Of the six schools enrolled only five participated as one school was unable to achieve consent and collect the baseline information from their pupils. In all, 470 rugby playing children were identified in the five schools and completed the consent form and baseline data survey.

Figures for the protective equipment worn regularly by the children (self-reported) are given in Table 1.

Injuries reported

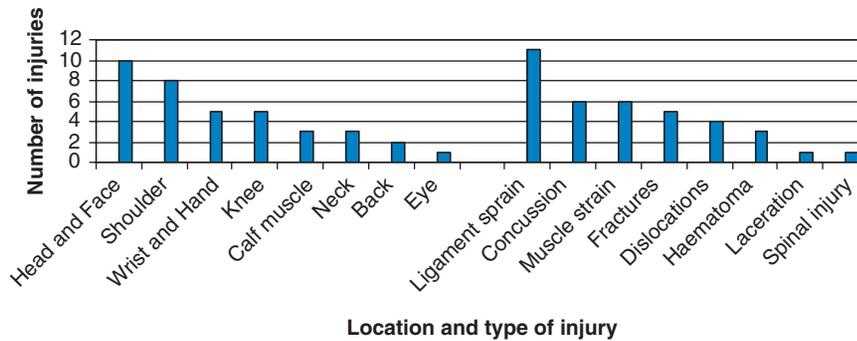
The total number of rugby injuries during the study was 37, with 26 injuries (70.3%) during matches and 11 (29.7%) during training. Twenty-nine (78.4%) injuries were sustained by children aged between 14 and 17, with only 8 (21.6%) in the 11–13 age-group. Breakdown of injuries by location and type are in Figure 1.

A&E attendance, time off school and injury severity

Of all the 37 training and match injuries, Accident & Emergency (A&E) attendance was required for 20 (54.1%) of them. Only one injury (the spinal injury) was admitted overnight in hospital; 19 (95%) of the other injuries seen at A&E were discharged without admission. Eight (21.6%) of the injuries resulted in time off school, but of these injuries,

Table 1 Protective equipment worn (training and matches)

Gumshield (mouthguard)	Headguard	Shoulder pads	Chest pads	Cycling shorts	Total number of consenting rugby playing children
413 (87.9%)	118 (25.1%)	165 (35.1%)	61 (13.0%)	280 (59.6%)	470 (100%)

**Fig. 1** Nature of injury: location and type.**Table 2** All injury severity (training and match injuries)

Injury severity	Number
Less than 1 week	6 (16.2%)
1–2 weeks	7 (18.9%)
3–6 weeks	17 (45.9%)
7–12 weeks	2 (5.4%)
Greater than 12 weeks	5 (13.5%)
Total	37 (100%)

five (62.5%) were only off school for 1 day, one injury was off for 3 days, one for 5 days and the spinal injury was off school long-term. Injury severity, in terms of time (number of weeks) unfit for rugby, is presented in Table 2.

Injury breakdown by position and phase of play

Of the 37 training and match injuries, 22 (59.4%) occurred among the backs, and 15 (40.6%) among the forwards. The Wing was the most injured position (21.6%), followed by the centre (18.9%). The remainder of the other injuries in the backs were spread among the other positions. In the forwards, 53.3% of all forwards injuries were in the front row, but by position (prop, hooker, second row and back row) there was a relatively similar spread.

Tackle was the phase of play most likely to cause injury, with 23 (62.1%) of all injuries reported as occurring in the tackle. Of those injuries, 65% of them were in the player being tackled, while 35% of the injuries were in the tackling

player. Of the injuries caused during the tackle (both tackling and the tackled player), nine (39.1%) were from a side-on tackle, seven (30.4%) from a head-on tackle and six (26.2%) when tackling from behind. One injury was recorded as being caused by an illegal tackle. For injuries sustained by the tackling player, there was an equal spread of injuries caused by tackles from the front (head-on), side and behind. For injuries sustained by the tackled player, 40% of them were from side-on tackles, with the remainder split between side-on and head-on tackles. Of injuries caused by phases of play other than the tackle, the ruck was implicated in nine (24.3%) injuries, three 'other' causes (8.1%) and two injuries in the scrum (5.4%).

Match injury incidence

Looking specifically at the match injuries, the five schools played a total of 193 matches over the second half of the season from January to April 2009. Adjusting for the number of players and length of game by the age-group, a total of 144 366 min or 2406.1 player hours of competitive rugby was played. With 26 match injuries in 2406.1 player hours, the incidence for all reported injuries was 10.8 injuries per 1000 player hours. Excluding injuries of less than one week severity, the incidence dropped to 8.7 injuries per 1000 player hours.

Of the 26 injuries occurring during match play, 34.5% were in the first half (23% in the first quarter and 11.5% in the second quarter) and 65.5% were in the second half (38.5% in the third quarter and 27% in the final quarter).

Discussion

Main findings of this study

Studies of rugby and indeed injury in sport are fraught with problems of interpretation and comparison. First the lack of consensus and consistency over the definition of an injury in rugby or sport generally means that study definitions can vary from 'any physical complaint', to an injury that requires 'temporary replacement or permanent substitution', to one requiring some level of medical attention, to other 'time-loss' definitions requiring for example 7 days absence from the sport. As a result, the incidence of injury in youth rugby ranges from 7 to 129.8 injuries per 1000 player-hours in match play.^{5–8} The 19-fold difference reflects the problem of both inconsistent injury definitions and differences in exposure data.

Brooks and Fuller¹ identified many of the challenges with resolving the issues of injury definition and method of reporting injuries, and stressed the importance of consensus agreements on acceptable study designs and methods of data analysis.¹ In 2007, the Rugby Injury Consensus Group (formed under the International Rugby Board) published a consensus statement on injury definitions and data collection procedures for studies of injuries in rugby union.⁴ While it offers a very accurate and concise definition of rugby injury, it is more focused on capturing data in the professional game by full-time medical staff, and is less easy to apply to community rugby studies. We therefore used their definition of 'time-loss' injuries for this study. The data champions in each school had no difficulty in this definition and there was no ambiguity with regards to what constituted an injury for the study. Indeed, they found completion of the injury report forms intuitive and the quality of data collection in the participating schools was high. We would advocate this for the future.

Looking first at the match injuries, our study recorded an incidence rate for all match injuries of 10.8 injuries per 1000 player hours, and excluding injuries of less than 1 week severity, the incidence dropped to 8.7 injuries per 1000 player hours. These data may underestimate the true incidence of match injuries, as injury rates in youth rugby are invariably higher at the beginning of the season (September onwards), and this study only collected data from the second half of the rugby season (January to April).^{7–10}

In addition, 30% of injuries in this study occurred during training, but lack of exposure data for what constitutes training (contact, non-contact, pad work, fitness training, gym-based training etc.) meant that incidence rates could not be calculated for training injuries. We felt, however, that although we were not able to calculate incidence rates for training injuries, it was important to include them in the

results because of their significant number and potential implication for injury prevention initiatives.

What is already known on this topic

Severity of injury

The severity of injuries can define the magnitude of the injury problem and assess the relationship between risk factors and injury more comprehensively.¹¹ Although pain and discomfort thresholds will vary between players, it is important to assess the severity of injuries sustained in youth rugby to determine the risk associated with participation. It is necessary therefore to have a relatively objective system under which data collectors can classify injuries into categories of severity, and in rugby this is commonly used as time unfit to play. For definition of injury severity, we used the IRB Consensus statement, and then converted days (date of injury to date of return to rugby) into number of weeks.

Age

Our study confirms the finding that youth rugby teams of the higher age group have a higher incidence of injury than younger age groups.^{12–15} In our study, 78.4% of all injuries were in the 14–17 age group. It is highly unlikely that age itself is the risk factor for injury, but rather a reflection of the greater aggression, more competitive nature, faster pace and larger physiques involved in the contact elements of the game in teams of higher age groups.¹⁴

Phase of play and player position

This study also confirms the tackle as being the primary contributor to injury. The tackle phase, which included both being the 'tackler' and being 'tackled', was associated with up to 75% of all injuries in the large study by McIntosh in 2005.¹⁴ In our study, the tackle was implicated in 62.1% of all injuries. The tackle is the most frequent phase of rugby (there are many more tackles made in a match than there are scrums) and one may therefore expect more injuries than from other phases. This highlights the need to try and address what is a much more difficult phase of the game to control. That may be through improved coaching of how to tackle, how to ride a tackle safely, or through some modification to the rules of rugby generally. Garraway (1999) looked more closely into the factors influencing tackle injuries¹⁶ and more recently Fuller *et al.*⁴ highlighted the significant risk factors for both ball carriers and tacklers.¹⁷

There are certain player positions that appear more injury-prone than others, although there is no consistency amongst studies in this age-group. McManus⁷ reported no significant difference in the distribution of injuries to

forwards and backs, whereas Bottini⁶ found that forwards had a statistically significant higher rate of injury than backs. In this study, backs experienced more injuries (both in matches and training).

Nature of injury

Durie and Munroe¹³ in their study reported 10% of injuries being to the head and neck. Head injury normally accounts for between 15 and 30% of all rugby injuries, with 15% of these concussion. Most of these studies are however in adult and often professional rugby. In our study, head and face injuries accounted for 27% of all injuries, which is consistent with other rugby injury studies, although 60% of that group were concussions. As published estimates of the incidence of concussion in rugby vary widely, and it has in the past been under-reported, developing accurate incidence data will help raise awareness and potentially identify unsafe techniques in youth rugby.^{18,19}

Protective equipment

The wearing of gumshields (mouthguards) is permitted in rugby, but under the IRB laws of the game, their use is not compulsory. In New Zealand, a 'domestic safety law variation' was introduced as far back as 1997, making their use mandatory in all Under 19 rugby, then in 1998 this was extended to all grades of rugby.²⁰ Their findings provide evidence that wearing mouthguards is a simple, effective strategy to prevent dental injuries in rugby. In Scotland, while some schools make it mandatory to wear a gumshield, it is not a governing body requirement, and in this study only 87% of children reported wearing one. If the evidence is available, perhaps we should make their use mandatory for all rugby players in schools.

Finch *et al.* (2001) reported the primary reason for U15 rugby players wearing headgear is safety.²¹ Players also reported that they are more confident and able to tackle harder if they wear headgear, suggesting that a belief in its protective capabilities may influence behaviour. There is however no evidence that headgear prevents concussion, only that it can prevent certain types of superficial head injuries.²² Twenty-five percent of players in our study reported wearing headgear, but we did not explore with them why they were wearing the headgear. This needs to be the subject of further research.

Lack of routine data

Over 50% of all injuries in the study presented at an A&E department but only one was admitted. With the current injury surveillance system at A&E departments in Scotland, none of the injuries attending but not admitted would have been recorded by the Information Services Division of

NHS Scotland, making monitoring and recording of injuries and long-term follow-up impossible.

What this study adds

This study confirms that a community-based rugby injury surveillance system in Scottish schools is feasible and should be strongly encouraged. The injury report form was easy to use, required no extra training for the teachers involved, and could be produced electronically in the future to further improve compliance of injury reporting.

It highlights the failings in the current A&E injury surveillance system, as only one of these injuries would have been recorded as a rugby injury by nature of being admitted to hospital. All the other injuries that were presented to A&E but were not admitted, including some significant injuries like shoulder dislocations and concussions, would not be captured in most A&E departments because of the limitations of the current injury surveillance systems.

Limitations of this study

The small number of schools in the study, lack of exposure data on training injuries and only recording injuries in the second half of the season (January to April) are limitations of this study.

Conclusion

This study confirms the feasibility of collecting injury data in schools rugby. The findings are consistent with other studies with respect to incidence and profile of injuries sustained. With better data collection, more evidence will be available on risk factors to inform intervention strategies to make the sport safer and inform the wider rugby community.

Supplementary data

Supplementary data are available at the *Journal of Public Health* online.

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References

- 1 Brooks JH, Fuller CW. The influence of methodological issues on the results and conclusions from epidemiological studies of sports injuries. *Sports Med* 2006;**36**(6):459–72.
- 2 Micheli LJ. *Enhancing Safety in Youth Rugby*. Available online at <http://www.usarugby.org/media/EDocs/EnhancingSafetyInYouth.pdf>, USA Rugby, 2003, 1–7.
- 3 Caine D, Caine C, Maffulli N. Incidence and distribution of pediatric sport-related injuries. *Clin J Sports Med* 2006;**16**:500–13.
- 4 Fuller CW, Molloy MG, Bagate C *et al*. Consensus statement on injury definitions and data collection procedures for studies of injuries in rugby union. *Br J Sports Med* 2007;**41**:328–31.
- 5 Junge A, Cheung K, Edwards T *et al*. Injuries in youth amateur soccer and rugby players—comparison of incidence and characteristics. *Br J Sports Med* 2004;**38**:168–72.
- 6 Bottini E, Poggi EJT, Luzuriaga F *et al*. Incidence and nature of the most common rugby injuries sustained in Argentina (1991–97). *Br J Sports Med* 2000;**34**:94–7.
- 7 McManus A, Cross DS. Incidence of injury in elite junior rugby union: a prospective descriptive study. *J Sci Med Sport* 2004;**7**(4):438–45.
- 8 Roux CE, Goedeke R, Visser GR *et al*. The epidemiology of schoolboy rugby injuries. *S Afr Med J* 1987;**71**:307–13.
- 9 Lee AJ, Garraway WM. Epidemiological comparisons of injuries in school and senior school rugby. *Br J Sports Med* 1996;**30**:213–7.
- 10 Nathan M, Goedeke R, Noakes TD. The incidence and nature of rugby injuries experienced at one school during the 1982 rugby season. *S Afr Med J* 1983;**64**:132–7.
- 11 Van Mechelen W, Hlobil H, Kemper HC *et al*. Incidence, severity, aetiology, and prevention of sports injuries: a review of concepts. *Sports Med* 1992;**14**:82–99.
- 12 Davidson RM. Schoolboy rugby injuries, 1969–1986. *Med J Aust* 1987;**147**:119–20.
- 13 Durie RM, Munroe AD. A prospective survey of injuries in a New Zealand schoolboy rugby population. *N Z J Sports Med* 2000;**28**:84–90.
- 14 McIntosh AS. Rugby injuries. *Med Sport Sci* 2005;**49**:120–39.
- 15 McIntosh AS, McCrory P, Finch CF *et al*. Head, face and neck injury in youth rugby: incidence and risk factors. *Br J Sports Med* 2010;**44**(3):188–93.
- 16 Garraway WM, Lee AJ, Macleod DAD *et al*. Factors influencing tackle injuries in rugby union football. *Br J Sports Med* 1999;**33**:37–41.
- 17 Fuller CW, Ashton T, Cancea RJ *et al*. Injury risks associated with tackling in rugby union. *Br J Sports Med* 2010;**44**(3):159–67.
- 18 Marshall SW, Spencer RJ. Concussion in rugby: the hidden epidemic. *J Athl Train* 2001;**36**(3):334–8.
- 19 Collie A, McCrory P, Makdissi M. Does history of concussion affect current cognitive status? *Br J Sports Med* 2006;**40**:550–1.
- 20 Quarrie KL, Gianotti SM, Chalmers DJ *et al*. An evaluation of mouthguard requirements and dental injuries in New Zealand rugby union. *Br J Sports Med* 2005;**39**:650–1.
- 21 Finch CF, McIntosh AS, McCrory P. What do under 15-year-old schoolboy rugby union players think about protective headgear? *Br J Sports Med* 2001;**35**:85–94.
- 22 Jones SJ, Lyons RA, Evans R *et al*. Effectiveness of rugby headgear in preventing soft tissue injuries to the head: a case–control and video cohort study. *Br J Sports Med* 2004;**38**:159–62.