A Three-Year Epidemiological Prospective Cohort Study of Rugby League Match Injuries from the European Super League.

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Abstract

Objective: Conduct a comprehensive epidemiological study of match injury characteristics (incidence, severity, causes, diagnostics, and temporal trends) in professional rugby league.

Design: Prospective cohort design

Method: Data was captured over the 2013,’14, and ’15 seasons, collected via an online-reporting survey tool, and underpinned by nominal group technique-agreed definitions. Injury details were provided by club medical staff in accordance to the survey fields from all European Super League teams (e.g. injury occurrence/return dates, diagnosis, mechanism, recurrence). All time-loss injuries have been reported.

Results: Injury incidence of 57 injuries/1000hrs has been observed over the three-year period, with an average of 34 days missed per injury. The final 20-minute period was the most significant period for injury occurrence, and higher incidence of injury/1000hrs played was during the start of the season in February, although an absolute injury risk for injury frequency was shown in April due to the greatest playing time. Forward positions reported the highest injury incidence whilst tackle activities were the most frequent mechanism of injury. Concussions and hamstring strains (5 injuries/1000hrs) were the most commonly diagnosed injuries, although the knee joint region (10 injuries/1000hrs) was the most frequently injured area.

Conclusions: In light of the most common injury diagnoses, mechanisms, identified seasonal risk, and time of match, the data should look to inform player preparation in terms of physical conditioning and tackle technique in order to optimise player welfare and availability for participation.
Key words: Epidemiology, sports injuries, injury incidence, injury severity.

Introduction

Injury surveillance is essential for identifying the injury risk and exposure rate for sport participation and performance, and likewise to underpin current and future safety practices in such environments.\(^1\) Rugby league (RL)\(^a\) is an invasive contact sport played competitively across the world. It consists of two teams of 13 players, played over 80 minutes; predominantly on a grass field. The game is intermittent, involving high intensity activities (such as tackling and sprinting) separated by low intensity periods of active recovery. Due to the nature of the game and high number of collisions, there is an inherent risk of musculoskeletal injury within the sport.\(^2\)

To date, the scope of prospective injury surveillance in RL has been limited. Although there is a range of published data sets representing professional level RL teams across the world, and the generalisability of the data is often considered more important than focussing on a specific competition, the lack of peer-reviewed, prospective, elite-cohort datasets that have considered the European Super League (ESL) as part of this wider picture are limited. A recent review of sports injury surveillance systems by Ekegren et al.\(^1\) highlighted that a formalised, regulated, project, or system for RL injury characteristics (within any level of competition) didn’t exist. Gissane et al.,\(^3\) Hoskins et al.,\(^4\) and King et al.,\(^5\) suggest that further research regarding injury coding was required in order to create an overall picture of injury incidence affecting the game.

The aim of the present study was to capture three-years of injury surveillance data and report on match injury patterns from all teams in the ESL by employing a consensus-driven prospective cohort design.

\(^a\) Abbreviations: ESL European Super League; RL Rugby League; NRL National Rugby League; NGT Nominal Group Technique
**Method**

Prior to the design of the data capture survey a nominal group technique (NGT) was used in order to reach consensus regarding injury definitions and the descriptors of standardised exposure to calculate injury incidence.\(^6,7\) Three NGT sessions were conducted, attended by ESL medical staff and representatives from the Rugby Football League (RFL). The definitions and descriptors were derived from research in rugby league, rugby union, and Australian rules football, and were based on recommendations from Hodgson Phillips,\(^8\) Orchard and Seward,\(^9\) Brooks and Fuller,\(^10\) Hoskins *et al.*,\(^4\) Fuller *et al.*,\(^6\) Hodgson *et al.*,\(^17\) Orchard and Hoskins,\(^12\) King *et al.*,\(^5\) and King *et al.*\(^13\) The prospective survey was subsequently adapted and edited with definitions agreed following these NGT meetings. Injury descriptors and definitions agreed as follows:

**Injury:** Any pain or disability that occurs during participation in league and cup match activities that is sustained by a player, irrespective of the need for match or training time loss, or for first aid or medical attention.

**Time Loss:** An injury that results in a player being unable to take full part in future rugby training or match play is referred to as a ‘time-loss’ injury. To allow for discrepancy of time periods between matches and training sessions across clubs, time loss from match injuries was counted as >3 calendar days missed. The panel of the NGT reached a unanimous consensus that >3 days influenced a measurable compromise to the player’s training status and selection potential.

**Injury severity:** Injury severity is calculated from the date of injury occurrence to the date of return to full training where the player is available for match selection: minor severity 4-7 days, moderate severity 8-28 days, major severity more than 28 days. These categories are comparative across rugby union,\(^6\) and soccer.\(^14\)

Injury diagnosis: The Orchard Code Injury Classification System (OSICS-10.1) was utilised to four diagnostic levels in order to capture the body region, tissue/injury type, and finer detailing of the specific injured structure (e.g., TMHB to represent a grade 1-2 biceps femoris muscle hamstring injury).

Recurrent Injury: An injury of the same type, site, side, and location as the index injury (Orchard Code) which occurs after a player’s return to full participation in rugby league activities from the index injury. Early recurrence – ‘injury occurring within two-months of a player’s return to full participation’. Late recurrence – ‘injury occurring 2-12 months after a player’s return to full participation’. Delayed recurrence – ‘injury occurring more than 12 months after a player’s return to full participation’.

Injury Incidence: Calculated as the number of injuries per 1000 match hours (i.e. exposure time):

\[
\frac{\text{Number of match injuries}}{\text{[number of match hours*number of players*number of matches]}} \times 1000
\]

Player position at the time of injury: defined as forwards (props, second row, loose forward), adjustables (stand-off, scrum half, hooker, full back), backs (wingers, centres).

An online electronic surveillance tool was developed based upon the completion of a survey paper version following the NGT sessions. This pilot of the surveillance tool was conducted during the latter months of the 2012 ESL season, where the final surveillance electronic format was refined following user feedback that enhanced the usability of the online tool. Furthermore, during this period, the authors conducted training sessions for all of the ESL medical staff who were to use the surveillance system and record injuries at their respective club. In order to optimise inter-rater reliability, injury definitions and descriptors were provided and explained to
each user of the electronic tool. Each ESL club was provided individual access via a unique login to the electronic system through appropriate online data protection methods. The authors continually maintained the accessibility to, and training on, the electronic system for new club medical staff by enabling new user access and user coaching to ensure injury descriptors were adhered to. The authors prohibited user access when a staff member was no longer at an ESL club.

Ethical consent for the research was obtained from the University of Bolton Ethics Committee. Consent for the release, use, and publication of anonymised player injury data was obtained from the RFL. The data of each participant (athlete) included in the study was provided by the RFL in accordance with the contractual relationship of the relevant parties and the RFL’s Operational Rules. Each player gave consent for their information to be included as part of this survey and research investigation, and each participant maintained the right to have their individual data removed from the study if they wished.

Data is reported either as an overall injury incidence, mean values (with 95% confidence interval), or percentage distributions. Significant differences in values of incidence were assessed using parametric one-way Analysis of Variance, with an alpha level set at p=0.05 (IBM SPSS v23).

Due to the complex nature of the data collection (and matters regarding player’ anonymity) it was not possible to adopt a single interface or sole reporter approach to recording the injury data. However, stringent steps were adopted to account for this; there was uniformity of definitions, and rigorous electronic system training was undergone by all of the injury recording personnel. One person from the medical team of each club was responsible for the data input of that squad (2013 N=14; 2014 N=14; 2015 N=12 – total numbers of staff reporting). These were senior clinical practitioners with extensive experience of injury diagnosis, data capture, and reporting.
Results

Match exposure time during this period for all ESL teams totalled 21,823 hours across 655 matches including all ESL, Challenge Cup, and Play-off/Super 8s fixtures involving all ESL teams. A total of 1241 time-loss match injuries were recorded, resulting in an overall injury incidence of 57 injuries/1000hrs. When 1-3 day time loss injuries were considered, this total increased to 1680 injuries with an overall incidence of 78 injuries/1000hrs. The seasonal variation is shown in Table 1. Minor severity injuries accounted for 24% of injuries, moderate severity injuries accounted for 40%, and major severity injuries, 36%.

On average, each club would typically experience 31 (28-34 95% CI) match injuries per season, with a time loss of 34 (30-38 95% CI) days per injury. The typical match injury would cause the player to miss a mean of 3.5 matches per injury. Four players were typically unavailable per match round which equates to approximately 15% of a typical first team squad.

Table 1: Seasonal match injury data displaying mean values (95% CI)

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Match injury incidence/1000hrs</td>
<td>60 (50 - 71)</td>
<td>55 (47 - 64)</td>
<td>55 (44 - 66)</td>
</tr>
<tr>
<td><em>(including 1-3 day injuries)</em></td>
<td>86 (58 - 114)</td>
<td>73 (52 - 94)</td>
<td>71 (43 - 99)</td>
</tr>
<tr>
<td>Days missed per match injury</td>
<td>37 (30 - 44)</td>
<td>31 (26 - 35)</td>
<td>34 (28 - 40)</td>
</tr>
<tr>
<td><em>(including 1-3 day injuries)</em></td>
<td>25 (17 - 33)</td>
<td>23 (17 - 29)</td>
<td>25 (19 - 31)</td>
</tr>
<tr>
<td>Matches missed per match injury</td>
<td>3 (2.4 - 3.4)</td>
<td>4 (3.3 - 4.1)</td>
<td>4 (3.2 - 4.8)</td>
</tr>
<tr>
<td>Match injuries per club</td>
<td>32 (26 - 38)</td>
<td>30 (25 - 34)</td>
<td>31 (25 - 37)</td>
</tr>
<tr>
<td><em>(including 1-3 day injuries)</em></td>
<td>46 (29 – 63)</td>
<td>39 (29 – 49)</td>
<td>41 (25 – 56)</td>
</tr>
</tbody>
</table>

Displayed in Figure 1, injury incidence was at its highest in the early season, with a statistically greater injury incidence in February (85/1000hrs) when compared to months of April (p<0.01),
May (p<0.05), and September (p<0.05), with no significant difference to that observed in March, June, July, and August. No significant differences were observed in terms of frequency of injuries through each month, although April contained the highest number of injuries (196) in correspondence to the highest match exposure time (3397 hrs). No differences in injury severity through the season in terms of average time loss were noted.

[Figure 1: Injury incidence/1000 match hours played (bars show mean, 95%CI), and total number of injuries per month over seasons 2013-2015. (* Indicates significantly different to April, May, September and October]

Injury incidence during the fourth quarter of matches was significantly the highest (91 injuries/1000hrs) in comparison to all other periods (p<0.002), with the rate during the first quarter being lowest (22 injuries/1000hrs). The second and third quarters of the match (52 and 45 injuries/1000hrs, respectively) also showed a significant elevation in comparison to the first 20 minutes of the match (p<0.005). No differences in injury severity were observed across match periods. Contact mechanisms (tackles and collisions) accounted for 61% of injuries, while non-contact mechanisms represented 19%. The majority of injuries via both categories of mechanism were significantly represented in the fourth quarter (p<0.001), although no differences were observed for injury severity across these two categories. When the tackle mechanism was investigated, it was noted that 30% of all tackle-related injuries (tackler and ball carrier) were from the side, 26% were to the front of an opponent, and 24% being tackled from the front by an opponent. Ligamentous sprain injuries were significantly highest compared to other injury types (p<0.001) particularly when observed alongside tackle and collision mechanisms, whereas muscle strain injuries were most significantly affected by high intensity running-based activities (p<0.001). The mechanism was reported by the player or by identification by the club physiotherapist (in most cases, a combination of the two).
In positional terms, forwards accounted for 46% of all match injuries and incurred a significantly (p=0.004) greater incidence of injury (80 injuries/1000hrs) than adjustables - 55 injuries/1000hrs (27%) and backs - 53 injuries/1000hrs (27%).

Table 2 displays the incidence and severity for the most commonly diagnosed match injuries. Of the total injury count, knee injuries accounted for 18% (10 injuries/1000hrs), with an average time loss of 47 (38-56 95%CI) days per injury. Thigh injuries covered 15% (9 injuries/1000hrs), and 20 (17-24) days per injury, ankle injuries accounting for 14% (8 Injuries/1000hrs), and 32 (27-37) days per injury, and shoulder injuries 11% (6 injuries/1000hrs), and 46 (33-59) days' time loss per injury. The severity of recurrent injuries was not significantly different to that of 'new' injuries when viewed at a diagnostic level. Although concussion injuries did show potential to incur greater time losses when they became recurrent injuries, as observed by an overall greater mean and range of time loss length in the recurrent group of injuries (although not statistically significant on an individual player level p=0.15).

Table 2: Incidence (injuries per 1000 hours) and severity (mean days missed, 95% CI) for the most common match injury diagnoses.

<table>
<thead>
<tr>
<th>Injury diagnostic category</th>
<th>Incidence</th>
<th>Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hamstring strain</td>
<td>4.6</td>
<td>22 (18-26)</td>
</tr>
<tr>
<td>Concussion</td>
<td>4.6</td>
<td>12 (9-15)</td>
</tr>
<tr>
<td>MCL</td>
<td>3.9</td>
<td>37 (32-42)</td>
</tr>
<tr>
<td>Syndesmosis injury</td>
<td>2.7</td>
<td>46 (38-53)</td>
</tr>
<tr>
<td>Ankle lateral ligament</td>
<td>2.6</td>
<td>19 (12-26)</td>
</tr>
<tr>
<td>Calf muscle injury</td>
<td>2.5</td>
<td>18 (14-22)</td>
</tr>
<tr>
<td>Acromioclavicular joint injury</td>
<td>1.8</td>
<td>22 (16-28)</td>
</tr>
<tr>
<td>Knee meniscal/cartilage injury</td>
<td>1.8</td>
<td>44 (32-56)</td>
</tr>
<tr>
<td>Injury Type</td>
<td>Incidence</td>
<td>Total Injuries</td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>-----------</td>
<td>----------------</td>
</tr>
<tr>
<td>Thigh muscle haematoma</td>
<td>1.7</td>
<td>11 (6-15)</td>
</tr>
<tr>
<td>Adductor muscle injury</td>
<td>1.5</td>
<td>14 (9-19)</td>
</tr>
<tr>
<td>Wrist/hand fracture</td>
<td>1.3</td>
<td>43 (34-52)</td>
</tr>
<tr>
<td>Bruised sternum/rib fracture</td>
<td>1.3</td>
<td>19 (8-31)</td>
</tr>
<tr>
<td>Shoulder dislocation</td>
<td>1.1</td>
<td>88 (62-113)</td>
</tr>
<tr>
<td>Sternal/costo joint injury</td>
<td>1.1</td>
<td>22 (14-31)</td>
</tr>
<tr>
<td>Glenohumeral joint sprain</td>
<td>1.0</td>
<td>51 (28-74)</td>
</tr>
<tr>
<td>ACL</td>
<td>0.9</td>
<td>228 (205-251)</td>
</tr>
</tbody>
</table>

**Discussion**

This is the first publication of findings from a comprehensive, co-ordinated injury surveillance system conducted in professional RL. The data provides a strong basis for future research, game management, optimising player safety and welfare, whilst also providing the practitioner with vital information on which to base injury prevention strategies.

The main findings of this study essentially highlight the key characteristics of injury occurrence and severity in an elite ESL population across three seasons from 2013-2015. Furthermore, we have been able to observe significantly heightened incidence of injury in the final quarter of matches, greater early season incidence of injury in February, increased incidence of injury to forward positions, and greatest incidence of ligamentous-based injuries via contact/collision mechanisms.

From a diagnostic perspective, similar to data from Rugby Union concussions were (alongside hamstring injuries) the most commonly diagnosed injuries (5 injuries/1000hrs over three seasons). We observed that the incidence of concussion injuries increased from 2 concussions/1000hrs in 2013, to 4 in 2014, to 8 in 2015. This does coincide with RL concussion
reporting laws being implemented during this period (2014). Therefore, it is likely that the compliance rate of reporting concussions prior to the law change was lower. This marked increase suggests either under-reporting of concussion injury, or on a positive note, the diagnosing and player/coach educating of such injuries is improving and therefore has potential benefits for player welfare. Similarly, the data from the England Rugby Union Injury Surveillance report\textsuperscript{16} demonstrates an increase in incidence when concussion reporting laws were introduced in the 2012/13 season. Given the present interest in concussion research in all sports, it is vital that mechanistic research seeks to utilise this monitoring tool of concussion injury incidence on a sport governing body level in order to inform and support sports practitioners across medical and conditioning staff in the game to reduce the risk and severity of concussion injury. Perhaps, more critically, we have also observed that the effects of recurrent concussion injury could potentially lead to increased severity and time loss (average 10 days longer than an initial concussion injury for an individual, although this did not reach statistical significance, p=0.15).

Following rigorous analysis ensuring that match exposure is correctly represented when calculating injury incidence across defined periods and exposure rates\textsuperscript{8}, a trend was observed which suggests that as match time increases the rate of injury follows suit. Across the three seasons observed here, in real terms, the month of April consistently produced the highest match time and accordingly the highest number of match injuries (Figure 1). However, when exposure was standardised per 1000 match hours, February had the highest incidence of injury compared to most of the year, with August and March closely following. We suggest that increases in intensity of activity at these points in the season may account for the findings (i.e. the transition from pre-season to competitive matches in February and March, and the period leading to play-off matches in August). Again, once accounting for standardisation of hours played, forwards incurred a significantly higher injury incidence rate than adjustables and backs.
Bearing in mind the differences in playing characteristics in that forwards naturally perform more tackle activities than other positions, it may be prudent in the future to view positional injury rates as a function of playing activity exposures. For example, rate of injury per number of collisions, or rate of injury per repeated high intensity efforts. Gissane et al.\textsuperscript{17} reported that when data from forwards and backs were subject to standardisation in terms of injuries/10,000 collisions rather than hours played, the backs were actually at greater ‘risk’ of injury than forwards per collision made.

The observed increase in injury occurrence in the second quarter of each match half compared to the first quarter, suggests that mechanisms of fatigue might be affecting these trends. Although, the nature of such fatigue mechanisms is beyond the scope of this study, and we have merely observed that the trend described is upheld even when contact and non-contact injuries have been separated, even though no change in injury severity was observed as a function of match period.

The most significant ($P<0.03$) injury mechanism for lower limb joint injuries was being tackled from the side (ball carrier), whereas muscle-based lower limb injuries (such as hamstring and calf muscle strains) were predominantly caused by high intensity running activities ($p<0.001$). Upper limb injuries were statistically shown to be caused mostly by frontal tackling ($p<0.05$), and head injuries caused mainly during frontal tackles both by the ball carrier and tackler ($p<0.03$).

Whilst some injury mechanisms are inevitably unavoidable, the potential implications of these findings coupled with a significant incidence of injury in the final quarter of matches, lend themselves to addressing preparative aspects of the RL player from a conditioning perspective to reduce the risk of injury as much as is feasible. In support of this view, our observations are that a statistically significant elevation of injury incidence for not only contact injuries ($p<0.001$), but also non-contact (such as accelerating/decelerating, changing direction) injuries ($p<0.001$) in the final quarter of matches. It has been previous recommended by Gabbett\textsuperscript{18} that players...
should aim to be conditioned sufficiently to reduce fatigue-induced decrements in tackle technique, improvements in endurance, direction change, anticipation skills, and also perform these tasks under fatigued conditions in training. In support of this point our data verifies the heightened risk of injury where the potential for fatigue is at its greatest.

When contextualising these observations for injury incidence rates, two key issues previously highlighted by Hodgson Philips⁸ can be explored. Firstly, the risk of over or underestimating a representative value for RL injury incidence when using single team analysis can be somewhat challenged as the confidence intervals around each season's point estimate are much wider than the differences in the point estimates themselves (Table 1), in these present findings, and as such can't truly be acknowledged as a meaningful difference. Further, when we compare the data from the present study with single team studies (for example Gissane et al.¹⁹ who recorded 50 injuries/1000hrs for one team over a season, which, when extended by four seasons' data, elevated to 60 injuries/1000hrs.²⁰), the point estimates are not very far apart. The observed incidence of injury across all teams, and during the three seasons analysed here, revealed a similar variation from 60 injuries/1000hrs in the 2013 season to 55 injuries/1000hrs in the 2015 season. Individual club data, consistent with the findings of Gissane et al.¹⁹ seem to represent the seasonal fluctuations, and this suggests that single-team observations can provide a meaningful insight to typical injury trends across the sport.

Secondly, the issue of defining injury severity greatly affects reported injury incidence rates, especially when comparing previous studies.²¹ Hodgson²² reported 182 injuries/1000hrs for a single team, whereas in the NRL 40 injuries/1000hrs were reported,²³ the fundamental difference influencing these data are the working definitions of time loss and how they were measured. In both cases, injury severity and what constituted a ‘time-loss’ injury showed great variation. For example, ‘single training session missed’²² and ‘match missed’²³ being reflective of the definitions used to record time-loss injuries. However, in order to demonstrate how little
effect definition inconsistency can exact we can consider the definition used by Orchard\textsuperscript{23}. If Orchard's definitions were applied to the data in this present study, the incidence rate would be reduced to 46 injuries/1000hrs, but this would still be within the confidence interval for 2015, whilst just outside that for 2014, of this present study. Unsurprisingly, therefore, the confidence interval around the revised definition data would overlap with that for the data presented and therefore the reduction in injuries-per-thousand-hours could not truly be described as indicative of a drastic difference.

Data from the NRL by O'Connor\textsuperscript{24} suggest that injury rates are higher (68–72 injuries/1000hrs) in the Southern Hemisphere. However, again, it is unclear what the definitions used to collect the data across clubs was in these instances. The suggestion that due to the NRL being played at a higher intensity, the injury rates may indeed be greater than that of the ESL,\textsuperscript{25} warrants evidencing and support. In order to clarify this, and compare across other collision sports, a universally agreed definition of what constitutes a meaningful, valid, and realistic time loss injury in the context of team sport practices is essential. To illustrate this point, by including injuries of 1-3 days of time-loss i.e. not allowing for varied post-match training practices (alternatively displayed in Table 1), the incidence of injury in our observations would have increased to 78 injuries/1000hrs. In the context of other collision sports the incidence of injury in this study would then be similar to those reported by the NRL (68–72 injuries/1000hrs), and likewise rugby union (81 injuries/1000hrs),\textsuperscript{26} but higher than Australian rules football (33-40 injuries/1000hrs),\textsuperscript{27} and higher to that of professional ice hockey (49 injuries/1000 hrs).\textsuperscript{28} Currently, this comparison is limited by the lack of agreement regarding to the definitions that constitute a time loss injury.

The impact of a lack of agreed definitions does create some disparity regarding injury severity statistics. The average severity by this study's consensus-agreed definition of time loss was 34 days per injury, whereas average match injury severity in rugby union\textsuperscript{16,26} was reported as
between 20-23 days. When we align our definitions to those employed by rugby union\textsuperscript{16,26}, and account for injuries with 1-3 days of missed time (Table 1), the average time loss of an injury reduces to 24 days. In this instance, therefore, the severity and incidence of injury is very similar across both codes of rugby.

The data presented here means that single-club analyses can now be viewed in a broader context, and across a cohort population of all professional ESL players. Although the typical trends have been presented here, it should be noted that these measures, despite agreed definitions, do demonstrate variation; potentially due to individual club’ training practices, squad sizes, and even club’ finances affecting medical/preventative provision. Each sub-cohort (club) is subject to these confounding variables, and therefore an inherent potential for variance should be acknowledged.

**Conclusion**

Concussion and hamstring injuries were observed as the most common injuries in the ESL over the previous three seasons, with a typical severity of 12 days and 22 days missed for each injury, respectively. In real terms, April is a seasonal hotspot that holds the greatest number of injuries in respect of the greatest match time played, although when standardised per 1000hrs played, February appears as the highest risk month for injuries. The latter period of matches also accentuates the risk of injury occurrence, suggesting that a fatigue mechanism is responsible for this heightened risk. The implications of these findings should look to inform the pre-season and early season practices for team conditioners and medical staff in order to maintain greater player availability for matches, whilst also managing player welfare.

The issue of surveillance system definitions, although consensually agreed in this instance, still uneartns difficulties when comparing such data to previous published findings. The clear
definition statements used in this report should provide a basis for further studies intending to make comparison to the information presented here.

**Study Implications**

- Coaching, medical, and training practitioners should be aware of the periods of significantly elevated incidence of injury both during matches and during the season to assist with player preparation.
- Increased injury incidence in forward players, greater ligamentous injuries caused through tackling and collision mechanisms emphasises the need to address tackling technique, and physical conditioning, when viewed in conjunction with wider related research.
- The most common injuries, and most severe injuries in terms of time-loss, warrant further investigation and research in order to support sport governing bodies in their development of player welfare programmes.

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**Competing Interests**

None

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**References**


15. OSICS version 10, Online access (11/03/12): http://www.johnorchard.com/osics-downloads.html


Figures

Figure 1: Injury incidence/1000 match hours played (mean, 95%CI), and total number of injuries per month over seasons 2013-2015. (* Indicates significantly different to April, May, September and October)
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