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Original research

A three-year epidemiological prospective cohort study of rugby league match injuries from the European Super League

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ABSTRACT

Objectives: Conduct a comprehensive epidemiological study of match injury characteristics (incidence, severity, causes, diagnostics, and temporal trends) in professional rugby league.
Design: Prospective cohort design.
Methods: 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/1000 h has been observed over the three-year period, with an average of 34 days missed per injury. The final 20-min period was the most significant period for injury occurrence, and higher incidence of injury/1000 h 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/1000 h) were the most commonly diagnosed injuries, although the knee joint region (10 injuries/1000 h) 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.

1. 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) is an invasive contact sport played competitively across the world. It consists of two teams of 13 players, played over 80 min; 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) did not 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.

Abbreviations: ESL, European Super League; RL, rugby league; NRL, National Rugby League; NGT, nominal group technique.

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2. 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.,[11] 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 classification: Acute injury—'immediate episode or onset'. Gradual injury—'progressively worsening symptoms'. Chronic injury—'long standing or residual injury already previously known'.

Injury diagnosis: The Orchard Code Injury Classification System (OSICS-10.1)[15] 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):

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

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.

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

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

3. Results

Match exposure time during this period for all ESL teams totalled 21,823 h across 655 matches including all ESL, Challenge Cup, and Play-off/Super 8 s fixtures involving all ESL teams. A total of 1241 time-loss match injuries were recorded, resulting in an overall injury incidence of 57 injuries/1000 h. When 1–3 day time loss injuries were considered, this total increased to 1680 injuries with an overall incidence of 78 injuries/1000 h. 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)

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