

Review

Epidemiological Review of Injuries in Rugby Union

Jean-François Kaux ^{1,2,3,*}, Marc Julia ⁴, François Delvaux ³, Jean-Louis Croisier ^{2,3},
Bénédicte Forthomme ^{2,3}, Damien Monnot ⁴, Marie Chupin ³, Jean-Michel Crielaard ^{2,3},
Caroline Le Goff ², Patrick Durez ⁵, Philippe Ernst ¹, Sébastien Guns ¹ and Arnaud Laly ¹

- ¹ Training Center of the Ligue Belge Francophone de Rugby (LBFR, Belgian French-speaking Rugby League), ADEPS du Blanc Gravier, Allée des Sports, P63, Liège 4000, Belgium; E-Mails: ernst.rugby@skynet.be (P.E.); guns.sebastien@gmail.com (S.G.); laly.arnaud@gmail.com (A.L.)
- ² Multidisciplinary Medical and Sports Traumatology Service (SPORTS²), Liège CHU, Service de Médecine de l'Appareil Locomoteur et Traumatologie du Sport, CHU et Université de Liège, Avenue de l'Hôpital, B35, Liège 4000, Belgium; E-Mails: jlcroisier@ulg.ac.be (J.-L.C.); bforthomme@chu.ulg.ac.be (B.F.); jmcrielaard@ulg.ac.be (J.-M.C.); carolinelegoff2002@yahoo.fr (C.L.G.)
- ³ Department of Motricity Sciences, University of Liège, Allée des Sports, P63, Liège 4000, Belgium; E-Mails: fdelvaux@ulg.ac.be (F.D.); chupin_56@hotmail.com (M.C.)
- ⁴ Medical Commission of the Fédération Française de Rugby (FFR, French Rugby Federation), Marcoussis 91460, France; E-Mails: marcjulia@hotmail.com (M.J.); damienmonnot@me.com (D.M.)
- ⁵ Medical Commission of the Fédération Belge de Rugby (FBRB, Belgian Rugby Federation), Brussels 1020, Belgium; E-Mail: patrick.Durez@uclouvain.be
- * Author to whom correspondence should be addressed; E-Mail: jfkau@chu.ulg.ac.be; Tel.: +32-4-366-82-41.

Academic Editor: Arno Schmidt-Trucksäss

Received: 21 November 2013 / Accepted: 14 January 2015 / Published: 23 January 2015

Abstract: Rugby is a sport that is growing in popularity. A contact sport *par excellence*, it causes a significant number of injuries. In Rugby Union, there are 30 to 91 injuries per 1000 match hours. This epidemiological review of injuries incurred by rugby players mentions the position and type of injuries, the causes, time during the match and season in which they occur and the players' positions as well as the length of players' absences following the injury.

Keywords: injuries; Rugby Union; epidemiology

1. Introduction

Rugby Union is known as a contact sport [1]. Fighting for possession of the ball (during contact, when running, when the game starts again with a scrum or lineout, or when the ball is kicked back and forth) is one of the basic characteristics of the game [1]. The aim for the team in possession of the ball is two-fold: to retain possession of the ball or to deprive the other team of the ball by moving it forward and to score points using their technical and physical abilities.

The epidemiological survey of injuries occurring during this sport (by position, time of match, type of surface, *etc.*) is required to highlight the risk factors for injuries and to be able to establish specific preventative protocols for each position [2].

Due to the difficulty of comparing data without a common method of data collection, the International Rugby Board (IRB) has developed, in 2007, definitions and procedures to improve the quality of data collected and reported in future studies of Rugby Union injuries [3,4]. This could help IRB to adapt even more efficiently the rules in the future. Moreover, the adoption of broadly similar definitions and methodologies across sports should enable meaningful inter-sport comparisons of results to be made [3,4]. Even if, in this review, most of the studies presented followed the consensus guidelines, some have not followed them because they were carried out before 2007.

Depending on the authors, the injury rate in Rugby Union ranges from 30 to 91 or even 120 per 1000 match hours [5–10]. It is rarer for injuries to occur during training (6/1000 training hours) and these generally affect the lower limbs [10]. During the last World Cup in New Zealand, the injury rate rose to 89.1/1000 match hours and 2.2/1000 training hours [11].

2. Location of Injuries

Most injuries occurring during a match affect the lower limbs (30% to 55% of injuries), followed by head and upper spinal injuries (14% to 30%), the upper limbs (15% to 20%) and finally the torso (10% to 14%) [7,12–15]. It should be specified that in professional players, the head (including concussions) is the part of the body that is most often affected (25%), followed by the knee (14%–20%), thighs (13%–19%) and ankle (11%), then the shoulder (6.5%), hand (5.6%), leg (5.6%) and foot (3.5%) [8,16–19].

In conclusion, lower-limb injuries occurred more often than injuries to other body regions, but differences between the remaining body regions were unclear in all studies [20].

3. Types of Injuries

More than half of injuries (55%) affecting professional players are closed soft tissue injuries [7]. These are followed by all other injuries, divided into capsular/ligament sprains or tears (20%–34%), muscle/tendon strains or tears (20%–29%), open wounds (12%–27%), bruises/hematomas (10%–22%), fractures (4%–14%), dislocations/subluxations (4%–10%) and, finally, cerebral concussion (3%–10%) [7,10] (Table 1).

Table 1. Type of injury and percentage according to anatomical site (shoulder, knee, ankle) [17,18,21].

<i>Injury Site</i>	<i>Type of Injury:</i>	<i>Percentage</i>
<i>Shoulder</i>	Acromioclavicular disjunctions	32%
	Rotator cuff injuries	23%
	Dislocations/instabilities	14%
	Direct hits	12%
	Fractures	1%
<i>Knee</i>	Sprain/torn medial collateral ligament	28.9%
	Meniscal/chondral injuries	18.5%
	Femeropatellar injuries	12.3%
	Extra-articular hematomas	10.9%
	Sprains/rupture of the posterial cruciate ligament	9%
	Sprains/rupture of the anterior cruciate ligament	4.3%
	Prepatellar bursitis	1.4%
<i>Ankle</i>	Sprain/rupture of the lateral collateral ligament	41.4% (Grade 1: 25%; Grade 2: 14%; Grade 3: 2.4%)
	Tibiofibular syndesmosis injuries	11%
	Articular capsule injuries	11%
	Sprain/rupture of the medial collateral ligament	7.8%
	Achilles tendon bursitis	7.8%
	Hematomas	4.8%
	Anterior or posterior impingement	4.8%
	Ruptured Achilles tendon	1.2%
	Lateral malleolus	1.2%

Some injuries have more serious consequences than others. Spinal injuries can lead to catastrophic neurological consequences (tetraplegia) and deaths have been reported [22,23]. The rate of this type of injury has decreased in recent years [24], as the rules of the game relating to entry into the scrum have changed, to ensure greater safety for the players [25]. However, the rate of acute spinal cord injuries with permanent neurological damage and traumatic brain injuries remains at 4.25/100,000 players, according to a study carried out between 2008 and 2011 in South Africa [26]. However, due to a low incidence of this type of injury and to a lack of epidemiological census, there exists an issue here to estimate exactly the number of injuries of cervical spinal cord in any given country [24]. However, this data is comparable to that observed in other contact sports, such as American football, but, this rate of catastrophic injuries is higher than in mountain biking [27] but lower than in horse riding [28] or paragliding [29]. In the lumbar region, violent collisions, sometimes combined with a pre-existing disc problem, can cause paraplegia [25].

In conclusion, ligament and tendon-muscle injuries were the most common, even if there exist no clear differences between them in the different studies [20].

4. Cause of Injuries

Most injuries (70%) occur following contact with another player [6,30]. Tackling causes most injuries (between 36% and 58%), 23%–29% in players who are tackled and 13%–27% in players tackling; the frequency increases for faster players [10,30]. Other studies confirm a higher rate of injury in players being tackled [5,8]. The injury rate as the result of tackles can be divided as follows: 39.1% for tackles

from the side, 30.4% for tackles from the front, 26.2% for tackles from behind [31]. Of injuries suffered during tackles, 22% were to the neck, head or face, 17% to the knee, 14% to the shoulder, 10% to the arms and hands, 8% to the ankles and 8% to the thighs [6]. Players who were tackled mostly suffered injuries to their lower limbs (51%), in comparison with their upper limbs (15%) and head (17%), while players who were tackling mostly suffered injuries to their arms (35%), followed by the head (28%) and the lower limbs (27%) [6]. Other reported causes of injury, such as rucks and mauls (15% to 36%), running and changing direction (10%) and entry into the scrum (1% to 7%), cause fewer injuries [8,10,13,15,30,32], but these can potentially be more serious, particularly in relation to entry into the scrums [22,23,26]. Approximately 40% of all rugby-related spinal cord injuries can be attributed to the scrum [24]. During the engagement phase, the forces generated at the interface between the two front rows during scrummaging are considerable and include forces in multiple directions, mainly forward but also downward [24]. This is the reason of the changing rules of the game relating to entry into the scrum to avoid this type of catastrophic injury [23].

The cause for around half of ankle injuries (53%) is contact, 35% are non-contact incidents with another player and 12% are due to unknown causes [18]. The majority of shoulder injuries occurring during matches follow contact with another player (97%) [21], mostly during tackles (65%; 40% for players tackling, 25% for players being tackled). A large proportion of dislocated shoulders and acromioclavicular disjunctions occur during tackles [21]. Seventy-two percent of knee injuries during matches occur during contact, 22% are non-contact related and 6% have no known cause [17]. Tackles cause the largest proportion of knee injuries [17].

Injuries also occur as the result of foul play, which is rarely penalized by the referee, with proportions ranging around 13% [14]. Of all injuries, 5% are as the result of foul play [6,8]. Head injuries (including injuries to the face and eyes) and muscular contusions were found to occur more frequently in foul play than non-foul play [14,33]. During the last World Cup, tackles caused the most injuries in matches (45%), while contact caused the most injuries during training [11].

Table 2. Number of injuries according to type of surface [34].

Injuries	Grass	Synthetic
Severity		
<i>Minor</i>	10.6/1000 match hours	11.8/1000 match hours
<i>Moderate</i>	10.6/1000 match hours	16.9/1000 match hours
<i>Severe</i>	5.8/1000 match hours	9.6/1000 match hours
Injury site		
<i>Head/neck</i>	25%	19.2%
<i>Upper limbs</i>	32.1%	17.3%
<i>Torso</i>	3.6%	5.8%
<i>Lower limb</i>	39.3%	57.7%
Actions		
<i>Contact between players</i>	70.4%	79.6%
<i>Non-contact</i>	29.6%	20.4%

Few studies evaluate the impact of the grass on injuries in sports. In Rugby Union, only one was found [34]. When a match takes place on grass, 26.9 injuries per 1000 match hours are recorded;

on synthetic surfaces, injury rate seems to increase to 38.2 per 1000 match hours (Table 2). However, further studies are needed to clarify the relation between the surface and injuries in Rugby Union.

In conclusion, being tackled and, to a lesser extent tackling, resulted in more injuries than any all other match incidents [20].

5. Time of Match when Injuries Occur

In one study, 46% of injuries took place during the first half and 40% during the second half; for the remaining 14%, information was not provided [14]. For other authors, more injuries take place during the second half (between 55% and 70%) than in the first half (between 30% and 45%). Many authors note that the number of injuries increases as the match progresses [6,8,14,33,35], but it appears that the most critical periods are the second and, above all, the fourth quarter [30].

A lower proportion of ankle injuries occur during the first half (42%) in comparison with the second (58%). The majority of these injuries take place during the last 20 min of the game (35%) [18]. Achilles tendon injuries are more likely to occur in the first half, while collateral ligament ankle injuries are more likely in the second half [18]. In relation to the shoulder, the injury rate increases as the match progresses [21]. Knee injuries most often occur in the second half (58%) and mainly during the last 20 min of the match (32%), with a lower incidence at the start of the match [17].

In conclusion, injuries occurred more often in the third quarter of matches (40–60 min) than other match periods, although the incidence rate was only possibly greater than the second and final quarters [20].

6. Players' Positions

The injury rate (Table 3) as the result of foul play remains similar for forwards and backs [33]. The overall rate of injuries during a match due to contact is higher for forwards than for backs, linked to the greater exposition to physical collisions; each team carries out an average of 300 tackles, with an average of 55 collisions for the forwards, while the backs are only exposed to an average of 29 [8–10]. Tackling leads to more injuries for backs and the rate of injuries during rucks or mauls is significantly higher for forwards [6]. The seriousness of injuries during a match does not differ significantly between forwards and backs, although authors do not seem to agree on the injury rate [14,17,18,21,32,35].

Analysis of the injury rate during the last World Cup showed that the backs suffered more injuries (93.8/100,000 match hours) than forwards (85.0/100,000 match hours) and that they presented more serious injuries during matches, but less serious injuries during training than forwards [12].

Opinions are divided on this issue. For some authors, second row players have a higher rate of injury, while positions 9, 10 and 12 present a lower injury rate than the other positions [14]. For others, the hooker and fly-half positions have the highest injury rate while the right locks and open-side flankers suffer from the most severe injuries [8].

In terms of substitute players, the flankers followed by the props are the positions, which are most often substituted for injury reasons [15,33]; in terms of the backs, it is the wings and centers who predominate. The substitution rate is very similar for all backs [15,33].

In conclusion, even if the incidence of injuries between forwards and backs is similar, injuries seem to be more severe for the forwards [20].

Table 3. Analysis of number of injuries in forwards and backs according to the action undertaken and part of the body affected [14,17,18,21,31,35].

Injuries	Forwards	Backs
<i>Actions</i>		
<i>Foul play</i>	7%	6%
<i>Contact with another player</i>	70%	61%
<i>Injury site</i>		
<i>Lower limb</i>	54%	65%
<i>Knee</i>	10%	17%
<i>Hamstring</i>	6%	15%
<i>Upper limb</i>	19%	14%
<i>Shoulder</i>	10%	10%
<i>Torso</i>	16%	9%
<i>Head</i>	10%	12%

7. Absence Time

Injuries are classified into three categories depending on the length of absence from competitive play. Minor injuries are those for which the length of the absence is less than one week. When a player is absent for between one and three weeks, the injury is considered to be moderate. After three weeks of absence from competition, the injury is said to be severe. Most injuries are considered to be minor (64%–82%), with moderate injuries (10%–18%) and severe injuries being less frequent (8%–22%) [8,10,15,32].

Knee injuries lead to the greatest number of days off (21%) followed by dislocated shoulders (15%); the consequences of thigh (11%) and ankle (10%) injuries are even lower [6,17,18].

In terms of knee injuries, damage to the anterior cruciate ligament led to 29% of days off, 26% resulted from injury to the medial crucial ligament and 21% from chondral meniscal injuries [17].

For shoulder injuries, dislocations represent 42% of days off [18]. Injuries to the acromioclavicular joint and the rotator cuff are a little less severe, each representing around 20% of player days off [32]. Injuries to the lateral collateral ligament (29%) and to the Achilles tendon, excluding ruptures (27%), represent the longest absences for ankle injuries [18]. In terms of muscular hamstring injuries, injuries are classified into the following three categories, 37% are recognized as minor, 37% as moderate and 26% as severe [35].

In conclusion, minor and moderate injuries represent the vast majority of all injuries of rugby players.

8. Conclusions

Rugby Union is a sport that is growing in popularity. A contact sport *par excellence*, it causes a significant number of injuries. The different epidemiological surveys observed that lower-limb injuries occurred more often than injuries to other body regions; ligament and tendon-muscle injuries were the most common, minor and moderate injuries represent the vast majority of all injuries of rugby players. Even if the incidence of injuries between forwards and backs seem similar, injuries seem to be more severe for the forwards; being tackled and tackling resulted in more injuries than any all other match incidents and injuries occurred more often in the third quarter of matches.

In 2004, the IRB established a working group to review the existing Laws of the Game with the aim of identifying ways in which the appeal of the game could be enhanced [1]. The efficacy of these proposals was initially assessed by the IRB during 2007 and 2008 in competitions essentially in southern hemisphere countries. However, the incidence, nature and causes of injuries remained similar to those under the previous Laws of Rugby [36]. Moreover, no differences could be seen in terms of the rate, cause and severity of injuries in the last two World Cups in 2007 and 2011 [11,37].

To improve the quality of epidemiological studies, the IRB has developed a specific methodology, which could help to adapt the rules even more efficiently to decrease injuries in rugby union.

Conflicts of Interest

The authors declare no conflict of interest.

References

1. International Rugby Board. *Les Règles du Jeu et la Charte du Jeu*; International Rugby Board: Dublin, Ireland, 2013; p. 216. (In French)
2. Van Mechelen, W.; Hlobil, H.; Kemper, H.C. Incidence, severity, aetiology and prevention of sports injuries. A review of concepts. *Sports Med.* **1992**, *14*, 82–99.
3. Fuller, C.W.; Molloy, M.G.; Bagate, C.; Bahr, R.; Brooks, J.H.; Donson, H.; Kemp, S.P.; McCrory, P.; McIntosh, A.S.; Meeuwisse, W.H.; *et al.* Consensus statement on injury definitions and data collection procedures for studies of injuries in rugby union. *Br. J. Sports Med.* **2007**, *41*, 328–331.
4. Fuller, C.W.; Molloy, M.G.; Bagate, C.; Bahr, R.; Brooks, J.H.; Donson, H.; Kemp, S.P.; McCrory, P.; McIntosh, A.S.; Meeuwisse, W.H.; *et al.* Consensus statement on injury definitions and data collection procedures for studies of injuries in rugby union. *Clin. J. Sport Med.* **2007**, *17*, 177–181.
5. Targett, S.G. Injuries in professional rugby union. *Clin. J. Sport Med.* **1998**, *8*, 280–285.
6. Garraway, W.M.; Lee, A.J.; Hutton, S.J.; Russell, E.B.; Macleod, D.A. Impact of professionalism on injuries in rugby union. *Br. J. Sports Med.* **2000**, *34*, 348–351.
7. Bathgate, A.; Best, J.P.; Craig, G.; Jamieson, M. A prospective study of injuries to elite Australian rugby union players. *Br. J. Sports Med.* **2002**, *36*, 265–269.
8. Brooks, J.H.; Fuller, C.W.; Kemp, S.P.; Reddin, D.B. Epidemiology of injuries in English professional rugby union: Part 1 match injuries. *Br. J. Sports Med.* **2005**, *39*, 757–766.
9. Brooks, J.H.; Fuller, C.W.; Kemp, S.P.; Reddin, D.B. Epidemiology of injuries in English professional rugby union: Part 2 training injuries. *Br. J. Sports Med.* **2005**, *39*, 767–775.
10. Kaplan, K.M.; Goodwillie, A.; Strauss, E.J.; Rosen, J.E. Rugby injuries: A review of concepts and current literature. *Bull. NYU Hosp. Jt. Dis.* **2008**, *66*, 86–93.
11. Fuller, C.W.; Sheerin, K.; Targett, S. Rugby world cup 2011: International rugby board injury surveillance study. *Br. J. Sports Med.* **2013**, *47*, 1184–1191.
12. Garraway, M.; Macleod, D. Epidemiology of rugby football injuries. *Lancet* **1995**, *345*, 1485–1487.
13. Lee, A.J.; Garraway, W.M. Epidemiological comparison of injuries in school and senior club rugby. *Br. J. Sports Med.* **1996**, *30*, 213–217.

14. Bird, Y.N.; Waller, A.E.; Marshall, S.W.; Alsop, J.C.; Chalmers, D.J.; Gerrard, D.F. The New Zealand rugby injury and performance project: V. Epidemiology of a season of rugby injury. *Br. J. Sports Med.* **1998**, *32*, 319–325.
15. Bottini, E.; Poggi, E.J.; Luzuriaga, F.; Secin, F.P. Incidence and nature of the most common rugby injuries sustained in Argentina (1991–1997). *Br. J. Sports Med.* **2000**, *34*, 94–97.
16. Gerrard, D.F.; Waller, A.E.; Bird, Y.N. The New Zealand rugby injury and performance project: II. Previous injury experience of a rugby-playing cohort. *Br. J. Sports Med.* **1994**, *28*, 229–233.
17. Dallalana, R.J.; Brooks, J.H.; Kemp, S.P.; Williams, A.M. The epidemiology of knee injuries in English professional rugby union. *Am. J. Sports Med.* **2007**, *35*, 818–830.
18. Sankey, R.A.; Brooks, J.H.; Kemp, S.P.; Haddad, F.S. The epidemiology of ankle injuries in professional rugby union players. *Am. J. Sports Med.* **2008**, *36*, 2415–2424.
19. Pearce, C.J.; Brooks, J.H.; Kemp, S.P.; Calder, J.D. The epidemiology of foot injuries in professional rugby union players. *Foot Ankle Surg.* **2011**, *17*, 113–118.
20. Williams, S.; Trawartha, G.; Kemp, S.; Stokes, K. A Meta-analysis of injuries in senior men's professional rugby union. *Sports Med.* **2013**, *43*, 1043–1055.
21. Headey, J.; Brooks, J.H.; Kemp, S.P. The epidemiology of shoulder injuries in English professional rugby union. *Am. J. Sports Med.* **2007**, *35*, 1537–1543.
22. Quarrie, K.L.; Cantu, R.C.; Chalmers, D.J. Rugby union injuries to the cervical spine and spinal cord. *Sports Med.* **2002**, *32*, 633–653.
23. Fuller, C.W. Catastrophic injury in rugby union: Is the level of risk acceptable? *Sports Med.* **2008**, *38*, 975–986.
24. Trewartha, G.; Preatoni, E.; England, M.E.; Stokes, K.A. Injury and biomechanical perspectives on the rugby scrum: A review of the literature. *Br. J. Sports Med.* **2014**, doi:10.1136/bjsports-2013-092972.
25. Gianotti, S.; Hume, P.A.; Hopkins, W.G.; Harawira, J.; Truman, R. Interim evaluation of the effect of a new scrum law on neck and back injuries in rugby union. *Br. J. Sports Med.* **2008**, *42*, 427–430.
26. Brown, J.C.; Lambert, M.I.; Verhagen, E.; Readhead, C.; van Mechelen, W.; Viljoen, W. The incidence of rugby-related catastrophic injuries (including cardiac events) in South Africa from 2008 to 2011: A cohort study. *BMJ Open* **2013**, *3*, doi:10.1136/bmjopen-2012-002475.
27. Dodwell, E.R.; Kwon, B.K.; Hughes, B.; Koo, D.; Townson, A.; Aludino, A.; Simons, R.K.; Fisher, C.G.; Dvorak, M.F.; Noonan, V.K. Spinal column and spinal cord injuries in mountain bikers: A 13-year review. *Am. J. Sports Med.* **2010**, *38*, 1647–1652.
28. Loder, R.T. The demographics of equestrian-related injuries in the United States: Injury patterns, orthopedic specific injuries, and avenues for injury prevention. *J. Trauma* **2008**, *65*, 447–460.
29. Schulze, W.; Richter, J.; Schulze, B.; Esenwein, S.A.; Büttner-Janzen, K. Injury prophylaxis in paragliding. *Br. J. Sports Med.* **2002**, *36*, 365–369.
30. Fuller, C.W.; Brooks, J.H.; Cancea, R.J.; Hall, J.; Kemp, S.P. Contact events in rugby union and their propensity to cause injury. *Br. J. Sports Med.* **2007**, *41*, 862–867.
31. Wilson, B.D.; Quarrie, K.L.; Milburn, P.D.; Chalmers, D.J. The nature and circumstances of tackle injuries in rugby union. *J. Sci. Med. Sport* **1999**, *2*, 153–162.
32. Brooks, J.H.; Fuller, C.W.; Kemp, S.P.; Reddin, D.B. A prospective study of injuries and training amongst the England 2003 Rugby World Cup squad. *Br. J. Sports Med.* **2005**, *39*, 288–293.

33. Sharp, J.C.; Murray, G.D.; Macleod, D.A. A unique insight into the incidence of rugby injuries using referee replacement reports. *Br. J. Sports Med.* **2001**, *35*, 34–37.
34. Fuller, C.W.; Clarke, L.; Molloy, M.G. Risk of injury associated with rugby union played on artificial turf. *J. Sports Sci.* **2010**, *28*, 563–570.
35. Brooks, J.H.; Fuller, C.W.; Kemp, S.P.; Reddin, D.B. Incidence, risk, and prevention of hamstring muscle injuries in professional rugby union. *Am. J. Sports Med.* **2006**, *34*, 1297–1306.
36. Fuller, C.W.; Raftery, M.; Readhead, C.; Targett, S.G.; Molloy, M.G. Impact of the International Rugby Board's experimental law variations on the incidence and nature of match injuries in southern hemisphere professional rugby union. *S. Afr. Med. J.* **2009**, *99*, 232–237.
37. Fuller, C.W.; Laborde, F.; Leather, R.J.; Molloy, M.G. International rugby board rugby world cup 2007 injury surveillance study. *Br. J. Sports Med.* **2008**, *42*, 452–459.

© 2015 by the authors; licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).