



International Rugby Board

Surveillance Studies

Junior World Rugby Trophy

Summary of Results: 2008 to 2013

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1 November 2013

1 Introduction

The IRB is committed to implementing surveillance studies (SS) at all major IRB Tournaments and to disseminate the results within the Rugby community. The aims of these studies are to record and analyse injuries and illnesses sustained by male and female players at individual Tournaments, to identify changing patterns of injury and to bring injury-related areas of concern to the attention of the IRB Chief Medical Officer.

The IRB Junior World Rugby Trophy (JWRT) represents the second tier of competition for U-20 international teams. The IRB Junior World Championship (JWC) represents the first tier of competition for international teams competing at U-20 level and injury epidemiology results for these Tournaments are presented in a separate report (Fuller and Taylor, 2013). A previous report summarised the incidence and nature of match injuries sustained during the IRB JWRT in the period 2008 to 2012 (Fuller and Taylor, 2012). This review consolidates the previous information with data collected during the 2013 Tournament.

2 Methods

All studies were conducted in accordance with the definitions and protocols described in the IRB approved consensus statement on definitions and procedures for injury surveillance studies in rugby union (Fuller et al., 2007).

The definition of injury was: *'Any injury sustained during a JWRT Tournament match that prevents a player from taking a full part in all normal training activities and/or match play for more than one day following the day of injury'*. Incidents where a player's absence from match play and/or training was caused by training activities, illness or other medical conditions not related to a JWRT match were not included. A recurrent injury was defined as: *'An injury (as defined above) of the same type and at the same site as an index injury and which occurs after a player's return to full participation from the index injury'*. Injuries were classified using the appropriate OSICS 8 Code (Orchard, 1995). Injury location, type and cause together with the event leading to the injury were also recorded.

Injury severity was determined by the number of days a player was injured. A player was deemed to be 'injured' until he could undertake full normal training and be available for match selection, whether or not he was actually selected. Medical staff were required to make an informed clinical judgement about a player's fitness to train/play on those days when players were not scheduled to train or play. Injured players were followed after each Tournament to obtain their return to play date.

The complete lists of categories and sub-categories used for injury locations and injury types are provided in the rugby injury consensus publication (Fuller et al., 2007).

Differences in players' anthropometric data were assessed using unpaired t-tests; differences in the incidences, mean severity and proportions of injuries were assessed using z-tests and differences in median severity using a Mann-Whitney U test. Statistical significance was accepted at the $p \leq 0.05$ level, although it is recognised that this could identify some differences that occur by chance due to the number of statistical comparisons being made in the study.

3 Data collection

At the beginning of each JWRT Tournament, the team's medical staff explained to each squad player the purpose of the epidemiological study. Each player's baseline anthropometric information was recorded on a Player Baseline Information Form (playing position [back, forward]; date of birth; body mass; stature) players joining a team's squad at a later date were added to the team's list of players and the anthropometric data recorded at the time the player joined the squad.

A member of the team's medical staff recorded every match injury sustained during a JWRT match on a Tournament Summary of Injuries Report Form, which was returned to the study co-ordinator immediately following the end of the Tournament. A member of the team's medical staff also recorded information about each injury on an Injury Report Form (date of injury, date of return to play, location and type of injury, cause of injury, event leading to injury): the final piece of information normally entered on the Injury Report Form being the date that the player returned to normal training/match play.

4 Results

Details relating to previous JWRT Tournaments have been presented in earlier reports (Fuller and Taylor, 2012). The IRB JWRT 2013 Tournament took place in Chile from 28 May to 9 June 2013. This study recorded players' anthropometric data and match injuries sustained by six (Canada, Chile, Italy, Portugal, Tonga, Uruguay) of the eight teams that took part in the 2013 Tournament.

Trends in anthropometric data and the incidence and mean severity of injury are reported over the period 2008 to 2013. All other parameters are presented as mean values over the same period in order to provide a comprehensive evaluation of the data according to the rugby consensus statement (Fuller et al., 2007).

4.1 Players' anthropometric data

Table 1 summarises the numbers and anthropometric data for players categorised as backs, forwards and all players at the 2013 JWRT Tournament together with mean values obtained for players over the period 2008 to 2013. Forwards are significantly heavier ($p < 0.001$) and taller ($p < 0.001$) than backs but there is no statistically significant difference in the ages of backs and forwards.

Table 1: Players' anthropometric data for 2013 and the mean data over the period 2008 - 2013.

Year / Measure	Mean (Standard deviation, number of players)		
	Backs	Forwards	ALL players
2013			
Stature, cm	180.4 (5.6, 66)	185.1 (6.5, 86)	183.1 (6.5, 152)
Body mass, Kg	85.3 (8.7, 66)	100.4 (9.6, 86)	93.8 (11.9, 152)
Age, years	19.1 (0.7, 68)	19.1 (9.6, 86)	19.1 (11.9, 152)
ALL Tournaments (2008 – 2013)			
Stature, cm	179.6 (6.2, 300)	184.8 (7.3, 372)	182.5 (7.3, 672)
Body mass, Kg	83.9 (8.5, 299)	100.9 (10.3, 369)	93.3 (12.7, 668)
Age, years	19.0 (0.68, 304)	19.0 (0.68, 379)	19.0 (0.68, 683)

Based on the All-Tournament data, backs and forwards competing in the JWRT are significantly shorter ($p < 0.001$) and lighter ($p < 0.001$) than players competing in IRB JWC Tournaments (Fuller and Taylor, 2013).

Trends in players' stature, body mass and age over the period 2008 to 2013 are presented for backs and forwards in Figures 1 - 3.

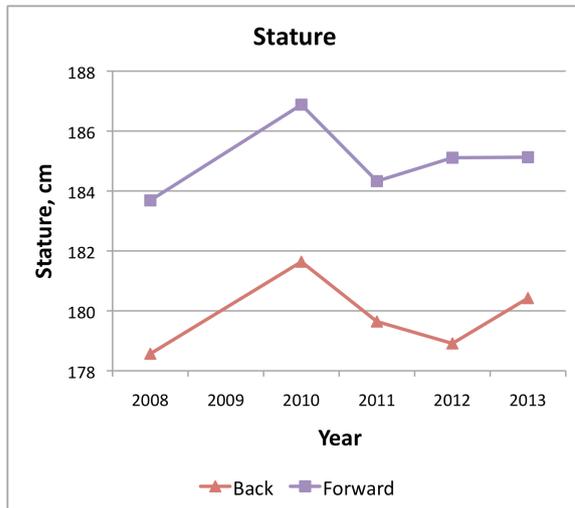


Figure 1. Trends in players' stature

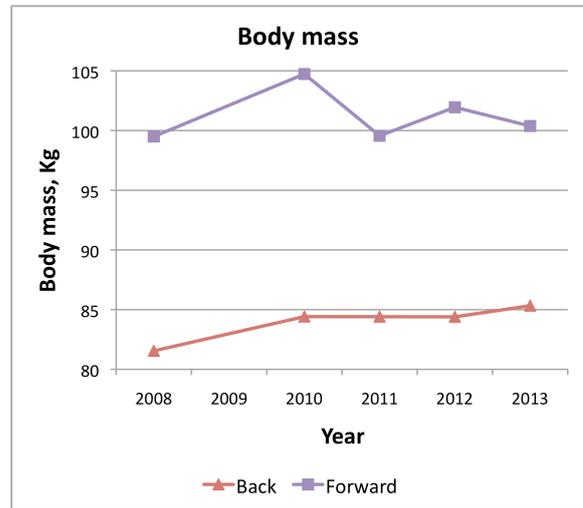


Figure 2. Trends in players' body mass

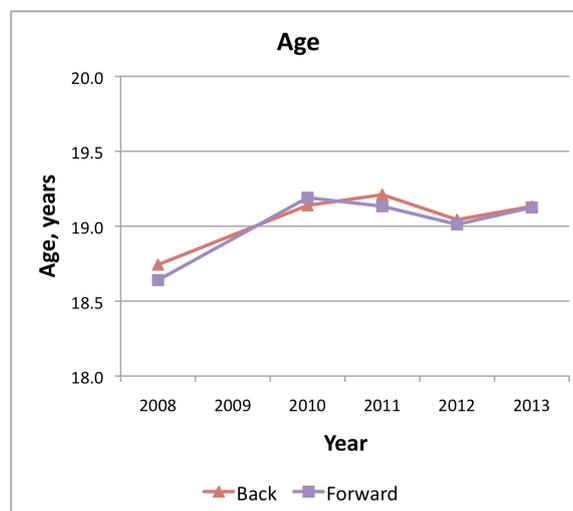


Figure 3. Trends in players' age

There have been no significant changes in players' stature or body mass.

4.2 Match injuries

4.2a Incidence of injury

Table 2 summarises the number of match injuries, match exposure and incidence of match injuries for backs, forwards and all players during the 2013 JWRT Tournament together with the values for the period 2008 to 2013.

The incidences of injury recorded at JWRT Tournaments are significantly lower (backs: $p < 0.001$; forwards: $p < 0.001$) than those recorded at the RWC (Fuller et al., 2012) and significantly lower (backs: $p = 0.024$; forwards: $p = 0.001$) than those for JWC Tournaments (Fuller and Taylor, 2013).

Table 2: Number, exposure (player-hours) and incidence (injuries/1000 player-match-hours, 95% confidence interval) of match injuries.

Year / Measure	Backs	Forwards	ALL players
2013			
Injuries	4	3	7
Exposure	224.0	256.0	480.0
Incidence	17.9 (6.7 – 47.6)	11.7 (3.8 – 36.3)	14.6 (7.0 – 30.6)
ALL Tournaments (2008 – 2013)			
Injuries	32	32	64
Exposure	970.7	1109.3	2080.0
Incidence	33.0 (23.3 – 46.6)	28.8 (20.4 – 40.8)	30.8 (24.1 – 39.3)

There are no significant differences in the incidences of injury between backs and forwards for either 2013 JWRT or for the mean values over the period 2008 – 2013.

Trends in injury incidence for backs and forwards over the period 2008 to 2013 are presented in Figure 4.

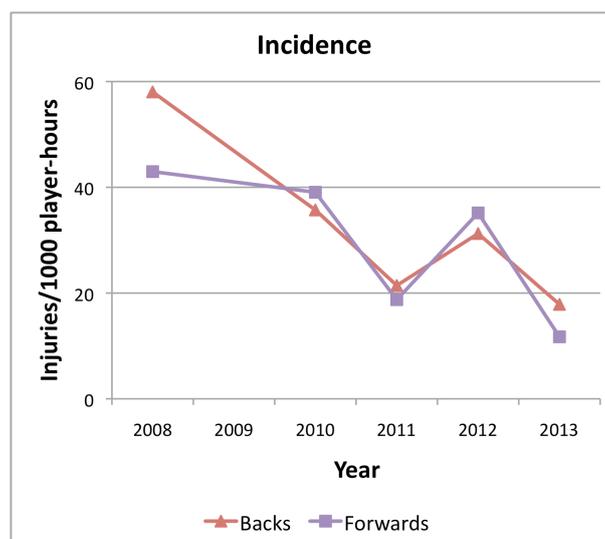


Figure 4. Trends in the incidence of injury

The downwards trend in the incidence of injury over the period 2008 to 2013 is statistically significant for backs ($p=0.035$) but not for forwards ($p=0.132$).

4.2b Severity of injury

Table 3 summarises the mean and median severity of all injuries sustained at JWRT Tournaments as a function of playing position. Based on the combined Tournament injury data, there are no significant differences between backs and forwards in the mean or median severity of injury.

Table 3: Mean and median severity of all match injuries sustained in the period 2008 to 2013.

Measure	Severity (95% Confidence interval), days		
	Backs	Forwards	ALL players
ALL Tournaments (2008 – 2013)			
Mean	20.4 (10.1 – 30.7)	31.2 (14.9 – 47.5)	25.9 (16.2 – 35.6)
Median	9 (2 – 22)	17.5 (5 – 27)	12.0 (7 – 22)

There are no significant differences in the severity of injuries sustained by forwards and backs at JWRT and JWC Tournaments (Fuller and Taylor, 2013).

Trends in injury severity for backs and forwards over the period 2008 to 2013 are presented in Figure 5.

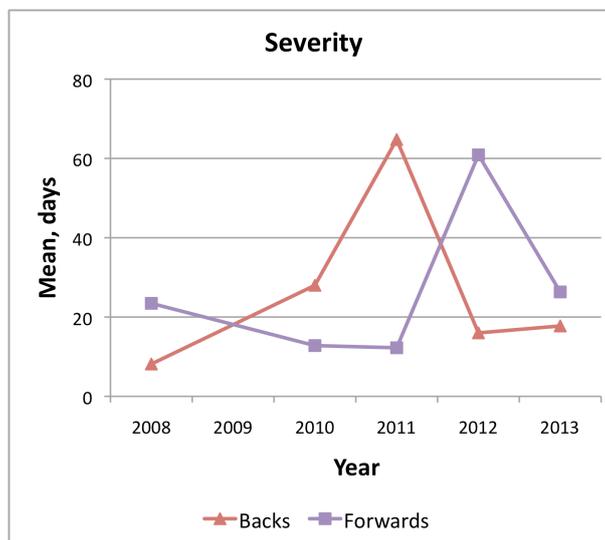


Figure 5. Trends in the mean severity of injury

There are no statistically significant trends in the severity of injury over time. The observed increases in severity for backs in 2011 and for forwards in 2012 reflect the relatively small number of injuries sustained in JWRT Tournaments and the disproportionate effect that a single severe injury can exert on the mean severity value in any individual Tournament.

4.2c Location of injury

Table 4 summarises the locations of all injuries sustained at JWRT Tournaments as a function of playing position.

Table 4: Locations of all match injuries sustained in the period 2008 to 2013.

Location of injury	% (95% Confidence interval)		
	Backs	Forwards	ALL players
ALL Tournaments (2008 – 2013)			
Head/neck	29.0 (13.1 – 45.0)	28.1 (12.5 – 43.7)	28.6 (17.4 – 39.7)
Head/face	25.8 (10.4 – 41.2)	21.9 (7.6 – 36.2)	23.8 (13.3 – 34.3)
Neck/cerv ^l spine	3.2 (0 – 9.4)	6.3 (0 – 14.6)	4.8 (0 – 10.0)
Upper limbs	35.5 (18.6 – 52.3)	21.9 (7.6 – 36.2)	28.6 (17.4 – 39.7)
Shoulder/clavicle	12.9 (1.1 – 24.7)	9.4 (0 – 19.5)	11.1 (3.4 – 18.9)
Upper arm	3.2 (0 – 9.4)	0.0 (-)	1.6 (0 – 4.7)
Elbow	0.0 (-)	3.1 (0 – 9.2)	1.6 (0 – 4.7)
Forearm	0.0 (-)	6.3 (0 – 14.6)	3.2 (0 – 7.5)
Wrist	12.9 (1.1 – 24.7)	0.0 (-)	6.3 (0.3 – 12.4)
Hand/fingers	6.5 (0 – 15.1)	3.1 (0 – 9.2)	4.8 (0 – 10.0)
Trunk	0.0 (-)	15.6 (3.0 – 28.2)	7.9 (1.3 – 14.6)
Ribs/upper back	0.0 (-)	12.5 (1.0 – 24.0)	6.3 (0.3 – 12.4)
Abdomen	0.0 (-)	0.0 (-)	0.0 (-)
Low back	0.0 (-)	3.1 (0 – 9.2)	1.6 (0 – 4.7)
Lower limbs	35.5 (18.6 – 52.3)	34.4 (17.9 – 50.8)	34.9 (23.1 – 46.7)
Hip/groin	0.0 (-)	0.0 (-)	0.0 (-)
Thigh, posterior	6.5 (0 – 15.1)	3.1 (0 – 9.2)	4.8 (0 – 10.0)
Thigh, anterior	9.7 (0 – 20.1)	0.0 (-)	4.8 (0 – 10.0)
Knee	12.9 (1.1 – 24.7)	15.6 (3.0 – 28.2)	14.3 (5.6 – 22.9)
L-Leg/Achilles	0.0 (-)	0.0 (-)	0.0 (-)
Ankle	6.5 (0 – 15.1)	12.5 (1.0 – 24.0)	9.5 (2.3 – 16.8)
Foot/toe	0.0 (-)	3.1 (0 – 9.2)	1.6 (0 – 4.7)

Based on the combined data the majority of injuries sustained by backs are upper (35.5%) and lower (35.5%) limb injuries while for forwards the majority are lower limb (34.4%) followed by head/neck (28.1%) injuries. The head/face is the most vulnerable sub-location for both backs (25.8%) and forwards (21.9%) followed by the shoulder/clavicle (12.9%), wrist (12.9%) and knee (12.9%) for backs and the knee (15.6%), ankle (12.5%) and ribs/upper back (12.5%) for forwards. There are no statistically significant differences between backs and forwards in the proportions of injuries sustained at each main location.

4.2d Type of injury

Table 5 summarises the types of injuries sustained at all JWRT Tournaments as a function of playing position.

Table 5: Types of all match injuries sustained in the period 2008 to 2013.

Type of injury	% (95% Confidence interval)		
	<i>Backs</i>	<i>Forwards</i>	<i>ALL players</i>
ALL Tournaments (2008 – 2013)			
Bone	6.5 (0 – 15.1)	18.8 (5.2 – 32.3)	12.7 (4.5 – 20.9)
Fracture	6.5 (0 – 15.1)	18.8 (5.2 – 32.3)	12.7 (4.5 – 20.9)
Other bone	0.0 (-)	0.0 (-)	0.0 (-)
CNS/PNS	19.4 (5.4 – 33.3)	12.5 (1.0 – 24.0)	15.9 (6.9 – 24.9)
Concussion	19.4 (5.4 – 33.3)	12.5 (1.0 – 24.0)	15.9 (6.9 – 24.9)
Nerve	0.0 (-)	0.0 (-)	0.0 (-)
Joint (non-bone)/lig^t	29.0 (13.1 – 45.0)	37.5 (20.7 – 54.3)	33.3 (21.8 – 45.0)
Dislocation/sublux ⁿ	3.2 (0 – 9.4)	3.1 (0 – 9.2)	3.2 (0 – 7.5)
Lesion meniscus	3.2 (0 – 9.4)	3.1 (0 – 9.2)	3.2 (0 – 7.5)
Sprain/ligament	22.6 (7.9 – 37.3)	31.3 (15.2 – 47.3)	27.0 (16.1 – 37.9)
Muscle/tendon	41.9 (24.6 – 59.3)	25.0 (10.0 – 40.0)	33.3 (21.8 – 45.0)
Haematoma/etc	19.4 (5.4 – 33.3)	18.8 (5.2 – 32.3)	19.0 (9.4 – 28.7)
Muscle rupture/etc	22.6 (7.9 – 37.3)	6.3 (0 – 14.6)	14.3 (5.7 – 22.9)
Tendon injury/etc	0.0 (-)	0.0 (-)	0.0 (-)
Skin	3.2 (0 – 9.4)	6.3 (0 – 14.6)	4.8 (0 – 10.0)
Abrasion	0.0 (-)	0.0 (-)	0.0 (-)
Laceration	3.2 (0 – 9.4)	6.3 (0 – 14.6)	4.8 (0 – 10.0)
Other types	0.0 (-)	0.0 (-)	0.0 (-)
Other	0.0 (-)	0.0 (-)	0.0 (-)

CNS/PNS: Central and peripheral nervous systems

Muscle/tendon (41.9%) injuries are the most common type of injury sustained by backs and joint (non-bone)/ligament (37.5%) the most common by forwards. Overall, muscle rupture/strain (22.6%), sprain/ligament (22.6%), concussion (19.4%) and muscle haematomas (19.4%) are the most common specific types of injury sustained by backs and sprain/ligament (31.3%), muscle haematoma (18.8%), fracture (18.8%) and concussion (12.5%) injuries the most common by forwards.

There are no statistically significant differences in the types of injuries sustained by backs and forwards at JWRT Tournaments.

4.2e Most common and highest risk injuries

The numbers of injuries recorded for backs (32) and forwards (32) in the five JWRT Tournaments are too small to allow a meaningful analysis of the most common or highest risk injuries. The only specific injuries resulting in more than 2 injuries for either backs or forwards were concussion (backs: 6; forwards: 4) and fractured rib (forwards: 3). These aspects of the analysis will only become meaningful when injuries from more JWRT Tournaments have been recorded.

4.2f Nature of onset of injury

Table 6 summarises the nature of injury-onset at JWRT Tournaments as a function of playing position.

Table 6: Nature of the injury-onset of all match injuries sustained in the period 2008 to 2013.

Nature of onset	% (95% Confidence interval)		
	<i>Backs</i>	<i>Forwards</i>	<i>ALL players</i>
All Tournaments (2008 – 2013)			
Acute	83.9 (70.9 – 96.8)	96.8 (90.6 – 100)	90.3 (83.0 – 97.7)
Gradual	16.1 (3.2 – 29.1)	3.2 (0 – 9.4)	9.7 (2.3 – 17.0)

Over 90% of all injuries sustained are acute injuries; there is no significant difference between backs and forwards in the proportions of acute and gradual-onset injuries sustained.

4.2g Cause of onset of injury

Table 7 summarises the cause of onset of match injuries at JWRT Tournaments as a function of playing position.

Table 7: Cause of onset of all injuries sustained in the period 2008 to 2013.

Cause of onset	% (95% Confidence interval)		
	<i>Backs</i>	<i>Forwards</i>	<i>ALL players</i>
All Tournaments			
Contact	90.0 (79.3 – 100)	85.7 (72.8 – 98.7)	87.9 (79.5 – 96.3)
Non-contact	10.0 (0 – 20.7)	10.7 (0 – 22.2)	10.3 (2.5 – 18.2)
Other	0.0 (-)	3.6 (0 – 10.4)	1.7 (0 – 5.1)

The majority of injuries sustained by backs (88.5%) and forwards (84.0%) are caused by contact events; there is no significant difference in the proportions of contact and non-contact injuries sustained by backs and forwards. There are no significant differences in the cause of injury-onset at JWRT compared with JWC Tournaments.

4.2h Match events leading to injury

Table 8 provides a summary of the match events leading to injury as a function of playing position.

Table 8: Match events leading to all injuries sustained in the period 2008 to 2013.

Cause of onset	% (95% Confidence interval)		
	<i>Backs</i>	<i>Forwards</i>	<i>ALL players</i>
All Tournaments			
Collision	17.2 (3.5 – 31.0)	10.7 (0 – 22.2)	14.0 (5.0 – 23.1)
Kicking	0.0 (-)	0.0 (-)	0.0 (-)
Lineout	0.0 (-)	3.6 (0 – 10.4)	1.8 (0 – 5.2)
Maul	0.0 (-)	0.0 (-)	0.0 (-)
Ruck	17.2 (3.5 – 31.0)	28.6 (11.8 – 45.3)	22.8 (11.9 – 33.7)
Running	10.3 (0 – 21.4)	10.7 (0 – 22.2)	10.5 (2.6 – 18.5)
Scrum	0.0 (-)	0.0 (-)	0.0 (-)
Tackled	27.6 (11.3 – 43.9)	21.4 (6.2 – 36.6)	24.6 (13.4 – 35.7)
Tackling	27.6 (11.3 – 43.9)	21.4 (6.2 – 36.6)	24.6 (13.4 – 35.7)
Other	0.0 (-)	3.6 (0 – 10.4)	1.8 (0 – 5.2)

Tackling (27.6%) and being tackled (27.6%) are the events responsible for the most injuries to backs and rucking (28.6%), tackling (21.4%) and being tackled (21.4%) the events responsible for most injuries to forwards.

4.2i Time of injury

Table 9 provides a summary of the period in a match when injury events take place as a function of playing position.

Table 9: Time during matches of injuries sustained in the period 2008 to 2013.

Time of injury, min	% (95% Confidence interval)		
	<i>Backs</i>	<i>Forwards</i>	<i>ALL players</i>
All Tournaments			
0-20	13.3 (1.2 – 25.5)	18.8 (5.2 – 32.3)	16.1 (7.0 – 25.3)
21-40+	23.3 (8.2 – 38.5)	31.3 (15.2 – 47.3)	27.4 (16.3 – 38.5)
41-60	23.3 (8.2 – 38.5)	34.4 (17.9 – 50.8)	29.0 (17.7 – 40.3)
61-80+	40.0 (22.5 – 57.5)	15.6 (3.0 – 28.2)	27.4 (16.3 – 38.5)

There are no statistically significant differences in the proportion of injuries sustained in each quarter for either backs or forwards. There are however significantly ($p=0.048$) more injuries sustained in the fourth quarter by backs than forwards.

4.2j Removal of injured players from the pitch

For all injuries, 31.1% of players were removed from play immediately, 23.0% were removed later in the game and 45.9% remained on the pitch until the end of the game. For players with concussion, 40.0% of players were removed immediately, 10.0% were removed later in the game and 50.0% remained on the pitch until the end of the game.

5 Summary

JWRT U-20 players are younger, shorter and lighter than players competing in the 2011 RWC (Fuller et al., 2012) and shorter and lighter than players at JWC Tournaments (Fuller and Taylor, 2013).

The status of the JWRT as the second tier of U-20 competition compared to the first tier U-20 competition (JWC) is reflected in the lower incidence of injury sustained in JWRT Tournaments. The severity of injuries sustained in JWRT Tournaments is similar to those sustained during the JWC Tournaments (Fuller and Taylor, 2013). The lower and upper limbs are equal as the most common injury location for backs and the lower limb is the most common location of injuries sustained by forwards. For backs, the most common type of injury is a muscle/tendon injury and for forwards joint (non-bone)/ligament injury.

Although data are presented in this review from five separate JWRT Tournaments, the amount of data remains limited. For this reason, it is important to continue monitoring and to increase compliance with the injury surveillance studies by the countries taking part in JWRT Tournaments. The results presented here provide the best benchmark information available for the incidence, severity, nature and causes of injury at this level of international U-20 rugby.

6. References

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7. Acknowledgements

The authors acknowledge the valuable support provided by many team physicians, physiotherapists and team managers during the collection of the data analysed in this report. Unfortunately the authors are not always aware of the specific people collecting the data, as medical support teams change from year-to-year. The authors would therefore like to apologise if anyone who provided data for the study is not included in the list of acknowledgements below:

Canada:	Anthony Dixon, Michael Cook
Chile:	Michael Marsalli, Nicolas Salvo
Georgia:	Sarah Cummings
Italy:	Vincenzo Ieracitano
Japan:	Kiyokazu Gotanda, Yasuhiro Iijima
Portugal:	Francisco Moreira
Russia:	Anatoly Besedin
Tonga:	Penisimani Poloniati
Uruguay:	C Hughes, Marcelo Santurio
USA:	Ben Cowin, Michael Keating
Zimbabwe:	Austin Jeans