International Rugby Board

Surveillance Studies

Junior World Rugby Trophy

Summary of Results: 2008 to 2014

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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 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, 2014). The IRB Junior World Rugby Trophy (JWRT) represents the second tier of competition for U-20 international teams. A previous report summarised the incidence and nature of match injuries sustained during the IRB JWRT in the period 2008 to 2013 (Fuller and Taylor, 2013). This review consolidates data collected during the 2014 Tournament with the data presented in the previous JWRT report.

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 players' 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 the 2014 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 [Kg]; stature [cm]). 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 was the date that the player returned to normal training/match play.

4 Results

Details relating to JWRT Tournaments in the period 2008 to 2013 have been presented in an earlier report (Fuller and Taylor, 2013).

The IRB JWRT 2014 Tournament took place in Hong Kong from 7 to 19 April 2014. This study recorded players' anthropometric data and match injuries sustained by six (Canada, Hong Kong, Japan, Namibia, Uruguay, USA) of the eight teams that took part in the 2013 Tournament.

Anthropometric data and the incidence of injury are reported for 2014. Information for all other parameters is not presented for the 2014 JWRT, as the number of injuries recorded in a single JWRT Tournament does not justify this level of analysis. However, data for all parameters are presented as mean values over the 2008 to 2014 period in order to provide a more meaningful long-term evaluation.

4.1 Players' anthropometric data

Table 1 summarises the numbers and anthropometric data for players categorised as backs, forwards and all players at the 2014 JWRT Tournament together with mean values obtained for players over the period 2008 to 2014. 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.

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, 2014).

Trends in players' stature, body mass and age over the period 2008 to 2014 are presented for backs and forwards in Figures 1 - 3.

Table 1: Players' anthropometric data for 2014 and the mean values over the period 2008 - 2014.

Year / Measure	**Mean** (*Standard deviation, number of players*)		
	Backs	***Forwards***	***ALL players***
2014			
Stature, cm	179.8 (6.3, 59)	185.9 (6.4, 76)	183.3 (7.1, 135)
Body mass, Kg	81.5 (8.3, 59)	101.0 (9.5, 75)	92.4 (13.2, 134)
Age, years	18.8 (0.9, 70)	19.0 (0.7, 85)	18.9 (0.8, 155)
ALL Tournaments (2008 – 2014)			
Stature, cm	179.7 (6.2, 359)	185.0 (7.1, 448)	182.6 (7.2, 807)
Body mass, Kg	83.5 (8.5, 358)	100.9 (10.2, 444)	93.1 (12.8,802)
Age, years	19.0 (0.7, 374)	19.0 (0.7, 464)	19.0 (0.7, 838)

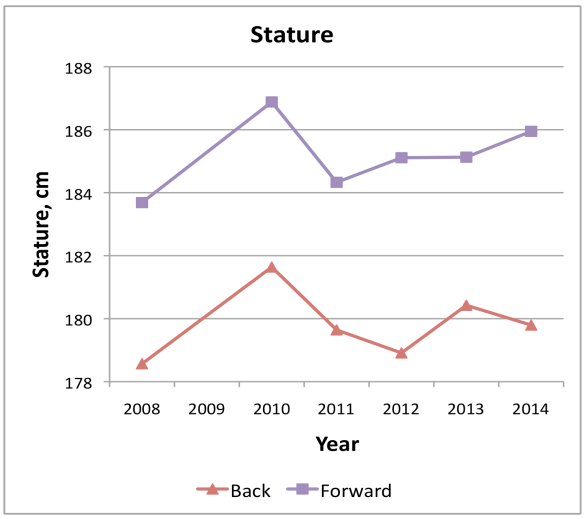

Figure 1. Trends in players' stature

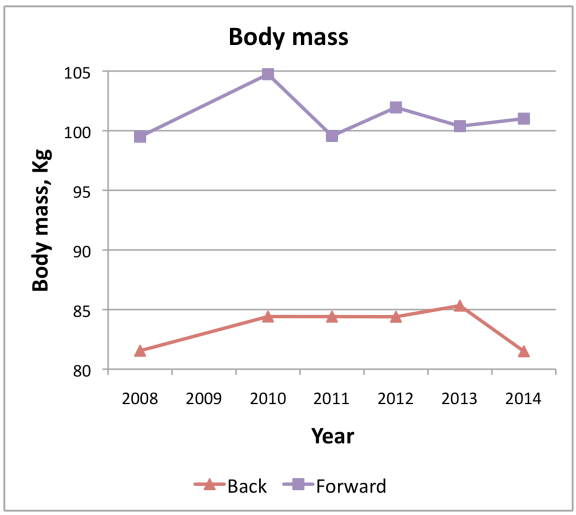

Figure 2. Trends in players' body mass

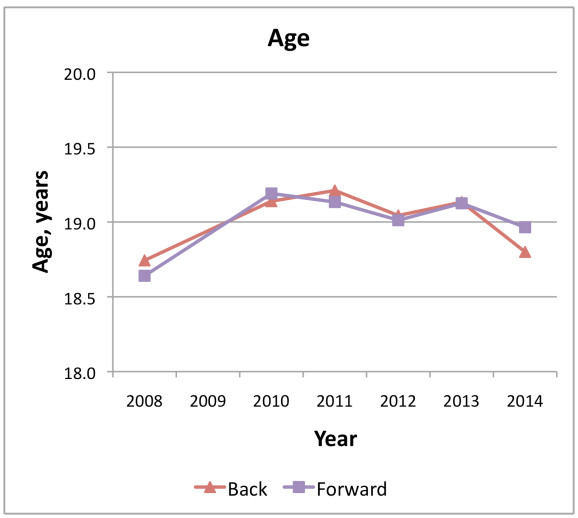

Figure 3. Trends in players' age

At the present time, there is no evidence that players are getting bigger, as there have been no statistically significant changes in backs' or forwards' stature or body mass in the period 2008 to 2014.

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 2014 JWRT Tournament together with the values for the period 2008 to 2014.

There are no significant differences in the incidences of injury between backs and forwards for either 2014 JWRT or for the mean values over the period 2008 – 2014.

The incidences of injury recorded at JWRT Tournaments are significantly lower (backs: p=0.024; forwards: p=0.001) than those recorded at JWC Tournaments over the same 2008 to 2014 time period (Fuller and Taylor, 2014).

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*
2014			
Injuries	7	10	17
Exposure	224.0	256.0	480.0
Incidence	31.3 (14.9 – 65.6)	39.1 (21.0 – 72.6)	35.4 (22.0 – 57.0)
ALL Tournaments (2008 – 2014)			
Injuries	39	42	81
Exposure	1194.7	1365.3	2560.0
Incidence	32.6 (23.9 – 44.7)	30.8 (22.7 – 41.6)	31.6 (25.4 – 39.3)

Trends in injury incidence for backs and forwards over the period 2008 to 2014 are presented in Figure 4.

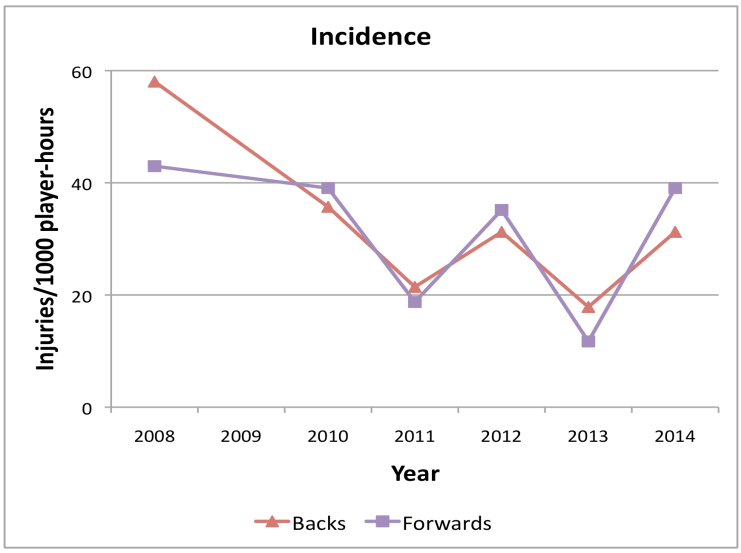

Figure 4. Trends in the incidence of injury

There are no statistically significant trends in the incidence of injury over this period for either backs (p=0.088 or forwards (p=0.438).

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 2014.

Measure	***Severity (95% Confidence interval)**, days*		
	Backs	***Forwards***	***ALL players***
ALL Tournaments (2008 – 2014)			
Mean	27.8 (8.2 – 47.3)	31.0 (17.8 – 44.3)	29.5 (17.9 – 41.0)
Median	8 (5 – 20)	21 (8 – 22)	14.0 (7 – 21)

There are no significant differences in the mean (p=0.266) or median (p=0.112) severity of injuries sustained by forwards and backs at JWRT Tournaments.

Trends in mean injury severity for backs and forwards over the period 2008 to 2014 are presented in Figure 5.

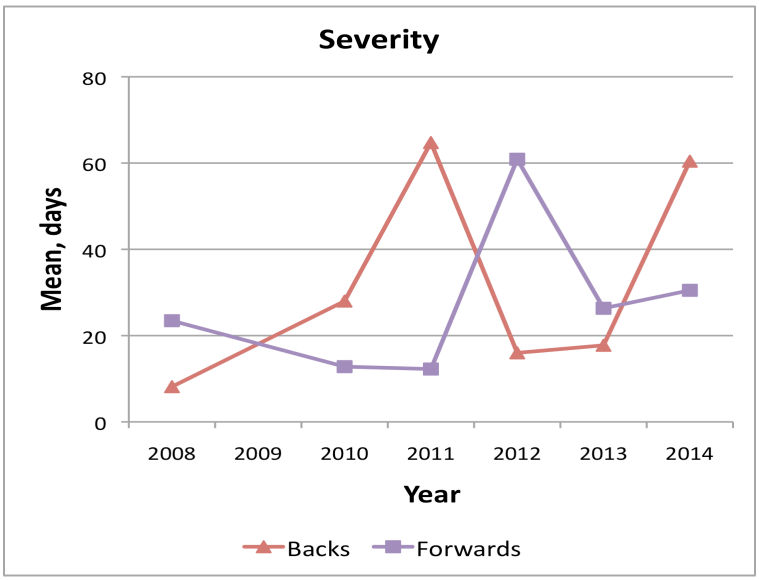

Figure 5. Trends in the mean severity of injury

There are no statistically significant trends in the severity of injury over time. The year-to-year fluctuations observed in the severity of injury for backs and forwards merely reflect the relatively small number of injuries sustained in JWRT Tournaments and the effect that one single severe injury in any one year can exert on the mean severity value reported for that year.

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 2014.

Location of injury	% (95% Confidence interval)		
	Backs	***Forwards***	***ALL players***
ALL Tournaments (2008 – 2014)			
Head/neck	34.2 (19.1 – 49.3)	26.2 (12.9 – 39.5)	30.0 (20.0 – 40.0)
Head/face	31.6 (16.8 – 46.4)	21.4 (9.0 – 33.8)	26.3 (16.6 – 35.9)
Neck/cerv[l] spine	2.6 (0 – 7.7)	4.8 (0 – 11.2)	3.8 (0 – 7.9)
Upper limbs	31.6 (16.8 – 46.4)	23.8 (10.9 – 36.7)	27.5 (17.7 – 37.3)
Shoulder/clavicle	10.5 (0.8 – 20.3)	14.3 (3.7 – 24.9)	12.5 (5.3 – 19.7)
Upper arm	2.6 (0 – 7.7)	0.0 (-)	1.3 (0 – 3.7)
Elbow	0.0 (-)	2.4 (0 – 7.7)	1.3 (0 – 3.7)
Forearm	0.0 (-)	4.8 (0 – 11.2)	2.5 (0 – 5.9)
Wrist	10.5 (0.8 – 20.3)	0.0 (-)	5.0 (0 – 9.8)
Hand/fingers	7.9 (0 – 16.5)	2.4 (0 – 7.7)	5.0 (0 – 9.8)
Trunk	2.6 (0 – 7.7)	11.9 (2.1 – 21.7)	7.5 (1.7 – 13.3)
Ribs/upper back	2.6 (0 – 7.7)	9.5 (0.6 – 18.4)	6.3 (0.9 – 11.6)
Abdomen	0.0 (-)	0.0 (-)	0.0 (-)
Low back	0.0 (-)	2.4 (0 – 7.7)	1.3 (0 – 3.7)
Lower limbs	31.6 (16.8 – 46.4)	38.1 (23.4 – 52.8)	35.0 (24.5 – 45.5)
Hip/groin	0.0 (-)	0.0 (-)	0.0 (-)
Thigh, anterior	7.9 (0 – 16.5)	0.0 (-)	3.8 (0 – 7.9)
Thigh, posterior	5.3 (0 – 12.4)	2.4 (0 – 7.7)	3.8 (0 – 7.9)
Knee	10.5 (0.8 – 20.3)	14.3 (3.7 – 24.9)	12.5 (5.3 – 19.7)
L-Leg/Achilles	0.0 (-)	2.4 (0 – 7.7)	1.3 (0 – 3.7)
Ankle	7.9 (0 – 16.5)	16.7 (5.4 – 27.9)	12.5 (5.3 – 19.7)
Foot/toe	0.0 (-)	2.4 (0 – 7.7)	1.3 (0 – 3.7)

Based on the combined data the majority of injuries sustained by backs are head/neck (34.2%) and upper (31.6%) and lower (31.6%) limb injuries while for forwards the majority are lower limb (38.1%) followed by head/neck (26.2%) injuries. The head/face is the most vulnerable sub-location for both backs (31.6%) and forwards (21.4%) followed by the shoulder/clavicle (10.5%), wrist (10.5%) and knee (10.5%) for backs and the ankle (16.7%), knee (14.3%) and shoulder/clavicle (14.3%) 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 2014.

Type of injury	% (95% Confidence interval)		
	Backs	***Forwards***	***ALL players***
ALL Tournaments (2008 – 2014)			
Bone	7.9 (0 – 16.5)	16.7 (5.4 – 27.9)	12.5 (5.3 – 19.7)
Fracture	7.9 (0 – 16.5)	16.7 (5.4 – 27.9)	12.5 (5.3 – 19.7)
Other bone	0.0 (-)	0.0 (-)	0.0 (-)
CNS/PNS	23.7 (10.2 – 37.2)	14.3 (3.7 – 24.9)	18.8 (10.2 – 27.3)
Concussion	23.7 (10.2 – 37.2)	11.9 (2.1 – 21.7)	17.5 (9.2 – 25.8)
Nerve	0.0 (-)	2.4 (0 – 7.0)	1.3 (0 – 3.7)
Joint (non-bone)/lig[t]	26.3 (12.3 – 40.3)	40.5 (25.6 – 55.3)	33.8 (23.5 – 44.1)
Dislocation/sublux[n]	2.6 (0 – 7.7)	2.4 (0 – 7.0)	2.5 (0 – 5.9)
Lesion meniscus	2.6 (0 – 7.7)	2.4 (0 – 7.0)	2.5 (0 – 5.9)
Sprain/ligament	21.1 (8.1 – 34.0)	35.7 (21.2 – 50.2)	28.8 (18.9 – 38.7)
Muscle/tendon	36.8 (21.5 – 52.2)	21.4 (9.0 – 33.8)	28.8 (18.9 – 38.7)
Haematoma/etc	18.4 (6.1 – 30.7)	14.3 (3.7 – 24.9)	16.3 (8.2 – 24.3)
Muscle rupture/etc	18.4 (6.1 – 30.7)	4.8 (0 – 11.2)	11.3 (4.4 – 18.2)
Tendon injury/etc	0.0 (-)	2.4 (0 – 7.0)	1.3 (0 – 3.7)
Skin	2.6 (0 – 7.7)	7.1 (0 – 14.9)	5.0 (0.3 – 9.8)
Abrasion	0.0 (-)	2.4 (0 – 7.0)	1.3 (0 – 3.7)
Laceration	2.6 (0 – 7.7)	4.8 (0 – 11.2)	3.8 (0 – 7.9)
Other types	2.6 (0 – 7.7)	0.0 (-)	1.3 (0 – 3.7)
Visceral	2.6 (0 – 7.7)	0.0 (-)	1.3 (0 – 3.7)

CNS/PNS: Central and peripheral nervous systems

Muscle/tendon (36.8%) injuries are the most common main type of injury sustained by backs and joint (non-bone)/ligament (40.5%) the most common by forwards. Overall, concussion (23.7%), sprain/ligament (21.1%), muscle rupture/strain (18.4%), and muscle haematomas (18.4%) are the most common specific types of injury sustained by backs and sprain/ligament (35.7%), fracture (16.7%), muscle haematoma (14.3%) and concussion (11.9%) injuries the most common by forwards.

There are no statistically significant differences in the main 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 (39) and forwards (42) in the six JWRT Tournaments remain 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: 9; forwards: 5), ankle lateral collateral ligament sprain (backs: 3; forwards: 4), fractured rib (forwards: 4) and knee medial collateral ligament sprain (forwards: 3). These aspects of the analysis will only become meaningful when injuries from a greater number of 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 2014.

Nature of onset	% (95% Confidence interval)		
	Backs	*Forwards*	*ALL players*
All Tournaments (2008 – 2014)			
Acute	86.8 (76.1 – 97.6)	92.7 (84.7 – 100)	89.9 (83.2 – 96.5)
Gradual	13.2 (2.4 – 23.9)	7.3 (0 – 15.3)	10.1 (3.5 – 16.8)

Ninety per cent 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 2014.

Cause of onset	% (95% Confidence interval)		
	Backs	*Forwards*	*ALL players*
ALL Tournaments (2008 – 2014)			
Contact	91.9 (83.1 – 100)	83.8 (71.9 – 95.7)	87.8 (80.4 – 95.3)
Non-contact	8.1 (0 – 16.9)	13.5 (2.5 – 24.5)	10.8 (3.7 – 17.9)
Other	0.0 (-)	2.7 (0 – 7.9)	1.4 (0 – 4.0)

The majority of injuries sustained by backs (91.9%) and forwards (83.8%) are caused by contact events; there is no significant difference in the proportions of contact and non-contact injuries sustained by backs and forwards.

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 2014.

Cause of onset	% (95% Confidence interval)		
	Backs	*Forwards*	*ALL players*
ALL Tournaments (2008 – 2014)			
Collision	22.2 (8.6 – 35.8)	10.8 (0.8 – 20.8)	16.4 (7.9 – 24.9)
Kicking	0.0 (-)	0.0 (-)	0.0 (-)
Lineout	0.0 (-)	2.7 (0 – 7.9)	1.4 (0 – 4.0)
Maul	0.0 (-)	0.0 (-)	0.0 (-)
Ruck	13.9 (2.6 – 25.2)	21.6 (8.4 – 34.9)	17.8 (9.0 – 26.6)
Running	8.3 (0 – 17.4)	8.1 (0 – 16.9)	8.2 (1.9 – 14.5)
Scrum	0.0 (-)	0.0 (-)	0.0 (-)
Tackled	25.0 (10.9 – 39.1)	27.0 (12.7 – 41.3)	26.0 (16.0 – 36.1)
Tackling	30.6 (15.5 – 45.6)	21.6 (8.4 – 34.9)	26.0 (16.0 – 36.1)
Other	0.0 (-)	8.1 (0 – 16.9)	4.1 (0 – 8.7)

Tackling (30.6%), being tackled (25.0%) and collisions (22.2%) are the events responsible for the most injuries to backs and being tackled (27.0%), rucking (21.6%) and tackling (21.6%) 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 2014.

Time of injury, min	% (95% Confidence interval)		
	Backs	*Forwards*	*ALL players*
ALL Tournaments (2008 – 2014)			
0-20	13.5 (2.5 – 24.5)	15.0 (3.9 – 26.1)	14.3 (6.5 -22.1)
21-40+	21.6 (8.4 – 34.9)	35.0 (20.2 – 49.8)	28.6 (18.5 – 38.7)
41-60	29.7 (15.0 – 44.5)	32.5 (18.0 – 47.0)	31.2 (20.8 – 41.5)
61-80+	35.1 (19.8 – 50.5)	17.5 (5.7 – 29.3)	26.0 (16.2 – 35.8)

There are no statistically significant differences in the proportion of injuries sustained in each quarter for either backs (p=0.264) or forwards (p=0.171). and there is no statistically significant difference in the times of injury between backs and forwards.

4.2j Removal of injured players from the pitch

For all injuries, 37.2% of players were removed from play immediately, 23.1% were removed later in the game and 39.7% remained on the pitch until the end of the game. For players with concussion, 42.9% of players were removed immediately, 14.3% were removed later in the game and 42.9% remained on the pitch until the end of the game. Significantly fewer players with concussion are removed immediately from the pitch during JWRT Tournaments compared to JWC Tournaments (Fuller and Taylor, 2014).

5 Summary

JWRT U-20 players are shorter and lighter than players competing in JWC Tournaments (Fuller and Taylor, 2014).

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 significantly lower incidence of injury sustained in JWRT Tournaments. The severity of injuries sustained in JWRT Tournaments is similar, however, to the injuries sustained during JWC Tournaments (Fuller and Taylor, 2014). The head/neck is the most common main location of injuries for backs and the lower limb the most common for forwards. For backs, the most common type of injury is a muscle/tendon injury and for forwards joint (non-bone)/ligament injuries. Fewer players with concussion are removed immediately from the pitch in JWRT Tournaments compared with JWC Tournaments.

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

6. References

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