



**WORLD
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World Rugby

Surveillance Studies

Women's Rugby World Cup 2017

Summary of Results

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18 December 2017

1 Introduction

World Rugby is committed to implementing surveillance studies at all major World Rugby 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 World Rugby's Chief Medical Officer.

Previous surveillance studies of the Women's Rugby World Cup (WRWC) reported the incidence and nature of match injuries sustained during the 2006, 2010 and 2014 tournaments (Schick et al., 2008, Taylor et al., 2011, Fuller and Taylor, 2014). The current report continues the on-going study of the WRWC by reporting match and training injuries sustained during the 2017 tournament.

This review also combines the new data, obtained from the 2017 tournament, with data reported previously in order to provide an updated overview of the risks of injury in the WRWC.

2 Methods

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

The definition of injury/illness was: *'Any injury/illness sustained during a WRWC match or training session 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/illness'*. Incidents where a player's absence from match play and/or training was caused by medical conditions not related to the WRWC were not included. A recurrent injury was defined as: *'An injury/illness (as defined above) of the same type and at the same site as an index injury/illness and which occurs after a player's return to full participation from the index injury/illness'*. Injuries and illnesses were classified using the appropriate OSICS 8 Code (Orchard et al., 2010). Location, type and cause of injury/illness together with the event leading to the injury/illness were also recorded.

Injury/illness severity was determined by the number of days a player was injured/ill. A player was deemed to be injured/ill until she could undertake full normal training and be available for match selection, whether or not she 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/ill players were followed up after the tournament to obtain their return-to-play date. The return-to-play dates for players with injuries/illnesses that remained unresolved 90 days after the final match were estimated on the basis of the player's medical staff's clinical judgement and prognosis.

The complete lists of categories and sub-categories used for injury/illness locations and types of injury/illness are provided in the rugby 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. Trends in anthropometric and incidence data were assessed using linear regression analyses. Statistical significance was accepted at the $p \leq 0.05$ level, although it is recognised that this could identify some differences that occurred by chance due to the number of statistical comparisons made in the report.

3 Data collection

At the beginning of each WRWC 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 injury/illness sustained during the WRWC on a Tournament Summary of Injuries and Illnesses 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/illness on an Injury/Illness Report Form (date of injury/illness, date of return to play, location and type of injury/illness, Orchard code, cause of injury/illness, event leading to injury/illness). Injury/Illness Report Forms were returned to the study co-ordinator when the final piece of information had been entered on the Form (normally the return-to-play date).

4 Results

Details relating to the countries competing at the 2006, 2010 and 2014 WRWCs were presented in earlier reports (Schick et al., 2008, Taylor et al., 2011, Fuller and Taylor, 2014). The 2017 WRWC took place in Ireland from 9 to 26 August 2017. This study reports players' anthropometric data and injuries and illnesses sustained by all twelve of the competing countries (Australia, Canada, England, France, Hong Kong, Ireland, Italy, Japan, New Zealand, Spain, USA and Wales). In addition to the results for the 2017 WRWC, trends in players' anthropometric data and the incidence of match injuries are reported for the four WRWCs that took place during the period 2006 to 2017.

4.1 Players' anthropometric data

Table 1 summarises the numbers and anthropometric data for players categorised as backs, forwards and all players in the 2017 WRWC together with values averaged over the period from 2010 to 2017 WRWC. Figures 1 to 3 show the trends in players' anthropometric data for the period 2006 to 2017.

Table 1: Players' anthropometric data recorded for the 2017 WRWC and averaged over the WRWCs in the period 2010 to 2017.

Tournament/ Measure	Mean (standard deviation, number of players)		
	<i>Backs</i>	<i>Forwards</i>	<i>ALL players</i>
2017 WRWC			
Stature, cm	167.1 (5.6, 150)	171.2 (6.8, 191)	169.4 (6.6, 341)
Body mass, Kg	67.3 (7.5, 150)	80.1 (11.2, 191)	74.5 (11.7, 341)
Age, years	25.8 (4.2, 150)	27.2 (4.5, 191)	26.6 (4.4, 341)
2010 to 2017 WRWCs			
Stature, cm	166.7 (5.7, 401)	171.4 (6.9, 484)	169.3 (6.8, 885)
Body mass, Kg	67.8 (7.5, 402)	80.0 (9.7, 484)	74.5 (10.7, 886)
Age, years	26.3 (4.3, 402)	27.7 (4.4, 484)	27.1 (4.4, 886)

For both the 2017 and the combined 2010 to 2017 WRWC data, forwards were significantly older ($p < 0.001$), heavier ($p < 0.001$) and taller ($p < 0.001$) than backs.

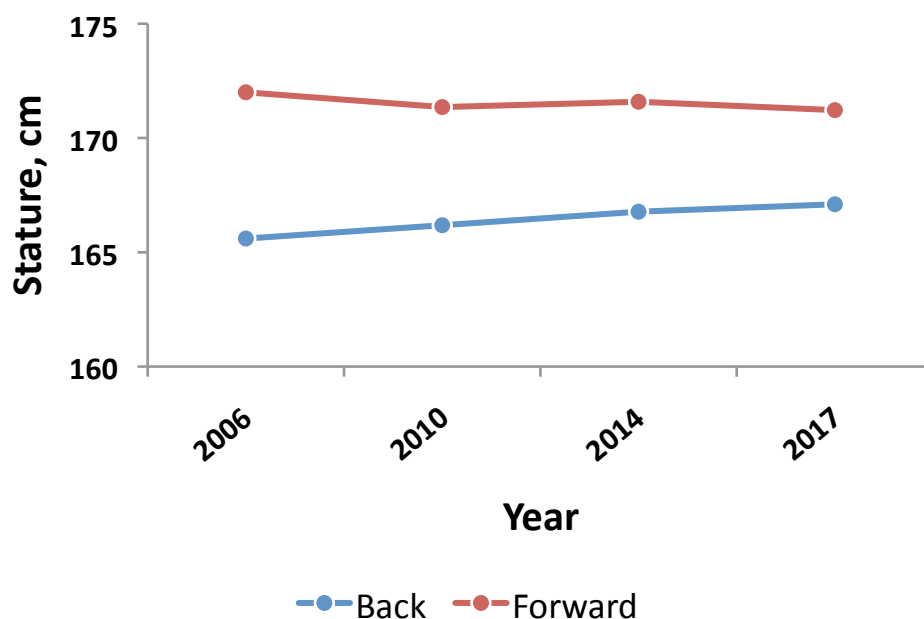


Fig 1. Trends in players' stature for WRWCs from 2006 to 2017 (data for 2006 from Schick et al., 2008)

There has been a small but statistically significant increase in the stature of backs ($p = 0.002$) over the 2006 to 2017 period but no statistically significant change for forwards ($p = 0.207$).

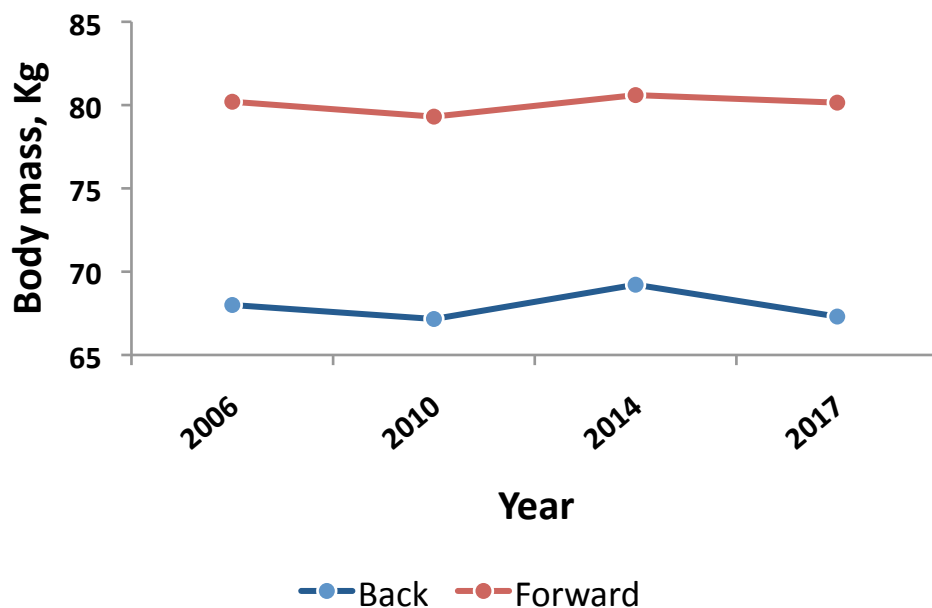


Fig 2. Trends in players' body mass for WRWCs from 2006 to 2017 (data for 2006 from Schick et al., 2008)

There have been no statistically significant changes in the body mass of backs ($p=0.958$) or forwards ($p=0.720$) in the period 2006 to 2017.

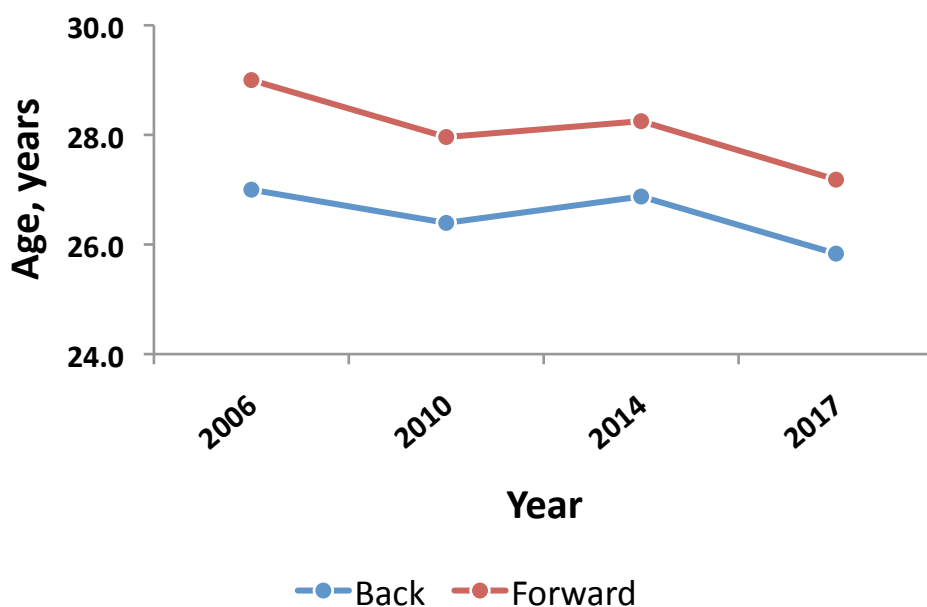


Fig 3. Trends in players' age for WRWCs from 2006 to 2017 (data for 2006 from Schick et al., 2008)

There have been small trends for backs ($p=0.298$) and forwards ($p=0.128$) to become younger but these changes have not reached statistical significance.

4.2 Match injuries

4.2a Incidence of injury

Table 2 summarises the numbers of match injuries, exposures and incidences of injuries for backs, forwards and all players during the 2017 WRWC together with values averaged over the WRWCs in the period 2010 to 2017. Figure 4 shows the trends in the incidence of match injuries over the period 2006 to 2017.

Table 2: Number, match exposure (player-hours) and incidence (injuries/1000 player-match-hours, 95% confidence interval) of match injuries: 2017 WRWC and combined 2010 to 2017 WRWC data.

Tournament/ Measure	Backs	Forwards	ALL players
2017 WRWC			
Injuries	31	33	64
Exposure	560.0	640.0	1200.0
Incidence	55.4 (38.9 – 78.7)	51.6 (36.7 – 72.5)	53.3 (41.7 – 68.1)
2010 to 2017 WRWCs			
Injuries	72	73	145
Exposure	1540.0	1760.0	3300.0
Incidence	46.8 (37.1 – 58.9)	41.5 (33.0 – 52.2)	43.9 (37.3 – 51.7)

There were no significant differences in the incidences of injury for backs and forwards for the 2017 WRWC ($p=0.779$) or for the combined 2010 to 2017 data ($p=0.472$).

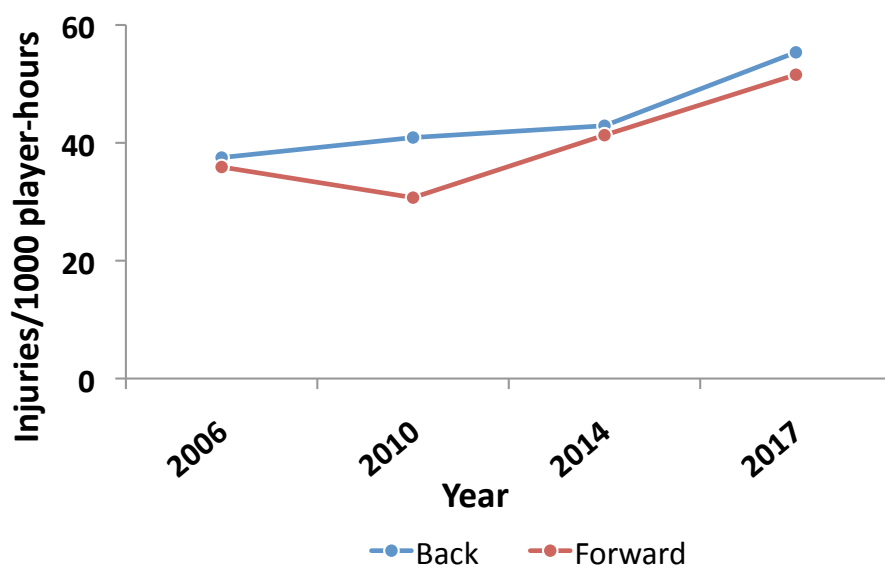


Fig 4. Trends in incidence of match injuries for WRWCs from 2006 to 2017 (data for 2006 from Schick et al., 2008)

The incidences of injury for backs and forwards at the 2017 WRWC were around 25% higher than those recorded at previous WRWCs and there are trends for the incidence of match injuries to be increasing for both backs ($p=0.109$) and forwards ($p=0.192$); although, these changes have not reached statistical significance. See also the discussion in Section 4.2d regarding the cause of this increased incidence of injury.

4.2b Severity of injury

Table 3 summarises the mean and median severities of injuries sustained during the 2017 WRWC for backs, forwards and all players together with values averaged over the WRWCs that took place in the period from 2010 to 2017.

Table 3: Mean and median severities of match injuries: 2017 WRWC and combined 2010 to 2017 WRWC data.

Tournament/ Measure	<i>Severity (95% confidence interval), days</i>		
	<i>Backs</i>	<i>Forwards</i>	<i>ALL players</i>
2017 WRWC			
Mean	35.1 (10.4 – 59.8)	46.3 (26.4 – 66.2)	40.9 (25.2 – 56.6)
Median	6 (4 – 19)	28 (6 – 35)	9 (6 – 28)
2010 to 2017 WRWCs			
Mean	52.4 (30.6 – 74.2)	39.1 (26.0 – 52.1)	45.7 (33.0 – 58.3)
Median	7 (6 – 11)	11 (6 – 25)	8 (7 – 13)

There are no statistically significant differences between the mean (2017 data: $p=0.490$; 2010 to 2017 data: $p=0.308$) or median (2017 data: $p=0.120$; 2010 to 2017 data: $p=0.771$) severity values of injuries sustained by backs and forwards.

4.2c Location of injury

Table 4 summarises the locations of injuries sustained by backs, forwards and all players during the 2017 WRWC.

The most common injury location for both backs and forwards at the 2017 WRWC was the head/face (backs: 38.7%; forwards: 27.3%) followed by the shoulder/clavicle for backs (22.6%) and the knee (12.1%) and ankle (12.1%) for forwards.

Table 4: Locations of match injuries sustained during the 2017 WRWC.

Tournament/ Location of injury	% (95% confidence interval)		
	<i>Backs</i>	<i>Forwards</i>	<i>ALL players</i>
2017 WRWC			
Head/neck	38.7 (21.6 – 55.9)	30.3 (14.6 – 46.0)	34.4 (22.7 – 46.0)
Head/face	38.7 (21.6 – 55.9)	27.3 (12.1 – 42.5)	32.8 (21.3 – 44.3)
Neck/cerv ^l spine	0.0 (-)	3.0 (0 – 8.9)	1.6 (0 – 4.6)
Upper limbs	25.8 (10.4 – 41.2)	24.2 (9.6 – 38.9)	25.0 (14.4 – 35.6)
Shoulder/clavicle	22.6 (7.9 – 37.3)	6.1 (0 – 14.2)	14.1 (5.5 – 22.6)
Upper arm	3.2 (0 – 9.4)	0.0 (-)	1.6 (0 – 4.6)
Elbow	0.0 (-)	6.1 (0 – 14.2)	3.1 (0 – 7.4)
Forearm	0.0 (-)	0.0 (-)	0.0 (-)
Wrist	0.0 (-)	6.1 (0 – 14.2)	3.1 (0 – 7.4)
Hand/fingers	0.0 (-)	6.1 (0 – 14.2)	3.1 (0 – 7.4)
Trunk	0.0 (-)	6.1 (0 – 14.2)	3.1 (0 – 7.4)
Ribs/upper back	0.0 (-)	0.0 (-)	0.0 (-)
Abdomen	0.0 (-)	0.0 (-)	0.0 (-)
Low back	0.0 (-)	3.0 (0 – 8.9)	1.6 (0 – 4.6)
Sacrum/pelvis	0.0 (-)	3.0 (0 – 8.9)	1.6 (0 – 4.6)
Lower limbs	35.5 (18.6 – 52.3)	39.4 (22.7 – 56.1)	37.5 (25.6 – 49.4)
Hip/groin	0.0 (-)	0.0 (-)	0.0 (-)
Thigh, anterior	3.2 (0 – 9.4)	0.0 (-)	1.6 (0 – 4.6)
Thigh, posterior	3.2 (0 – 9.4)	0.0 (-)	1.6 (0 – 4.6)
Knee	12.9 (1.1 – 24.7)	12.1 (1.0 – 23.0)	12.5 (4.4 – 20.6)
L-Leg/Achilles	6.5 (0 – 15.1)	9.1 (0 – 18.9)	7.8 (1.2 – 14.4)
Ankle	9.7 (0 – 20.1)	12.1 (1.0 – 23.3)	10.9 (3.3 – 18.6)
Foot/toe	0.0 (-)	6.1 (0 – 14.2)	3.1 (0 – 7.4)

Table 5 presents the average injury location values for backs, forwards and all players averaged over the 2010, 2014 and 2017 WRWCs.

Table 5: Locations of match injuries sustained during the 2010, 2014 and 2017 WRWCs.

Tournament/ Location of injury	% (95% confidence interval)		
	<i>Backs</i>	<i>Forwards</i>	<i>ALL players</i>
2010 to 2017 WRWCs			
Head/neck	33.3 (22.2 – 44.2)	26.0 (16.0 – 36.1)	29.7 (21.8 – 37.1)
Head/face	30.6 (19.9 – 41.2)	21.9 (12.4 – 31.4)	26.2 (18.6 – 33.4)
Neck/cerv ^l spine	2.8 (0 – 6.6)	4.1 (0 – 8.7)	3.4 (0.3 – 6.4)
Upper limbs	19.4 (10.3 – 28.6)	24.7 (14.8 – 34.5)	22.1 (14.9 – 28.8)
Shoulder/clavicle	15.3 (7.0 – 23.6)	8.2 (1.9 – 14.5)	11.7 (6.2 – 17.0)
Upper arm	1.4 (0 – 4.1)	0.0 (-)	0.7 (0 – 2.0)
Elbow	0.0 (-)	4.1 (0 – 8.7)	2.1 (0 – 4.4)
Forearm	0.0 (-)	0.0 (-)	0.0 (-)
Wrist	1.4 (0 – 4.1)	4.1 (0 – 8.7)	2.8 (0 – 5.4)
Hand/fingers	1.4 (0 – 4.1)	8.2 (1.9 – 14.5)	4.8 (1.1 – 8.3)
Trunk	4.2 (0 – 8.8)	6.8 (1.1 – 12.6)	5.5 (1.6 – 9.2)
Ribs/upper back	1.4 (0 – 4.1)	0.0 (-)	0.7 (0 – 2.0)
Abdomen	2.8 (0 – 6.6)	0.0 (-)	1.4 (0 – 3.3)
Low back	0.0 (-)	5.5 (0.3 – 10.7)	2.8 (0 – 5.4)
Sacrum/pelvis	0.0 (-)	1.4 (0 – 4.0)	0.7 (0 – 2.0)
Lower limbs	43.1 (31.6 – 54.5)	42.5 (31.1 – 53.8)	42.8 (34.3 – 50.8)
Hip/groin	0.0 (-)	4.1 (0 – 8.7)	2.1 (0 – 4.4)
Thigh, anterior	2.8 (0 – 6.6)	2.7 (0 – 6.5)	2.8 (0 – 5.4)
Thigh, posterior	2.8 (0 – 6.6)	0.0 (-)	1.4 (0 – 3.3)
Knee	20.8 (11.5 – 30.2)	16.4 (7.9 – 24.9)	18.6 (11.9 – 25.0)
L-Leg/Achilles	5.6 (0.3 – 10.8)	6.8 (1.1 – 12.6)	6.2 (2.1 – 10.1)
Ankle	11.1 (3.9 – 18.4)	9.6 (2.8 – 16.3)	10.3 (5.1 – 15.3)
Foot/toe	0.0 (-)	2.7 (0 – 6.5)	1.4 (0 – 3.3)

The majority of injuries sustained by both backs (43.1%) and forwards (42.5%) were located in the lower limbs. Overall, however, the head/face was the site most often injured for both backs (30.6%) and forwards (21.9%) followed by the knee (20.8%) and shoulder/clavicle (15.3%) for backs and the knee (16.4%) and ankle (9.6%) for forwards. There are no statistically significant differences between backs and forwards with respect to the main body locations injured.

4.2d Type of injury

Table 6 summarises the types of injuries sustained by backs, forwards and all players during the 2017 WRWC.

Table 6: Types of match injuries sustained during the 2017 WRWC.

Tournament/ Type of injury	% (95% confidence interval)		
	<i>Backs</i>	<i>Forwards</i>	<i>ALL players</i>
2017 WRWC			
Bone	6.5 (0 – 15.1)	15.2 (2.9 – 27.4)	10.9 (3.3 – 18.6)
Fracture	6.5 (0 – 15.1)	15.2 (2.9 – 27.4)	10.9 (3.3 – 18.6)
Other bone	0.0 (-)	0.0 (-)	0.0 (-)
CNS/PNS	29.0 (13.1 – 45.0)	27.3 (12.1 – 42.5)	28.1 (17.1 – 39.1)
Concussion	29.0 (13.1 – 45.0)	24.2 (9.6 – 38.9)	26.6 (15.7 – 37.4)
Nerve	0.0 (-)	3.0 (0 – 8.9)	1.6 (0 – 4.6)
Joint (non-bone)/lig^t	35.5 (18.6 – 52.3)	33.3 (17.2 – 49.4)	34.4 (22.7 – 46.0)
Dislocation/sublux ⁿ	3.2 (0 – 9.4)	3.0 (0 – 8.9)	3.1 (0 – 7.4)
Lesion meniscus	0.0 (-)	12.1 (1.0 – 23.3)	6.3 (0.3 – 12.2)
Sprain/ligament	32.3 (15.8 – 48.7)	18.2 (5.0 – 31.3)	25.0 (14.4 – 35.6)
Muscle/tendon	25.8 (10.4 – 41.2)	21.2 (7.3 – 35.2)	23.4 (13.1 – 33.8)
Haematoma/etc	6.5 (0 – 15.1)	9.1 (0 – 18.9)	7.8 (1.2 – 14.4)
Muscle rupture/etc	16.1 (3.2 – 29.1)	6.1 (0 – 14.2)	10.9 (3.3 – 18.6)
Tendon injury/etc	3.2 (0 – 9.4)	6.1 (0 – 14.2)	4.7 (0 – 9.9)
Skin	0.0 (-)	0.0 (-)	0.0 (-)
Laceration	0.0 (-)	0.0 (-)	0.0 (-)
Other injuries	3.2 (0 – 9.4)	3.0 (0 – 8.9)	3.1 (0 – 7.4)
Dental	0.0 (-)	0.0 (-)	0.0 (-)
Visceral	0.0 (-)	0.0 (-)	0.0 (-)
Other	3.2 (0 – 9.4)	3.0 (0 – 8.9)	3.1 (0 – 7.4)

CNS/PNS: Central and peripheral nervous systems

The most common injury type sustained by backs at the 2017 WRWC was a sprain/ligament injury (32.3%) followed by concussion (29.0%). For forwards the most common type of injury sustained was a concussion (24.2%) followed by a sprain/ligament injury (18.2%).

Table 7 presents the injury types for backs, forwards and all players averaged over the 2010, 2014 and 2017 WRWCs.

Table 7: Types of match injuries sustained during the 2010, 2014 and 2017 WRWCs.

Tournament/ Type of injury	% (95% confidence interval)		
	<i>Backs</i>	<i>Forwards</i>	<i>ALL players</i>
2010 to 2017 WRWCs			
Bone	9.7 (2.9 – 16.6)	16.4 (7.9 – 24.9)	13.1 (7.6 – 18.6)
Fracture	9.7 (2.9 – 16.6)	15.1 (6.9 – 23.3)	12.4 (7.0 – 17.8)
Other bone	0.0 (-)	1.4 (0 – 4.0)	0.7 (0 – 2.0)
CNS/PNS	22.2 (12.6 – 31.8)	16.4 (7.9 – 24.9)	19.3 (12.9 – 25.7)
Concussion	22.2 (12.6 – 31.8)	15.1 (6.9 – 23.3)	18.6 (12.3 – 25.0)
Nerve	0.0 (-)	1.4 (0 – 4.0)	0.7 (0 – 2.0)
Joint (non-bone)/lig^t	36.1 (25.0 – 47.2)	41.1 (29.8 – 52.4)	38.6 (30.7 – 46.5)
Dislocation/sublux ⁿ	2.8 (0 – 6.6)	1.4 (0 – 4.0)	2.1 (0 – 4.4)
Lesion meniscus	2.8 (0 – 6.6)	9.6 (2.8 – 16.3)	6.2 (2.3 – 10.1)
Sprain/ligament	30.6 (19.9 – 41.2)	30.1 (19.6 – 40.7)	30.3 (22.9 – 37.8)
Muscle/tendon	27.8 (17.4 – 38.1)	19.2 (10.1 – 28.2)	23.4 (16.6 – 30.3)
Haematoma/etc	6.9 (1.1 – 12.8)	11.0 (3.8 – 18.1)	9.0 (4.3 – 13.6)
Muscle rupture/etc	13.9 (5.9 – 21.9)	2.7 (0 – 6.5)	8.3 (3.8 – 12.8)
Tendon injury/etc	6.9 (1.1 – 12.8)	5.5 (0.3 – 10.7)	6.2 (2.3 – 10.1)
Skin	1.4 (0 – 4.1)	1.4 (0 – 4.0)	1.4 (0 – 3.3)
Laceration	1.4 (0 – 4.1)	1.4 (0 – 4.0)	1.4 (0 – 3.3)
Other injuries	2.8 (0 – 6.6)	5.5 (0.3 – 10.7)	4.1 (0.9 – 7.4)
Dental	0.0 (-)	1.4 (0 – 4.0)	0.7 (0 – 2.0)
Visceral	1.4 (0 – 4.1)	1.4 (0 – 4.0)	1.4 (0 – 3.3)
Other injuries	1.4 (0 – 4.1)	2.7 (0 – 6.5)	2.1 (0 – 4.4)

CNS/PNS: Central and peripheral nervous systems

The majority of injuries sustained by backs (36.1%) and forwards (41.1%) are joint (non-bone)/ligament injuries. For backs, sprain/ligament injuries (30.6%) and concussion (22.2%) are the most common types of injury. For forwards, the most common injuries are sprain/ligament injuries (30.1%), concussion (15.1%) and fracture (15.1%).

Figure 5 shows the increasing trend in the incidence of reported concussions over the period from 2006 to 2017. This is a trend that has been observed in all men's and women's rugby competitions. This increasing trend in the incidence of concussion matches the observed increase in the overall incidence of injury observed at the 2014 and 2017 WRWCs.

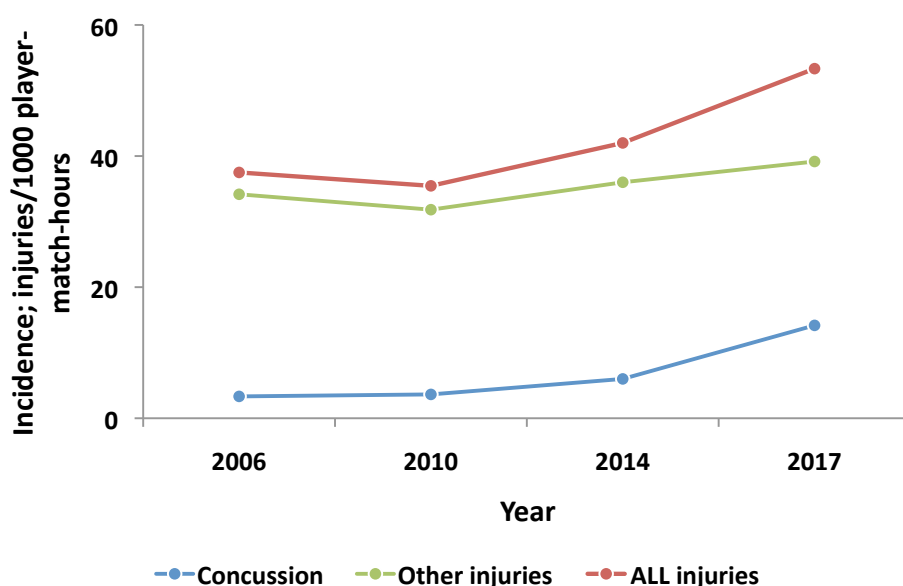


Fig 5. Incidence of concussion, other injuries and all injuries for WRWCs from 2006 to 2017 (data for 2006 from Schick et al., 2008)

4.2e Most common and highest risk injuries

The most common specific injuries sustained by backs at WRWCs in the period 2010 to 2017 were concussion (22.2%), ankle lateral ligament sprain (7.0%) and ACL injuries (7.0%): for forwards, the most common specific injuries were concussion (15.1%), knee medial collateral ligament sprain (8.2%) and hand/finger fractures (8.2%).

For backs, the injuries causing the greatest number of days absence were anterior cruciate ligament injuries (32.0% of all days lost by backs), rotator cuff tendon rupture (14.6%), knee cartilage damage (9.9%) and concussion (9.2%). For forwards, the highest risk injuries were anterior cruciate ligament injuries (18.9% of all days lost by forwards), lower leg fractures (12.7%) and knee medial collateral ligament rupture (8.3%).

4.2f Nature of onset of injury

Table 8 summarises the nature of the onset of the injuries sustained by backs, forwards and all players during the 2017 WRWC and averaged over the 2010 to 2017 WRWCs.

Table 8: Nature of onset of match injuries sustained in the 2017 WRWC and averaged over the 2010 to 2017 WRWCs.

Tournament/ Nature of onset	% (95% confidence interval)		
	<i>Backs</i>	<i>Forwards</i>	<i>ALL players</i>
2017 WRWC			
Acute	96.8 (90.6 – 100)	100.0 (-)	98.4 (95.4 – 100)
Gradual	3.2 (0 – 9.4)	0.0 (-)	1.6 (0 – 4.6)
2010 to 2017 WRWCs			
Acute	94.4 (89.2 – 99.7)	93.2 (87.4 – 98.9)	93.8 (89.9 – 97.7)
Gradual	5.6 (0.3 – 10.8)	6.8 (1.1 – 12.6)	6.2 (2.3 – 10.1)

Over 90% of all injuries sustained are acute in nature.

4.2g Cause of onset of injury

Table 9 summarises the cause of the onset of injuries sustained during the 2010 to 2017 WRWCs by backs, forwards and all players.

Table 9: Cause of onset of match injuries sustained in 2010 to 2017 WRWCs.

Tournament/ Cause of onset	% (95% confidence interval)		
	<i>Backs</i>	<i>Forwards</i>	<i>ALL players</i>
2017 WRWC			
Contact	77.4 (62.7 – 92.1)	90.9 (81.1 – 100)	84.4 (75.5 – 93.3)
Non-contact	22.6 (9.1 – 15.6)	9.1 (0 – 18.9)	15.6 (6.7 – 24.5)
2010 to 2017 WRWCs			
Contact	86.6 (78.4 – 94.7)	91.5 (85.1 – 98.0)	89.1 (83.9 – 94.3)
Non-contact	13.4 (5.3 – 21.6)	8.5 (2.0 – 14.9)	10.9 (5.7 – 16.1)

Over 80% of all injuries sustained are the result of contact activities.

4.2h Match events leading to injury

Table 10 summarises the specific match activities causing the injuries sustained by backs, forwards and all players during WRWCs in the period 2010 to 2017.

Across all WRWC tournaments, being-tackled (30.4%), tackling (20.3%) and collisions (17.4%) were the events responsible for the most injuries to backs; being-tackled (25.0%), collisions (22.2%) and rucks (19.4%) were the events responsible for most injuries sustained by forwards.

Table 10: Match events leading to injury during the 2010 to 2017 WRWCs.

Tournament/ Cause of onset	% (95% confidence interval)		
	<i>Backs</i>	<i>Forwards</i>	<i>ALL players</i>
2010 to 2017 WRWCs			
Collision	17.4 (8.4 – 26.3)	22.2 (12.6 – 31.8)	19.9 (13.3 – 26.4)
Lineout	0.0 (-)	1.4 (0 – 4.1)	0.7 (0 – 2.1)
Maul	1.4 (0 – 4.3)	2.8 (0 – 6.6)	2.1 (0 – 4.5)
Ruck	13.0 (5.1 – 21.0)	19.4 (10.3 – 28.6)	16.3 (10.2 – 22.4)
Running	11.6 (4.0 – 19.1)	4.2 (0 – 8.8)	7.8 (3.4 – 12.2)
Scrum	1.4 (0 – 4.3)*	5.6 (0.3 – 10.8)	3.5 (0.5 – 6.6)
Tackled	30.4 (19.6 – 41.3)	25.0 (15.0 – 35.0)	27.7 (20.3 – 35.0)
Tackling	20.3 (10.8 – 29.8)	12.5 (4.9 – 20.1)	16.3 (10.2 – 22.4)
Other	4.3 (0 – 9.2)	6.9 (1.1 – 12.8)	5.7 (1.9 – 9.5)

* Scrum half injured in scrum-related activity

4.2i Time of injury

Table 11 provides a summary of the period in a match when injuries occurred during the WRWCs from 2010 to 2017, as a function of playing position.

Table 11: Time of match when injuries were sustained during the 2010 to 2017 WRWCs.

Time of injury, min	% (95% confidence interval)		
	<i>Backs</i>	<i>Forwards</i>	<i>ALL players</i>
2010 to 2017 WRWCs			
0 – 20	8.7 (2.0 – 15.3)	14.1 (6.0 – 22.2)	11.4 (6.2 – 16.7)
21 – 40+	36.2 (24.9 – 47.6)	19.7 (10.5 – 29.0)	27.9 (20.4 – 35.3)
41 – 60	20.3 (10.8 – 29.8)	32.4 (21.5 – 43.3)	26.4 (19.1 – 33.7)
61 – 80+	34.8 (23.5 – 46.0)	33.8 (22.8 – 44.8)	34.3 (26.4 – 42.1)

Significantly fewer injuries were sustained in the first quarter of matches, for both backs and forwards, compared to the other three quarters.

4.3 Training injuries

Nine injuries (backs: 5; forwards: 4) were recorded during training activities at the 2017 WRWC; match day: warm-up – 1, cool-down -1; non-match day training activities: semi-contact rugby skills – 5, non-contact rugby skills – 1, conditioning-non-weights – 1. A total of 6,470 player-hours of training were recorded, which corresponds to an overall incidence of training injuries of 1.4 injuries/1000 player-training-hours. Further analysis of these injuries was not undertaken as the number of training injuries recorded were too small to provide meaningful information.

4.4 Illnesses

Four cases of gastrointestinal infection were reported by one country during the 2017 WRWC but only one of these cases lasted for more than 1 day. This represents a prevalence of illness amongst all squad players attending the 2017 WRWC of 1.2%. Further analysis of the illnesses was not undertaken.

5 Key conclusions

While the amount of injury data available for women's international Rugby-15s remains small compared to the amount available for men's international Rugby-15s, the level of information now available provides important information. As the level of knowledge increases further, more evidenced-based decisions about the risk of injury in the women's game will become possible.

Key conclusions reached from the data presented, include:

- Forwards are significantly older, taller and heavier than backs. There is evidence that backs are getting taller but there is no indication that backs or forwards are increasing in body mass.
- There is a non-significant trend indicating that players are getting younger.
- There is an indication that the overall incidence of injury at the WRWC is increasing and that this increase relates directly to the increase in the reporting of concussions.
- The mean severities of injury for backs and forwards remain high.
- Head/face is the most common location for injuries sustained by backs and forwards followed by the knee and shoulder for backs and the knee and ankle for forwards.
- Sprain/ligament and concussion are the most common types of injury for both backs and forwards.
- Concussion is the most common specific injury sustained by both backs and forwards but anterior cruciate ligament injuries are responsible for the most time loss for both backs and forwards.
- Over 90% of all injuries are acute in nature and over 80% of all injuries are caused by contact events.
- Being-tackled, tackling and collision events are responsible for most injuries sustained by backs and being-tackled, collisions and ruck events responsible for the most injuries sustained by forwards.
- The incidence of training injuries is low.
- The prevalence of illness is low.

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7. Acknowledgements

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

Australia:	Nicole Sly, Sharon Stay
Canada:	Adrienne Stinson, Shannon Houston
England:	Justin Hughes, Kate Hornby, Luke Woodhouse, Ruth Hibbins Butler
France:	Jean Loup Hadjadj
Hong Kong:	Talia Sekotill
Ireland:	Alan Farrell, Brigid Collins
Italy:	Cecilia di Biagio
Japan:	Soichi Hattori
New Zealand:	Deb Robinson, Kirsty Stewart
Samoa:	Neru Leavasa
South Africa:	Jerome Mampane
Spain:	Carmen Leon Paris, Jose Luis Bada
USA:	Katie Gloyer, Michelle Look
Wales:	Gary Ahmed, Hilary Mae Gannon, Matt Giles