World Rugby

Surveillance Studies

World Rugby U20 Trophy

Summary of Results: 2008 to 2016

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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 World Rugby U20 Trophy (previously known as the Junior World Rugby Trophy) reported the incidence and nature of match injuries sustained during tournaments from 2008 to 2015 (Fuller and Taylor, 2015). The current report continues the on-going study of the World Rugby U20 Trophy (WRT) by reporting match injuries sustained during the 2016 tournament.

This review also combines the new data, obtained from the 2016 tournament, with data reported previously in order to provide an updated review of the risks of injury in the World Rugby U20 Trophy.

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 union (Fuller et al., 2007).

The definition of injury was: '*Any injury sustained during a WRT 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 WRT 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 up after the tournament to obtain their return-to-play date. The return-to-play dates for players with injuries 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 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 WRT 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 their anthropometric data recorded at the time the player joined the squad.

A member of the team's medical staff recorded every injury sustained during a WRT 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). Injury 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

Results for previous WRT tournaments (2008 to 2015) were presented in earlier reports (Fuller and Taylor, 2015).

The 2016 WRT tournament took place in Harare (Zimbabwe) from 19 April to 1 May 2016. This study recorded anthropometric data for the eight teams (Fiji, Hong Kong, Namibia, Samoa, Spain, Uruguay, USA, Zimbabwe) taking part in the 2016 tournament and injury data for seven of the teams (Fiji, Hong Kong, Samoa, Spain, Uruguay, USA, Zimbabwe) taking part.

4.1 Players' anthropometric data

Table 1 summarises the numbers and anthropometric data for players from all 8 teams at the 2016 WRT tournament categorised as backs, forwards and all players together with mean values obtained for players over the period 2008 to 2016. Forwards are significantly heavier ($p<0.001$) and taller ($p<0.001$) than backs but there is no statistically significant difference between the ages of backs and forwards.

Trends in players' stature and body mass over the period 2008 to 2016 are presented for backs and forwards in Figures 1 and 2.

Table 1: Players' anthropometric data for 2016 and the mean values over the period 2008 - 2016.

Year / Measure	**Mean** (*Standard deviation, number of players*)		
	Backs	***Forwards***	***ALL players***
2016			
Stature, cm	178.0 (6.7, 91)	183.3 (8.7, 120)	181.0 (8.3, 211)
Body mass, Kg	82.7 (8.1, 91)	102.5 (14.4, 119)	93.9 (15.6, 210)
Age, years	19.0 (0.88, 91)	19.0 (0.70, 120)	19.0 (0.78, 211)
ALL tournaments (2008 – 2016)			
Stature, cm	179.1 (6.5, 550)	184.7 (7.4, 701)	182.3 (7.5, 1251)
Body mass, Kg	83.2 (8.6, 549)	101.3 (11.3, 696)	93.3 (13.6, 1245)
Age, years	19.0 (0.77, 554)	19.0 (0.71, 707)	19.0 (0.73, 1261)

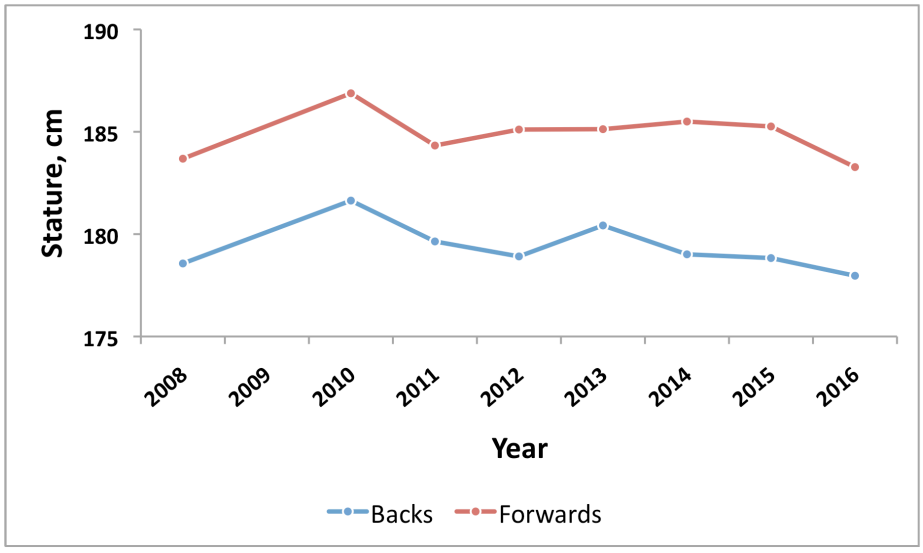

Figure 1. Trends in players' stature

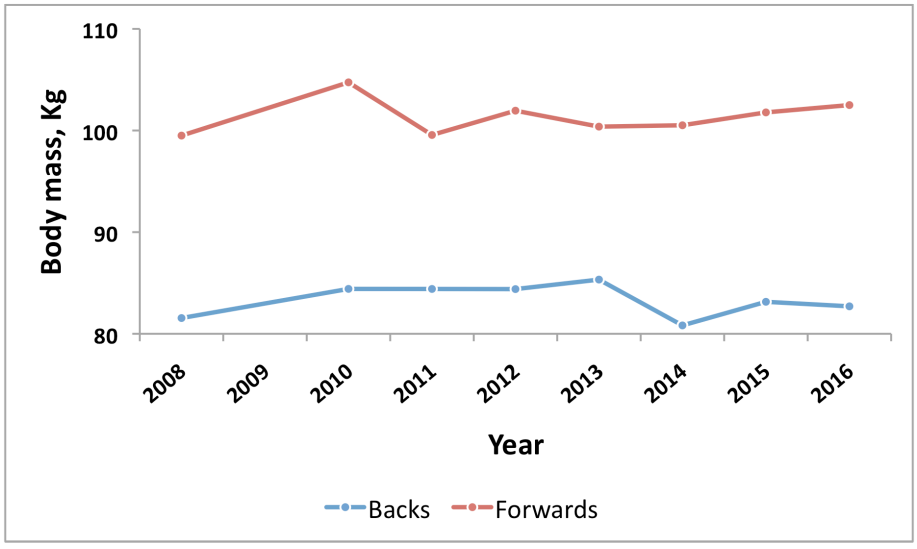

Figure 2. Trends in players' body mass

At the present time, there is no evidence to suggest that players competing in the WRT are getting bigger, as there have been no statistically significant changes in backs' or forwards' stature or body mass over the period 2008 to 2016.

4.2 Match injuries

Detailed information on match exposure and the number, incidence and severity of injuries is provided for 7 of the 8 teams competing at the 2016 tournament together with the average values for these parameters for all countries included over the period 2008 to 2016. For all other injury information, only the average values for the period 2008 to 2016 are presented, as the number of injuries reported in any one year does not justify meaningful analysis of the results for other parameters within individual tournaments.

4.2a Incidence of injury

Table 2 summarises the number of match injuries, match exposures and incidences of match injuries for backs, forwards and all players during the 2016 WRT tournament together with the mean values for the period 2008 to 2016.

There are no significant differences in the incidences of injury between backs and forwards for either the 2016 WRT (p=0.373) or for the mean values over the period 2008 – 2016 (p=0.741).

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*
2016			
Injuries	23	20	43
Exposure	261.3	298.7	560.0
Incidence	88.0 (58.5 – 132.4)	67.0 (43.2 – 103.8)	76.8 (56.9 – 103.5)
ALL tournaments (2008 – 2016)			
Injuries	81	88	169
Exposure	1754.7	2005.3	3760.0
Incidence	46.2 (37.1 – 57.4)	43.9 (35.6 – 54.1)	44.9 (38.7 – 52.3)

Trends in injury incidence for backs and forwards over the period 2008 to 2016 are presented in Figure 3.

The increasing trend in the incidence of injury for backs and forwards has continued in 2016, although at a reduced rate. The incidence of injury in the U-20 WRT is currently higher than that observed in the World Rugby Championship and is approaching the values observed at the full international level of competition.

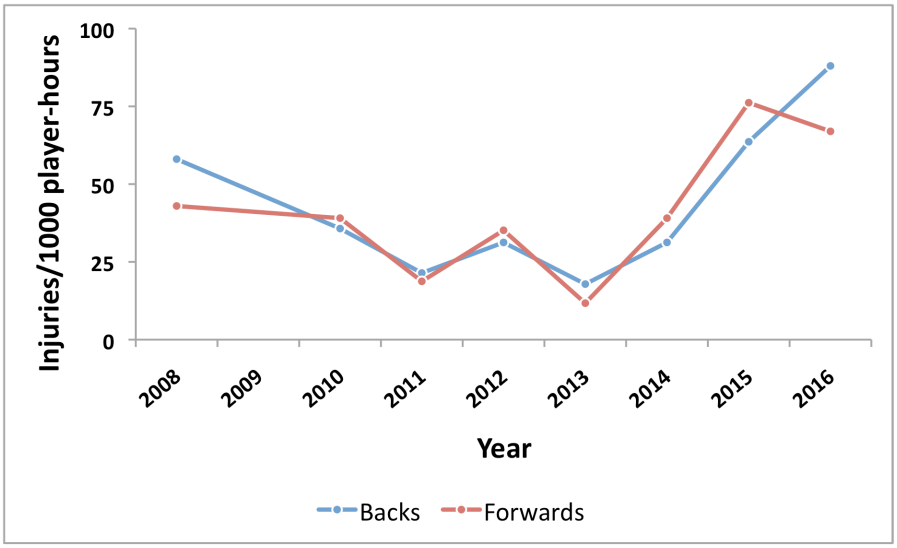

Figure 3. Trends in the incidence of injury

4.2b Severity of injury

Table 3 summarises the mean and median severities of injuries sustained during the 2016 tournament and for all injuries sustained at WRT tournaments in the period 2008 to 2016, as a function of playing position. Based on the 'All tournament' injury data, there are no significant differences between backs and forwards in the mean (p=0.447) or median (p=0.832) severities of injury.

Table 3: Mean and median severity of all match injuries sustained in the period 2008 to 2016.

Series / Measure	***Severity** (95% Confidence interval), days*		
	Backs	***Forwards***	***ALL players***
2016			
Mean	35.7 (13.9 – 57.5)	18.1 (7.7 – 28.4)	27.7 (20.8 – 40.7)
Median	6.0 (3.0 – 34.0)	7.0 (3.0 – 31.0)	6.5 (3.0 -24.0)
All tournaments (2008 – 2016)			
Mean	33.1 (19.5 – 46.8)	26.3 (17.1 – 35.5)	29.6 (22.9 – 37.7)
Median	8.0 (5.0 – 20.0)	9.0 (6.0 – 21.0)	9.0 (6.0 – 14.0)

Trends in the mean and median severity of injuries sustained by backs and forwards over the period 2008 to 2016 are presented in Figure 4 and 5, respectively.

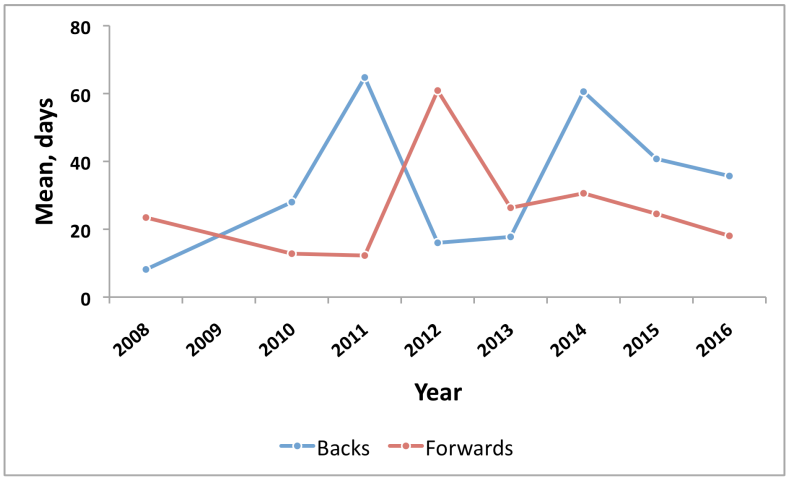

Figure 4. Trends in the mean severity of injury

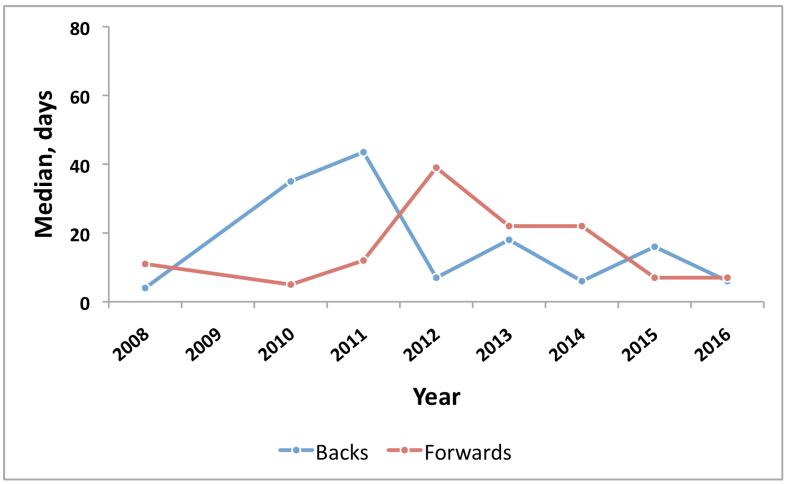

Figure 5. Trends in the median severity of injury

There are no statistically significant trends in the mean or median severities of injury over time. The occasional fluctuation observed in the mean severity of injury for backs and forwards reflects the relatively small number of injuries sustained in individual WRT tournaments linked with the occurrence of one or two severe injuries in those years; these injuries impact greatly on the mean severity values reported for those years. A small change in the number of severe injuries has a much less pronounced effect on the median value of injury severity.

4.2c Location of injury

Table 4 summarises the locations of all injuries sustained at WRT tournaments in the period 2008 to 2016, as a function of playing position.

Table 4: Locations of all match injuries sustained in the period 2008 to 2016.

Location of injury	*% (95% Confidence interval)*		
	Backs	***Forwards***	***ALL players***
ALL tournaments (2008 – 2016)			
Head/neck	26.3 (16.6 – 35.9)	21.8 (13.2 – 30.5)	24.0 (17.5 – 30.4)
Head/face	21.3 (12.3 – 30.2)	18.4 (10.3 – 26.5)	19.8 (13.7 – 25.8)
Neck/cerv[l] spine	5.0 (0.2 – 9.8)	3.4 (0 – 7.3)	4.2 (1.2 – 7.2)
Upper limbs	27.5 (17.7 – 37.3)	25.3 (16.2 – 34.4)	26.3 (19.7 – 33.0)
Shoulder/clavicle	13.8 (6.2 – 21.3)	12.6 (5.7 – 19.6)	13.2 (8.0 – 18.3)
Upper arm	1.3 (0 – 3.7)	2.3 (0 – 5.4)	1.8 (0 – 3.8)
Elbow	0.0 (-)	1.1 (0 – 3.4)	0.6 (0 – 1.8)
Forearm	0.0 (-)	3.4 (0 – 7.3)	1.8 (0 – 3.8)
Wrist	6.3 (0.9 – 11.6)	2.3 (0 – 5.4)	4.2 (1.2 – 7.2)
Hand/fingers	6.3 (0.9 – 11.6)	3.4 (0.2 – 9.8)	4.8 (1.6 – 8.0)
Trunk	6.3 (0.9 – 11.6)	6.9 (1.6 – 12.2)	6.6 (2.8 – 10.3)
Ribs/upper back	2.5 (0 – 5.9)	5.7 (0.9 – 10.6)	4.2 (1.2 – 7.2)
Abdomen	1.3 (0 – 3.7)	0.0 (-)	0.6 (0 – 1.8)
Low back	1.3 (0 – 3.7)	1.1 (0 – 3.4)	1.2 (0 – 2.8)
Sacrum/pelvis	1.3 (0 – 3.7)	0.0 (-)	0.6 (0 – 1.8)
Lower limbs	40.0 (29.3 – 50.7)	46.0 (35.5 – 56.4)	43.1 (35.6 – 50.6)
Hip/groin	2.5 (0 – 5.9)	0.0 (-)	1.2 (0 – 2.8)
Thigh, anterior	7.5 (1.7 – 13.3)	5.7 (0.9 – 10.6)	6.6 (2.8 – 10.3)
Thigh, posterior	7.5 (1.7 – 13.3)	4.6 (0.2 – 9.0)	6.0 (2.4 – 9.6)
Knee	15.0 (7.2 – 22.8)	12.6 (5.7 – 19.6)	13.8 (8.5 – 19.0)
L-Leg/Achilles	0.0 (-)	3.4 (0 – 7.3)	1.8 (0 – 3.8)
Ankle	6.3 (0.9 – 11.6)	18.4 (10.3 – 26.5)	12.6 (7.5 – 17.6)
Foot/toe	1.3 (0 – 3.7)	1.1 (0 – 3.4)	1.2 (0 – 2.8)

Based on the 'All tournament' data the majority of injuries sustained by backs and forwards are lower (backs: 40.0%; forwards: 46.0%) and upper (backs: 27.5%; forwards: 25.3%) limb injuries. The head/face (21.3%) and knee (15.0%) are the most vulnerable sub-locations for backs and the ankle (18.4%) and head/face (18.4%) 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 WRT tournaments in the period 2008 to 2016, as a function of playing position.

Joint (non-bone)/ligament (backs: 33.8%; forwards: 39.1%) and muscle/tendon (backs: 38.8%; forwards: 27.6%) injuries are the most common main types of injury sustained. Sprain/ligament (28.8%) and muscle rupture (22.5%) are the most common types of injury sustained by backs and sprain/ligament (32.2%) and muscle haematoma (12.6%), concussion (12.6%) and fracture (12.6%) injuries the most common by forwards.

There are no statistically significant differences in the main types of injuries sustained by backs and forwards at WRT tournaments.

Table 5: Types of all match injuries sustained in the period 2008 to 2016.

Type of injury	*% (95% Confidence interval)*		
	Backs	***Forwards***	***ALL players***
ALL tournaments (2008 – 2016)			
Bone	6.3 (0.9 – 11.6)	12.6 (5.7 – 19.6)	9.6 (5.1 – 14.0)
Fracture	6.3 (0.9 – 11.6)	12.6 (5.7 – 19.6)	9.6 (5.1 – 14.0)
Other bone	0.0 (-)	0.0 (-)	0.0 (-)
CNS/PNS	17.5 (9.2 – 25.8)	16.1 (8.4 – 23.8)	16.8 (11.1 – 22.4)
Concussion	17.5 (9.2 – 25.8)	12.6 (5.7 – 19.6)	15.0 (9.6 – 20.4)
Nerve	0.0 (-)	3.4 (0 – 7.3)	1.8 (0 – 3.8)
Joint (non-bone)/lig[t]	33.8 (23.4 – 44.1)	39.1 (28.8 – 49.3)	36.5 (29.2 – 43.8)
Dislocation/sublux[n]	3.8 (0 – 7.9)	3.4 (0 – 7.3)	3.6 (0.8 – 6.4)
Lesion meniscus	1.3 (0 – 3.7)	3.4 (0 – 7.3)	2.4 (0.1 – 4.7)
Sprain/ligament	28.8 (18.8 – 38.7)	32.2 (22.4 – 42.0)	30.5 (23.6 – 37.5)
Muscle/tendon	38.8 (28.1 – 49.4)	27.6 (18.2 – 37.0)	32.9 (25.8 – 40.1)
Haematoma/etc	15.0 (7.2 – 22.8)	12.6 (5.7 – 19.6)	13.8 (8.6 – 19.0)
Muscle rupture/etc	22.5 (13.3 – 31.7)	11.5 (4.8 – 18.2)	16.8 (11.1 – 22.4)
Tendon injury/etc	1.3 (0 – 3.7)	3.4 (0 – 7.3)	2.4 (0.1 – 4.7)
Skin	1.3 (0 – 3.7)	3.4 (0 – 7.3)	2.4 (0.1 – 4.7)
Abrasion	0.0 (-)	1.1 (0 – 3.4)	0.6 (0 – 1.8)
Laceration	1.3 (0 – 3.7)	2.3 (0 – 5.4)	1.8 (0 – 3.8)
Other types	2.5 (0 – 5.9)	1.1 (0 – 3.4)	1.8 (0 – 3.8)
Visceral	1.3 (0 – 3.7)	0.0 (-)	0.6 (0 – 1.8)
Other	1.3 (0 – 3.7)	1.1 (0 – 3.4)	1.2 (0 – 2.8)

CNS/PNS: Central and peripheral nervous systems

4.2e Most common and highest risk injuries

The most common specific injuries sustained by backs in the period 2008 to 2016 were concussion (17.5%), acromioclavicular joint sprain (9.0%) and hamstring muscle strain (6.4%); for forwards, they were concussion (12.6%), ankle lateral collateral ligament sprain (10.3%), acromioclavicular joint sprain (4.6%), fractured rib/sternum (4.6%) and knee medial collateral ligament tear (4.6%).

The injuries causing the greatest loss of time for backs were ACL ligament tear/sprain (32.1%), concussion (25.1%) and wrist scaphoid ligament tear (6.0%); for forwards they were concussion (12.3%), shoulder dislocation/subluxation (11.9%) and shoulder SLAP lesion (11.4%).

4.2f Nature of onset of injury

Table 6 summarises the nature of injury-onset at WRT tournaments in the period 2008 to 2016, as a function of playing position.

Table 6: Nature of the injury-onset of all match injuries sustained in the period 2008 to 2016.

Nature of onset	*% (95% Confidence interval)*		
	Backs	***Forwards***	***ALL players***
All tournaments (2008 – 2016)			
Acute	78.8 (69.8 – 87.7)	86.0 (78.7 – 93.4)	82.5 (76.8 – 88.3)
Gradual	21.3 (12.3 – 30.2)	14.0 (6.6 – 21.3)	17.5 (11.7 – 23.2)

Eighty-three per cent of all injuries sustained were acute injuries; there was no statistically significant difference (p=0.215) 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 sustained at WRT tournaments in the period 2008 to 2016, as a function of playing position.

Table 7: Cause of onset of all injuries sustained in the period 2008 to 2016.

Cause of onset	*% (95% Confidence interval)*		
	Backs	***Forwards***	***ALL players***
ALL tournaments (2008 – 2016)			
Contact	84.6 (76.6 – 92.6)	89.0 (82.3 – 95.8)	86.9 (81.6 – 92.1)
Non-contact	15.4 (7.4 – 23.4)	9.8 (3.3 – 16.2)	12.5 (7.4 – 17.6)
Other	0.0 (-)	1.2 (0 – 3.6)	0.6 (0 – 1.8)

The majority of injuries sustained by backs and forwards were caused by contact events; there was no statistically significant difference (p=0.294) 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 specific match events leading to injury in the period 2008 to 2016, as a function of playing position.

Being tackled (31.2%), tackling (28.6%) and collision (14.3%) were the events responsible for most injuries to backs and being tackled (24.4%), tackling (20.7%) and ruck (19.5%) the events responsible for most injuries to forwards.

The most common events, for all players, leading to concussion were tackling (30.4%) and collision (30.4%); being tackled accounted for 17.4% of concussions.

Table 8: Match events leading to all injuries sustained in the period 2008 to 2016.

Cause of onset	*% (95% Confidence interval)*		
	Backs	***Forwards***	***ALL players***
ALL tournaments (2008 – 2016)			
Collision	14.3 (6.5 – 22.1)	8.5 (2.5 – 14.6)	11.3 (6.4 – 16.2)
Kicking	0.0 (-)	0.0 (-)	0.0 (-)
Lineout	0.0 (-)	2.4 (0 – 5.8)	1.3 (0 – 3.0)
Maul	1.3 (0 – 3.8)	2.4 (0 – 5.8)	1.9 (0 – 4.0)
Ruck	9.1 (2.7 – 15.5)	19.5 (10.9 – 28.1)	14.5 (9.0 – 19.9)
Running	15.6 (7.5 – 23.7)	4.9 (0.2 – 9.5)	10.1 (5.4 – 14.7)
Scrum	0.0 (-)	8.5 (2.5 – 14.6)	4.4 (1.2 – 7.6)
Tackled	31.2 (20.8 – 41.5)	24.4 (15.1 – 33.7)	27.7 (20.7 – 34.6)
Tackling	28.6 (18.5 – 38.7)	20.7 (12.0 – 29.5)	24.5 (17.8 – 31.2)
Other	0.0 (-)	8.5 (2.5 – 14.6)	4.4 (1.2 – 7.6)

4.2i Time of injury

Table 9 provides a summary of the period in a match when injury events in the period 2008 to 2016 took place, as a function of playing position.

Table 9: Time during matches of injuries sustained in the period 2008 to 2016.

Time of injury, min	*% (95% Confidence interval)*		
	Backs	***Forwards***	***ALL players***
ALL tournaments (2008 – 2016)			
0-20	13.9 (6.3 – 21.6)	14.0 (6.6 – 21.3)	13.9 (8.7 – 19.2)
21-40+	29.1 (19.1 – 39.1)	33.7 (23.7 – 43.7)	31.5 (24.4 – 38.6)
41-60	21.5 (12.5 – 30.6)	26.7 (17.4 – 36.1)	24.2 (17.7 – 30.8)
61-80+	35.4 (24.9 – 46.0)	25.6 (16.4 – 34.8)	30.3 (23.3 – 37.3)

There are significantly more injuries sustained in the second period of the first half for backs and forwards and in the second period of the second half for backs.

4.2j Removal of injured players from the pitch

For all injuries sustained in the period 2008 to 2016, 39.0% of players were removed from play immediately, 26.7% were removed later in the game and 34.5% remained on the pitch until the end of the game.

5 Summary

There is no evidence to suggest that players competing in the World Rugby U20 Trophy have increased in stature or body mass in the period 2008 to 2016. Players competing in the WRT are significantly shorter and lighter than players competing in World Rugby Championship (WRC) tournaments (Fuller and Taylor, 2016).

The incidence of injury sustained in WRT tournaments has increased over the last 3 tournaments; the incidence is currently higher than that seen in the World Rugby Championship and is approaching that recorded for players in senior international games. The severity of injuries sustained in WRT tournaments, however, has not changed significantly over this period.

The small number of injuries recorded in individual tournaments means that incidence and severity values tend to show larger variations from year-to-year compared to results for the WRC and RWC. The results presented here for the WRT tournaments and the companion report for WRC 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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