



# **World Rugby**

## **Surveillance Studies**

### **World Rugby U20 Championship**

Summary of Results: 2008 to 2015

Colin Fuller and Aileen Taylor

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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 Championship (previously known as the Junior World Championship) reported the incidence and nature of match injuries sustained during tournaments from 2008 to 2014 (Fuller and Taylor, 2014). The current report continues the on-going study of the World Rugby U20 Championship (WRC) by reporting match injuries sustained during the 2015 tournament.

This review also combines the new data, obtained from the 2015 tournament, with data reported previously in order to provide an updated review of the risks of injury in the World Rugby U20 Championship.

## 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 WRC 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 WRC 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 types of injury 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 occurred by chance due to the number of statistical comparisons made in the study.

### 3 Data collection

At the beginning of the 2015 WRC 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 sustained during a WRC 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 WRC tournaments (2008 to 2014) have been presented in an earlier report (Fuller and Taylor, 2014).

The 2015 WRC tournament took place in Italy from 2 to 20 June 2015. This study recorded players' anthropometric data and match injuries sustained by 11 (Argentina, Australia, England, France, Ireland, Italy, Japan, New Zealand, Scotland, South Africa, Wales) of the 12 countries taking part in the 2015 tournament.

#### 4.1 Players' anthropometric data

Table 1 summarises the numbers and anthropometric data for players categorised as backs, forwards and all players competing at the 2015 WRC tournament together with mean values obtained for players over the period 2008 to 2015. 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.

Based on the 'All-tournament' data, backs and forwards competing in the WRC are significantly taller ( $p < 0.001$ ) and heavier ( $p < 0.001$ ) than players competing in WR U20 Trophy tournaments (Fuller and Taylor, 2015).

Table 1: Players' anthropometric data for 2015 and the mean data for the period 2008 - 2015.

Year / Measure	Mean (Standard deviation, number of players)		
	Backs	Forwards	ALL players
<b>2015</b>			
Stature, cm	181.2 (5.6, 138)	188.1 (7.2, 180)	185.1 (7.3, 318)
Body mass, Kg	88.2 (7.8, 138)	107.5 (9.3, 180)	99.1 (12.9, 318)
Age, years	19.1 (0.66, 138)	19.2 (0.65, 180)	19.2 (0.66, 318)
<b>ALL tournaments (2008 – 2015)</b>			
Stature, cm	181.7 (5.8, 1038)	188.1 (6.9, 1285)	185.2 (7.2, 2323)
Body mass, Kg	88.4 (7.6, 1036)	106.5 (8.9, 1284)	98.4 (12.3, 2320)
Age, years	19.1 (0.90, 1048)	19.2 (0.86, 1290)	19.2 (0.88, 2338)

Trends in players' stature and body mass over the period 2008 to 2015 are presented for backs and forwards in Figures 1 and 2.

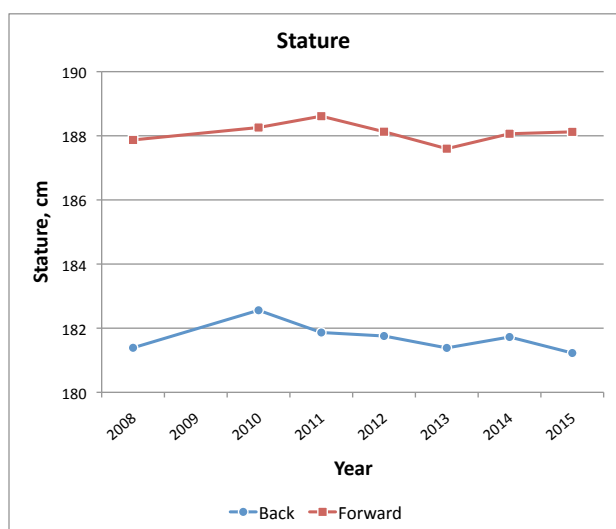


Figure 1. Trends in players' stature

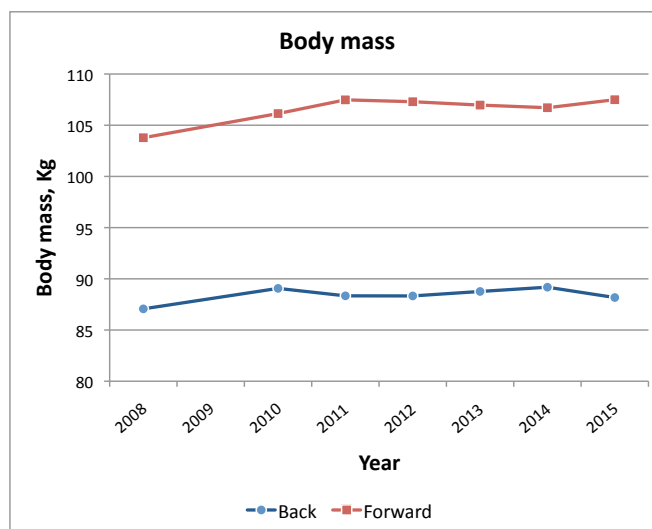


Figure 2. Trends in players' body mass

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 2015.

## 4.2 Match injuries

### 4.2a Incidence of injury

Table 2 summarises the numbers of match injuries, match exposures and incidences of match injuries for backs, forwards and all players during the 2015 WRC tournament together with the mean values for the period 2008 to 2015.

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
<b>2015</b>			
Injuries	24	42	66
Exposure	513.3	586.7	1100.0
Incidence	46.8 (31.3 – 69.8)	71.6 (52.9 – 96.9)	60.0 (47.1 – 76.4)
<b>ALL tournaments (2008 – 2015)</b>			
Injuries	201	243	444
Exposure	3920.0	4480.0	8400.0
Incidence	51.3 (44.7 – 58.9)	54.2 (47.8 – 61.5)	52.9 (48.2 – 58.0)

There are no significant differences in the incidences of injury between backs and forwards for either the 2015 WRC ( $p=0.097$ ) or for the mean values over the period 2008 – 2015 ( $p=0.562$ ).

Based on the 'All tournament' data for all players, the incidence of injury recorded at WRC tournaments is significantly higher ( $p<0.001$ ) than that recorded at the WRT (Fuller and Taylor, 2015).

Trends in the incidence of injury over the period 2008 to 2015 are presented for backs and forwards in Figure 3.

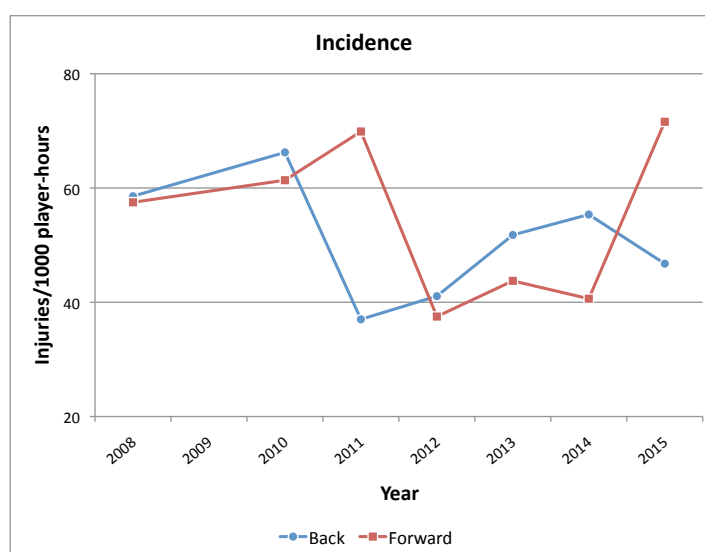


Figure 3. Trends in the incidence of injury

## 4.2b Severity of injury

Table 3 summarises the mean and median severities of all injuries sustained at the 2015 WRC tournament and over the period 2008 to 2015 as a function of playing position. Based on the 'All tournament' injury data, there are no significant differences between backs and forwards for either the mean ( $p=0.075$ ) or median ( $p=0.676$ ) severity of injury.

Table 3: Mean and median severity of all match injuries sustained in at the 2015 WRC and over the period 2008 to 2015.

Measure	Severity (95% Confidence interval), days		
	Backs	Forwards	ALL players
<b>2015</b>			
Mean	35.4 (12.8 – 58.1)	33.8 (17.7 – 50.0)	34.4 (21.4 – 47.5)
Median	10 (3 – 36)	11 (4 – 28)	11 (5 – 23)
<b>ALL tournaments (2008 – 2015)</b>			
Mean	26.5 (20.0 – 33.0)	36.1 (28.0 – 44.1)	31.7 (26.4 – 37.0)
Median	8 (6 – 9)	7 (6 – 9)	7 (6 – 9)

The mean severities of injury sustained by backs and forwards over the period 2008 to 2015 are presented in Figure 4. There are no statistically significant trends in the mean severity of injury over this period for either backs or forwards.

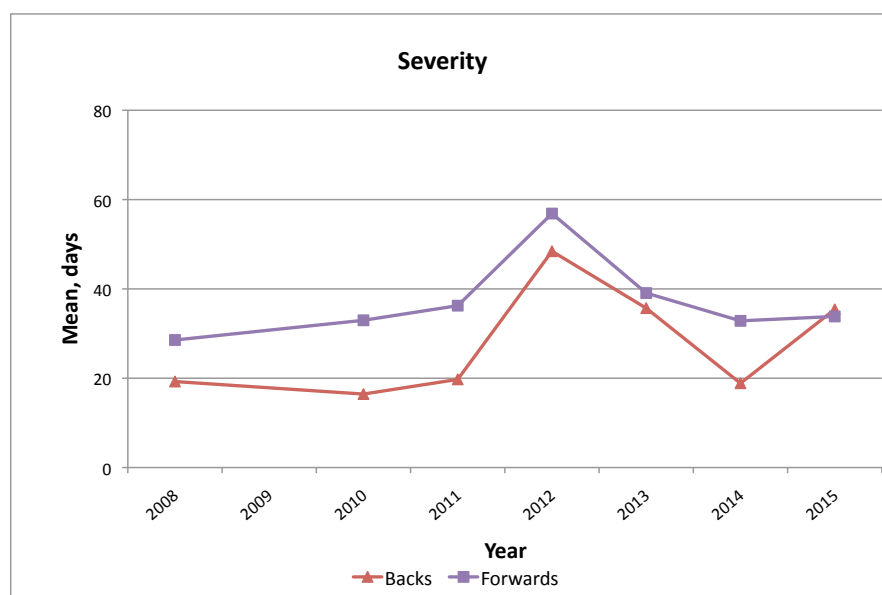


Figure 4. Trends in the mean severity of injury

## 4.2c Location of injury

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

Table 4: Locations of all match injuries sustained in the period 2008 to 2015.

Location of injury	% (95% Confidence interval)		
	<i>Backs</i>	<i>Forwards</i>	<i>ALL players</i>
<b>ALL tournaments (2008 – 2015)</b>			
<b>Head/neck</b>	12.8 (8.1 – 17.4)	16.8 (12.0 – 21.6)	15.0 (11.6 – 18.3)
Head/face	11.7 (7.2 – 16.2)	15.1 (10.5 – 19.7)	13.6 (10.3 – 16.8)
Neck/cerv <sup>l</sup> spine	1.0 (0 – 2.4)	1.7 (0.0 – 3.4)	1.4 (0.3 – 2.5)
<b>Upper limbs</b>	26.0 (19.9 – 32.2)	29.3 (23.5 – 35.2)	27.8 (23.6 – 32.0)
Shoulder/clavicle	17.3 (12.0 – 22.6)	22.4 (17.0 – 27.8)	20.1 (16.3 – 23.9)
Upper arm	0.0 ( - )	0.4 (0 – 1.3)	0.2 (0 – 0.7)
Elbow	1.5 (0 – 3.2)	2.6 (0.5 – 4.6)	2.1 (0.7 – 3.5)
Forearm	0.0 ( - )	0.4 (0 – 1.3)	0.2 (0 – 0.7)
Wrist	0.0 ( - )	0.9 (0 – 2.1)	0.5 (0 – 1.1)
Hand/fingers	7.1 (3.5 – 10.7)	2.6 (0.5 – 4.6)	4.7 (2.7 – 6.7)
<b>Trunk</b>	7.7 (3.9 – 11.4)	7.8 (4.3 – 11.2)	7.7 (5.2 – 10.2)
Ribs/upper back	5.1 (2.0 – 8.2)	3.0 (0.8 – 5.2)	4.0 (2.1 – 5.8)
Abdomen	0.5 (0 – 1.5)	1.3 (0 – 2.7)	0.9 (0.0 – 1.8)
Low back	1.0 (0 – 2.4)	1.3 (0 – 2.7)	1.2 (0.2 – 2.2)
Sacrum/pelvis	1.0 (0 – 2.4)	2.2 (0.3 – 4.0)	1.6 (0.4 – 2.8)
<b>Lower limbs</b>	53.6 (46.6 – 60.6)	46.1 (39.7 – 52.5)	49.5 (44.8 – 54.3)
Hip/groin	4.1 (1.3 – 6.9)	1.3 (0 – 2.7)	2.6 (1.1 – 4.1)
Thigh, anterior	4.1 (1.3 – 6.9)	5.6 (2.6 – 8.6)	4.9 (2.9 – 7.0)
Thigh, posterior	7.7 (3.9 – 11.4)	4.3 (1.7 – 6.9)	5.8 (3.6 – 8.1)
Knee	13.3 (8.5 – 18.0)	15.1 (10.5 – 19.7)	14.3 (10.9 – 17.6)
L-leg/Achilles	5.6 (2.4 – 8.8)	3.0 (0.8 – 5.2)	4.2 (2.3 – 6.1)
Ankle	14.3 (9.4 – 19.2)	14.7 (10.1 – 19.2)	14.5 (11.2 – 17.8)
Foot/toe	4.6 (1.7 – 7.5)	2.2 (0.3 – 4.0)	3.3 (1.6 – 5.0)

Based on the 'All tournament' data, the majority of injuries sustained by backs and forwards are lower (backs: 53.6%; forwards: 46.1%) and upper (backs: 26.0%; forwards: 29.3%) limb injuries. The shoulder/clavicle is the most vulnerable sub-location for both backs (17.3%) and forwards (22.4%) followed by the ankle (14.3%) and knee (13.3%) for backs and the knee (15.1%) and head/face (15.1%) for forwards. There are no statistically significant differences between backs and forwards in the proportions of injuries sustained at each of the main body locations.

## 4.2d Type of injury

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

Table 5: Types of all match injuries sustained in the period 2008 to 2015.

Type of injury	% (95% Confidence interval)		
	<i>Backs</i>	<i>Forwards</i>	<i>ALL players</i>
<b>ALL tournaments (2008 – 2015)</b>			
<b>Bone</b>	8.2 (4.3 – 12.0)	6.0 (3.0 – 9.1)	7.0 (4.6 – 9.4)
Fracture	7.7 (3.9 – 11.4)	3.4 (1.1 – 5.8)	5.4 (3.2 – 7.5)
Other bone	0.5 (0 – 1.5)	2.6 (0.5 – 4.6)	1.6 (0.4 – 2.8)
<b>CNS/PNS</b>	10.7 (6.4 – 15.0)	13.8 (9.4 – 18.2)	12.4 (9.3 – 15.5)
Concussion	8.7 (4.7 – 12.6)	11.2 (7.1 – 15.3)	10.0 (7.2 – 12.9)
Nerve	2.0 (0.1 – 4.0)	2.6 (0.5 – 4.6)	2.3 (0.9 – 3.8)
<b>Joint (non-bone)/lig<sup>t</sup></b>	42.9 (35.9 – 49.8)	53.9 (47.5 – 60.3)	48.8 (44.1 – 53.6)
Dislocation/sublux <sup>n</sup>	7.1 (3.5 – 10.7)	7.8 (4.3 – 11.2)	7.5 (5.0 – 10.0)
Lesion meniscus	2.0 (0.1 – 4.0)	4.3 (1.7 – 6.9)	3.3 (1.6 – 5.0)
Sprain/ligament	33.7 (27.1 – 40.3)	41.8 (35.5 – 48.2)	38.1 (33.5 – 42.7)
<b>Muscle/tendon</b>	35.7 (29.0 – 42.4)	23.3 (17.8 – 28.7)	29.0 (24.7 – 33.3)
Haematoma/etc	19.4 (13.9 – 24.9)	14.2 (9.7 – 18.7)	16.6 (13.1 – 20.1)
Muscle rupture/etc	12.8 (8.1 – 17.4)	7.3 (4.0 – 10.7)	9.8 (7.0 – 12.6)
Tendon injury/etc	3.6 (1.0 – 6.2)	1.7 (0.0 – 3.4)	2.6 (1.1 – 4.1)
<b>Skin</b>	1.5 (0 – 3.2)	2.6 (0.5 – 4.6)	2.1 (0.8 – 3.5)
Abrasion	0.0 ( - )	0.4 (0 – 1.3)	0.2 (0 – 0.7)
Laceration	1.5 (0 – 3.2)	2.2 (0.3 – 4.0)	1.9 (0.6 – 3.2)
<b>Other types</b>	1.0 (0 – 2.4)	0.4 (0 – 1.3)	0.7 (0 – 1.5)
Other	1.0 (0 – 2.4)	0.4 (0 – 1.3)	0.7 (0 – 1.5)

CNS/PNS: Central and peripheral nervous systems

Joint (non-bone)/ligament (backs: 42.9%; forwards: 53.9%) and muscle/tendon (backs: 35.7%; forwards: 23.3%) injuries are the most common main categories of injury sustained by both backs and forwards. Sprain/ligament (backs: 33.7%; forwards: 41.8%) and muscle haematoma (backs: 19.4%; forwards: 14.2%) injuries the most common specific types of injury sustained by backs and forwards.

There are no statistically significant differences between backs and forwards in the main types of injuries sustained at WRC tournaments over the period 2008 to 2015.

#### 4.2e Most common injuries and injuries creating the greatest burden

The most common injuries and the injuries causing the greatest burden in terms of days lost from training and match play are shown in Table 6.



Table 6: Most common injuries sustained and injuries causing the greatest burden (days lost) in the period 2008 to 2015.

<b><i>Backs</i></b>	<b><i>%</i></b>	<b><i>Forwards</i></b>	<b><i>%</i></b>
<b>All tournaments (2008 – 2015)</b>			
<b>Most common injuries, % of total number</b>			
Concussion	9.0	Concussion	11.5
Ankle lateral collateral ligament sprain	6.9	Acromioclavicular joint injuries	8.4
Hamstring muscle strain	6.9	Shoulder dislocation/subluxation	7.0
Acromioclavicular joint sprain	5.3	Knee MCL sprain	7.0
Thigh haematoma	5.3	Inferior tib-fib syndesmosis sprain	7.0
Knee MCL sprain	4.8	Thigh haematoma	6.2
<b>Injuries causing greatest burden, % of total days lost</b>			
Anterior cruciate ligament sprain	19.4	Anterior cruciate ligament sprain	22.1
Shoulder dislocation/subluxation	13.0	Shoulder dislocation/subluxation	19.6
Hamstring muscle strain	10.5	Knee MCL sprain	7.7
Acromioclavicular joint sprain	6.1	Inferior tib-fib syndesmosis sprain	7.4
Inferior tib-fib syndesmosis sprain	5.6	Acromioclavicular joint sprain	4.9
Knee MCL sprain	5.3	Concussion	4.1

The most common specific injury for both backs (9.0%) and forwards (11.5%) is concussion. Anterior cruciate ligament injuries (backs: 19.4%; forwards: 22.1%) and shoulder dislocation/subluxation (backs: 13.0%; forwards: 19.6%) together are responsible for the greatest time loss for both backs (>30% in total) and forwards (>40% in total).

#### 4.2f Nature of onset of injury

Table 7 summarises the nature of injury-onset at WRC tournaments as a function of playing position.

Table 7: Nature of the injury-onset of all match injuries sustained in the period 2008 to 2015.

<b>Nature of onset</b>	<b>% (95% Confidence interval)</b>		
	<b><i>Backs</i></b>	<b><i>Forwards</i></b>	<b><i>ALL players</i></b>
<b>All tournaments (2008 – 2015)</b>			
Acute	95.4 (92.5 – 98.3)	88.8 (84.8 – 92.9)	91.8 (89.3 – 94.4)
Gradual	4.6 (1.7 – 7.5)	11.2 (7.1 – 15.2)	8.2 (5.6 – 10.7)

Over 90% of all injuries sustained are acute in nature: there were significantly ( $p=0.012$ ) fewer acute and more gradual onset injuries sustained by forwards than backs.

#### 4.2g Cause of onset of injury

Table 8 summarises the cause of onset of match injuries at WRC tournaments as a function of playing position.

Table 8: Cause of onset of all injuries sustained in the period 2008 to 2015

Cause of onset	% (95% Confidence interval)		
	<i>Backs</i>	<i>Forwards</i>	<i>ALL players</i>
<b>All tournaments (2008 – 2015)</b>			
Contact	85.3 (80.2 – 90.3)	91.1 (87.4 – 94.8)	88.4 (85.4 – 91.5)
Non-contact	14.2 (9.2 – 19.2)	8.9 (5.2 – 12.6)	11.3 (8.3 – 14.4)
Other	0.5 (0 – 1.6)	0.0 ( - )	0.2 (0 – 0.7)

The majority of injuries sustained by backs and forwards are the result of contact events; there is no significant difference ( $p=0.063$ ) between backs and forwards in the proportions of contact and non-contact injuries.

#### 4.2h Match events leading to injury

Table 9 provides a summary of the match events leading to injury as a function of playing position.

Table 9: Match events leading to all injuries sustained in the period 2008 to 2015.

Cause of onset	% (95% Confidence interval)		
	<i>Backs</i>	<i>Forwards</i>	<i>ALL players</i>
<b>All tournaments (2008 – 2015)</b>			
Collision	13.0 (8.3 – 17.8)	17.6 (12.7 – 22.6)	15.5 (12.0 – 19.0)
Kicking	1.0 (0 – 2.5)	0.0 ( - )	0.5 (0 – 1.1)
Lineout	0.0 ( - )	3.5 (1.1 – 5.9)	1.9 (0.6 – 3.2)
Maul	1.0 (0 – 2.5)	4.4 (1.7 – 7.1)	2.9 (1.3 – 4.5)
Ruck	7.8 (4.0 – 11.6)	12.8 (8.4 – 17.1)	10.5 (7.6 – 13.4)
Running	12.0 (7.4 – 16.6)	6.2 (3.0 – 9.3)	8.8 (6.1 – 11.5)
Scrum	0.0 ( - )	7.0 (3.7 – 10.4)	3.8 (2.0 – 5.7)
Tackled	40.6 (33.7 – 47.6)	21.6 (16.2 – 26.9)	30.3 (25.9 – 34.7)
Tackling	21.4 (15.6 – 27.2)	22.9 (17.4 – 28.4)	22.2 (18.2 – 26.2)
Other	3.1 (0.7 – 5.6)	4.0 (1.4 – 6.5)	3.6 (1.8 – 5.4)

Being tackled (40.6%), tackling (21.4%) and collisions (13.0%) are the events responsible for the most injuries sustained by backs and tackling (22.9%), being tackled (21.6%) and collisions (17.6%) for forwards.

Sixty-five percent of all concussions result from either tackling (41.9%) or collisions (23.3%).

## 4.2i Time of injury

Table 10 provides a summary of the period in a match when injury events take place as a function of playing position.

Table 10: Time during matches of injuries sustained in the period 2008 to 2015.

Time of injury, min	% (95% Confidence interval)		
	<i>Backs</i>	<i>Forwards</i>	<i>ALL players</i>
<b>All tournaments (2008 – 2015)</b>			
0-20	15.5 (10.4 – 20.7)	20.7 (15.5 – 25.9)	18.4 (14.7 – 22.0)
21-40+	30.6 (24.2 – 37.1)	30.2 (24.3 – 36.1)	30.4 (26.0 – 34.7)
41-60	34.7 (28.0 – 41.4)	33.6 (27.5 – 39.7)	34.1 (29.6 – 38.6)
61-80+	19.2 (13.6 – 24.7)	15.5 (10.9 – 20.2)	17.2 (13.6 – 20.8)

There are significantly more injuries sustained in the second and third quarters compared to the first and fourth quarters for both backs ( $p < 0.001$ ) and forwards ( $p < 0.001$ ) over the period 2008 to 2015.

## 4.2j Removal of injured players from the pitch

Based on all injuries sustained over the period 2008 to 2015, 33.7% of players were removed from play immediately, 33.7% were removed later in the game and 32.6% remained on the pitch until the end of the game. For players with concussion, however, 55.8% of players were removed immediately, 25.6% were removed later in the game and 18.6% 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 Championship have increased in stature or body mass over the period 2008 to 2015. Players competing in the WRC are, however, significantly taller and heavier than players competing in the WRT. The incidence and severity of injuries sustained in the WRC have not changed significantly over the period 2008 to 2015. Lower limb injuries, especially to the knee and ankle and joint (non-bone)/ligament injuries are the most common locations and types of injury. The most common specific injury sustained by backs and forwards is concussion. Anterior cruciate ligament injuries, however, cause the greatest burden in terms of days lost to injury. The great majority of injuries are acute in nature and result from contact game activities with the tackle the main source of injuries.

The results presented here together with the results reported separately for the WRT (Fuller and Taylor, 2015) provide benchmarks for the incidence, severity, nature and causes of injury in international U-20 rugby.

## 6. References

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