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World Rugby

Surveillance Studies

Sevens World Series (Men)

Summary of Results: 2008/09 to 2018/19

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Summary of key points

- Although forwards are significantly heavier and taller than backs, the anthropometric measurements of both groups of players have remained essentially constant over the period 2008/09 to 2017/18. The ages of backs and forwards have continued to show a gradual increase since 2008/09.
- The overall incidence of injury in 2018/19 (152.0 injuries/1000 player-match-hours) was significantly higher ($p=0.003$) than the long-term average incidence of injury (122.4). Incidences of injury for both backs (163.4) and forwards (136.8) in 2018/19 were significantly higher than the long-term average values (backs: $p=0.034$; forwards: $p=0.035$).
- There were no significant changes in the mean or median severities of injuries sustained by backs or forwards in 2018/19 compared to the long-term average values.
- Injury burden levels for the SWS are $\sim 7,000$ days-absence/1000 player-match-hours backs and $\sim 6,000$ days-absence/1000 playermatch-hours for forwards. This level compares to $\sim 2,700$ days-absence/1000 player-match-hours for the Rugby World Cup.
- The most common locations for match injuries in the SWS are backs: ankle (16%), head/face (15%) and knee (15%); forwards: knee (16%), head/face (16%) and ankle (14%).
- The most common types of match injuries in the SWS are backs: ligament sprain (30%), muscle tear/strain (19%) and concussion (13%); forwards: ligament sprain (32%), muscle tear/strain (12%) and concussion (12%).
- Concussion remains the most common specific injury for backs (13%) and forwards (12%); the specific injuries responsible for most time-loss are hamstring strain (11%) for backs and ACL injuries (15%) for forwards.
- The majority of injuries sustained are acute in nature and result from contact events; however, backs sustain more non-contact injuries than forwards, which result mainly from running activities.
- Being-tackled (33%), tackling (23%) and running (16%) activities are the match events responsible for the most injuries.
- Two thirds of all injuries sustained in the SWS occur during the second half of games.
- Although training injury and illness data have been collected for six Series, the numbers of cases reported remain small, which limits the generalisations that can be presented.

1 Introduction

World Rugby is committed to implementing surveillance studies at all major World Rugby Tournaments and to disseminate the results within the wider 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 in men's Rugby Sevens reported the incidence and nature of match and training injuries sustained during the men's Sevens World Series (SWS) from 2008/09 to 2017/18 (Fuller and Taylor, 2018). Data collected in Rugby Sevens injury surveillance studies have also been used to address player welfare issues in a broader context (Fuller et al, 2015, 2016, 2017; Fuller, 2018).

This report continues the World Rugby on-going study of Rugby Sevens by reporting match and training injuries and illnesses sustained during the men's 2018/19 SWS. The review also combines the new data, from the men's 2018/19 SWS, with all data reported in previous men's Sevens World Series in order to provide an updated overview of the risks of injury in elite men's Rugby Sevens.

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 was: '*Any injury sustained during a Sevens World Series Tournament match or training activity 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*'. 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*'.

Specific injuries were classified using OSICS 8 (Orchard, 2010). Injury location, type and cause together with the event leading to the injury were also recorded.

The definition of an illness used in this study was: '*Any medical condition sustained while travelling to a Sevens World Series Tournament, while at a Tournament or while travelling home at the end of a Tournament that prevents a player from taking a full part in all training activities and/or match play for more than one day following the day of onset of the illness*'.

Injuries and illnesses that were not related directly to SWS rugby-related activities are not included in this report.

Injury/illness severity was determined by the number of days a player was injured/ill: a player was deemed to be 'injured/ill' 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/ill players were followed up after each Tournament to obtain their return-to-play date: the return-to-play dates for players with injuries/illnesses that remained unresolved 3 months after the final Tournament in the Series were defined on the basis of the player's medical staff's clinical judgement and prognosis. The complete lists of categories and sub-categories used for categorising 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. Differences in injury numbers were assessed using the chi-squared test. Statistical significance was accepted at the $p \leq 0.05$ level; it is recognised that this could identify some differences as being statistically significant when they in fact occur by chance, due to the number of comparisons being made in the study.

3 Data collection

At the beginning of each SWS, the purpose of the epidemiological study was outlined to each participating team. 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 country's squad at a later date were added to the list of players and the anthropometric data recorded at the time the player joined the squad.

Medical staff recorded injuries/illnesses sustained during each tournament on a Tournament Summary of Injuries and Illnesses Report Form, which was returned to the study co-ordinator at the end of each Tournament. A member of the team's medical staff also recorded detailed information about each injury and illness on an Injury/Illness Report Form (date of injury/illness, date of return to play, location and type of injury/illness, 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

In the 2015/16 SWS, the number of tournaments increased from 9 to 10 and this format continued in the 2018/19 Series. The 2018/19 SWS tournaments (Dubai, South Africa, New Zealand, Australia, USA, Canada, Hong Kong, Singapore, England, France) took place over the period 30 November 2018 to 2 June 2019.

This study recorded players' anthropometric data and match and training injuries, illnesses and exposures for all fifteen core teams (Argentina, Australia, Canada, England, Fiji, France, Japan, Kenya, New Zealand, Samoa, Scotland, South Africa, Spain, USA, Wales) taking part in the 2018/19 SWS tournaments.

4.1 Anthropometric data

Table 1 summarises the numbers and anthropometric data for players categorised as backs, forwards and all players in the 2018/19 SWS together, for comparison, with values averaged over the period 2008/09 to 2018/19.

Table 1: Players' anthropometric data: 2018/2019 SWS.

Series / Measure	Mean (Standard deviation, number of players)		
	Backs	Forwards	ALL players
2018/19			
Stature, cm	179.9 (6.3, 218)	186.8 (5.1, 142)	182.6 (6.8, 360)
Body mass, Kg	86.0 (7.7, 217)	95.5 (6.3, 142)	89.7 (8.5, 359)
Age, years	23.6 (3.6, 218)	24.9 (4.1, 142)	24.1 (3.9, 360)
All Series (2008/09 – 2018/19)			
Stature, cm	180.5 (6.3, 1931)	187.2 (5.3, 1289)	183.2 (6.8, 3239)
Body mass, Kg	86.8 (7.6, 1934)	96.8 (6.6, 1289)	90.8 (8.7, 3242)
Age, years	23.4 (3.4, 1933)	24.4 (3.7, 1290)	23.8 (3.6, 3242)

During 2018/19, forwards were significantly ($p < 0.001$) older, taller and heavier than backs.

Trends in players' age, stature and body mass over the period 2008/09 to 2018/19 are shown in Figures 1 to 3, respectively.

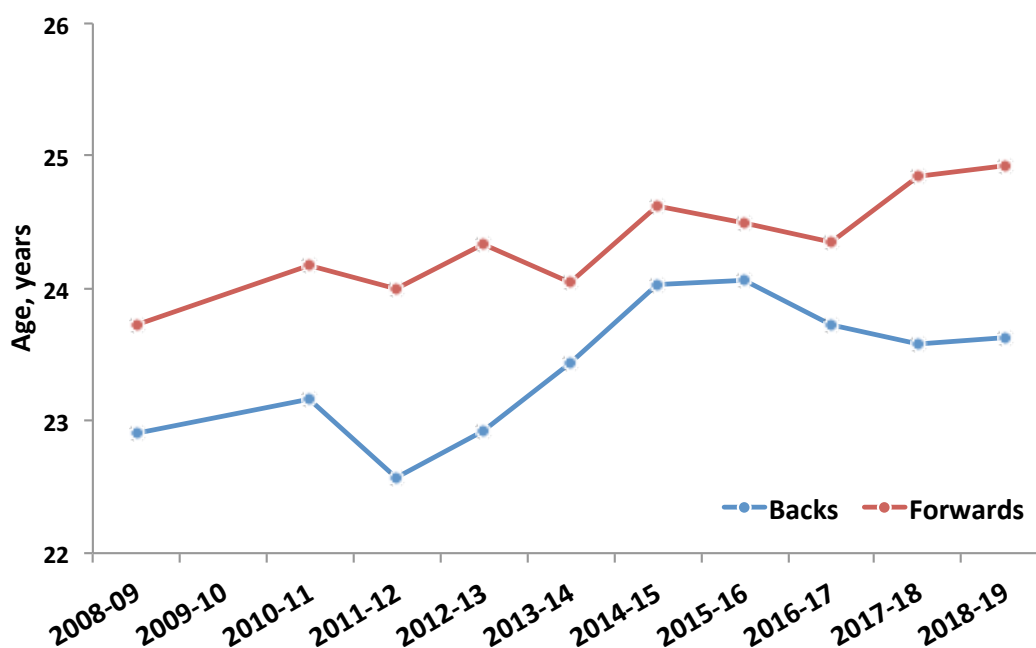


Fig 1. Long-term trends in players' age (years)

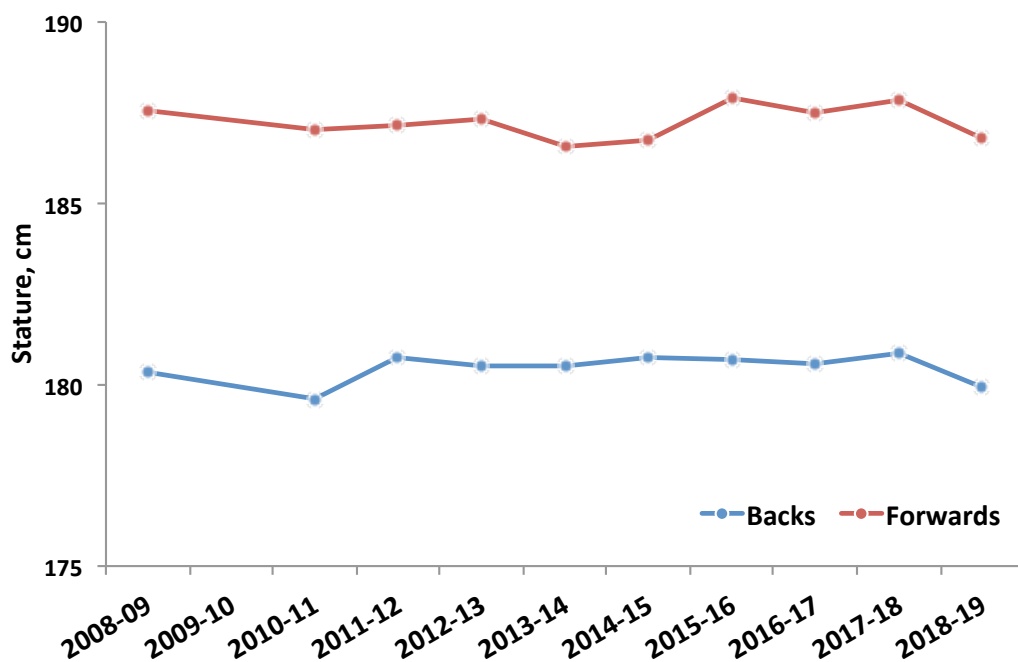


Fig 2. Long-term trends in players' stature (cm)

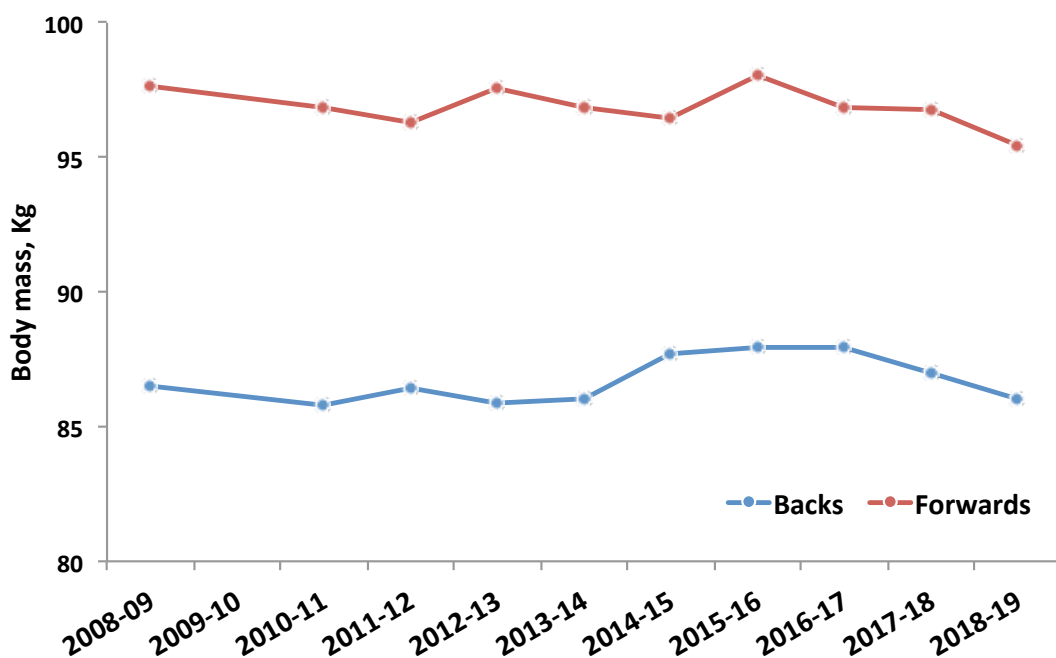


Fig 3. Long-term trends in players' body mass (Kg)

Averaged over the period 2008/09 to 2018/19, forwards were also significantly ($p < 0.001$) older, taller and heavier than backs. There has been a trend for

increasing age among both backs ($p=0.023$) and forwards ($p=0.001$) over the period 2008/09 to 2018/19 but there have been no significant trends in the stature (backs: $p=0.532$; forwards: $p=0.858$) or body mass (backs: $p=0.256$; forwards: $p=0.230$) of players.

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 2018/19 SWS and the equivalent values over the period 2008/09 to 2018/19.

Table 2: Number, match exposure (player-hours) and incidence (injuries/1000 player-match-hours, 95% confidence interval) of match injuries: 2018/19 SWS.

Series / Measure	Backs	Forwards	ALL players
2018/19			
Injuries	129	81	210
Exposure	789.6	592.2	1,381.8
Incidence	163.4 (137.5 – 194.1)	136.8 (110.0 – 170.1)	152.0 (132.8 – 174.0)
All Series (2008/09 – 2018/19)			
Injuries	913	548	1461
Exposure	6,819.2	5,114.4	11,933.6
Incidence	133.9 (125.5 – 142.9)	107.1 (98.5 – 116.5)	122.4 (116.3 – 128.9)

The high incidences of injury for backs and forwards first reported in 2016/17 were again observed during 2018/19. The incidence of injury sustained by backs compared to forwards was again higher during the 2018/19 SWS but the difference did not reach statistical significance ($p=0.211$). The overall incidence of injury in 2018/19 was significantly higher ($p=0.003$) than the long-term average incidence of injury. The 2018/19 incidences of injury for backs and forwards were also significantly higher than their long-term average values (backs: $p=0.034$; forwards: $p=0.035$).

The long-term trend (figure 4) for the incidence of injury sustained by backs to be higher than that of forwards is statistically significant ($p<0.001$). Over the period from 2008/09 to 2018/19, there are statistically significant increasing trends in the incidences of injury for backs ($p=0.011$) and forwards ($p=0.054$).

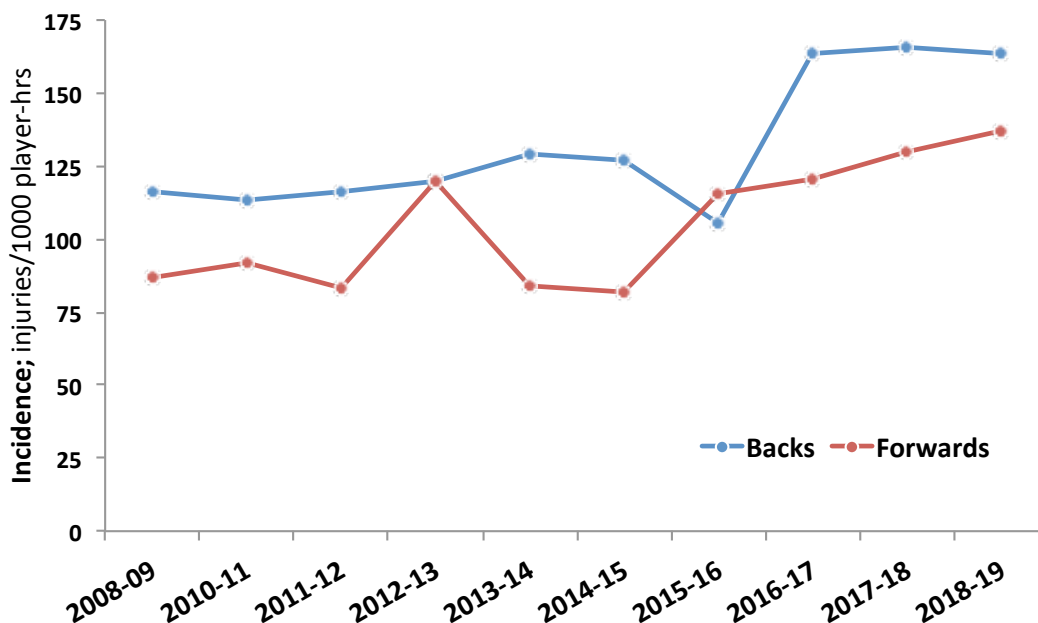


Figure 4. Long-term trends in the incidence of match injuries

4.2b Severity of injury

Table 3 summarises the mean and median severities of injuries sustained during the 2018/19 SWS for backs, forwards and all players and the equivalent average values observed over the period 2008/09 to 2018/19.

Table 3: Mean and median severities of match injuries: 2018/19 SWS.

Series / Measure	Severity (95% Confidence interval), days		
	Backs	Forwards	ALL players
2018/19			
Mean	43.9 (35.0 – 52.7)	45.5 (33.7 – 57.3)	44.5 (37.4 – 51.6)
Median	26.0 (21 – 33)	28.0 (21 – 42)	28.0 (22 – 31)
All Series (2008/09 – 2018/19)			
Mean	43.2 (39.9 – 46.4)	42.7 (37.9 – 47.5)	43.0 (40.3 – 45.7)
Median	27.0 (23 – 29)	23.0 (21 – 26)	25.0 (23 – 27)

There were no significant differences between backs and forwards for either the mean ($p=0.826$) or median ($p=0.894$) severity of injuries sustained in the 2018/19 SWS. Similarly, there are no significant differences between backs and forwards for either the mean ($p=0.865$) or median ($p=0.193$) severity of injuries over the period 2008/09 to 2018/19.

Trends in the mean and median injury severity values over the period 2008/09 to 2018/19 for backs and forwards are shown in Figures 5 and 6.

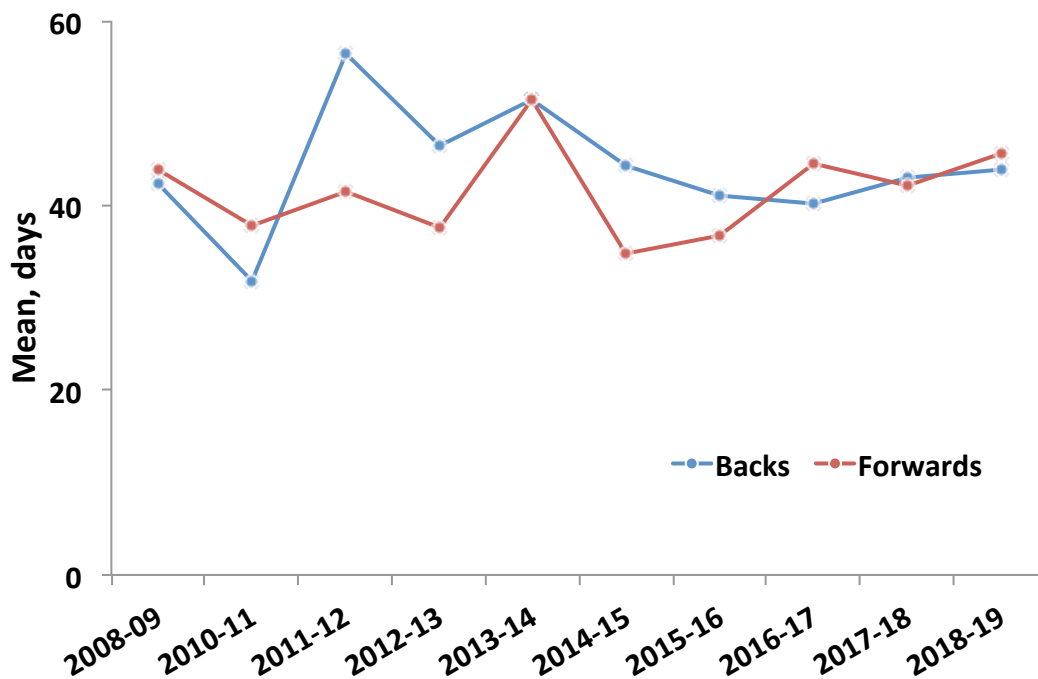


Fig 5. Long-term trends in mean severity

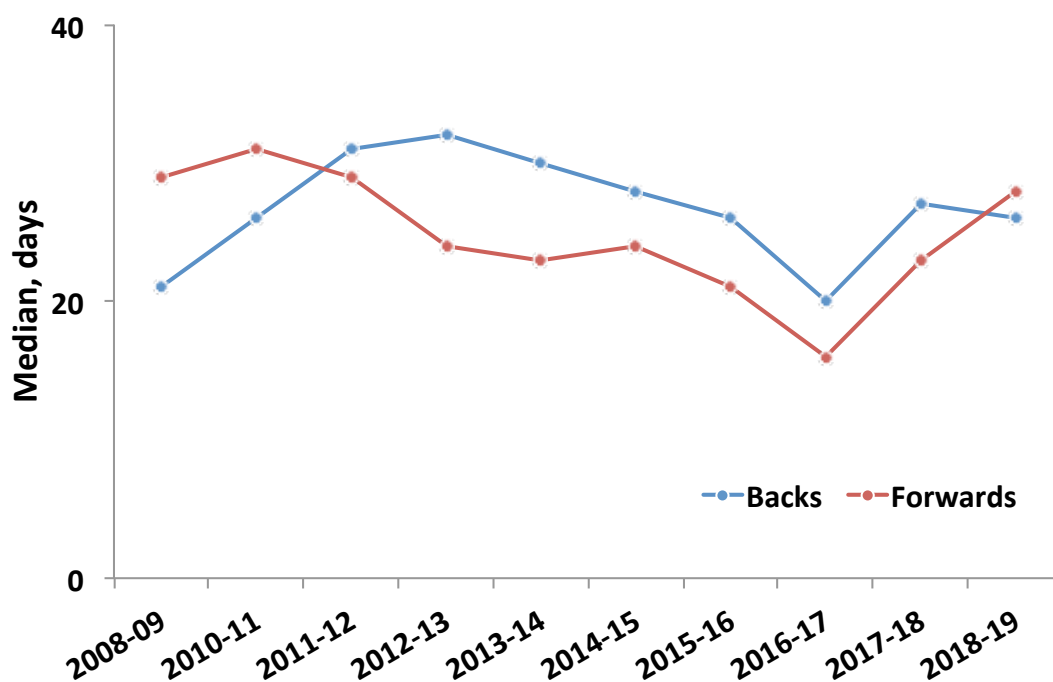


Fig 6. Long-term trends in median severity

There have been no statistically significant trends, over the period 2008/09 to 2018/19, in the mean severity of injuries sustained by backs ($p=0.937$) or forwards ($p=0.724$). There is similarly no significant trend in the median severity of injuries for backs ($p=0.888$) and the previous observation of a downward trend in the median severity of injuries sustained by forwards has disappeared ($p=0.091$), due to a further increase in the median severity of injuries sustained by forwards during the 2018/19 SWS.

The revised injury severity bands introduced in the 2017/18 SWS report for the more severe injuries have again been used in this report in order to provide a better description of injury severity. Current data can be compared to the data presented in previous SWS reports simply by combining the proportions of injuries now reported as 'severe' and 'major' and comparing this value with the data reported previously for 'severe' injuries.

Figures 7 and 8 show the proportions of injuries falling within the five revised severity categories for backs and forwards, respectively, over the period 2008/09 to 2018/19.

There are no significant differences in the distribution of the five injury severity groups between backs and forwards ($p=0.157$) over the period 2008/09 to 2018/19.

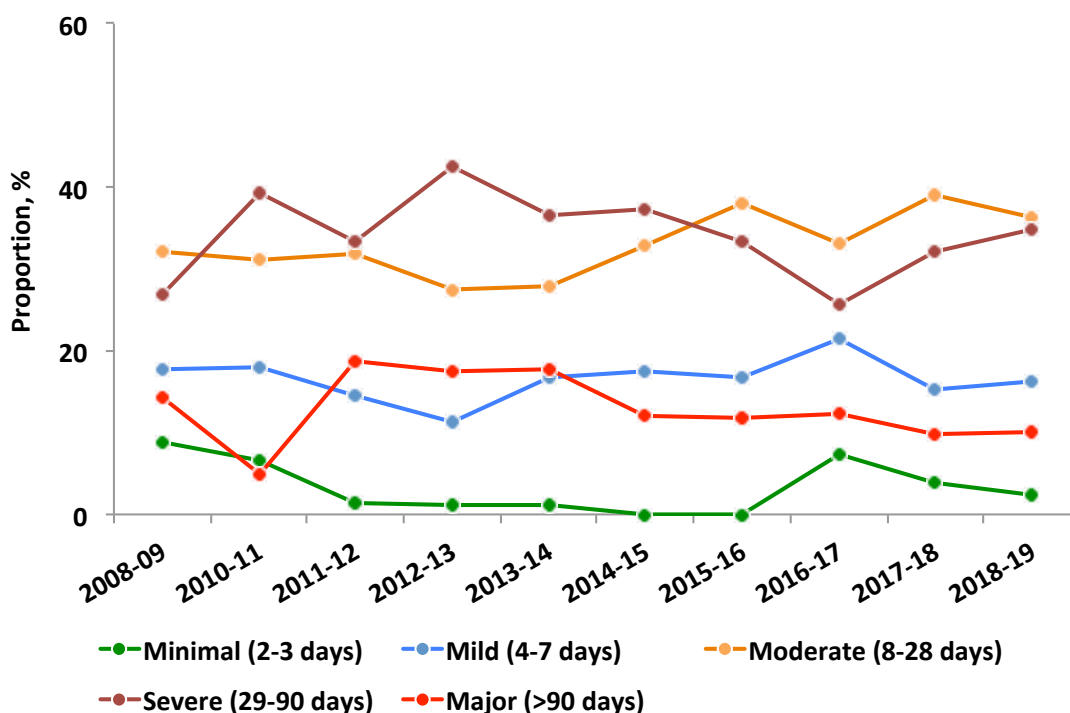


Fig 7. Long-term trends in injury severity categories for backs

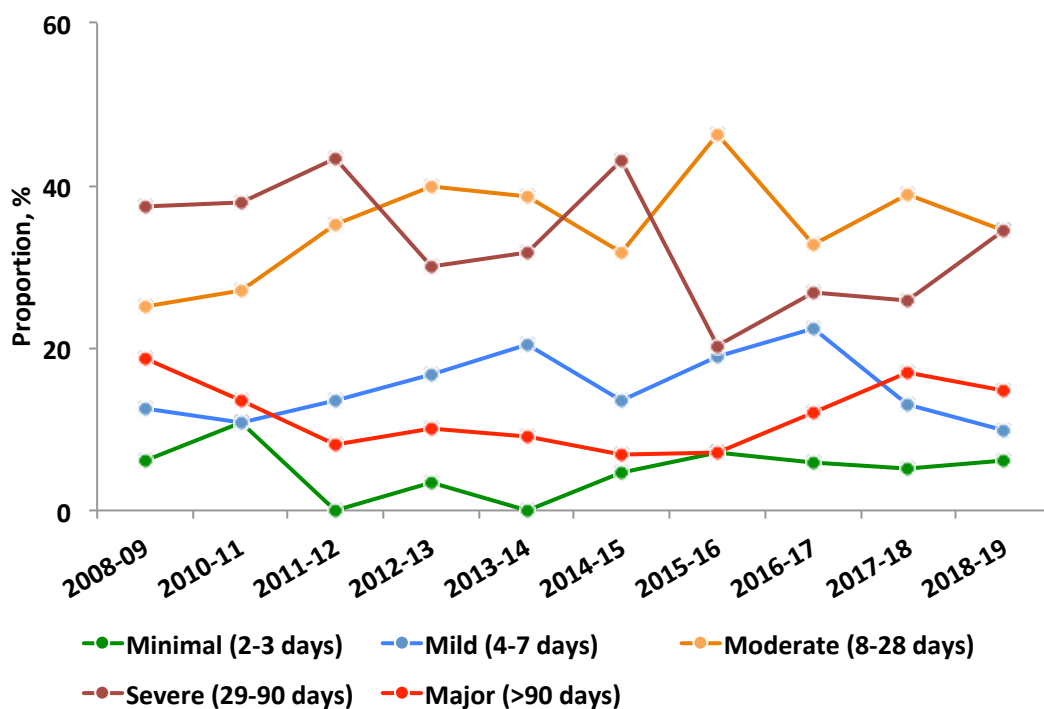


Fig 8. Long-term trends in injury severity categories for forwards

4.2c Injury burden

Injury burden (Fuller, 2018), expressed as days-absence/1000 player-match-hours, combines the parameters of incidence and mean severity. Figure 9 shows the variation of injury burden over the period from 2008/09 to 2018/19.

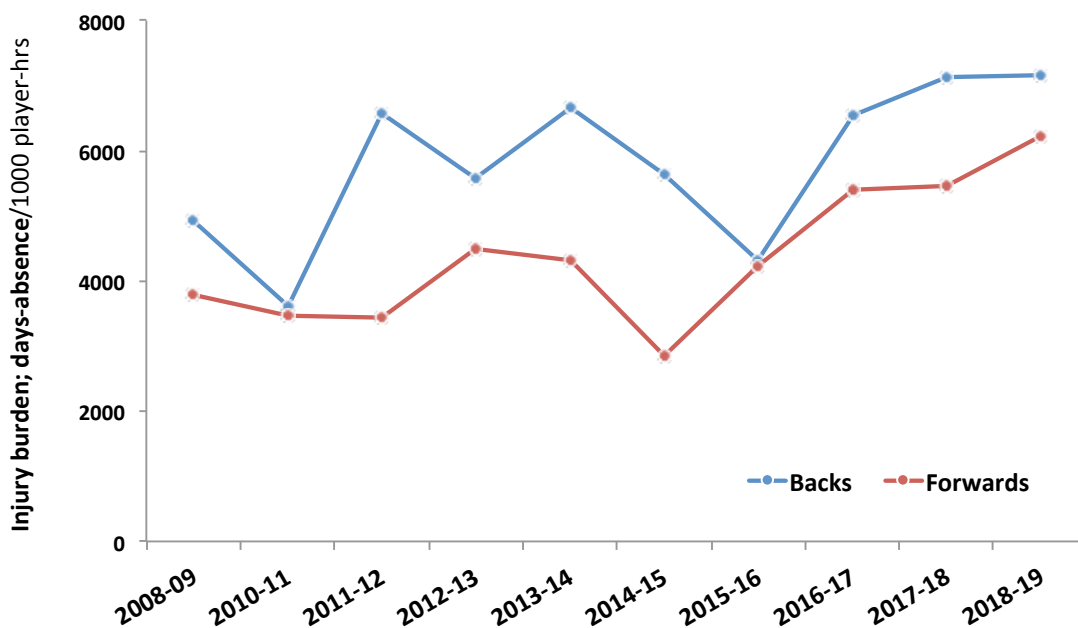


Fig 9. Long-term trends in injury burden for backs and forwards

Injury burden levels during the 2018/19 SWS rose to ~7,000 days-absence/1000 player-match-hours for backs and ~6,000 days-absence/1000 player-match-hours for forwards, which reflects the rising injury incidence values observed over the past three SWS seasons. Fifteen-a-side elite rugby competitions, such as the Rugby World Cup (Fuller et al., 2017), lead to an injury burden of ~2,700 days' absence/1000 player hours (incidence: 90 injuries/1000 player-match-hours; mean severity: 30 days).

4.2d Location of injury

Tables 4 summarises the main and sub-locations of injuries sustained during the 2018/19 SWS for backs, forwards and all players.

Table 4: Locations of match injuries sustained: 2018/19 SWS.

Location of injury	% (95% Confidence interval)		
	Backs	Forwards	ALL players
2018/19			
Head/neck	18.8 (12.0 – 25.5)	13.6 (6.1 – 21.0)	16.7 (11.7 – 21.8)
Head/face	18.8 (12.0 – 25.5)	13.6 (6.1 – 21.0)	16.7 (11.7 – 21.8)
Neck/cerv ¹ spine	0.0 (-)	0.0 (-)	0.0 (-)
Upper limbs	20.3 (13.3 – 27.3)	17.3 (9.0 – 25.5)	19.1 (13.8 – 24.5)
Shoulder/clavicle	14.8 (8.7 – 21.0)	4.9 (0.2 – 9.7)	11.0 (15.2)
Upper arm	0.8 (0 – 2.3)	1.2 (0 – 3.6)	1.0 (0 – 2.3)
Elbow	1.6 (0 – 3.7)	1.2 (0 – 3.6)	1.4 (0 – 3.0)
Forearm	0.0 (-)	0.0 (-)	0.0 (-)
Wrist	0.8 (0 – 2.3)	1.2 (0 – 3.6)	1.0 (0 – 2.3)
Hand/fingers	2.3 (0 – 5.0)	8.6 (2.5 – 14.8)	4.8 (1.9 – 7.7)
Trunk	3.9 (0.5 – 7.3)	9.9 (3.4 – 16.4)	6.2 (2.9 – 9.5)
Ribs/upper back	3.1 (0.1 – 6.1)	6.2 (0.9 – 11.4)	4.3 (1.6 – 7.1)
Abdomen	0.0 (-)	1.2 (0 – 3.6)	0.5 (0 – 1.4)
Low back	0.8 (0 – 2.3)	2.5 (0 – 5.8)	1.4 (0 – 3.0)
Sacrum/pelvis	0.0 (-)	0.0 (-)	0.0 (-)
Lower limbs	57.0 (48.5 – 65.6)	59.3 (48.6 – 70.0)	57.9 (51.2 – 64.6)
Hip/groin	5.5 (1.5 – 9.4)	3.7 (0 – 7.8)	4.8 (1.9 – 7.7)
Thigh, anterior	2.3 (0 – 5.0)	2.5 (0 – 5.8)	2.4 (0.3 – 4.5)
Thigh, posterior	12.5 (6.8 – 18.2)	11.1 (4.3 – 18.0)	12.0 (7.6 – 16.4)
Knee	11.7 (6.1 – 17.3)	11.1 (4.3 – 18.0)	11.5 (7.2 – 15.8)
L-Leg/Achilles	5.5 (1.5 – 9.4)	3.7 (0 – 7.8)	4.8 (1.9 – 7.7)
Ankle	17.2 (10.7 – 23.7)	23.5 (14.2 – 32.7)	19.6 (14.2 – 25.0)
Foot/toe	2.3 (0 – 5.0)	3.7 (0 – 7.8)	2.9 (0.6 – 5.1)

The main and sub-locations of injuries for backs and forwards, averaged over the period 2008/09 to 2018/19, are shown, as a function of playing position, in Table 5.

The most common locations for match injuries sustained by backs over the period 2008/09 to 2018/19 are the ankle (16.2%), head/face (15.4%), knee (15.3%) and posterior thigh (11.9%); for forwards they are the knee (16.2%), head/face (16.2%), ankle (14.1%) and shoulder/clavicle (12.4%).

Table 5: Locations of match injuries sustained: 2008/09 to 2018/19 SWS.

Location of injury	% (95% Confidence interval)		
	<i>Backs</i>	<i>Forwards</i>	<i>ALL players</i>
All Series (2008/09 – 2018/19)			
Head/neck	16.2 (13.9 – 18.6)	18.1 (14.8 – 21.3)	16.9 (15.0 – 18.9)
Head/face	15.4 (13.0 – 17.7)	16.2 (13.2 – 19.3)	15.7 (13.8 – 17.6)
Neck/cerv ^l spine	0.9 (0.3 – 1.5)	1.8 (0.7 – 2.9)	1.2 (0.7 – 1.8)
Upper limbs	18.6 (16.0 – 21.1)	19.9 (16.5 – 23.2)	19.1 (17.0 – 21.1)
Shoulder/clavicle	11.5 (9.5 – 13.6)	12.4 (9.6 – 15.2)	11.9 (10.2 – 13.5)
Upper arm	0.8 (0.2 – 1.3)	0.2 (0 – 0.5)	0.5 (0.2 – 0.9)
Elbow	1.2 (0.5 – 1.9)	0.7 (0.0 – 1.4)	1.0 (0.5 – 1.5)
Forearm	0.5 (0.1 – 1.0)	0.4 (0 – 0.9)	0.5 (0.2 – 0.9)
Wrist	0.4 (0.0 – 0.9)	1.6 (0.6 – 2.7)	0.9 (0.5 – 1.5)
Hand/fingers	4.1 (2.8 – 5.3)	4.6 (2.8 – 6.3)	4.2 (3.2 – 5.3)
Trunk	4.9 (3.5 – 6.3)	7.8 (5.6 – 10.1)	6.0 (4.8 – 7.3)
Ribs/upper back	2.6 (1.6 – 3.7)	4.0 (2.4 – 5.7)	3.2 (2.3 – 4.0)
Abdomen	0.7 (0.1 – 1.2)	1.1 (0.2 – 2.0)	0.8 (0.4 – 1.3)
Low back	1.1 (0.4 – 1.8)	1.6 (0.6 – 2.7)	1.3 (0.7 – 1.9)
Sacrum/pelvis	0.5 (0.1 – 1.0)	1.1 (0.2 – 2.0)	0.8 (0.3 – 1.2)
Lower limbs	60.3 (57.1 – 63.4)	54.2 (50.0 – 58.4)	58.0 (55.5 – 60.5)
Hip/groin	2.9 (1.8 – 3.9)	2.9 (1.5 – 4.3)	2.9 (2.0 – 3.7)
Thigh, anterior	4.9 (3.5 – 6.3)	5.3 (3.4 – 7.2)	5.1 (3.9 – 6.2)
Thigh, posterior	11.9 (9.8 – 14.0)	6.0 (4.0 – 8.0)	9.7 (8.1 – 11.2)
Knee	15.3 (12.9 – 17.6)	16.2 (13.2 – 19.3)	15.6 (13.8 – 17.5)
L-Leg/Achilles	6.0 (4.5 – 7.6)	6.4 (4.3 – 8.4)	6.2 (4.9 – 7.4)
Ankle	16.2 (13.9 – 18.6)	14.1 (11.1 – 17.0)	15.4 (13.6 – 17.3)
Foot/toe	3.1 (2.0 – 4.2)	3.3 (1.8 – 4.8)	3.2 (2.3 – 4.0)

Trends in the main body locations of all injuries for backs and forwards in the period 2008/09 to 2018/19 are shown in Figures 10 and 11, respectively.

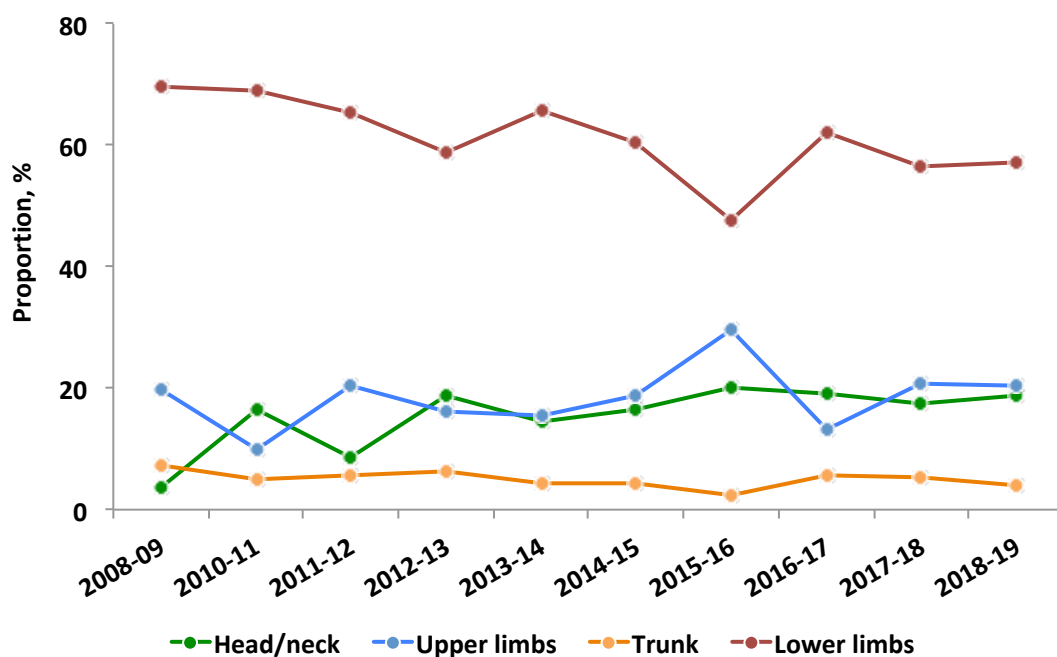


Fig 10. Long-term trends in main body locations of match injuries sustained by backs

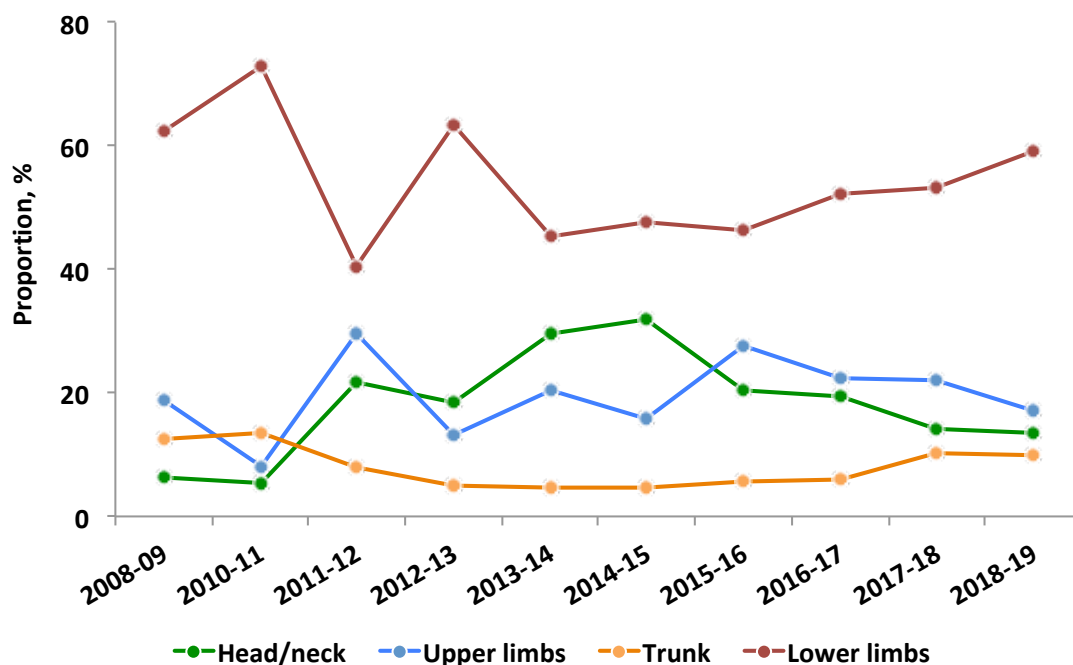


Fig 11. Long-term trends in main body locations of match injuries sustained by forwards

4.2e Type of injury

Table 6 details the types of injury sustained during the 2018/19 SWS, as a function of playing position.

Table 6: Types of match injuries sustained: 2018/19 SWS.

Type of injury	% (95% Confidence interval)		
	<i>Backs</i>	<i>Forwards</i>	<i>ALL players</i>
2018/19			
Bone	7.8 (3.2 – 12.5)	11.1 (4.3 – 18.0)	9.1 (5.2 – 13.0)
Fracture	3.9 (0.5 – 7.3)	7.4 (1.7 – 13.1)	5.3 (2.2 – 8.3)
Other bone	3.9 (0.5 – 7.3)	3.7 (0 – 7.8)	3.8 (1.2 – 6.4)
C/PNS	18.8 (12.0 – 25.5)	8.6 (2.5 – 14.8)	14.8 (10.0 – 19.7)
Concussion	17.2 (10.7 – 23.7)	7.4 (1.7 – 13.1)	13.4 (8.8 – 18.0)
Nerve	1.6 (0 – 3.7)	1.2 (0 – 3.6)	1.4 (0 – 3.0)
Joint (non-bone)/lig^t	38.3 (29.9 – 46.7)	34.6 (24.2 – 44.9)	36.8 (30.3 – 43.4)
Dislocation/sublux ⁿ	6.3 (2.1 – 10.4)	2.5 (0 – 5.8)	4.8 (1.9 – 7.7)
Lesion meniscus	8.6 (3.7 – 13.4)	4.9 (0.2 – 9.7)	7.2 (3.7 – 10.7)
Sprain/ligament	23.4 (16.1 – 30.8)	27.2 (17.5 – 36.8)	24.9 (19.0 – 30.7)
Muscle/tendon	33.6 (25.4 – 41.8)	34.6 (24.2 – 44.9)	34.0 (27.6 – 40.4)
Haematoma/etc	7.0 (2.6 – 11.5)	13.6 (6.1 – 21.0)	9.6 (5.6 – 13.6)
Muscle rupture/etc	18.8 ()	17.3 (9.0 – 25.5)	18.2 (13.0 – 23.4)
Tendon injury/etc	7.8 (3.2 – 12.5)	3.7 (0 – 7.8)	6.2 (2.9 – 9.5)
Skin	0.0 (-)	4.9 (0.2 – 9.7)	1.9 (0.1 – 3.8)
Abrasion	0.0 (-)	0.0 (-)	0.0 (-)
Laceration	0.0 (-)	4.9 (0.2 – 9.7)	1.9 (0.1 – 3.8)
Other types	1.6 (0 – 3.7)	6.2 (0.9 – 11.4)	3.3 (0.9 – 5.8)
Visceral	0.0 (-)	2.5 (0 – 5.8)	1.0 (0 – 2.3)
Other	1.6 (0 – 3.7)	3.7 (0 – 7.8)	2.4 (0.3 – 4.5)

C/PNS: Central and peripheral nervous systems

The increasing trend previously observed in the proportion of concussion injuries sustained by players over the period 2010/11 to 2016/17 showed a reduction in the 2017/18 SWS season and this lower level was maintained during the 2018/19 SWS, Figure 12.

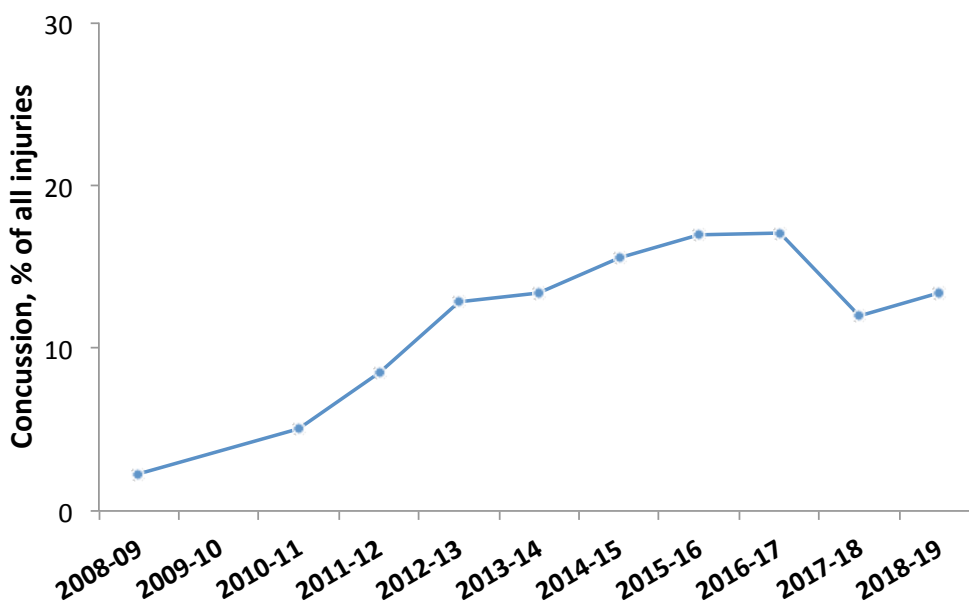


Figure 12: Long-term trend in reported concussion injuries

The main and sub-types of injury sustained by backs and forwards, over the period 2008/09 to 2018/19, are shown, as a function of playing position, in Table 7.

Table 7: Types of match injuries sustained: 2008/09 to 2018/19 SWS.

Type of injury	% (95% Confidence interval)		
	Backs	Forwards	ALL players
All Series (2008/09 – 2018/19)			
Bone	8.1 (6.3 – 9.9)	9.1 (6.7 – 11.5)	8.5 (7.1 – 9.9)
Fracture	6.4 (4.8 – 8.0)	8.0 (5.8 – 10.3)	7.0 (5.7 – 8.3)
Other bone	1.8 (0.9 – 2.6)	1.1 (0.2 – 2.0)	1.5 (0.9 – 2.1)
C/PNS	14.2 (11.9 – 16.4)	13.3 (10.5 – 16.2)	13.8 (12.1 – 15.6)
Concussion	12.8 (10.7 – 15.0)	12.2 (9.5 – 15.0)	12.6 (10.9 – 14.3)
Nerve	1.3 (0.6 – 2.1)	1.1 (0.2 – 2.0)	1.2 (0.7 – 1.8)
Joint (non-bone)/lig^t	41.9 (38.7 – 45.1)	44.0 (39.8 – 48.1)	42.7 (40.2 – 45.2)
Dislocation/sublux ⁿ	6.1 (4.6 – 7.7)	7.3 (5.1 – 9.5)	6.6 (5.3 – 7.9)
Lesion meniscus	6.1 (4.6 – 7.7)	4.7 (3.0 – 6.5)	5.6 (4.4 – 6.8)
Sprain/ligament	29.6 (26.7 – 32.6)	31.9 (28.0 – 35.8)	30.5 (28.1 – 32.9)
Muscle/tendon	33.0 (30.0 – 36.1)	28.8 (25.0 – 32.6)	31.5 (29.1 – 33.8)
Haematoma/etc	9.8 (7.8 – 11.7)	12.0 (9.3 – 14.8)	10.6 (9.0 – 12.2)
Muscle rupture/etc	18.9 (16.3 – 21.4)	12.4 (9.6 – 15.2)	16.4 (14.5 – 18.4)
Tendon injury/etc	4.4 (3.1 – 5.7)	4.4 (2.7 – 6.1)	4.4 (3.3 – 5.4)
Skin	1.4 (0.7 – 2.2)	2.6 (1.2 – 3.9)	1.9 (1.2 – 2.5)
Abrasion	0.0 (-)	0.5 (0 – 1.2)	0.2 (0.0 – 0.4)
Laceration	1.4 (0.7 – 2.2)	2.0 (0.8 – 3.2)	1.6 (1.0 – 2.3)
Other types	1.3 (0.6 – 2.1)	2.2 (1.0 – 3.4)	1.6 (1.0 – 2.3)
Visceral	0.5 (0.1 – 1.0)	1.1 (0.2 – 2.0)	0.8 (0.3 – 1.2)
Other	0.8 (0.2 – 1.3)	1.1 (0.2 – 2.0)	0.9 (0.4 – 1.4)

The most common types of match injuries sustained by backs over the period 2008/09 to 2018/19 were ligament sprains (29.6%), muscle ruptures (18.9%), concussion (12.8%) and haematomas (9.8%) while for forwards they were ligament sprains (31.9%), muscle ruptures (12.4%), concussion (12.2%) and haematomas (12.0%).

Trends in the main types of match injuries sustained by backs and forwards over the period 2008/09 to 2018/19 are shown in Figures 13 and 14 respectively.

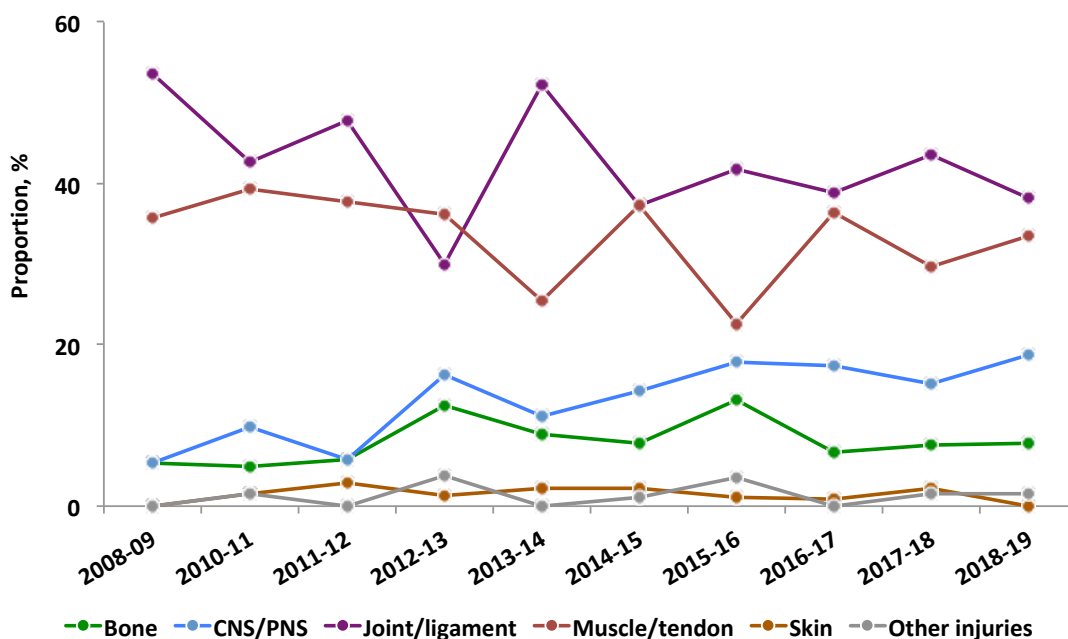


Fig 13. Long-term trends in the main types of match injuries sustained by backs

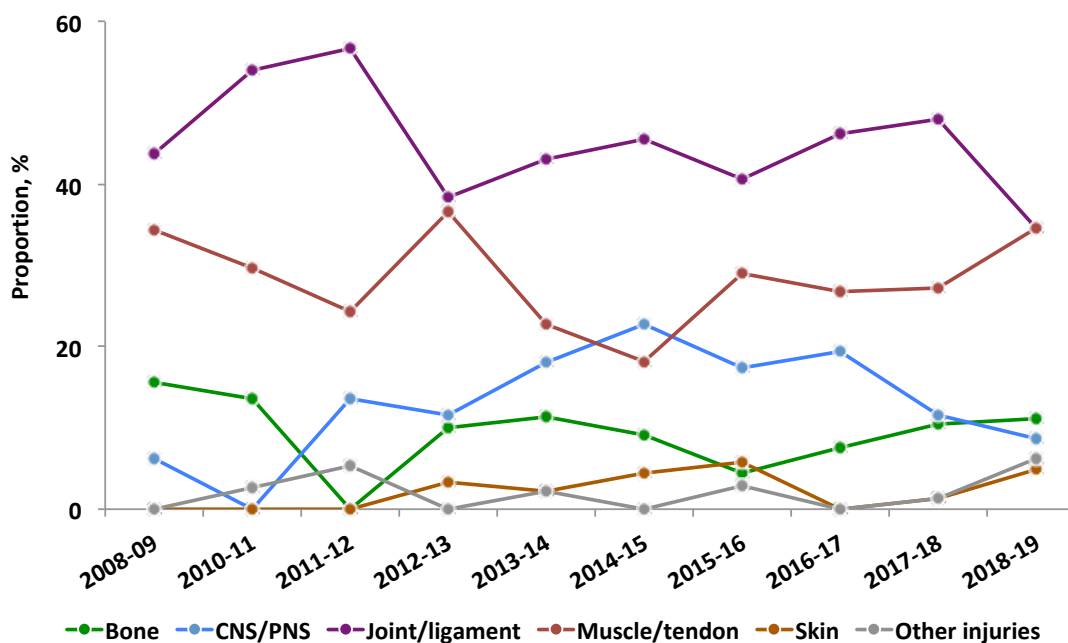


Fig 14. Long-term trends in the main types of match injuries sustained by forwards

4.2f Most common and highest risk injuries

Table 8 lists the six most common specific injuries and Table 9 lists the six injuries resulting in the greatest injury burden (total days lost) for backs and forwards over the period 2008/09 to 2018/19.

Table 8: The six most common injuries sustained by backs and forwards: SWS 2008/09 – 2018/19 (% of total number of injuries reported).

Backs		Forwards	
<i>Injury</i>	<i>%</i>	<i>Injury</i>	<i>%</i>
Concussion	13.2	Concussion	12.4
Hamstring muscle strain	11.7	Ankle lateral ligament sprain	5.8
Ankle lateral ligament sprain	5.5	Knee MCL sprain	5.6
Knee MCL sprain	5.3	Hamstring muscle strain	5.4
Inf ^f tib-fib syndesmosis injury	5.3	Quadriceps haematoma	4.1
Acromioclavicular joint sprain	3.9	Inf ^f tib-fib syndesmosis injury	3.9

The injuries listed in Table 8 represent ~40% of all match injuries sustained by backs and forwards.

Table 9: The six injuries resulting in the greatest injury burden for backs and forwards: SWS 2008/09 – 2018/19 (% of total reported days lost).

Backs		Forwards	
<i>Injury</i>	<i>Injury burden %</i>	<i>Injury</i>	<i>Injury burden %</i>
Hamstring muscle strain	10.5	Anterior cruciate ligament injury	14.5
Anterior cruciate ligament injury	8.7	Shoulder dislocat ⁿ /instability	6.0
Inf ^f tib-fib syndesmosis injury	8.0	Knee MCL sprain	5.8
Knee MCL sprain	6.3	Concussion	4.5
Shoulder dislocat ⁿ /instability	6.1	Hamstring muscle strain	4.3
Concussion	4.7	Inf ^f tib-fib syndesmosis injury	4.3

The injuries listed in Table 9 are responsible for ~40% of all days-absence resulting from match injuries sustained by backs and forwards.

4.2g Nature of injury onset

Table 10 summarises the nature of injury-onset (acute, gradual) during the 2018/19 SWS, as a function of playing position, and the average values for the period 2008/09 to 2018/19.

Table 10: Nature of the injury-onset of match injuries: 2018/19 SWS.

Series / Nature of onset	% (95% Confidence interval)		
	Backs	Forwards	ALL players
2018/19			
Acute	89.8 (84.6 – 95.1)	88.9 (82.0 – 95.7)	89.5 (85.3 – 94.6)
Gradual	10.2 (4.9 – 15.4)	11.1 (4.3 – 18.0)	10.5 (6.4 – 14.7)
All Series (2008/09 – 2018/19)			
Acute	92.3 (90.6 – 94.1)	91.4 (89.1 – 93.8)	92.0 (90.6 – 93.4)
Gradual	7.7 (5.9 – 9.4)	8.6 (6.2 – 10.9)	8.0 (6.6 – 9.4)

The majority of injuries sustained are acute in nature (backs: 92%; forwards: 91%). There is no statistically significant difference between backs and forwards with respect to the nature of injury onset ($p=0.529$).

4.2h Cause of injury onset

Table 11 summarises the cause of onset of injury (contact, non-contact) at the 2018/19 Sevens World Series, as a function of playing position, and the average values for the period 2008/09 to 2018/19.

Table 11: Cause of onset of injury: 2018/19 SWS.

Series / Cause of onset	% (95% Confidence interval)		
	Backs	Forwards	ALL players
2018/19			
Contact	77.0 (69.6 – 84.3)	78.8 (69.8 – 87.7)	77.7 (72.0 – 83.4)
Non-contact	23.0 (15.7 – 30.4)	21.3 (12.3 – 30.2)	22.3 (16.6 – 28.0)
All Series (2008/09 – 2018/19)			
Contact	76.0 (73.1 – 78.8)	86.8 (83.9 – 89.7)	80.1 (78.0 – 82.1)
Non-contact	24.0 (21.2 – 26.9)	13.2 (10.3 – 16.1)	19.9 (17.9 – 22.0)

The majority of injuries are sustained as a consequence of contact events (backs: 76%; forwards: 87%); however, backs sustain twice as many non-contact injuries as forwards, which results mainly from running injuries (Table 12).

4.2i Match events leading to injury

Table 12 provides a summary of the match events leading to injury as a function of playing position. Because of the wide range of match events leading to injury, only the all-Series (2008/09 – 2018/19) summary is presented.

Table 12: Match events leading to injury: Sevens World Series 2008/09 – 2018/19.

Series / Cause of onset	% (95% Confidence interval)		
	<i>Backs</i>	<i>Forwards</i>	<i>ALL players</i>
All Series (2008/09 – 2018/19)			
Collision	11.6 (9.5 – 13.7)	13.7 (10.8 -16.5)	12.4 (10.7 – 14.1)
Kicking	0.7 (0.1 – 1.2)	0.0 (-)	0.4 (0.1 – 0.8)
Lineout	0.0 (-)	1.8 (0.7 – 3.0)	0.7 (0.3 – 1.1)
Maul	0.3 (0.0 – 0.7)	0.2 (0 – 0.5)	0.3 (0.0 – 0.6)
Ruck	6.8 (5.1 – 8.4)	10.0 (7.4 – 12.5)	8.0 (6.6 – 9.4)
Running	19.9 (17.3 – 22.6)	9.8 (7.3 – 12.3)	16.1 (14.2 – 18.0)
Scrum	0.0 (-)	1.1 (0.2 – 2.0)	0.4 (0.1 – 0.8)
Tackled	33.3 (30.2 – 36.4)	32.7 (28.7 – 36.6)	33.1 (30.6 – 35.5)
Tackling	22.2 (19.5 – 24.9)	25.5 (21.8 – 29.1)	23.4 (21.2 – 25.6)
Other	5.2 (3.7 – 6.6)	5.4 (3.5 – 7.2)	5.2 (4.1 – 6.4)

Being-tackled (33%), tackling (22%) and running (20%) are the match events responsible for most injuries sustained by backs, while being-tackled (33%), tackling (26%) and collision (14%) are the events responsible for most injuries sustained by forwards. Apart from position-specific activities such as lineouts and scrums, the higher proportion of running injuries sustained by backs is the only statistically significant difference between backs and forwards. This higher proportion of running injuries reflects the higher proportion of non-contact injuries sustained by backs (Table 11).

The most common match events leading to concussion for backs were tackling (43%), being tackled (26%) and collision (20%); whereas for forwards they were tackling (34%), collision (27%) and being tackled (24%).

4.2j Time of injury

Based on the all-Series data (2008/09 – 2018/19), Table 13 provides a summary of the period in a match when injury events take place, as a function of playing position.

Table 13: Time during matches of injuries sustained in the period 2008/09 to 2018/19.

Time of injury, min	% (95% Confidence interval)		
	<i>Backs</i>	<i>Forwards</i>	<i>ALL players</i>
All Series (2008/09 – 2018/19)			
First half	38.0 (34.8 – 41.1)	38.3 (34.3 – 42.4)	38.1 (35.6 – 40.6)
Second half	62.0 (58.9 – 65.2)	61.7 (57.6 – 65.7)	61.9 (59.4– 64.4)

There are significantly ($p < 0.001$) more injuries sustained in the second half of matches for both backs and forwards. A detailed analysis of the time that injuries are sustained during SWS tournaments has been published separately (Fuller et al., 2016).

4.2k Removal of injured players from the pitch

Based on the all-Series injury data (2008/09 – 2018/19), only 52% of players were removed from play immediately, 25% were removed later in the game and 23% remained on the pitch until the end of the game. For players with concussion, 71% of players were removed immediately, 14% were removed later in the game and 15% remained on the pitch until the end of the game. A detailed analysis of this aspect of the game has been published separately (Fuller et al., 2018).

4.3 Training injuries

A total of 14 training injuries (backs: 11; forwards: 3) were reported during the 2018/19 Series, of which 4 occurred during non-contact-rugby-skills, 4 during contact-rugby-skills, 1 during conditioning (weights), 1 during conditioning (non-weights) and 4 during warm-up activities.

Over the ten 2018/19 Tournaments, a total of 12,322 player-hours of training exposure were reported (backs: 6,324; forwards: 5,998): the overall incidence of training injuries over these ten Tournaments was, therefore, 1.1 injuries/1000 player-training-hours (95% CI: 0.7 – 1.9). For backs, the incidence was 1.7 (95% CI: 1.0 – 3.1) and for forwards 0.5 (95% CI: 0.2 – 1.6). The difference in the incidences of training injuries between backs and forwards was close to statistical significance ($p=0.056$).

The mean severity of training injuries during the 2018/19 Series, for all players, was 90.1 days and the median severity was 37 days, which are both high compared to the values reported for match injuries (men: 44.5 days; median: 28 days). Because of the small number of training injuries sustained during the Series, further analysis of the 2018/19 training data is not justified.

The average incidence of training injuries sustained over the six Series from 2013/14 to 2018/19, for which training injuries and training exposures have been recorded, is 0.9 injuries/1000 player-training hours (backs: 1.0, 95% CI: 0.7 – 1.4; forwards: 0.8, 95% CI: 0.6 – 1.2). The mean severity of training injuries is 55.1 days (backs: 50.2; forwards: 54.4) and the median severity is 30.0 days (backs: 32; forwards: 26.5).

Further analysis of the training data is not justified due to the small number of training injuries sustained in each Series.

4.4 Illnesses

Although 13 cases of illness were reported during the ten 2018/19 tournaments, only three cases resulted in more than one day's absence (travelling to tournament: 1; during tournament: 2). Of these illnesses, 1 related to a gastrointestinal infection and 2 to respiratory conditions. Of the 10 reported cases resulting in ≤ 1 days' absence, 7 cases related to gastrointestinal conditions and 3 to respiratory conditions.

These results indicate a Series-wide time-loss illness prevalence of 0.8%.

5. References

- Fuller CW. Modelling injury-burden in rugby sevens. *J Sci Med Sport* 2018; 21: 553-557.
- Fuller CW. Injury risk (burden), risk matrices and risk contours in team sports: a review of principles, practices and problems. *Sports Med* 2018;48:1597-1606.
- Fuller CW. "Recognize and remove": a universal principal for the management of sports injuries. *Clin J Sport Med* 2018;28:377-381.
- Fuller CW, Molloy MG, Bagate C, et al. Consensus statement on injury definitions and data collection procedures for studies of injuries in rugby union. *Br J Sports Med* 2007;41:328-331.
- Fuller CW, Taylor A, Molloy MG. Epidemiological study of injuries in international rugby sevens. *Clin J Sport Med* 2010;20:179-184.
- Fuller CW, Taylor A. World Rugby – Surveillance Studies: Sevens World Series (Men) – Summary of Results: 2008/09 to 2017/18. World Rugby; Dublin: 2018. Available at: <http://playerwelfare.worldrugby.org>
- Fuller CW, Taylor A. World Rugby – Surveillance Studies: Sevens World Series (Women). Summary of Results: 2011/12 to 2017/18. World Rugby; Dublin: 2018. Available at: <http://playerwelfare.worldrugby.org>
- Orchard J, Rae K, et al., Revision, uptake and coding issues related to the open access Orchard Sports Injury Classification System (OSICS) versions 8, 9 and 10.1. *Open Access J Sports Med* 2010: 1; 207-214.
- Fuller CW, Taylor A, Raftery M. Does long-distance air travel associated with the Sevens World Series increase players' risk of injury? *British Journal of Sports Med* 2015;49:458-464
- Fuller CW, Taylor A, Raftery M. Should player fatigue be the focus of injury prevention strategies for international rugby sevens tournaments? *Br J Sports Med* 2016;50:682-7.
- Fuller CW, Taylor AE, Raftery M. 2016 Rio Olympics: an epidemiological study of the men's and women's Rugby-7s tournaments. *Br J Sports Med* 2017; 51: 1272-1278.
- Fuller CW, Taylor AE, Kemp SPT, Raftery M. Rugby World Cup 2015: World Rugby injury surveillance study. *Br J Sports Med* 2017; 51: 51-57.

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