



England
Rugby

R – P – A

ENGLAND PROFESSIONAL RUGBY INJURY SURVEILLANCE PROJECT

SEASON REPORT

2020-21

RFU INJURY SURVEILLANCE PROJECTS

Professional Rugby Injury Surveillance Project (PRISP)

Gallagher Premiership and England Senior Men

Women's Rugby Injury Surveillance Project (WRISP)

Allianz Premier 15s and Red Roses

Championship Rugby Injury Surveillance Project

Greene King Championship

BUCS Super Rugby Injury Surveillance Project

Elite men's University Rugby

Community Rugby Injury Surveillance and Prevention (CRISP) Project

Levels 3-9 of adult men's community rugby

Youth Rugby Injury Surveillance Project (YRISP)

Schoolboy rugby in under 13, under 15 and under 18 age groups



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AT-A-GLANCE SUMMARY

Premiership Rugby Match Injuries

Injury Incidence: 79/1000 hours
 Injury Severity: 31
 Injury Burden: 2040 days absence/1000 hours
 Injury Event: 27% tackling; 21% being tackled
 Most Common Injury: Concussion, 28% of all injuries (22.2/1000 hours)

Premiership Rugby Training Injuries

Injury Incidence: 2.9/1000 hours
 Injury Severity: 36 days
 Injury Burden: 104 days absence/1000 hours
 Injury Event: 41% running
 Most Common Injury: Hamstring muscle, 13% of all injuries

England Rugby Match Injuries

Injury Incidence: 96/1000 hours
 Injury Severity: 23 days
 Injury Burden: 2195 days absence/1000 hours
 Injury Event: Being tackled 38%
 Most Common Injury: Knee ligament sprain 14%

Injury incidence and severity in the professional game 2014-15 to 2020-21

How common an injury is (incidence) increases from left to right and how many days are lost per injury (severity) increases from bottom to top. Each data point represents a season. If the lines that extend from each point do not overlap with those for other points, then there is a difference between seasons. There was a higher rate of injuries in 2020-21 than in 2015-16, a lower rate than 2016-17 and 2018-19, but no difference from the other seasons. Less days were lost per injury in 2020-21 than in 2019-20, but no different from the other seasons.

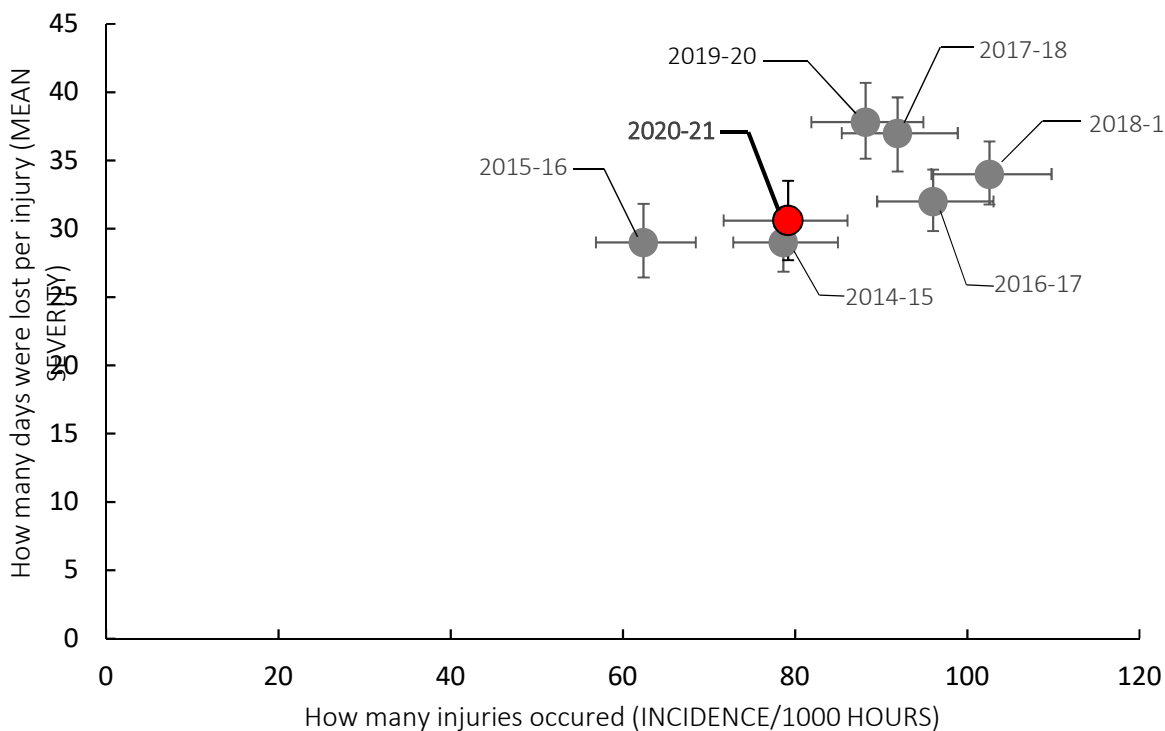


Figure 1: Incidence and severity of match injuries per season from 2014-15 to 2020-21

EXECUTIVE SUMMARY

The 2020-21 season was unlike any previous season, which is important to consider when reading this report. Due to the Coronavirus-induced disruptions and the extended duration of the 2019-20 season, the first match of the 2020-21 season was played four-weeks after the final match of the 2019-20 season. This meant that the typical 5–6-week off-season and subsequent pre-season period between seasons did not occur. The 2019-20 season was also unique in structure seeing a 22-week period of match suspension three-quarters of the way through the season, and mid-week matches introduced when competition restarted. The 2019-20 report highlighted that the way that players were managed appeared to mitigate potential increases in injury incidence and patterns; however, it acknowledged that any medium-term impact of the disruptions to the 2019-20 season and short turnaround to the 2020-21 season would be described in this report and is perhaps best shown in comparison to previous seasons in Figure 1 above.

With the Coronavirus pandemic still prevalent throughout the 2020-21 season, the season was disrupted by match cancellations, with 22 of the 170 (13%) scheduled fixtures involving Premiership teams cancelled. The 22 fixture cancellations were across the Gallagher Premiership (10 fixtures), Heineken Champions Cup (8 fixtures) and European Rugby Challenge Cup (4 fixtures). In addition, the Premiership Cup competition was not held in the 2020-21 season, further reducing match exposure in comparison to a typical season. Overall, 148 fixtures involving Premiership rugby teams were played in the season.

- In 2020-21, the match injury incidence was 79 injuries per 1000 hours. This is lower than the 2002-20 period mean of 87 injuries per 1000 hours and equates to 1.6 injuries per team per match. On average, each match injury lasted 31 days. This is 5 days longer than the 2002-20 period mean but represents a decrease from the 2019-20 season.
- Concussion was the most reported match injury, accounting for 28% of all match injuries, with an incidence of 22.2 concussions per 1000 hours. This is the highest reported incidence for concussion in the surveillance period. On average, each match concussion resulted in 17 days missed, which is above the 2002-20 period mean, but within the expected season-to-season variation. Compliance with the World Rugby GRTP was excellent with no players returning to full team training or match player earlier than the minimum requisite of 6 days.
- 48% of all match injuries were attributed to the tackle, with being tackled accounting for 27% and tackling accounting for 21% of all match injuries.
- 37% of all injuries were sustained during training, which is higher than the 2002-20 period mean of 32%, but a decrease on the 44% reported in the 2019-20 season. The incidence of training injuries was stable at 2.9 injuries per 1000 hours. On average, each training injury

lasted for 36 days, which is close to, but below, the upper limit of expected season-to-season variation.

- During the 2020-21 season, neither the incidence, severity nor burden of match injuries was different between artificial turf and natural grass/hybrid. When aggregating eight seasons of match data, the incidence is not different, but the mean severity of injuries on artificial turf has remained consistently 6 days greater than natural grass/hybrid.
- During the 2020-21 season, neither the incidence, severity nor burden of training injuries was different between artificial turf and natural grass/hybrid. When aggregating six seasons of training data, the incidence, severity, and burden of injury are not significantly different between surface types. This aggregated season data trend has been consistent across the surveillance period.
- The incidence of match injury for the England Senior side for 2020-21 was 96 injuries per 1000 hours, which is lower than the 2002-20 period mean of 126 injuries per 1000 hours. The mean severity of injury was 23 days, which is similar to the 2002-20 period mean of 20 days.
- The incidence of training injury for the England Senior side was 6.0 injuries per 1000 hours, which is similar to the 2002-20 period mean of 5.4 injuries per 1000 hours. The mean severity of training injury was 29 days, which is higher than the 2002-20 period mean of 20 days. This statistically non-significant difference is explained by the higher proportion of 8-28 days injuries and lower proportion of 2-7 day injuries than the 2002-20 period mean.
- In 2020-21, five players retired because of injury.

CONTENTS

EXECUTIVE SUMMARY	II
KEY FINDINGS.....	V
MATCH INJURIES.....	V
TRAINING INJURIES.....	VII
CONCUSSION	VIII
THE TACKLE	X
INJURIES LEADING TO RETIREMENT	XII
ARTIFICIAL TURF.....	XIII
TRAINING INJURY EVENT	XIV
INJURY DIAGNOSIS	XVII
ENGLAND SENIOR MEN'S SIDE.....	XIX
RFU INJURY SURVEILLANCE PROJECT METHODS.....	XX
CURRENT PUBLICATIONS	XXII
SUPPLEMENTARY DATA	XXIV

KEY FINDINGS

MATCH INJURIES

In 2020-21, 467 match injuries were sustained in 5900 match exposure hours, which equates to a match injury incidence of 79 injuries per 1000 hours. This is lower than the 2002-20 period mean incidence of 87 injuries per 1000 hours (**Figure 2**) and equates to about 39 injuries per club or 1.6 injuries per club per match during the 2020-21 season.

Note - For a normal distribution, 95% of all data should fall between (Mean – 2 x standard deviation) and (Mean + 2 x standard deviation).

Figure 2: Incidence

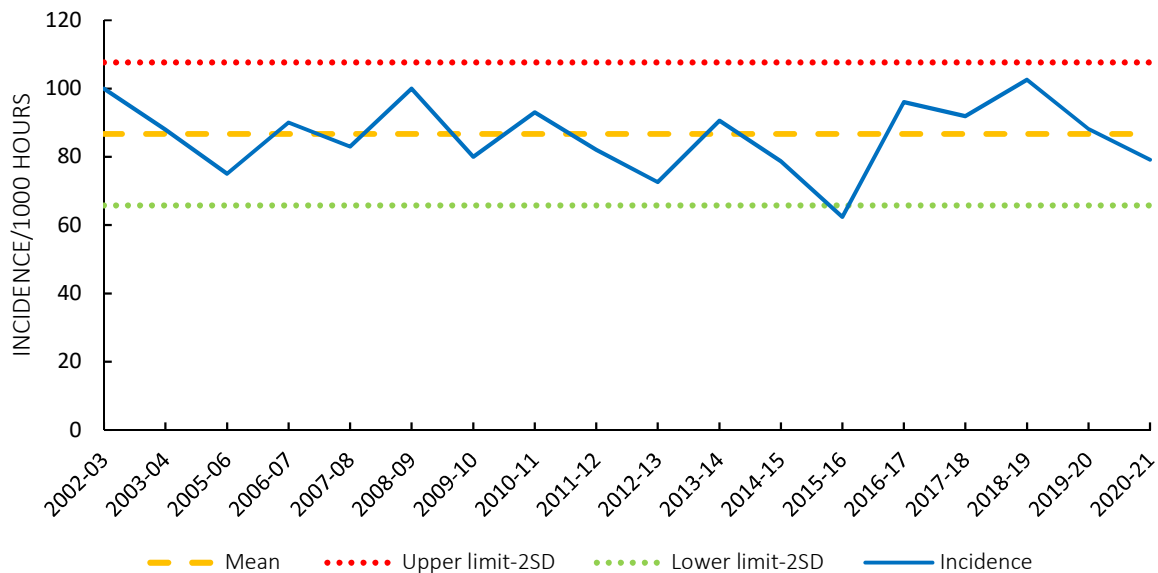


Figure 2: Incidence of match injuries over the surveillance period with mean \pm 2 x standard deviation shown.

The average days absent per match injury for the 2020-21 season was 31 days, which is 5 days greater than the 2002-2020 period mean (26 days) but represents a decrease from the last three seasons (**Figure 3**). Mean days absence provides a useful measure to assess changes in severity of injuries over time, but it can be skewed by a small number of significant long-term injuries; therefore, the median value is also useful. The median severity of injury for 2020-21 was 14 days, compared with 9 days for the 2002-20 period).

Figure 3: Days absent

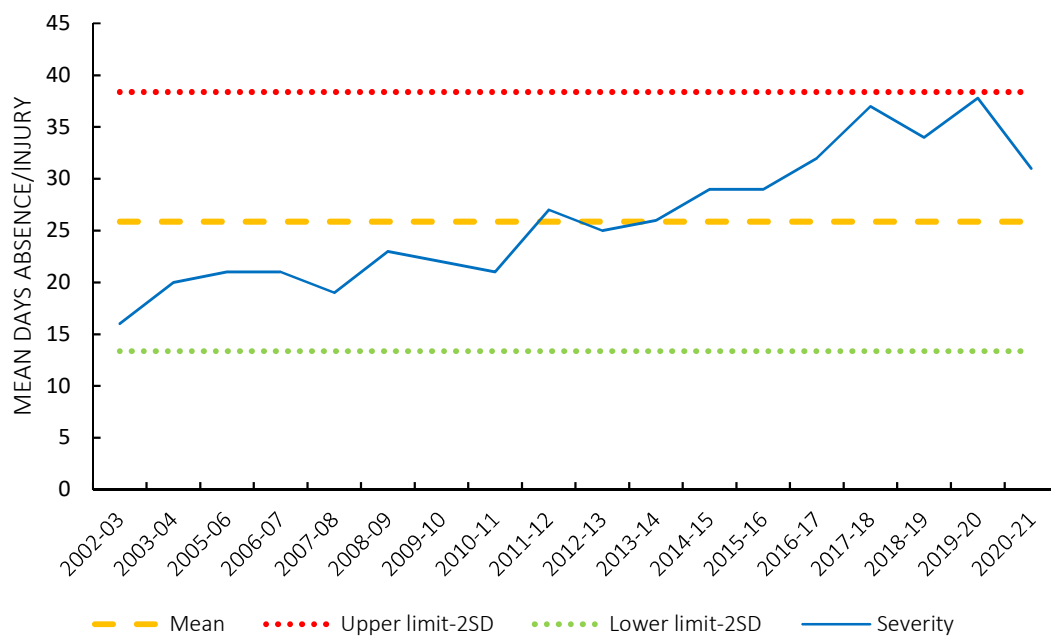


Figure 3: Mean days absent per match injury over the surveillance period with mean \pm 2 x standard deviation shown.

TRAINING INJURIES

A total of 274 time-loss training injuries were reported in 2020-21, representing 37% of the total injury proportion for the season. The training injury incidence was 2.9 injuries per 1000 hours, which falls within the limits of season-to-season variation (**Figure 4**). An incidence of 2.9 injuries per 1000 hours equates to about 23 training injuries per club. The mean days absent per training injury in 2019-20 was 36 days, which is 11 days greater than the 2002-2019 period mean (25 days) but falls within the limits of expected season-to-season variation (**Figure 5**). The greater mean days absence is due to the higher rate of injuries lasting >28 days than the 2002-20 period mean. The burden of training injuries was 104 days absence per 1000 hours, which is at the upper limit of expected season-to-season variation.

Figure 4: Incidence

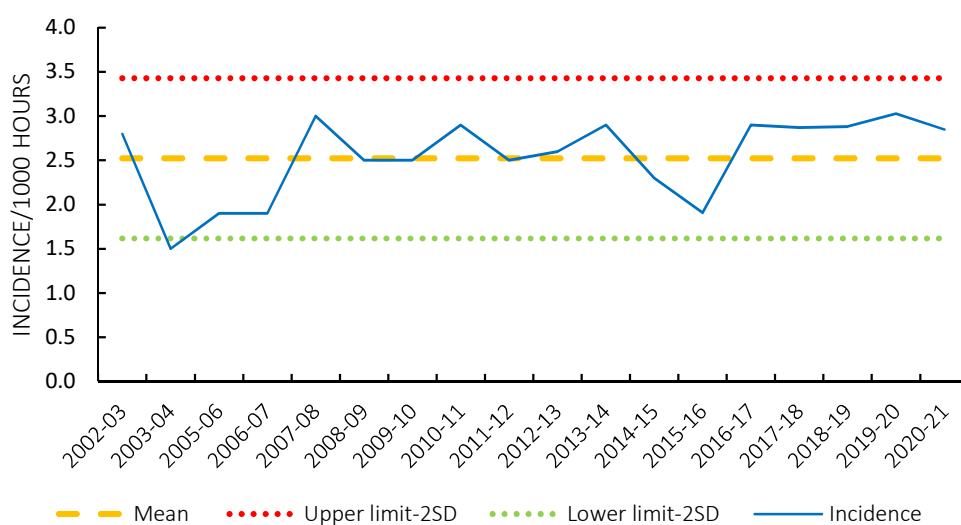


Figure 4: Incidence of training injuries over the surveillance period with mean ± 2 x standard deviation shown.

Figure 5: Days absent

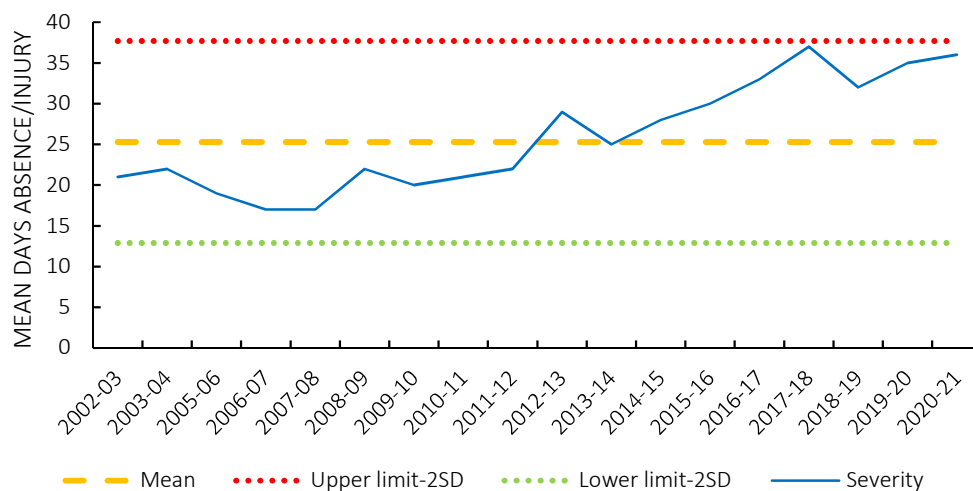


Figure 5: Mean days absent per training injury over the surveillance period with mean ± 2 x standard deviation shown.

CONCUSSION

Multiple refinements to the process of concussion recognition and management have been introduced over the surveillance period. As such, the rate of concussion can be described to have followed three phases since 2002: stability (2002-2009), growth (2009-2017) and re-stabilisation (2017-2020). In this section of the report the 2020-21 concussion data is most accurately compared to the re-stabilisation (2017-2020) period mean.

In 2020-21, there were 131 match concussions accounting for 28% of all match injuries. This is higher than the 2017-20 period mean of 21% of all match injuries being concussions (**Table S4**). There were 17 training concussions sustained in 2020-21, which represents 11% of all concussions and which is lower than the 2017-20 period mean of 16% (**Table S4**). In 2020-21, concussion accounted for 6% of all training injuries, which is identical to the 2017-20 period mean. Thirteen percent of players sustained at least one match concussion and 2% sustained more than one during the 2020-21 season.

In 2020-21, the incidence of match concussion was 22.2 concussions per 1000 hours, which is the highest recorded incidence across the surveillance period (**Figure 6**). It should be noted that the 2020-21 season saw an increase in the incidence of match concussion despite observing a decrease in the incidence of all injuries. Future reports will examine any patterns that emerge from this, while developing and evaluating strategies to reduce concussion incidence and optimally managing recovery after concussion remains a priority.

Figure 6: Incidence



Figure 6: Incidence of reported match concussions by season with mean $\pm 2 \times$ standard deviation shown.

The mean days absent per match concussion was 17 days in 2020-21. This is 4 days longer than the 2002-20 period mean of 13 days absence per concussion (**Figure 7**). Median severity of concussion was 9 days, which is similar to the 2002-20 period mean of 8 days. When a concussion occurred in 2020-21, players returned between 6-7 days in 43% of cases, in 8-14 days in 29% of cases, and 3% of cases had not returned within 84 days (**Table S5**). It is possible that, in some cases, the time to return from concussion is extend as a result of conservative management and/or review from an external specialist. The burden of match concussion in 2020-21 was 381 days absence per 1000 hours (**Table S6**).

Figure 7: Days absent

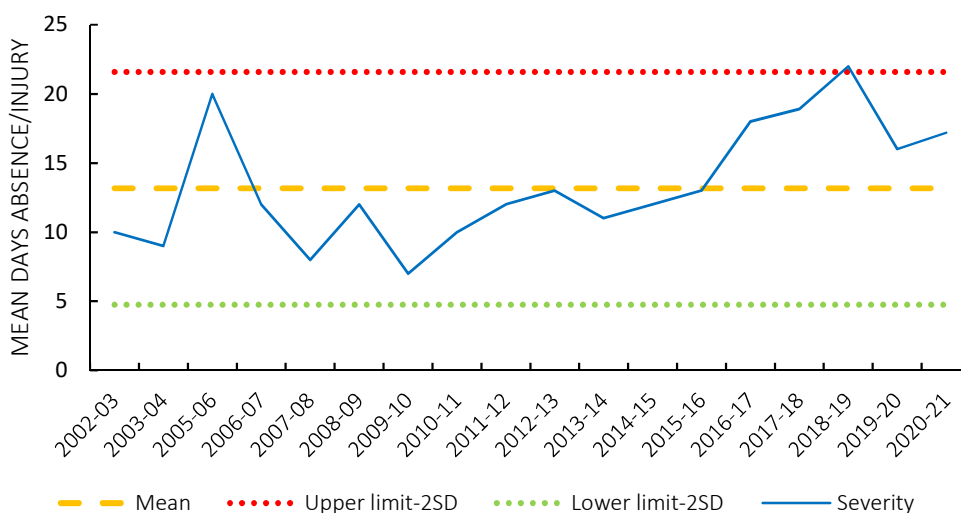


Figure 7: Mean days absent per reported match concussions by season with mean $\pm 2 \times$ standard deviation shown.

THE TACKLE

The tackle was the match event most likely to result in an injury in 2020-21, with 48% of all injuries attributed to the tackle. In 2020-21, the incidence of injuries to the ball carrier was 16.9 per 1000 hours, while the incidence of injury to the tackler was 21.0 per 1000 hours (**Figure 8**). There has only been one previous season (2017-18) over the surveillance period where the incidence of injury to the tackler was greater than the ball carrier. The mean days absent per injury to the ball carrier and tackler were 32 and 26 days, respectively (**Figure 9**). The burden of injury to the ball carrier was 542 days absence per 1000 hours and 546 days absence per 1000 hours to the tackler (**Table S7**). The most common injury in the tackle to both the ball carrier and tackler was concussion, making up 48% of all injuries to the tackler and 32% to the ball carrier.

Figure 8: Incidence

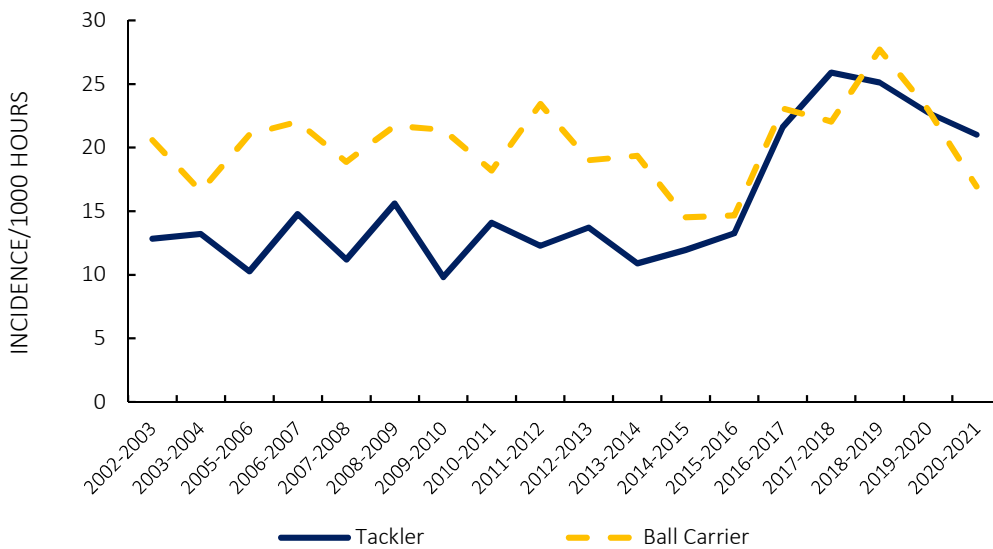


Figure 8: Incidence of tackle related injuries by season to tacklers (solid line) and ball carriers (dashed line).

Figure 9: Days absent

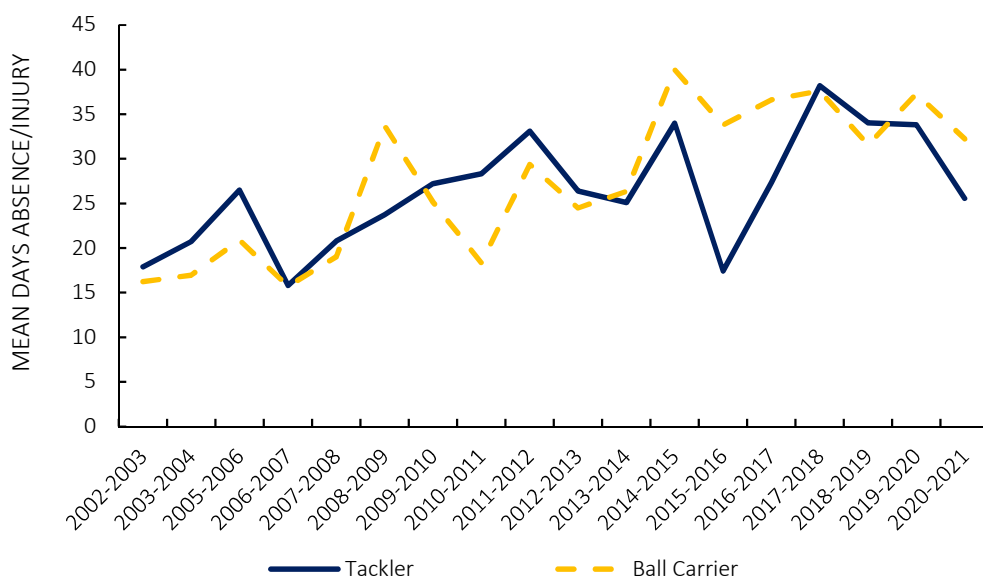


Figure 9: Mean days absent per tackle related injury by season to tacklers (solid line) and ball carriers (dashed line).

Data from OPTA (<https://optaprourugby.com/>) indicates that since the 2013-14 season, there has been an overall increase in the number of tackles per match. In 2020-21 there were an average of 126 tackles per team per match, which is a 24% increase from the average of 102 in the 2013-14 season. Calculating the rate of injury per 1000 tackle events (propensity for injury) reveals that the propensity of all tackle related injuries in 2020-21 was 6.0/1000 hours, which is similar to the 5.6/1000 hours recorded in 2013-14. Across the 2013-21 period, overall, there has been a 39% increase in the propensity of tackle-related injuries to the tackler, while the data varies for the ball carrier each season, with no clear pattern observed (Figure 10).

Figure 10: Propensity/ 1000 tackles

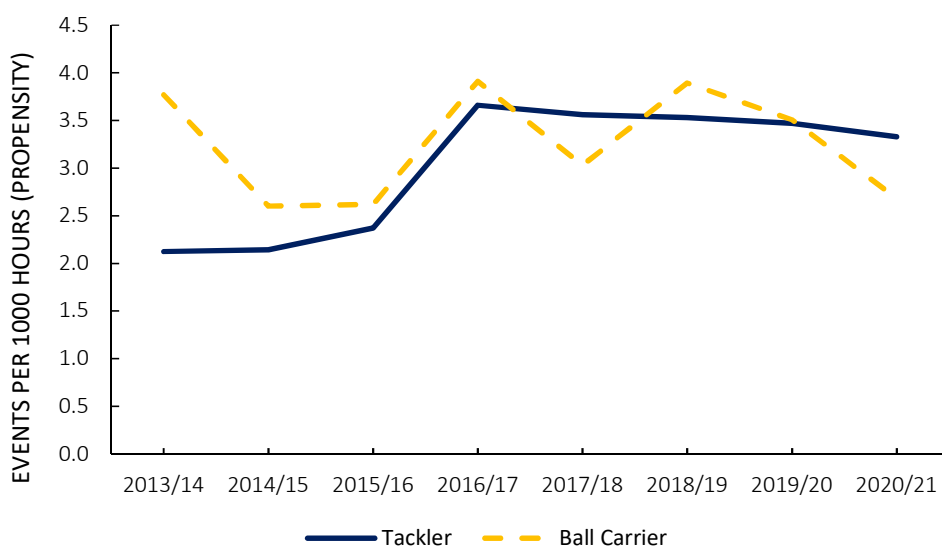


Figure 10: Propensity of tackle-related injuries to tacklers (solid line) and ball carriers (dashed line).

INJURIES LEADING TO RETIREMENT

Since 2013-14 the injury surveillance report has published the number of players who have retired with injury or illness being cited as the reason for retirement. In 2020-21, 5 players retired as a result of injury.

Season	Number retired through illness	Number retired through injury
2013-14	2	23
2014-15	1	11
2015-16	1	10
2016-17	0	19
2017-18	0	10
2018-19	1	9
2019-20	0	14
2020-21	0	5

The injuries, which led to players retiring from the sport, were sustained at the following body locations in 2020-21:

LOWER LIMB	1
THORACIC AND LUMBER SPINE	0
TRUNK	0
UPPER LIMB	2
HEAD/NECK	2

ARTIFICIAL TURF

In 2020-21, 13% of all matches and 22% of field-based training was played on artificial turf pitches. There were 389 injuries in matches played on natural grass/hybrid pitches (5140 exposure hours) and 78 injuries in matches on artificial turf pitches (760 exposure hours). In 2020-21 the incidence, severity and burden of match injuries was not different between surface types (**Table 1**). Aggregating eight seasons of match data revealed that match injury incidence is not different for natural grass/hybrid and artificial turf (grass/hybrid: 84 injuries per 1000 hours vs artificial: 85 injuries per 1000 hours). However, over the course of eight seasons, the mean days absent per injury on artificial turf is 38 days per injury, which is 6 days greater than natural grass/hybrid at 32 days per injury, resulting in the burden of injury on artificial turf (3266 days absence per 1000 hours) to be significantly greater than that for natural grass/hybrid (2644 days absence per 1000 hours) (**Table 1**). The aggregated season data trend for match injuries has been consistent across the surveillance period, with mean days absent per injury for artificial turf ranging from 5 to 7 days greater than natural grass/hybrid. The median severity of injury on artificial turf of 13 days is comparable to the 11 days reported on natural grass/hybrid.

Training on artificial turf accounted for 22% of on-pitch training exposure. In 2020-21, there were 171 training injuries on natural grass/hybrid (46902 exposure hours) and 61 on artificial turf (13431 exposure hours). The incidence of training injury on natural grass/hybrid was 3.6 injuries per 1000 hours, which is not significantly different to the 4.5 injuries per 1000 hours on artificial turf. There was no difference in the mean severity or burden of training injuries between surface types. The mean days absent per training injury on both natural grass/hybrid and artificial turf in 2020-21 was higher than the 2015-21 aggregated mean days absent, however the median severities reported in 2020-21 were comparable to the 2015-21 median values. When aggregating six seasons worth of training data, for which training surface information is available, the incidence, severity and burden of injury are not significantly different between surface types (**Table 1**). The aggregated season data trend for training injuries has been consistent across the surveillance period.

Table 1: Incidence, severity and burden of match and training injuries sustained on natural grass/hybrid vs artificial turf.

		Natural Grass/Hybrid		Artificial Turf	
		2013-21	2020-21	2013-21	2020-21
Match	Incidence (95%CI)	83 (82 - 87)	76 (69 - 84)	86 (79 - 91)	103 (82 - 128)
	Mean severity (95%CI)	32 (30 – 33)	30 (28 - 34)	38 (35 – 41)	32 (25 - 39)
	Median severity	11	13	13	15
	Burden (95%CI)	2644 (2565 - 2724)	2301 (1837 - 2882)	3266 (3060 - 3486)	3230 (2662 - 3920)
		2015-21	2020-21	2015-21	2020-21
Training	Incidence (95%CI)	4.1 (3.9 -4.3)	3.6 (3.1 - 4.2)	3.7 (3.4 - 4.1)	4.5 (3.5 - 5.8)
	Mean severity (95%CI)	35 (30 – 37)	46 (39 - 53)	39 (30 – 47)	48 (37 - 62)
	Median severity	17	19	20	20
	Burden (95%CI)	145 (139 - 152)	166 (143 - 193)	217 (169 - 279)	146 (134 - 159)

TRAINING INJURY EVENT

When considering the data in this next section, it is important to remember that the COVID-19 induced changes to the season (namely a short turnaround from the 2019-20 season, reduced preseason period and 13% of scheduled matches cancelled across the season), may have influenced the distribution of time spent in different training types. In addition, the 2020-21 season also saw the introduction of more detailed and precise training exposure data capture to support increased understanding of contact training practices moving forwards where changes were introduced to facilitate the capture of more specific training exposure time and activities.

In 2020-21, the incidence of injuries associated with rugby skills non-contact training was significantly higher than the 2002-20 period mean (2.5/1000 hours vs 1.6/1000 hours), while the incidence of conditioning weights training sessions was significantly lower (0.2 /1000 hours vs 0.8/1000 hours) (Figure 11).

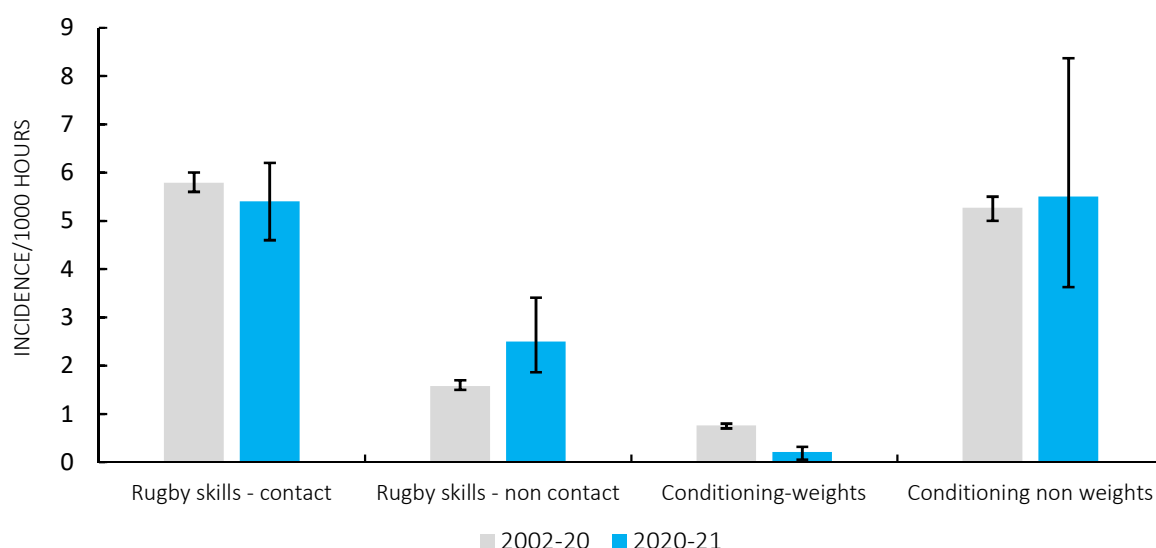


Figure 11: Incidence of training injury types for the 2020-21 seasons compared with the surveillance period (2002-20). Error bars show 95% CIs.

In 2020-21, the incidence of “full-contact” training injury was lower than the 2012-20 period mean (6.4/1000 hours vs 11.5 /1000 hours) (Table 2). The reason for the decrease in incidence of “full-contact” injuries is likely multifactorial and may be partly explained by the highlighted changes to the season structure and recording methodologies or may represent a significant change in the training practices across the league. A dip in the incidence of “full-contact” injuries was also observed in 2014-15 and as this remains an area of focus it will be monitored in the coming seasons. In 2020-21, the most commonly occurring injury in “full-contact” training sessions was concussion (12% of all full-contact training injuries). In “semi-contact” sessions, hamstring injuries were the most commonly occurring injuries (15% of all semi-contact training injuries).

Table 2: Incidence, severity and burden of full- and semi-contact related injuries.

	FULL CONTACT TRAINING			SEMI CONTACT TRAINING		
	Incidence/ 1000hrs	Mean severity (days)	Burden/ 1000 hrs	Incidence/ 1000hrs	Mean severity (days)	Burden/ 1000 hrs
2012-13	9.0	22	199	4.1	40	163
2013-14	10.8	26	278	4.5	14	64
2014-15	4.4	32	141	4.8	32	151
2015-16	11.1	28	306	3.2	25	78
2016-17	16.2	35	562	4.7	37	175
2017-18	13.2	44	577	6.0	32	195
2018-19	13.3	34	457	5.6	32	179
2019-20	17.6	32	561	6.3	35	218
2020-21	6.4	34	268	4.8	42	162
2012-20	11.5 (11 - 12)	31 (29 - 33)	356 (200 - 635)	4.9 (4.6 - 5.3)	31 (29 - 33)	153 (63 - 370)

INJURY DIAGNOSIS

For the tenth successive season, concussion was the most common match injury (22.2 concussions per 1000 hours). Hamstring muscle injuries were the second most common match injuries (4.1 injuries per 1000 hours). For the sixth season in succession, concussion was the highest burden match injury and ACL the second highest burden.

MATCH INJURY

Figure 12: Most common



Figure 12: Ranking of the top 5 most common match injuries for each season with the associated incidence rates (injuries/1000 hours).

Figure 13: Highest burden



Figure 13: Ranking of the top 5 highest burden match injuries for each season with the associated days absence per 1000 hours.

TRAINING INJURY

Hamstring injuries was both the most common and highest burden training injury for the fourth consecutive season. For the fifth successive season, concussion was third most common training injury (0.18 concussions per 1000 hours).

Figure 14: Most common



Figure 14: Ranking of the top 5 most common training injuries for each season with the associated incidence rates (injuries/1000 hours).

Figure 15: Highest burden



Figure 15: Ranking of the top 5 highest burden training injuries for each season with the associated days absence per 1000 hours.

ENGLAND SENIOR MEN'S SIDE

Match Injuries

The England Senior Men's team played 11 matches in the 2020-21 season, with 21 recorded injuries. The incidence of match injuries for the England Senior side in 2020-21 was 96 injuries per 1000 hours compared with 126 injuries per 1000 hours for the 2002-20 period mean (**Table S8**). The mean days absent per match injury was 23 days, which is similar to the mean for the surveillance period (20 days). The overall burden of match injury was 2195 days absence per 1000 hours, which is lower than the 2002-20 period mean burden of 2528 days absence per 1000 hours and reflects the lower incidence (**Table S8**).

Training Injuries

In 2020-21, the incidence of training injuries was 6.0 injuries per 1000 hours, which is similar to the 2002-20 period mean of 5.4 injuries per 1000 hours. In 2020-21, the 2-7 days category accounted for 29% of training injuries in the England squad, which is lower than their surveillance period mean of 54% and comparable to the 26% recorded by the Premiership clubs (**Table S9**). Overall, there was a higher proportion of training injuries lasting 8-28 days and lower proportion of training injuries lasting 2-7 days in the 2020-21 season than the 2002-20 period mean (**Table S10**).

For injuries in rugby skills sessions (full-contact, semi-contact and non-contact combined), the incidence was 10.2 injuries per 1000 hours, which is higher than that of the 2002-20 period mean (6.7 injuries per 1000 hours). Injuries in strength and conditioning (2.6 injuries per 1000 hours) were lower than the 2002-20 period mean (3.9 injuries per 1000 hours) (**Table S11**).

The burden for rugby skills injuries (275 days absence per 1000 hours) was higher than the 2002-20 period mean (146 days absence per 1000 hours). There were only two injuries sustained in strength and conditioning sessions, with one injury carrying a severity of 88 days, resulting in a mean severity and burden (123 days absence per 1000 hours) that was higher than the surveillance period average (60 days absence per 1000 hours) (**Table S11**).

NB: The relatively small number of senior England training sessions and training injuries included in the study each season means that the training injury risk for England should be interpreted with caution. The small sample size means that any differences in risk are much more likely to have arisen "by chance" rather than to be the result of a "true" difference, reflected in the wide 95% confidence intervals.

RFU INJURY SURVEILLANCE PROJECT METHODS

Written informed consent was obtained from 703 of 733 (96%) registered Premiership squad players for the 2020-21 season. A total of 295 team games were included in the analyses for the 2020-21 season.

Injuries from consented 1st team squad (including academy players that trained regularly with the 1st team) players sustained in training and in all matches in the Gallagher Premiership, European Competitions (Champions and Challenge Cup) were included. Injuries sustained while players represented England were reported and analysed separately.

Match and training injury data, and training exposure data, were provided by all 12 Premiership clubs in 2020-21. A complete set of data were collected from all 12 Premiership clubs and the England senior side. Medical personnel at each Premiership club and the England senior team reported the details of injuries and illnesses sustained by a player at their club/team that were included in the study group together with the details of the associated injury event using an online medical record keeping system, "Rugby Squad" (The Sports Office UK Ltd). Strength and conditioning staff recorded the squad's weekly training schedules and exposure on a password protected online system, "Elitehub". Team match days were also recorded by strength and conditioning staff. Injury and illness diagnoses were recorded using the Orchard Sports Injury Classification System (OSICS) version 10.1. This sports-specific injury classification system allows detailed diagnoses to be reported and injuries to be grouped by body part and injury pathology.

The definitions and data collection methods utilised in this study are aligned with the World Rugby Consensus statement on injury definitions and data collection procedures for studies of injuries in Rugby Union.

In the instance that a player retries from injury within the same season that their injury was sustained, this injury is included in all incidence calculations and excluded from all severity and burden calculations.

Several quality control processes are embedded within the PRISP data collection process to ensure the validity and integrity of the data being presented within this report. All match exposures are crosschecked against fixture lists for each club at the end of the season to ensure match exposure is correct. During each match in the Gallagher Premiership and Premiership Cup, a match report card is completed by an official, which notes the reasons for substitutions (i.e., tactical, injury, blood substitution, head injury assessment etc.). These report cards are cross-referenced against match injuries entered in the PRISP database to ensure that all injuries sustained are captured.

Furthermore, concussions reported in the PRISP database are crosschecked with the CSx (concussion management mobile application) data to ensure all concussions are logged correctly. Finally, before the PRISP data is analysed, all injuries are checked for duplicates and inconsistencies and final approval of the included injuries is sought from the medical lead in each club.

PROJECT DEFINITIONS

Time-loss injury

A time-loss injury was defined as ‘any injury that prevents a player from taking a full part in all training activities typically planned for that day and/or match play for more than 24 hours from midnight at the end of the day the injury was sustained’. For example, if a player was injured during a match on Saturday and he was able to take a full part in training on Monday, the incident would not be classed as an injury. If the player’s training was restricted on Monday due to the injury received on Saturday, the incident would be classed as a time-loss injury and reported.

Injury severity

Injury severity was measured as time (days) lost from competition and practice and defined as the number of days from the date of the injury to the date that the player was deemed to have regained full fitness not including the day of injury or the day of return. A player was deemed to have regained full fitness when he was ‘able to take a part in training activities (typically planned for that day) and was available for match selection.’

Recurrent injury

An injury of the same type and at the same site as an index (original) injury and which occurs after a player’s return to full participation from the index (original) injury. Manual calculation of within season injury recurrence was completed using player registration codes and OSICS codes (to two digits).

Injury incidence and days absence

The likelihood of sustaining an injury during match play or training is reported as the injury incidence. The injury incidence is the number of injuries expressed per 1,000 player-hours of match exposure (or training exposure).

Burden

The burden of injury is a measure that combines the frequency and severity of injuries. Burden is measured as the day’s absence per 1,000 player-hours of exposure.

Illness

Any illness (classified using the Orchard sports injury classification system – OSICS 10.1) for which the player sought consultation at his club that prevented the player from participating in training or match play for a period greater than 24 hours after the onset of symptoms.

Statistical significance

A result is considered to be statistically significant if the probability that it has arisen by chance is less than 5% or 1 in 20. In this report, statistical analysis has been performed for the match and training injury incidence and days absence.

Median severity

The median severity is the middle value when all the severity values are lined up in order numerically.

CURRENT PUBLICATIONS

Further detailed information on injury risk in this cohort of players can be obtained from the following peer reviewed publications that have been produced as part of the Premiership injury surveillance project:

Publications

- West, S., Cross, M., Trewartha, A., Brooks, J., Kemp, S., Locke, D., Ahmed, O and Stokes., K. Trends in match concussion incidence and return-to-play time in male professional Rugby Union: A 16-season prospective cohort study, *Brain Injury*, 35:10, 1235-1244, DOI: 10.1080/02699052.2021.1972142
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- West, S., Williams, S., Cazzola, D., Cross, M., Kemp, S. and Stokes, K. Training load and injury risk in elite Rugby Union: The largest investigation to date. *International Journal of Sports Medicine*. DOI: 10.1055/a-1300-2703
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- Williams, S., Trewartha, G., Kemp, S.P.T., Cross, M.J., Brooks, J.H.M., Fuller, C. W., Taylor, A.E. and Stokes, K.A. 2017. Subsequent injuries and early recurrent diagnoses in elite rugby union players. *International Journal of Sports Medicine*. DOI:10.1055/s-0043-114862
- Williams, S., Trewartha, G., Kemp, S.P.T., Brooks, J.H.M., Fuller, C. W., Taylor, A.E., Cross, M.J., and Stokes, K.A. 2017. How much rugby is too much? A seven-season prospective cohort study of match exposure and injury risk in professional rugby union players. *Sports Medicine*. 47 (11): 2395-2402. DOI: 10.1007/s40279-017-0721-3
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SUPPLEMENTARY DATA

Table S1: Match injury incidence, severity and burden 2002-21.	xxv
Table S2: Training injury incidence by severity grouping 2002-21.	xxv
Table S3: Training injury incidence, severity and burden 2002-21.....	xxvi
Table S4: Concussions sustained in matches and training.....	xxvi
Table S5: Proportion of concussion by severity grouping.....	xxvii
Table S6: Incidence, severity and burden of match concussions 2002-21	xxvii
Table S7: Incidence, severity and burden of tackle related injuries to the ball carrier and tackler.	xxviii
Table S8: England match injury incidence, severity and burden 2002-21. *Asterisk indicate world cup year.	xxviii
Table S9: Proportion of Premiership and England training injuries by severity grouping 2002-21.....	xxix
Table S10: Proportion of England match and training injuries by severity grouping 2002-21. *Asterisk indicate world cup year.	xxix
Table S11: England training injury incidence, severity and burden 2002-21. *Asterisk indicate world cup year.	xxx

Table S1: Match injury incidence, severity and burden 2002-21.

Season	Exposure	Number of match injuries	Incidence/1000 hrs (95% CI)	Injuries per club per match	Mean severity (days) (95%CI)	Burden/1000 hrs (95% CI)	Median Severity
2002-03	7480	748	100 (92-107)	2.0	16 (15-17)	1556 (1444-1667)	5
2003-04	7420	653	88 (82-95)	1.8	20 (19-22)	1773 (1637-1909)	7
2005-06	6427	482	75 (68-82)	1.5	21 (19-23)	1591 (1449-1733)	10
2006-07	8389	755	90 (84-97)	1.8	21 (20-23)	1879 (1745-2013)	7
2007-08	7952	660	83 (77-89)	1.7	19 (18-21)	1613 (1490-1736)	8
2008-09	7690	769	100 (93-107)	2.0	23 (21-25)	2285 (2123-2446)	8
2009-10	7950	636	80 (73-86)	1.6	22 (20-24)	1722 (1588-1856)	8
2010-11	8022	746	93 (86-99)	1.9	21 (20-23)	1917 (1779-2054)	8
2011-12	7980	655	82 (76-88)	1.6	27 (25-29)	2222 (2052-2392)	9
2012-13	8100	588	73 (67-79)	1.5	25(23-27)	1784 (1645-1936)	11
2013-14	8160	739	91 (85-98)	1.8	26 (24-28)	2247 (2091-2415)	9
2014-15	8200	645	79 (73-85)	1.6	29 (27-31)	2369 (2193-2560)	9
2015-16	7162	447	62 (57-68)	1.2	29 (26-32)	1808 (1648-1984)	10
2016-17	8100	778	96 (90-103)	1.9	33 (31-35)	3150 (2936-3379)	11
2017-18	7800	717	92 (86-99)	1.8	37 (34-40)	3401 (3161-3659)	14
2018-19	8120	823	103 (96-110)	2.0	34 (32-36)	3479 (3249-3725)	14
2019-20	8040	709	88 (82-95)	1.8	38 (35-41)	3334 (2706-4108)	11
2020-21	5900	467	79 (72-87)	1.6	31 (28-34)	2420 (1942-3017)	14
MEAN (2002-20)	7823	679	87 (81-94)	1.7	26 (24-28)	2257 (1829-2785)	9

Table S2: Training injury incidence by severity grouping 2002-21.

Season	Incidence/1000hrs (95%CI)				All injuries
	2-7 days	8-28 days	29-84 days	>84 days	
2002-03	1.13	1.29	0.42	0.18	3.0
2003-04	0.16	0.63	0.30	0.08	1.2
2005-06	1.04	0.70	0.35	0.10	2.2
2006-07	0.99	0.61	0.20	0.07	1.9
2007-08	1.26	1.08	0.38	0.07	2.8
2008-09	1.00	0.94	0.31	0.10	2.4
2009-10	1.09	0.89	0.34	0.07	2.4
2010-11	1.24	1.12	0.32	0.13	2.8
2011-12	0.87	0.97	0.30	0.14	2.3
2012-13	0.90	0.98	0.49	0.21	2.6
2013-14	0.94	1.25	0.52	0.18	2.9
2014-15	0.87	0.82	0.44	0.19	2.3
2015-16	0.47	0.86	0.43	0.14	1.9
2016-17	0.89	1.06	0.61	0.34	2.9
2017-18	1.00	0.87	0.66	0.35	2.9
2018-19	0.87	1.11	0.65	0.25	2.9
2019-20	0.73	1.22	0.79	0.29	3.0
2020-21	0.73	1.01	0.74	0.37	2.9
MEAN (2002-20)	0.88 (0.02 - 0.84)	0.97 (0.02 - 0.93)	0.47 (0.01 - 0.44)	0.18 (0.01 - 0.16)	2.20 (0.03 - 2.14)

Table S3: Training injury incidence, severity and burden 2002-21.

Season	Exposure	Total number of training injuries	Proportion of all injuries (%)	Incidence/1000 hrs	Injuries per club	Mean severity (days)	Median severity (days)	Burden/1000 hrs
2002-03	56786	159	18	2.8	13	21	7	59
2003-04	144667	217	25	1.5	18	22	8	33
2005-06	109730	203	30	1.9	17	19	9	36
2006-07	112973	209	22	1.9	17	17	8	32
2007-08	107797	318	33	3	27	17	9	51
2008-09	105306	258	25	2.5	22	22	9	55
2009-10	121633	298	32	2.5	25	20	9	50
2010-11	119298	340	31	2.9	28	21	9	61
2011-12	139956	323	33	2.5	27	22	10	55
2012-13	129019	335	36	2.6	28	29	12	75
2013-14	131900	414	36	2.9	35	25	12	73
2014-15	140263	325	34	2.3	27	28	12	64
2015-16	159398	304	40	1.9	25	30	17	57
2016-17	147983	429	36	2.9	36	33	14	96
2017-18	152533	438	38	2.9	37	37	14	106
2018-19	183280	528	39	2.9	44	32	15	93
2019-20	182049	551	44	3.0	46	35	18	105
2020-21	96125	274	37	2.9	23	36	19	104
MEAN (2002-20)	132034	332	32	3	28	25	11	65

Table S4: Concussions sustained in matches and training

Season	MATCH CONCUSSIONS		TRAINING CONCUSSIONS		
	Number Concussions	% of match injuries	Number concussions	% of training injuries	% of all concussions
2002-03	42	6	3	1	7
2003-04	24	4	3	1	11
2005-06	20	4	2	1	9
2006-07	37	5	2	1	5
2007-08	37	6	1	0	3
2008-09	38	5	2	1	5
2009-10	31	5	8	3	21
2010-11	38	5	5	1	12
2011-12	41	6	4	1	9
2012-13	54	9	5	1	8
2013-14	86	12	9	2	10
2014-15	110	17	6	2	5
2015-16	113	25	18	6	14
2016-17	169	22	21	5	11
2017-18	140	20	32	7	19
2018-19	166	20	38	7	19
2019-20	159	22	34	6	18
2020-21	131	28	17	6	11
MEAN (2016-20)	159	21	31	6	16

Table S5: Proportion of concussion by severity grouping.

Season	Proportion (%)				
	2-7 days	8-14 days	15-28 days	29-84 days	>84 days
2010-11	57	22	19	3	0
2011-12	49	24	20	8	0
2012-13	42	37	12	11	3
2013-14	49	29	18	11	0
2014-15	55	29	6	6	3
2015-16	46	38	7	8	1
2016-17	40	35	14	7	4
2017-18	39	34	14	10	4
2018-19	37	31	17	9	6
2019-20	42	33	15	8	3
2020-21	43	29	17	8	3
MEAN (2010-20)	43	32	14	8	3

Table S6: Incidence, severity and burden of match concussions 2002-21

Season	Exposure	Total number of concussion	Incidence/1000 hrs	Injuries per club	Mean severity (days)	Median Severity (days)	Burden/1000 hrs
2002-03	7480	42	5.6	3	10	6	56
2003-04	7420	24	3.3	2	9	8	30
2005-06	6427	20	3.1	2	20	8	62
2006-07	8389	37	4.4	3	12	7	53
2007-08	7952	37	4.6	3	8	7	37
2008-09	7690	38	4.9	3	12	8	59
2009-10	7950	31	3.9	3	7	6	27
2010-11	8022	38	4.7	3	10	7	47
2011-12	7980	41	5.1	3	12	8	61
2012-13	8100	54	6.7	5	13	9	87
2013-14	8160	86	10.5	7	11	8	116
2014-15	8200	110	13.4	9	12	7	161
2015-16	7162	113	15.8	9	13	8	205
2016-17	8100	169	20.9	14	18	8	376
2017-18	7800	140	17.9	12	19	9	339
2018-19	8120	166	20.4	14	22	10	455
2019-20	8040	159	19.8	13	16	8	317
2020-21	5900	131	22.2	11	17	9	381
MEAN (2002-20)	7823	77	10	6	13	8	146

Table S7: Incidence, severity and burden of tackle related injuries to the ball carrier and tackler.

Season	Ball Carrier			Tackler		
	Incidence/1000 hours	Mean severity	Burden/1000 hours	Incidence/1000 hours	Mean severity	Burden/1000 hours
2002-03	21	1	334	13	18	230
2003-04	17	17	281	13	21	274
2005-06	21	21	439	10	27	272
2006-07	22	16	347	15	16	234
2007-08	19	19	359	11	21	233
2008-09	22	34	731	16	24	370
2009-10	21	25	537	10	27	267
2010-11	18	18	334	14	28	399
2011-12	23	29	688	12	33	406
2012-13	19	24	465	14	26	361
2013-14	19	16	511	11	25	274
2014-15	15	40	580	12	34	406
2015-16	15	34	495	13	17	231
2016-17	23	37	845	22	27	590
2017-18	22	38	830	26	38	989
2018-19	28	32	874	25	34	855
2019-20	23	37	858	23	34	769
2020-21	17	32	542	21	26	546
MEAN (2002-19)	20	26	559	15	26	421

Table S8: England match injury incidence, severity and burden 2002-21. *Asterisk indicate world cup year.

Season	Total number of injuries	Incidence/1000 hours (95%CI)	Injuries per match	Mean severity	Burden/1000 hours (95%CI)	Days absence per match
2002-03	53	221 (169-289)	4.4	19	4264 (4010-4533)	85
2003-04	83	207 (167-256)	4.1	11	2371 (2225-2527)	47
2005-06	30	136 (95-195)	2.7	10	1391 (1243-1556)	28
2006-07	30	136 (95-195)	2.7	28	3836 (3586-4104)	77
2007-08	55	162 (119-205)	3.2	24	3876 (2852-4901)	78
2008-09	23	96 (57-135)	1.9	8	813 (480-1145)	16
2009-10	23	88 (52-125)	1.8	19	1712 (1012-2411)	34
2010-11	14	78 (37-119)	1.5	23	1789 (852-2726)	36
2011-12*	16	62 (31-92)	1.2	29	1754 (894-2613)	35
2012-13	31	111 (78-158)	2.2	24	2618 (1841-3722)	52
2013-14	19	86 (55-135)	1.7	20	1509 (963-2366)	34
2014-15	27	113 (78-165)	2.3	23	2604 (1786-3797)	52
2015-16*	39	163 (119-223)	3.3	13	2043(1492-2795)	41
2016-17	27	113 (78-165)	2.3	16	1774 (1217- 2587)	35
2017-18	23	105 (70-158)	2.1	30	3131 (2081-4712)	62
2018-19	23	89 (59-134)	1.8	19	1664 (1106-2504)	39
2019-20*	37	112 (84-160)	2.3	27	3156 (2630-3787)	63
2020-21	21	96 (62-146)	1.9	23	2195 (1796-2683)	44
MEAN (2002-19)	33	126 (116-137)	2.4	20	2528 (2124-3009)	48

Table S9: Proportion of Premiership and England training injuries by severity grouping 2002-21.

	PREMIERSHIP TRAINING INJURIES				ENGLAND TRAINING INJURIES			
	2-7 days	8-28 days	29-84	>84	2-7 days	8-28 days	29-84	>84
2002-03	40	46	15	6	64	29	0	7
2003-04	11	42	20	5	51	40	9	0
2005-06	56	38	19	5	93	0	7	0
2006-07	54	33	11	4	53	27	20	0
2007-08	43	37	13	2	50	46	4	0
2008-09	41	38	13	4	53	40	0	7
2009-10	44	36	14	3	61	17	17	6
2010-11	44	39	11	5	86	14	0	0
2011-12	38	42	13	6	44	39	11	6
2012-13	35	38	19	8	17	50	17	17
2013-14	30	40	17	6	51	37	10	2
2014-15	38	35	19	8	63	19	13	6
2015-16	25	45	23	7	67	29	4	0
2016-17	31	37	21	12	36	9	45	9
2017-18	35	30	23	12	42	17	25	17
2018-19	30	39	23	9	42	26	21	11
2019-20	24	40	26	10	44	31	15	10
2020-21	26	35	26	13	29	41	12	18
MEAN (2002-21)	35	38	18	7	54	30	11	5

Table S10: Proportion of England match and training injuries by severity grouping 2002-21. *Asterisk indicate world cup year.

Season	Proportion (%)							
	Match				Training			
	2-7 days	8-28 days	29-84 days	>84 days	2-7 days	8-28 days	29-84 days	>84 days
2002-03	72	15	11	2	64	29	0	7
2003-04	61	30	7	1	51	40	9	0
2005-06	70	20	0	10	93	0	7	0
2006-07	34	47	6	13	53	27	20	0
2007-08	55	27	16	2	50	46	4	0
2008-09	48	30	17	4	53	40	0	7
2009-10	39	52	9	0	61	17	17	6
2010-11	29	43	21	7	86	14	0	0
2011-12*	63	6	19	13	44	39	11	6
2012-13	35	35	26	3	17	50	17	17
2013-14	58	21	21	0	51	37	10	2
2014-15	70	15	11	4	63	19	13	6
2015-16*	59	39	2	0	67	29	4	0
2016-17	70	15	11	4	36	9	45	9
2017-18	48	26	17	9	42	17	25	17
2018-19	61	9	30	0	42	26	21	11
2019-20*	38	41	11	11	44	31	15	10
2020-21	57	29	0	14	29	41	12	18
MEAN (2002-20)	55	28	12	4	54	30	11	5

Table S11: England training injury incidence, severity and burden 2002-21. *Asterisk indicate world cup year.

Season	RUGBY SKILLS			STRENGTH AND CONDITIONING		
	Incidence/1000 hours (95%CI)	Mean severity	Burden/1000 hrs (95%CI)	Incidence/1000 hours (95%CI)	Mean severity	Burden/1000 hrs (95%CI)
2002-03	4.5 (2.6 - 8.0)	15	69 (60 - 80)	4.0 (1.0 - 15.9)	4	16 (8 - 32)
2003-04	7.6 (5.3 - 11.0)	12	89 (80 - 99)	6.3 (3.8 - 10.3)	13	79 (68 - 90)
2005-06	0.6 (0.1 - 4.0)	4	2 (1 - 6)	-	-	-
2006-07	9.8 (5.9 - 16.3)	15	149 (131 - 169)	-	-	-
2007-08	7.3 (4.5 - 10.1)	9	74 (46 - 103)	2.5 (0.5 - 4.6)	12	34 (7 - 61)
2008-09	6.5 (3.0 - 10.0)	20	135(62 - 209)	12.1 (4.2 - 20.0)	18	233 (81 - 385)
2009-10	5.3 (3.4 - 8.3)	8	46 (30 - 73)	4.0 (2.0 - 8.6)	6	26 (12 - 55)
2010-11	1.7 (0.8 - 3.5)	7	12 (6 - 26)	4.4 (1.8 - 10.5)	5	22 (9 - 53)
2011-12*	3.2 (1.4 - 5.1)	22	70 (31 - 110)	2.8 (0.4 - 5.3)	18	51 (6 - 95)
2012-13	3.7 (1.6 - 9.0)	20	58 (24 - 134)	1.1 (0.2 - 7.8)	9	10 (1 - 71)
2013-14	7.9 (4.7 - 13.3)	11	87 (52 - 147)	3.9 (1.3 - 12.1)	14	57 (18 - 177)
2014-15	3.3 (1.6 - 6.9)	25	85 (50 - 145)	2.3 (0.6 - 9.2)	2	3 (1 - 80)
2015-16*	15.7 (11.6 - 21.3)	9	135 (99 - 183)	7.3 (4.7 - 11.3)	8	55 (36 - 85)
2016-17	7.7 (4.1 - 14.3)	44	337 (181 - 626)	0.8 (0.1 - 5.7)	17	13 (2 - 93)
2017-18	12.2 (7.8 - 19.1)	47	579 (369 - 908)	1.8 (0.8 - 4.3)	32	57 (24 - 137)
2018-19	9.9 (6.0 - 16.4)	38	371 (224 - 615)	1.9 (0.7 - 5.1)	19	36 (14 - 96)
2019-20*	9.7 (6.9 - 13.6)	20	193 (103 - 362)	1.4 (0.6 - 3.4)	117	165 (21 - 858)
2020-21	10.2 (6.1 - 16.9)	27	275 (149 - 509)	2.6 (0.7 - 10.5)	47	123 (37 - 413)
MEAN (2002-10)	6.9 (6.1 - 7.8)	19	146 (56 - 69)	3.9 (3.1 - 4.9)	21	60 (30 - 22)