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ENGLAND PROFESSIONAL RUGBY INJURY SURVEILLANCE PROJECT

SEASON REPORT
2021-22

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

Adult men's (levels 3-9) and women's (levels 2-5) community rugby

Youth Rugby Injury Surveillance Project (YRISP)

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



**England
Rugby**

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The content of the report is based on data collected at the University of Bath

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AT-A-GLANCE SUMMARY

Premiership Rugby Match Injuries

Injury Incidence: 75/1000 hours

Injury Severity: 44 days

Injury Burden: 3276 days absence/1000 hours

Injury Event: 20% tackling; 25% being tackled

Most Common Injury: Concussion, 24% of all injuries (18.2/1000 hours)

Injuries Per Club: 50

Days Absent Per Club: 2187

Premiership Rugby Training Injuries

Injury Incidence: 2.8/1000 hours

Injury Severity: 39 days

Injury Burden: 110 days absence/1000 hours

Injury Event: 38% running

Most Common Injury: Hamstring muscle, 14% of all injuries (0.4/1000 hours)

Injuries Per Club: 29

Days Absent Per Club: 1129

England Rugby Match Injuries

Injury Incidence: 121/1000 hours

Injury Severity: 33 days

Injury Burden: 4002 days absence/1000 hours

Injury Event: Being tackled 38%

Most Common Injury: Concussion 24% (29.2/1000 hours)

Match Injury incidence and severity in the professional game (2014-15 to 2021-22)

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 significant difference between seasons.

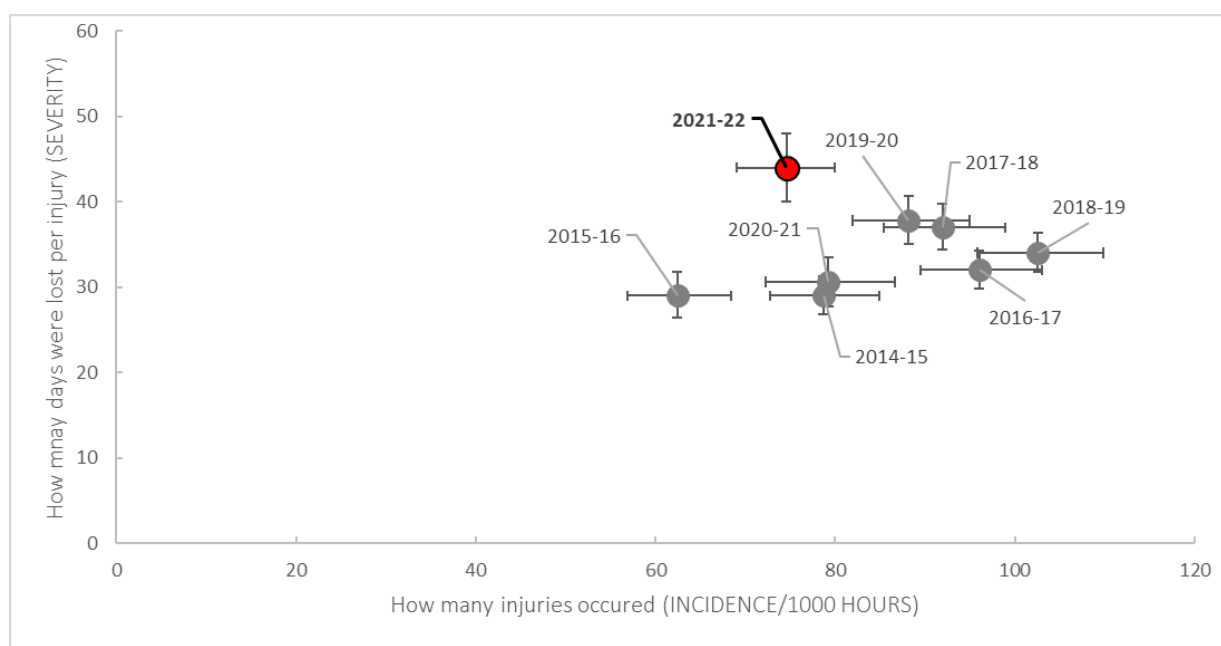


Figure 1: Incidence and severity of match injuries per season from 2014-15 to 2021-22

EXECUTIVE SUMMARY

The 2021-22 season was the first season with a normal structure after the Coronavirus-induced disruptions of the previous two seasons. In this 2021-22 season there were 13 teams in the Gallagher Premiership, and the Premiership Cup competition returned. With the Coronavirus pandemic still evident in the 2021-22 season, there were some match cancellations, with 19 of the 245 (8%) scheduled fixtures involving Premiership teams cancelled. The 19 cancelled fixtures were across the Gallagher Premiership (3 fixtures), Premiership Rugby Cup (1 fixture), Heineken Champions Cup (11 fixture) and European Rugby Challenge Cup (4 fixtures). However, overall, a total of 226 fixtures involving Premiership rugby teams were played in the season, resulting in the highest number of hours of match exposure since PRISP began.

- In 2021-22, the match injury incidence was 75 injuries per 1000 hours. This is lower than the 2002-21 period mean of 87 injuries per 1000 hours and equates to 1.5 injuries per team per match.
- On average, each match injury lasted 44 days. This is a substantial increase over previous seasons and is 18 days longer than the mean for the 2002-21 period. The greater mean days absence is due to a reduction in the rate of injuries lasting 2-7 days (17 per 1000 hours for 2021-22 vs. 35 per 1000 hours for 2002-21) and a higher rate of injuries lasting >84 days (13 per 1000 hours for 2021-22 vs. 6 per 1000 hours for 2002-21).
- Concussion was the most reported match injury, accounting for 24% of all match injuries, with an incidence of 18.2 concussions per 1000 hours. On average, each match concussion resulted in 22 days missed, which is at the upper limit of the expected season-to-season variation. The proportion of players who sustained a concussion and returned in 6-7 days was 25%, which is substantially lower than the 43% for previous seasons.
- 45% of all match injuries were attributed to the tackle, with being tackled accounting for 25% and tackling accounting for 20% of all match injuries.
- 37% of all injuries were sustained during training, which is higher than the 2002-21 period mean of 33%, but the same as the 37% reported in the 2020-21 season. The incidence of training injuries was stable at 2.8 injuries per 1000 hours. On average, each training injury lasted for 39 days, which is at the upper limit of expected season-to-season variation.
- During the 2021-22 season, neither the incidence, severity nor burden of match injuries was different between artificial turf and natural grass/hybrid. When aggregating nine seasons of match data, the incidence is not different, but the mean severity of injuries on artificial turf is 6 days greater than on natural grass/hybrid.

- During the 2021-22 season, neither the incidence, severity nor burden of training injuries was different between artificial turf and natural grass/hybrid. When aggregating seven 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 2021-22 was 121 injuries per 1000 hours, which is the same as the 2002-21 period mean. The mean severity of injury was 33 days, which is greater to the 2002-21 period mean of 20 days.
- The incidence of training injury for the England Senior side was 12.8 injuries per 1000 hours, which is higher than the 2002-21 period mean of 7.0 injuries per 1000 hours. The mean severity of training injuries was 24 days, which is higher than the 2002-20 period mean of 20 days. This is explained by the higher proportion of 29-84 days injuries and lower proportion of 2-7 day injuries than the 2002-21 period mean.
- In 2021-22, six players retired because of injury and two because of illness.

CONTENTS

EXECUTIVE SUMMARY	ii
KEY FINDINGS.....	v
MATCH INJURIES	v
TRAINING INJURIES	vii
CONCUSSION.....	viii
THE TACKLE.....	x
INJURIES LEADING TO RETIREMENT	xiii
SURFACE TYPE	xiv
TRAINING INJURY EVENT	xvii
INJURY DIAGNOSIS.....	xix
ENGLAND SENIOR MEN'S SIDE.....	xxi
RFU INJURY SURVEILLANCE PROJECT METHODS.....	xxii
PROJECT DEFINITIONS.....	xxiii
PUBLICATIONS	xxiv
SUPPLEMENTARY DATA	xxvi

KEY FINDINGS

MATCH INJURIES

In 2021-22, 647 match injuries were sustained in 8678 match exposure hours, which equates to a match injury incidence of 75 injuries per 1000 hours. This is lower than the 2002-21 period mean incidence of 86 injuries per 1000 hours (**Figure 2**) and equates to approximately 50 injuries per club or 1.5 injuries per club per match during the 2021-22 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

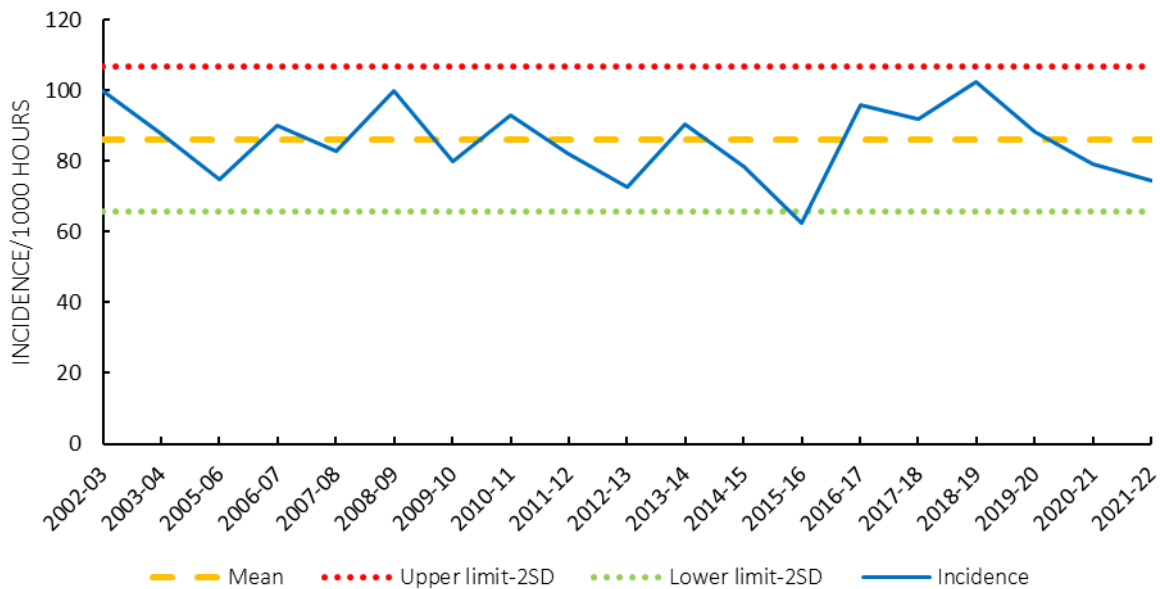


Figure 2: Incidence of match injuries over the surveillance period with mean \pm 2 x standard deviation shown.

The average days absent per match injury for the 2021-22 season was 44 days, which is 18 days greater than the 2002-21 period mean (26 days). This represents a substantial increase from all previous seasons and is outside the limits of expected season-to-season variation (**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 days absence for 2021-22 was 20 days, which is double the value of 10 days for the 2002-21 period (**Table S1**), also representing a large increase from previous seasons. The greater mean days absence is due to a reduction in the rate of injuries lasting 2-7 days (17 per 1000 hours for 2021-22 vs. 35 per 1000 hours

for 2002-21) and a higher rate of injuries lasting >84 days (13 per 1000 hours for 2021-22 vs. 6 per 1000 hours for 2002-21) (Table S2).

Injury burden is calculated by multiplying average incidence by average days lost per injury. Injury burden for 2021-22 was 3276 days per 1000 hours, which is higher than the 2002-21 period mean (2252 days per 1000 hours), but similar to values reported in seasons 2016-17 to 2019-20 (Table S1).

Figure 3: Days absent

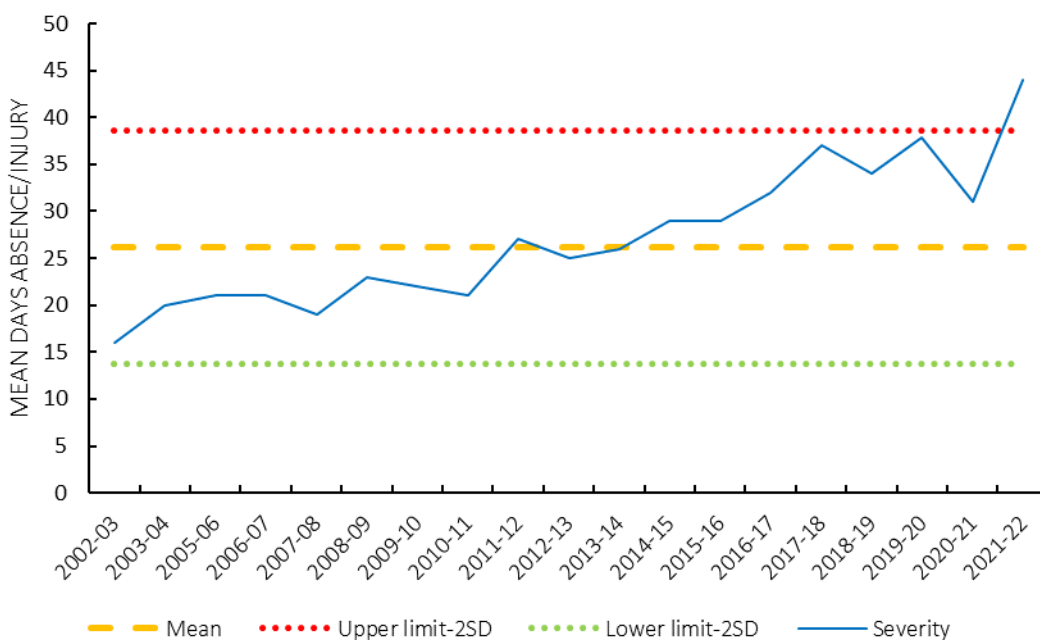


Figure 3: Mean days absent per match injury over the surveillance period with mean ± 2 x standard deviation shown.

TRAINING INJURIES

A total of 376 time-loss training injuries were reported in 2021-22, representing 37% of the total injury proportion for the season. The training injury incidence was 2.8 injuries per 1000 hours, which falls within the limits of season-to-season variation (**Figure 4**). An incidence of 2.8 injuries per 1000 hours equates to about 29 training injuries per club. The mean days absent per training injury in 2021-22 was 39 days, which is 13 days greater than the 2002-2021 period mean (26 days) and is at the upper limit of expected season-to-season variation (**Figure 5**). The greater mean days absence is due to a reduction in the rate of injuries lasting 2-7 days and a higher rate of injuries lasting >28 days than the 2002-21 period mean (**Table S3**). The burden of training injuries was 110 days absence per 1000 hours (**Table S4**).

Figure 4: Incidence

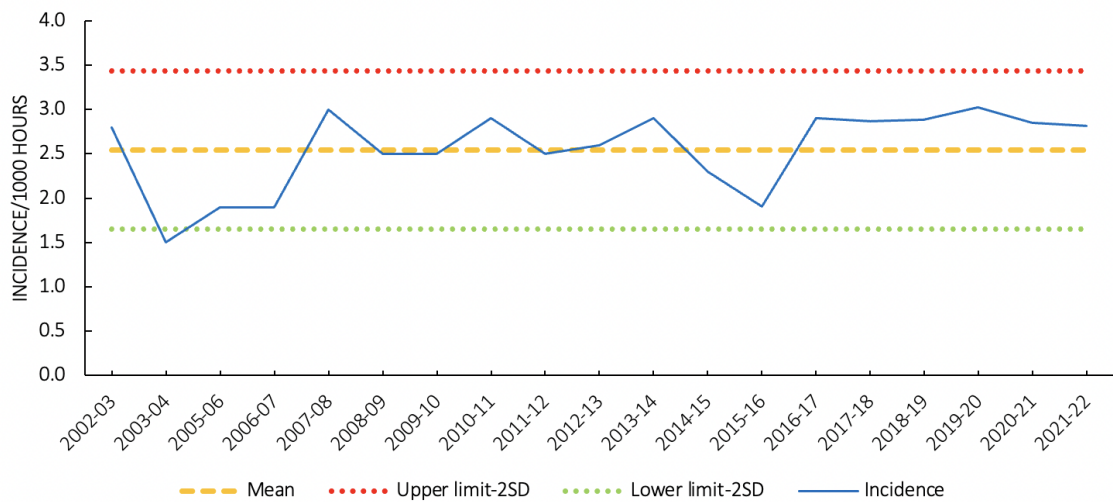


Figure 4: Incidence of training injuries over the surveillance period with mean $\pm 2 \times$ standard deviation shown.

Figure 5: Days absent

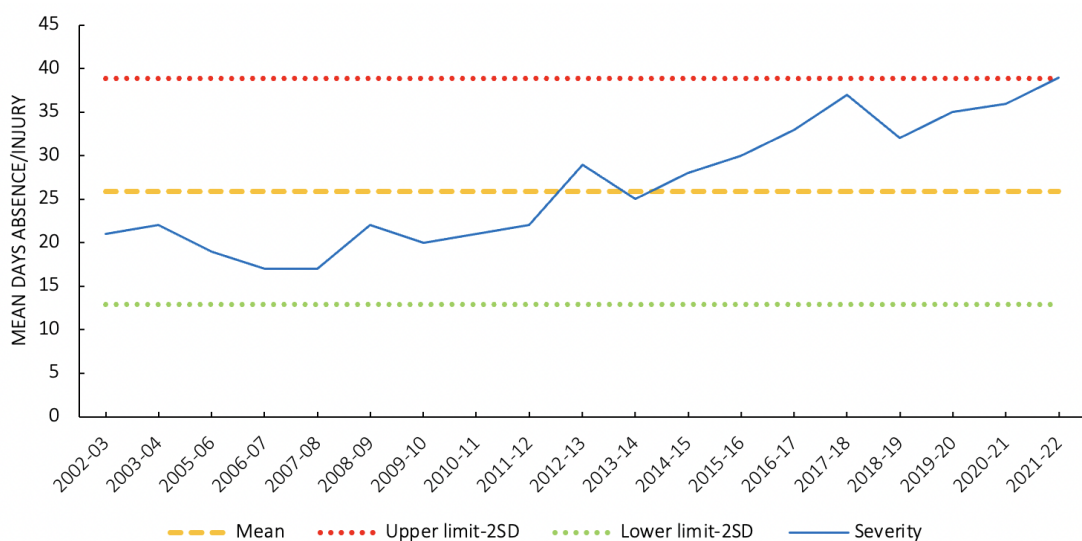


Figure 5: Mean days absent per training injury over the surveillance period with mean $\pm 2 \times$ standard deviation shown.

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 (2009-2016) and re-stabilisation (2016-2021). In this section of the report the 2021-22 concussion data is most accurately compared to the re-stabilisation (2016-2021) period mean.

In 2021-22, there were 158 match concussions accounting for 24% of all match injuries, which is similar to the 2016-21 period mean of 22% of all match injuries being concussions (**Table S5**). There were 43 training concussions sustained in 2021-22, which represents 21% of all concussions and which is higher than the 2016-21 period mean of 15% (**Table S5**). In 2021-22, concussion accounted for 11% of all training injuries, which is higher than the 2016-21 period mean of 6%. Nineteen percent of players (135 players) sustained at least one match concussion and 3% (21 players) sustained more than one match concussion during the 2021-22 season.

In 2021-22, the incidence of match concussion was 18.2 concussions per 1000 hours, which is within the expected season-to-season variation for the period 2016-21 (**Figure 6**).

Figure 6: Concussion Incidence

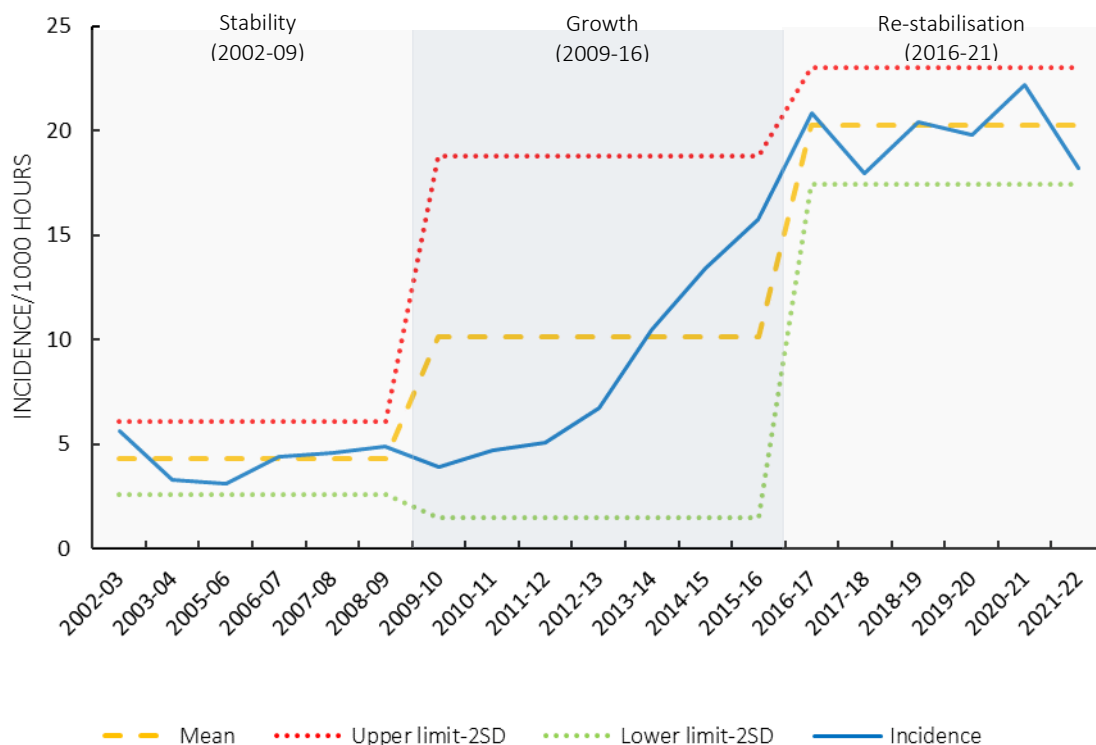


Figure 6: Incidence of reported match concussions by season with mean $\pm 2 \times$ standard deviation shown.

The mean days absence per match concussion was 22 days in 2021-22. This is the joint highest with 2018-19 in the 2002-21 period (**Figure 7**). Median severity of concussion was 11 days, compared with the 2002-21 period mean of 8 days. When a concussion occurred in 2021-22, players returned between 6-7 days in 25% of cases, which is lower than the value of 43% for seasons 2010-21. In 2021-22, players returned following concussion in 8-14 days in 39% of cases, and 5% of cases had not returned within 84 days (Error! Reference source not found. **Table S6**). It is possible that, in some cases, the time to return from concussion is extended as a result of conservative management and/or review from an external specialist. The burden of match concussion in 2021-22 was 399 days absence per 1000 hours (**Table S6**Error! Reference source not found.).

Figure 7: Days absent

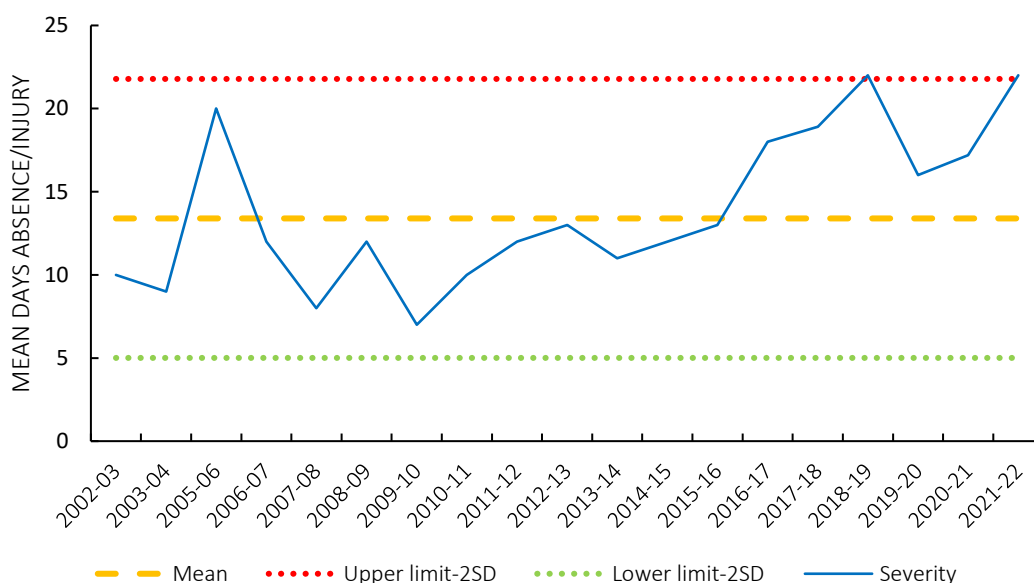


Figure 7: Mean days absent per reported match concussions by season with mean ± 2 x standard deviation shown.

THE TACKLE

The tackle was the match event most associated with an injury in 2021-22, with 45% of all injuries attributed to the tackle. In 2021-22, the incidence of injuries to the ball carrier was 18.4 per 1000 hours, while the incidence of injury to the tackler was 14.7 per 1000 hours (**Figure 8**). The mean days absence per injury to the ball carrier and tackler were 39 and 37 days, respectively (**Figure 9**). The burden of injury to the ball carrier was 716 days per 1000 hours and 547 days per 1000 hours to the tackler (**Table S8**Error! Reference source not found.). The most common injury in the tackle to both the ball carrier and tackler was concussion, making up 45% of all injuries to the tackler and 25% to the ball carrier.

Figure 8: Incidence

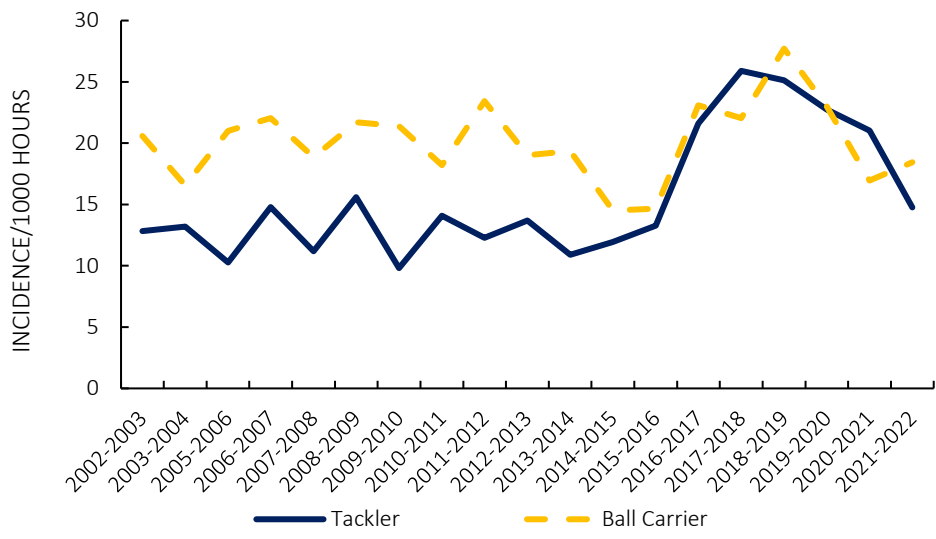


Figure 8: Incidence of tackle related injuries by season to tacklers (solid line) and ball carriers (dashed line).

Figure 9: Days absent

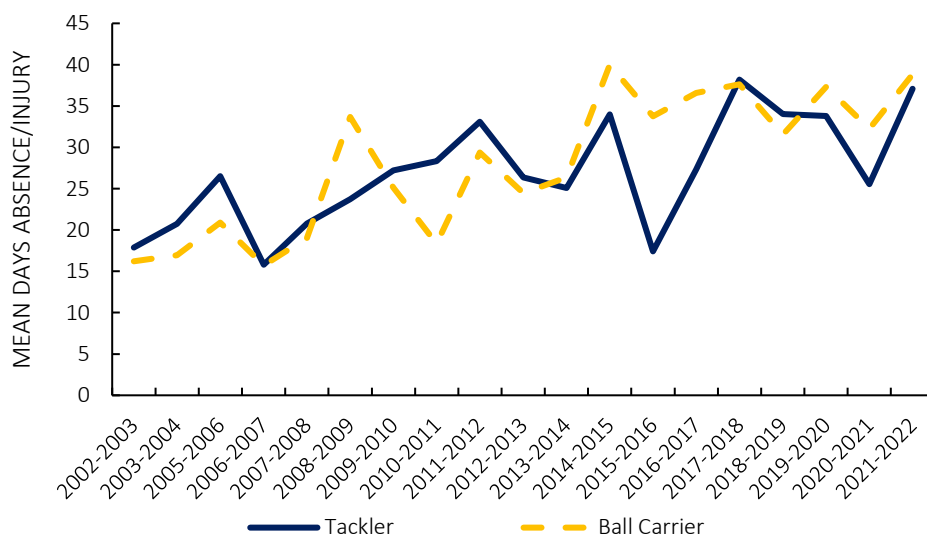


Figure 9: Mean days absent per tackle related injury by season to tacklers (solid line) and ball carriers (dashed line).

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 2021-22 there were an average of 166 tackles per team per match, compared with the average of 102 tackles per team per match 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 2021-22 was 4.9 per 1000 tackle events, which is lower than the average of 6.3 per 1000 tackle events across the 2013-22 period. The lower propensity of tackle-related injuries in 2021-22 is due to a substantial reduction in the propensity of tackle-related injuries to the tackler, decreasing from 3.3 per 1000 tackle events in 2020-21 to 2.2 per 1000 tackle events in 2021-22 (**Figure 10**).

Figure 10: Propensity/ 1000 tackles

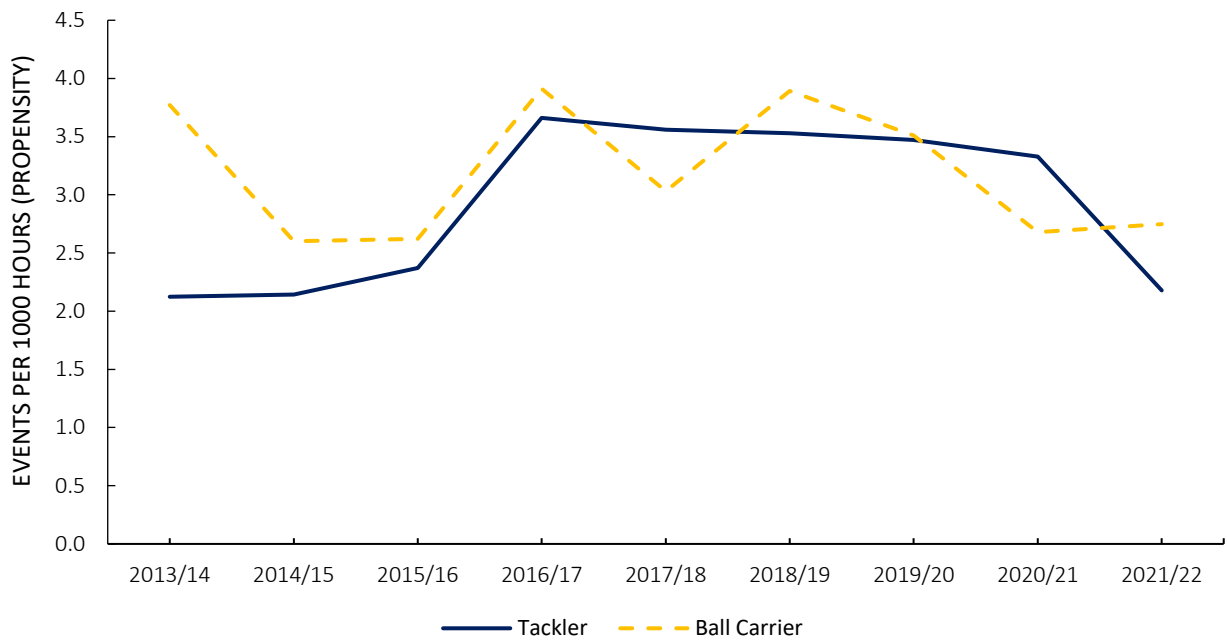


Figure 10: Propensity of tackle-related injuries to tacklers (solid line) and ball carriers (dashed line).

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 2021-22, 6 players retired as a result of injury and 2 as a result of illness.

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
2021-22	2	6

The injuries, which led to players retiring from the sport, were sustained at the following body locations in 2021-22:

LOWER LIMB	0
THORACIC AND LUMBER SPINE	0
TRUNK	0
UPPER LIMB	1
HEAD/NECK	5

SURFACE TYPE

In 2021-22, 31% of match exposure was on artificial turf pitches. There were 431 injuries in matches played on natural grass/hybrid pitches (5985 exposure hours) and 187 injuries in matches on artificial turf pitches (2693 exposure hours). In 2021-22 the incidence, severity and burden of match injuries were not different between surface types (

Table 1). Aggregating nine seasons of match data reveals that match injury incidence is not different for natural grass/hybrid and artificial turf (grass/hybrid: 82 injuries per 1000 hours vs artificial: 83 injuries per 1000 hours). Over the course of nine seasons, the mean days absent per injury on artificial turf is 39 days per injury, which is 6 days greater than natural grass/hybrid at 33 days per injury, resulting in the burden of injury on artificial turf (3229 days absence per 1000 hours) to be significantly greater than that for natural grass/hybrid (2703 days absence per 1000 hours) (

Table 1). Until the 2020-21 season, the aggregated season data trend for match injuries was 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. However, in 2021-22 this was the same for natural grass/hybrid and artificial turf. Over the 2013-21 period, the median days absence of injury on artificial turf of 14 days

is similar to the 12 days reported on natural grass/hybrid. In terms of the patterns of injury on different surfaces, we have previously reported higher burden of posterior thigh, hip/groin and foot/toe injuries sustained when playing on artificial turf versus natural/hybrid surfaces.

Training on artificial turf accounted for 25% of on-pitch training exposure. In 2021-22, there were 239 training injuries on natural grass/hybrid (61846 exposure hours) and 97 on artificial turf (20567 exposure hours). The incidence of training injury on natural grass/hybrid was 3.9 injuries per 1000 hours, which is not substantially different to the 4.7 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 2021-22 were similar to the 2015-22 aggregated mean days absent. When aggregating seven seasons worth of training data, for which training surface information is available, the incidence, severity and burden of injury are not substantially different between surface types (

Table 1).

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

		Grass		Artificial Turf	
		2013-22	2021-22	2013-22	2021-22
Match	Incidence (95%CI)	82 (80 - 84)	72 (66 - 79)	83 (78 - 88)	69 (60 - 80)
	Mean severity (95%CI)	33 (32 - 34)	44 (40 - 48)	39 (37 - 41)	44 (38 - 50)
	Median severity	12	18	14	18
	Burden (95%CI)	2703 (2627 - 2781)	3167 (2882 - 3481)	3229 (3043 - 3427)	3085 (2673 - 3560)
		2015-22	2021-22	2015-22	2021-22
Training	Incidence (95%CI)	4.1 (3.9 - 4.3)	3.9 (3.4 - 4.4)	3.8 (3.5 - 4.1)	4.7 (3.9 - 5.7)
	Mean severity (95%CI)	36 (34 - 38)	36 (32 - 41)	40 (37 - 43)	41 (34 - 50)
	Median severity	17	17	20	18
	Burden (95%CI)	145 (139 - 152)	141 (124 - 160)	152 (140 - 165)	194 (159 - 237)

TRAINING INJURY EVENT

In 2021-22, the incidence of injuries associated with rugby skills - contact training was significantly higher than the 2002-21 period mean (7.9/1000 hours vs 5.8/1000 hours), as was the incidence of injuries associated with conditioning non-weights training (8.1/1000 hours vs 5.3/1000 hours), while the incidence of conditioning weights training sessions was significantly lower (0.2 /1000 hours vs 0.7/1000 hours) (Figure 11).

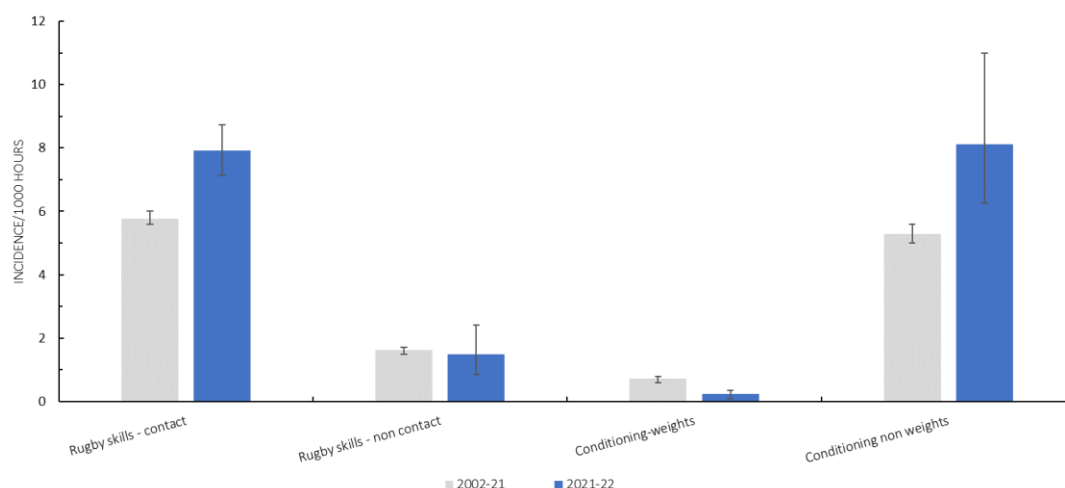


Figure 11: Incidence of training injury types for the 2021-22 season compared with the surveillance period (2002-21). Error bars show 95% CIs.

In 2021-22, the incidence of “full-contact” training injury was higher than the 2012-20 period mean (13.4/1000 hours vs 10.7/1000 hours), but similar to that seen in previous seasons (Table 3). In 2021-22, the most commonly occurring injury in “full-contact” training sessions was concussion (22% of all full-contact training injuries). In “semi-contact” sessions, concussion injuries were also the most commonly occurring injuries (14% 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	Severity	Burden	Incidence	Severity	Burden
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
2021-22	13.4	43	496	3.9	45	147
2012-21	10.7 (10.0 - 11.4)	32 (30 - 34)	355 (333 - 378)	4.9 (4.6 - 5.2)	32 (30 - 34)	157 (147 - 167)

INJURY DIAGNOSIS

For the eleventh successive season, concussion was the most common match injury (18.2 concussions per 1000 hours). Hamstring muscle injuries were the second most common match injuries (5.9 injuries per 1000 hours). For the seventh season in succession, concussion was the highest burden match injury. Hamstring muscle injuries were the match injuries with 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 were both the most common and highest burden training injury for the fifth consecutive season. Concussion was second most common training injury (0.32 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 12 matches in the 2021-22 season, with 29 recorded injuries. The incidence of match injuries for the England Senior side in 2021-22 was 121 injuries per 1000 hours. This is the same as the 121 injuries per 1000 hours for the 2002-21 period mean (**Table S9**). The mean days absent per match injury was 33 days, which is higher than the mean for the surveillance period (20 days). The overall burden of match injury was 4008 days absence per 1000 hours, which is higher than the 2002-21 period mean burden of 2361 days absence per 1000 hours and reflects the higher severity (**Table S9**).

Training Injuries

In 2021-22, the incidence of training injuries was 12.8 injuries per 1000 hours, which is higher than the 2002-21 period mean of 7.0 injuries per 1000 hours. In 2021-22, the 2-7 days category accounted for 43% of training injuries in the England squad, which is lower than the surveillance period mean of 53% and in contrast to the 24% recorded by the Premiership clubs (**Table S10**). Overall, there was a higher proportion of training injuries lasting 8-28 days and 29-84 days, and lower proportion of training injuries lasting 2-7 days and >84 days in the 2021-22 season than the 2002-21 period mean (**Table S11**). For injuries in rugby skills sessions (full-contact, semi-contact and non-contact combined), the incidence was 12.4 injuries per 1000 hours, which is higher than that of the 2002-21 period mean (7.0 injuries per 1000 hours). The burden for rugby skills injuries (290 days absence per 1000 hours) was higher than the 2002-21 period mean (154 days absence per 1000 hours). There were no injuries in strength and conditioning compared to the 2002-21 period mean (3.7 injuries per 1000 hours) (**Table S12** Error! Reference source not found.).

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 709 of 807 (88%) registered Premiership squad players for the 2021-22 season. A total of 435 team games were included in the analyses for the 2021-22 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, Premiership Cup, and 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 13 Premiership clubs in 2021-22. A complete set of data were collected from all 13 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.

Median severity

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

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 Professional Rugby Injury Surveillance Project:

Publications

- Williams, S., Kay, E., Bryan, R., Lambert, M., Cross, M., West, S. W., Kemp, S., & Stokes, K. A. The influence of match exposure on injury risk in elite men's rugby union. *Journal of Science and Medicine in Sport*. 2023; 6(1), 25-30.
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SUPPLEMENTARY DATA

Table S1: Match injury incidence, severity and burden 2002-22.....	xxv
Table S2: Match injury incidence by severity grouping 2002-22.....	xxv
Table S3: Training injury incidence by severity grouping 2002-22.....	xxvi
Table S4: Training injury incidence, severity and burden 2002-22.....	xxvii
Table S5: Concussions sustained in matches and training.....	xxvii
Table S6: Proportion of concussion by severity grouping.....	xxviii
Table S7: Incidence, severity and burden of match concussions 2002-22.....	xxviii
Table S8: Incidence, severity and burden of tackle related injuries to the ball carrier and tackler.....	xxix
Table S9: England match injury incidence, severity and burden 2002-22. *Asterisk indicate world cup year.....	xxx
Table S10: Proportion of Premiership and England training injuries by severity grouping 2002-22.....	xxx
Table S11: Proportion of England match and training injuries by severity grouping 2002-22. *Asterisk indicate world cup year.....	xxxi
Table S12: England training injury incidence, severity and burden 2002-22. *Asterisk indicate world cup year.....	xxxi

Table S1: Match injury incidence, severity and burden 2002-22.

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
2021-22	8678	647	75 (69-81)	1.5	44 (41-48)	3276 (3033-3538)	20
MEAN (2002-21)	7716	668	87 (81-94)	1.7	26 (24-28)	2252 (2088-2429)	10

Table S2: Match injury incidence by severity grouping 2002-22.

Season	Incidence/1000hrs (95%CI)				All injuries
	2-7 days	8-28 days	29-84 days	>84 days	
2002-03	57	30	9	3	100
2003-04	45	26	14	4	88
2005-06	29	29	13	3	75
2006-07	47	28	11	5	90
2007-08	39	30	10	4	83
2008-09	48	31	14	6	100
2009-10	36	29	10	4	80
2010-11	44	32	11	5	93
2011-12	34	28	13	7	82
2012-13	26	30	13	4	73
2013-14	38	33	14	6	91
2014-15	33	25	12	9	79
2015-16	23	24	11	5	62
2016-17	36	33	20	10	96
2017-18	28	32	19	12	92
2018-19	32	39	22	10	103
2019-20	31	30	15	11	88
2020-21	25	29	17	7	79
2021-22	17	29	15	13	75
MEAN (2002-21)	36 (35.0 - 37.0)	30 (29.1 - 30.9)	14 (13.4 - 14.6)	6 (5.6 - 6.4)	87 (85.5 - 88.6)

Table S3: Training injury incidence by severity grouping 2002-22.

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
2021-22	0.59	1.07	0.73	0.34	2.8
MEAN (2002-21)	0.90 (0.86-0.94)	0.97 (0.93-1.01)	0.46 (0.43-0.49)	0.18 (0.16-0.20)	2.51 (2.45-2.57)

Table S4: Training injury incidence, severity and burden 2002-22.

Season	Exposure	Total number of training injuries	Proportion of all injuries (%)	Incidence/100 0 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
2021-22	133773	376	37	2.8	29	39	18	110
MEAN (2002-21)	130039	329	33	3	27	26	12	67

Table S5: 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
2021-22	158	24	43	11	27
MEAN (2016-21)	153	22	28	6	15

Table S6: 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
2021-22	25	39	19	12	5
MEAN (2010-21)	43	37	17	9	4

Table S7: Incidence, severity and burden of match concussions 2002-22

Season	Exposure	Total number of concussion	Incidence/10 00 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
2021-22	8678	158	18.2	12	22	11	399
MEAN (2002-21)	7716	80	10	7	13	8	159

Table S8: 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
2021-22	23	38	857	18	35	641
MEAN (2002-21)	20	26	558	16	26	428

Table S9: England match injury incidence, severity and burden 2002-22. *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	0	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
2021-22	29	121 (84-174)	2.4	33	4008 (2785-5768)	80
MEAN (2002-21)	31	121 (85-172)	2.4	20	2361 (1660-3357)	48

Table S10: Proportion of Premiership and England training injuries by severity grouping 2002-22.

	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
2021-22	24	38	26	12	43	32	21	4
MEAN (2002-21)	36	38	18	7	53	28	13	6

Table S11: Proportion of England match and training injuries by severity grouping 2002-22. *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
2021-22	48	10	28	14	43	32	21	4
MEAN (2002-21)	55	28	12	4	53	30	11	5

Table S12: England training injury incidence, severity and burden 2002-22. *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)
2021-22	12.4 (8.5 - 18.1)	25	290 (199 - 423)	-	-	-
MEAN (2002-21)	7.0 (6.2 - 7.8)	20	154 (137 - 172)	3.7 (3.0 - 4.6)	21	70 (56.5 - 86.8)