TITLE

Training activities and injuries in English youth academy and schools rugby union

ABSTRACT

Background: All rugby training activities carry an injury risk but in the training environment these injury risks should be more controllable than during matches.

Hypothesis/Purpose: To compare training activities and the incidence and nature of training injuries within two levels of play (professional academy v school) in English youth rugby union.

Study Design: A prospective cohort design

Methods: A 2-season (2006-2007 and 2007-2008) study recorded exposure to training activities and time-loss injuries in male youth rugby union players (age, 16 – 18 yrs) from 12 English Premiership academies (n = 250) and 7 schools (n = 222).

Results: Training injury incidence was lower for the academy group (1.4/1000 player-hours, 95% CI 1.0 to 1.7) compared with the school group (2.1/1000 player-hours, 95% CI 1.4 to 2.9; *P* = .06). Injuries to the ankle/heel and thigh were most common in academy players, and injuries to the lumbar spine and ankle/heel region the most common in school players. The training activities responsible for injury differed between the two groups: technical skills for school players and contact skills for academy players.

Conclusion: The incidence of training injuries for youth rugby was similar to previous studies in senior rugby. For injury risk management in youth rugby, coaches of school players should focus on the development of the correct technique during practice of technical skills such as scrummaging, weight training and skills training, and coaches of academy players should consider the extent to which contact drills are necessary during training.

Key Terms: sport; injury; epidemiology; youth; injury risk

What is known about the subject:

Match injury rates across all playing levels of rugby union are considered high in relation to other team sports. Injury rates from rugby training are lower than match play and the injury patterns and risk factors may be different but training injuries have not been comprehensively studied in youth rugby.

What this study adds to existing knowledge:

Training injury incidence was considerably lower than the previously reported incidence of match injury in the same cohorts of players.

Training-related injuries were more common and more severe at the lower level of play (school) compared with the higher level (academy).

The type of training activities undertaken within youth rugby union might contribute to training injury risk to a greater extent than the overall volume of training and the composition of training sessions in terms of contact elements should be considered carefully from an injury risk perspective.

INTRODUCTION

Training in team sports is performed to: 1) develop individual and team skills; 2) develop specific physical attributes; and 3) formulate team strategies. It may also have a role in player welfare by conditioning players to prevent injuries during competition. Rugby Union is one of the most popular team sports in the world but as a full-contact sport the inherent injury risk is substantial. In the professional game, the incidence of injury in match play has been shown to be much higher than during training, [24] which reflects the differences between match and training activities in rugby, although in a two-year injury surveillance study of elite rugby 20% of the total number of injuries occurred in the training situation due to greater exposure time to training. [2, 3] Activities occurring within the training environment are more controllable than during match play and therefore injury reduction may be more feasible in training. In order to be able to identify targets for injury reduction during training, it is important to understand which injuries occur and how they are incurred.

The nature and intensity of many of the activities performed during training differ from those during match play. This is likely to influence not only injury incidence but also the risk factors contributing to training-related as opposed to match-related injuries. Although the incidence of training injuries is lower than that for match play, more time is spent in training than match play, consequently players sustain a sizeable proportion of overall injuries during training. A number of studies have investigated injury risk during match play within youth rugby, [12, 16, 19, 21] but only a few have reported results for training injuries separately from match injuries. [1, 17] As is evident with match injury incidence, training injury incidence has been reported to increase

with higher levels of competition in senior rugby union, [3, 4] but this has not been explored in youth rugby.

Therefore, the aim of this study was to determine the relationships between the training activities carried out and the nature of injuries sustained during training in English youth rugby union players, including a comparison between two levels of play, namely professional academy versus school rugby.

METHODS

The study was an observational prospective cohort design that used a questionnaire-based data collection procedure. Data collection occurred over two complete seasons (2006-2007 and 2007-2008) and involved twelve English Premiership youth academies and seven senior school rugby union teams. Individual players were squad members of their respective teams, aged 16-18 years, and all players provided written informed consent with passive consent forms sent to the players' parents / legal guardians. The two cohorts comprised 250 academy players and 222 school players; 46 academy and 10 school players participated in both seasons. There were 121 forwards and 129 backs in the academy cohort, and 122 forwards and 100 backs in the school cohort. Participant characteristics are identical to those provided previously. [21] The academy group consisted of players selected into the Premiership academies structure and so represented the potential future elite England professional senior players. The school group comprised players from well-established rugby playing schools and so could be considered as being towards the higher end of the secondary school playing standard in England. Nevertheless, the academy level was deemed a higher playing level.

The injury definition used was consistent with the 2007 IRB consensus statement. [9] The definition used in the study was for time-loss injuries, which were defined as 'any injury that prevents a player from taking a full part in all training and match play activities typically planned for that day for a period of greater than 24 hours from midnight at the end of the day the injury was sustained'. Recurrent injuries were defined as 'any injury of the same type and at the same site as an index (new) injury, occurring after a player's return to full participation from the index injury'. Injury severity was defined by the total number of days elapsed from the day of injury until a player returned to full fitness, with full fitness being defined as 'the player being able to take a full part in training activities typically planned for that day and available for match selection'.

Details of each individual injury were recorded on a specific form utilising the Orchard Sports Injury Classification System version 8, [22] and included information about date of injury, classification of the injury to two levels (body site, type of injury), information regarding the injury event, and date of return from injury. Weekly training exposure was calculated at a group level for each team by summing the duration of different training activities and the number of players participating in each training session. Training activities only included those sessions organised specifically by the rugby coaching team and were separated into broad categories to permit a breakdown of the proportion of time spent in each training activity. Only injuries attributed to these organised training sessions were included in the analysis. Within academies, training exposure and injury data were collected by Strength and Conditioning Coaches and Physiotherapists. In the school setting, the first team

Coach recorded training exposure and the school Nurse or Doctor recorded injury data. For each of the two seasons, Week 1 of injury surveillance was 1st July (the beginning of pre-season) with the season ending (Week 52) on 30th June. Injuries were recorded within these time periods and follow-ups continued past the end of the second season until all injuries had been resolved. Variability in quality of reporting may have occurred due to different levels of experience in the diagnosis of musculoskeletal injuries amongst the medical support available at each club; this potential bias was minimised by ensuring that a nominated medical professional (either an on-site nurse, physiotherapist or doctor) had to treat all rugby injuries. This restriction was considered important from a data quality perspective but may have biased the school cohort towards the higher end of the overall school playing population in England.

Injury incidence was reported as the number of injuries per 1000 player-training hours along with 95% confidence intervals (CIs), with injuries sustained during specific training activities reported as the number of injuries per 1000 player-training activity hours (e.g. weight training injuries per 1000 player weight training hours). Injury severity was reported as the mean and median number of days absence. Two-tailed Z tests were used to assess whether significant differences between groups (academy versus school) for injury incidence and mean severity were evident. [15] Significance was accepted at $P \leq 0.05$ (equal variances assumed), and exact P values are reported throughout.

Ethical approval for the study was obtained from the institutional ethics committee.

RESULTS

A total of 47,431 player-training hours (forwards: 22,245; backs: 25,186) were recorded for the academy group and 15,877 player-training hours (forwards: 9391; backs: 6486) were recorded for the school group over the two seasons. The average academy player (190 hours/season) therefore completed approximately two and half times the duration of training of the average school player (72 hours/season). Academy players spent relatively and absolutely more time performing weight training and 'prehabilitation' training, whereas school players spent relatively more of their training time in rugby-specific training, primarily involving activities with an element of body contact. (Figure 1).

Incidence and Severity of Training Injury

The academy group sustained 64 training injuries (forwards: 27; backs 37; new: 54; recurrent: 10) and the school group 34 training injuries (forwards: 23; backs: 11; new: 27; recurrent: 7). There were a total of 1075 and 929 lost days of training and playing because of training injuries within academies and schools, respectively. The training injury incidence was lower in the academy group with 1.4 injuries per 1000 player-training hours (95% CI 1.0 to 1.7), compared with the school group with 2.1 injuries per 1000 player-training hours (95% CI 1.4 to 2.9; $P = .06$) although this difference just failed to reach the critical threshold for significance (Table 1). The mean severity of training injuries was also significantly lower for the academy group (mean = 17 days, 95% CI 13 to 21) compared with the school group (mean = 27 days, 95% CI 18 to 36; $P = .03$). Recurrent injuries were significantly less severe in the academy group (12 days, 95% CI 5 to 19) compared with the school group (60 days, 95% CI 16 to 104; $P < .01$) (Table 1).

The incidence of training injuries was significantly lower for the academy forwards (1.2/1000 player-hours, 95% CI 0.8 to 1.7) than the school forwards (2.5/1000 player-hours, 95% CI 1.5 to 3.5; P = .01) but there was no difference between academy backs (1.5/1000 player-hours, 95% CI 1.0 to 1.9) and school backs (1.7/1000 player-hours, 95% CI 0.7 to 2.7; P = .72).

Nature of Training Injury

Injury location

The lower limb was the most commonly injured body area for both academies and schools (Figure 2). Within academies, the mean severity of training injuries was highest for the lower limb and head and neck, whereas for schools injuries to the trunk and upper limb were the most severe (Figure 2).

By individual anatomical location, the incidence of training injuries was highest to the ankle/heel and thigh within academies. In schools, the incidence of training injuries was highest to the lumbar spine, ankle/heel and shoulder, with the incidence of lumbar spine injuries significantly higher than in academies (P = .002) (Figure 3).

Injury Type

The tissues most commonly injured during training were muscle and tendon strains (academy: 0.6/1000 player-training hours; school: 0.9/1000 player-training hours) followed by ligament injuries (academy: 0.4/1000 player-training hours; school: 0.8/1000 player-training hours), for both the academy and school groups (Table 2).

Injury Event

Running (Academy: 20%; School: 20%) and tackling (Academy: 20%; School: 14%) were responsible for the greatest proportion of injuries by individual event (Table 3). The most common specific injury diagnoses across both groups, resulting from running related activities, were lateral collateral ankle ligament sprains (n=6 of 20 injuries), hamstring strains (n=4), and adductor muscle strains (n=3). Tackling resulted in upper and lower limb injuries with over a third of all upper limb training injuries (n = 5 out of 13 total upper limb injuries) sustained by players making a tackle, including 3 shoulder muscle injuries, one carpometacarpal joint dislocation and one "skier's thumb" injury. A third of all lower limb contact training injuries occurred as players were tackled (n=8 out of 24 injuries), with the most common specific diagnosis being thigh haematoma (n=3).

Injury by Training Activity

By nominated training activity, defence training presented the highest injury incidence in academies (8.2/1000 player-training activity hours), and scrummaging training the greatest injury incidence in schools (9.9/1000 player-training activity hours) (Table 4). The incidence of injury during isolated skill (P = .12) and weight training (P = .07) tended towards being higher within schools than academies. All weight training injuries within schools occurred to the trunk (n = 3) and two out of three head and neck injuries in schools occurred during scrummaging training.

DISCUSSION

This study determined the incidence, severity, nature and training events and activities associated with injury in English Premiership academy and school (16–18 years)

rugby union. The main findings are that (1) training injury incidence rate was lower than the previously reported match injury incidence for these two groups, (2) training injury incidence and recurrent injury severity were lower for academy than school players (i.e., lower values at the higher level of play), (3) running and the tackle were the most common training events causing injury for both academy and school players.

The incidence of training injuries was significantly lower than the corresponding match injury incidence rates for both academies (1.4 vs. 47/1000 player-match hours; $P < .01$) and schools (2.1 vs. 35/1000 player-match hours; $P < .01$). [21] This is in agreement with previous studies in senior rugby where the reported number and incidence of injuries were significantly greater in matches than training. [24] However, training injuries still accounted for 37% and 20% of all (combined match and training) injuries sustained by the players over the 2-season period, for academies and schools respectively. [21] Because the training environment is more controllable than the match environment, there may be a greater opportunity for injury risk reduction in this setting, making a better understanding of injury risk during training a priority.

The incidence of training injuries was higher for school players (2.1/1000 player-training hours) than academy players (1.4/1000 player-training hours, $P = .06$), approaching statistical significance, which was in contrast to match injury incidence reported from the same study group where match injury incidence was higher for academy players than school players. [21] The findings of the present study in youth rugby union also contrast with those reported previously in senior rugby, which have observed the incidence of training injuries to be higher at higher playing standards. Within senior rugby union, training injury incidence was reported at 1.3/1000 hours

for amateur, [13] 2.0/1000 hours for professional [3] and 3.5/1000 hours for international rugby union, [6] although the incidence during international competition was only 2.2/1000 hours for RWC 2011, [10] somewhat counter to the trend. Therefore, the school training injury incidence value of 2.1 per 1000 player-training hours is similar to the values previously reported in senior professional rugby union. It is of note that there was a difference in injury incidence between school and academy level forwards, but not for backs, suggesting that the greater training injury incidence observed in the school group is primarily a result of increased injury incidence in forwards.

In professional rugby it has been reported that higher training volumes lead to more severe injuries, mediated by higher levels of fatigue. [4] In the present study, academy players undertook on average 2.5 times the volume of training in comparison with school players, but the overall incidence of training injury was lower within academies than schools. This is likely to reflect the content of the training, since within the professional academies there was a clear focus towards the physical development of players, including considerable proportions of time spent on general conditioning and injury minimisation exercises as well as weight training, all activities with a low propensity for injury. Certain components of training have been observed to be protective and reduce the number and incidence of injury, including weight training, [11] hamstring focused 'pre-habilitation' training [5] and proprioceptively-focussed knee training. [18] It would seem that, despite relatively high training volumes, the training programmes undertaken by the academy players did not pose a higher injury risk. On the other hand, the emphasis within schools, with less time available to train, was on rugby-related training and preparation for match play.

Interestingly, the occurrence of injury in elements of training with a high technical component was greater in schools, including injury incidence during weight training, scrummaging and isolated skill work. This suggests that time spent in the development of correct technique and functional movement conditioning is important before full training activities are undertaken and there might be a need for a greater focus on this principle in school rugby.

The mean severity of all training injuries was higher in schools (27 days) compared with academies (17 days), although the severity of new injuries was similar between academies (18 days) and schools (19 days). The increased overall severity for schools was therefore mainly due to the significantly greater severity of recurrent training injuries reported in schools (academy: 12 days; school: 60 days). Similarly, more days absence were previously observed for the same study group for recurrent than for new injuries during match play in schools compared to the academies. [21] Taken together, these findings suggest that full and complete rehabilitation after an index injury may not have been achieved within schools. It is reasonable to speculate that full rehabilitation before returning to training and play is likely to be important, not just in the prevention of recurrent injuries but also in lessening the severity of those injuries when they do recur.

Our findings are consistent with those of previous studies [3, 14] showing that, of all contact and non-contact injury events, running was the most common training injury event within both the professional academies and schools. This injury event accounts in part for the high proportion of lower limb injuries sustained, and these injuries were mainly ankle ligament sprains, hamstring muscle and adductor muscle strains.

Studies from other sports have shown that it is possible to substantially reduce the number of non-contact lower limb injuries through injury minimisation training interventions, such as specific warm-up protocols. For example, acute knee and ankle injuries were reduced by 50% in adolescent female handball players as a result of a structured warm-up intervention programme. [20] Similarly, a neuromuscular warm-up programme reduced the anterior cruciate ligament injury rate by 64% in adolescent female footballers, although it should be noted that there was only a small number of injury events in this study. [23] These findings are nonetheless promising and it is important to determine whether similar effects can be achieved in adolescent and young adult males in a collision sport environment such as rugby.

With regard to contact events, both tackling and being tackled had comparatively high incidences of injury, within both academies and schools, which is consistent with recent evidence from schools rugby match play and training in Scotland. [19] However, we found a difference between academies and schools in the incidence of injury during scrummaging training, with scrummaging training in schools producing one of the highest incidence rates of all training activities per unit of exposure time (total scrummaging exposure = 405 hours). In contrast, we did not record any scrum-related injuries to academy players with a total exposure of 287 hours. Caution needs to be taken in reading too much into these findings given the relatively low number of injuries and exposure, but the scrum has received a lot of attention in the context of injury risk. [8] Coaching of safe technique and training of the full scrum via staged progressions beginning with correct individual technique is emphasised in the various coach education initiatives led by national rugby unions, including ‘Scrum Factory’ (England), ‘Scrum Ready’ (Scotland) and ‘Força 8’ (Portugal). All coaches involved

318 in youth rugby should subscribe to these training principles, irrespective of the
319 playing level being coached.
320
321 Weight training has previously been reported to be a low risk activity and the results
322 from the present study support previous findings from senior rugby union. Injury
323 incidence for weight training within academies (0.4/1000 hours weight training) and
324 schools (1.5/1000 hours weight training) elicited the lowest injury incidence of all
325 reported activities and these values were comparable (less so for schools) to previous
326 reports of 0.9 per 1000 hours for senior forwards and 0.4 per 1000 hours for senior
327 backs. [3] To improve rugby performance, one of the aims of a weight training
328 programme is to develop muscle strength and endurance, with specific strengthening
329 and power training around key joints and areas of impact (e.g. the knee, shoulder and
330 neck) to help to reduce the overall incidence of rugby injury. [11] However, high
331 volumes of weight training have also been suggested to increase the incidence of
332 specific training injuries, such as lumbar disc/nerve root injuries in forwards, [3, 7]
333 potentially due to factors including sub-optimal pre-conditioning of lumbar spine
334 stabiliser muscles, overload of the lumbar spine, poor lifting technique, and other
335 lumbar loading activities such as scrummaging. In our study, although the overall
336 number of injuries sustained through weight training was comparatively small, all
337 weight training injuries in schools and half of these injuries in the academies were
338 lumbar spine injuries. Thus, there is a basis to suggest that the preparation of players
339 for weight training and the progression of the training itself should be carefully
340 managed from both a loading and a technique point of view. Further, this might
341 require particular attention in the schools cohort where little or no pre-season

conditioning or physical preparation took place and also with less strength and conditioning support provided to players.

This study only surveyed a small proportion of the youth rugby playing population in England although it did involve the majority of eligible academy level players nationally. It should be noted that the present analysis is also restricted to analyzing only those injuries sustained by rugby players as a direct result of rugby-related training exposure

CONCLUSIONS

The present study demonstrated that the incidence of training injury was considerably lower than the incidence of match injury in the same two cohorts of players. However, there were differences between the cohorts with training injuries more common and more severe at the lower level of play (school) compared with the higher level (academy). Furthermore, the type of training activities undertaken within youth rugby union might contribute to training injury risk to a greater extent than the overall volume of training.

COMPETING INTERESTS

None.

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438 **FIGURE LEGENDS**

439 Figure 1. Distribution of training activities for academies and schools

440 Figure 2. Body location of training injuries for academy and school players as a
441 percentage of all injuries (mean severity in parentheses).

442 Figure 3. Training injury incidence (injuries per 1000 player-hours, with 95% CI) by
443 specific anatomical location, for academies and schools. Significant difference
444 between academy and school at ** $P \leq .01$. CI, confidence interval.

Table 1. Training Injury Incidence and Severity for Academies and Schools

	Academy		School	
Type of injury	Incidence (95% CI)	Severity, mean (95% CI) [median]	Incidence (95% CI)	Severity, mean (95% CI) [median]
New	1.1 (0.8 to 1.4)	18 (13 to 23) [9]	1.7 (1.1 to 2.3)	19 (12 to 26) [7]
Recurrent	0.2 (0.1 to 0.3)	12 (5 to 19) [7]**	0.4 (0.1 to 0.8)	60 (16 to 94) [37]†
All	1.4 (1.0 to 1.7)	17 (13 to 21) [9]*	2.1 (1.4 to 2.9)	27 (18 to 36) [7]

Incidence was measured as number of injuries per 1000 player-training hours; severity was measured as mean and median number of days' absence. Significant difference between academy and school * at $P = \leq .05$; ** at $P = \leq .01$. Significant difference between new and recurrent at † $P = \leq .05$. CI, Confidence Interval

Table 2 Training Injury Type expressed as Percentage of Injuries, Incidence and Severity for Academies and Schools [a]

	Academy				School			
Injury type group	% of injuries (n=64)	Incidence (95% CI)	Severity (median)		% of injuries (n=34)	Incidence (95% CI)	Severity (median)	
CNS/PNS	8	0.1 (0.0 to 0.2)	17	(8)	6	0.1 (0.0 to 0.3)	75	(-[b])
Contusion/laceration/lesion	14	0.2 (0.1 to 0.3)	8	(8)	6	0.1 (0.0 to 0.3)	6	(-[b])
Bone stress/fractures	3	0.1 (0.0 to 0.1)	94	(-[b])				
Joint (non-bone) ligament	31	0.4 (0.2 to 0.6)	18	(9)	38	0.8 (0.4 to 1.3)	39	(7)
Muscle & tendon	41	0.6 (0.3 to 0.8)	12	(8)	41	0.9 (0.4 to 1.3)	16	(13)
Other	3	0.1 (0.0 to 0.1)	21	(-[b])	9	0.1 (0.0 to 0.3)	13	(-[b])

[a]Incidence was measured as number of injuries per 1000 player-training hours; severity was measured as mean and median number of days' absence; CNS/PNS, Central Nervous System / Peripheral Nervous System. [b]Fewer than 3 injuries in the category displayed.

Table 3. Training Injury Event expressed as Percentage of Injuries and Severity for Academies and Schools [a]

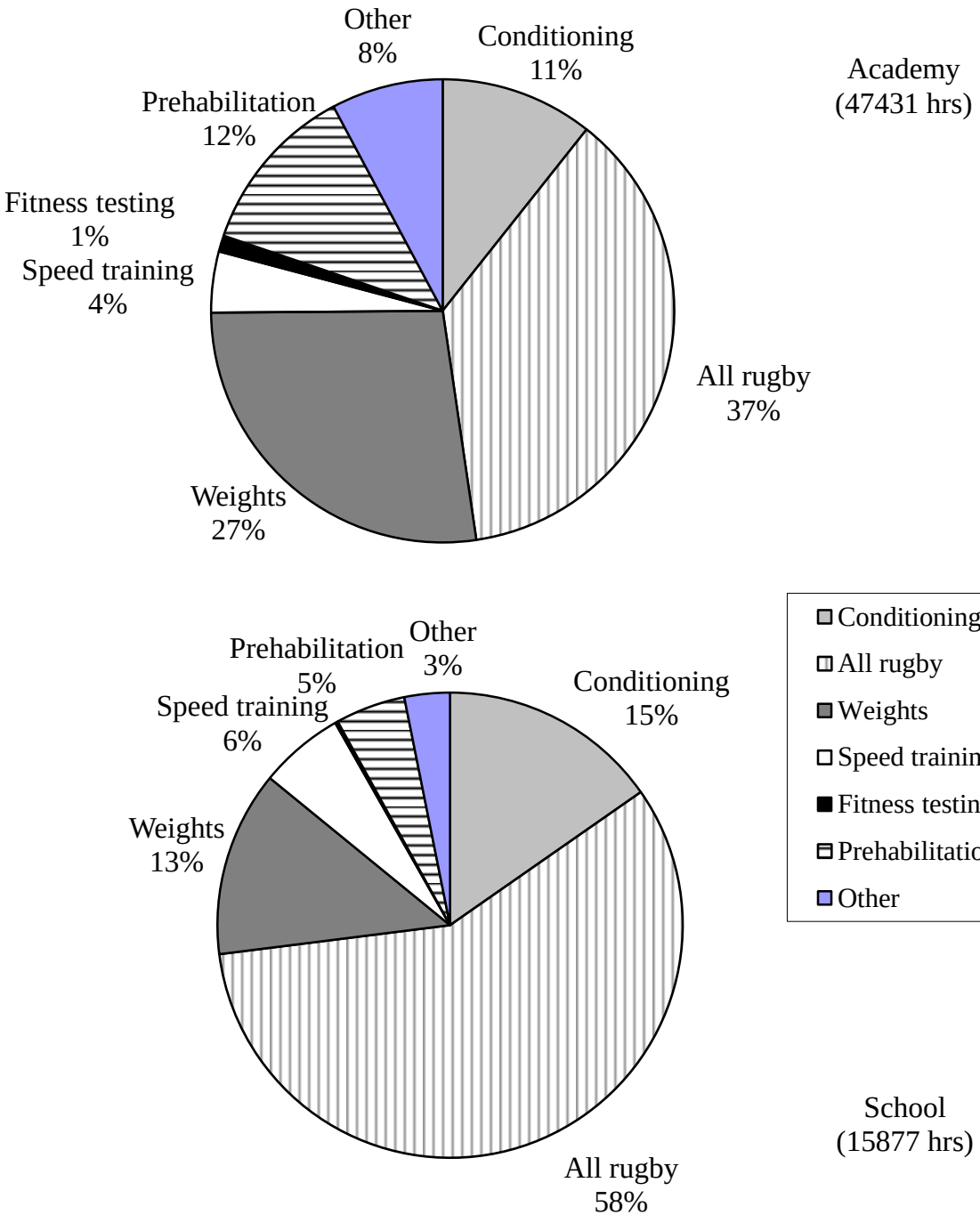
Injury Event	Academy			School		
	% of injuries (n=64)	Severity (median)		% of injuries (n=34)	Severity (median)	
Collision	5	39	(5)	6	84	(-[b])
Ruck/maul	8	9	(8)	3	1	(-[b])
Scrum				12	7	(6)
Tackled	13	21	(7)	9	5	(3)
Tackling	20	13	(7)	14	14	(14)
Other contact	5	30	(27)	6	13	(-[b])
All Contact	51	18	(8)	50	18	(9)
Change direction	8	10	(9)	3	19	(-[b])
Conditioning	11	22	(6)	0		
Jumping	1	24	(-[b])	0		
Running	20	15	(9)	20	17	(5)
Weights	8	12	(9)	9	80	(3)
All Non-Contact	48	16	(9)	32	35	(5)
Unknown	1			18		

[a]Severity was measured as mean and median number of days' absence. The specific event associated with training injury was recorded for 63 out of 64 injuries for the academy group (1 unknown event) and 28 out of 34 injuries for the school group (6 unknown events), with 100% equating to the total number of injuries. [b]Fewer than 3 injuries in the category displayed.

Table 4. Training Injury expressed as Percentage of Injuries, Incidence and Severity by Training Activity for Academies and Schools [a]

	Academy				School			
Training Activity	% of injuries (n=64)	Incidence (95% CI)	Severity (median)		% of injuries (n=34)	Incidence (95% CI)	Severity (median)	
Weight training	8	0.4 (0.1 to 0.7)	12	9	9	1.5 (0.0 to 3.1) *	80	(-[b])
All rugby								
Ind. skills	5	0.8 (0.0 to 1.8)	43	(-[b])	9	2.8 (0.0 to 6.0) *	57	(-[b])
Attack	27	5.8 (3.1 to 8.6)	18	(9)	14	4.1 (0.5 to 7.7)	8	(7)
Defence	28	8.2 (4.4 to 12.0)	10	(7)	14	7.4 (0.9 to 13.8)	11	(12)
Scrummaging					12	9.9 (0.2 to 19.5) *	7	(6)
Ruck/maul	9	7.1 (1.4 to 12.8)	9	(-[b])	9	5.3 (0.0 to 11.3)	2	(-[b])
Lineouts	3	2.6 (0.0 to 6.1)	24	(-[b])	3	1.7 (0.0 to 5.0)	23	(-[b])
Conditioning	11	1.4 (0.4 to 2.4)	12	(-[b])	3	4.5 (0.0 to 13.4)	5	(-[b])
Unknown	9				27			

[a]Incidence was measured as number of injuries per 1000 player-training activity hours; mean and median severity was measured as number of days' absence. Significant difference between academy and school at *$P = \leq .05$. CI, Confidence Interval. The specific training activity being undertaken at the time of training injury was recorded for 58 of 64 injuries for the academy group (6 unknown) and 25 of 34 injuries for the school group (9 unknown), with 100% in this table equating to the total number of injuries. [b]Fewer than 3 injuries in the category displayed.


Other
8%
Conditioning
11%
Academy
(47431 hrs)
Prehabilitation
12%
Fitness testing
1%
Speed training
4%
All rugby
37%
Weights
27%
Prehabilitation
5%
Other
3%
Conditioning
15%
Speed training
6%
Weights
13%
All rugby
58%
School
(15877 hrs)
Conditioning
All rugby
Weights
Speed training
Fitness testing
Prehabilitation
Other

Academy (64 Injuries)

head & neck
9% (18 days)

upper limb
13% (10 days)

trunk
13% (8 days)

lower limb
65% (19 days)

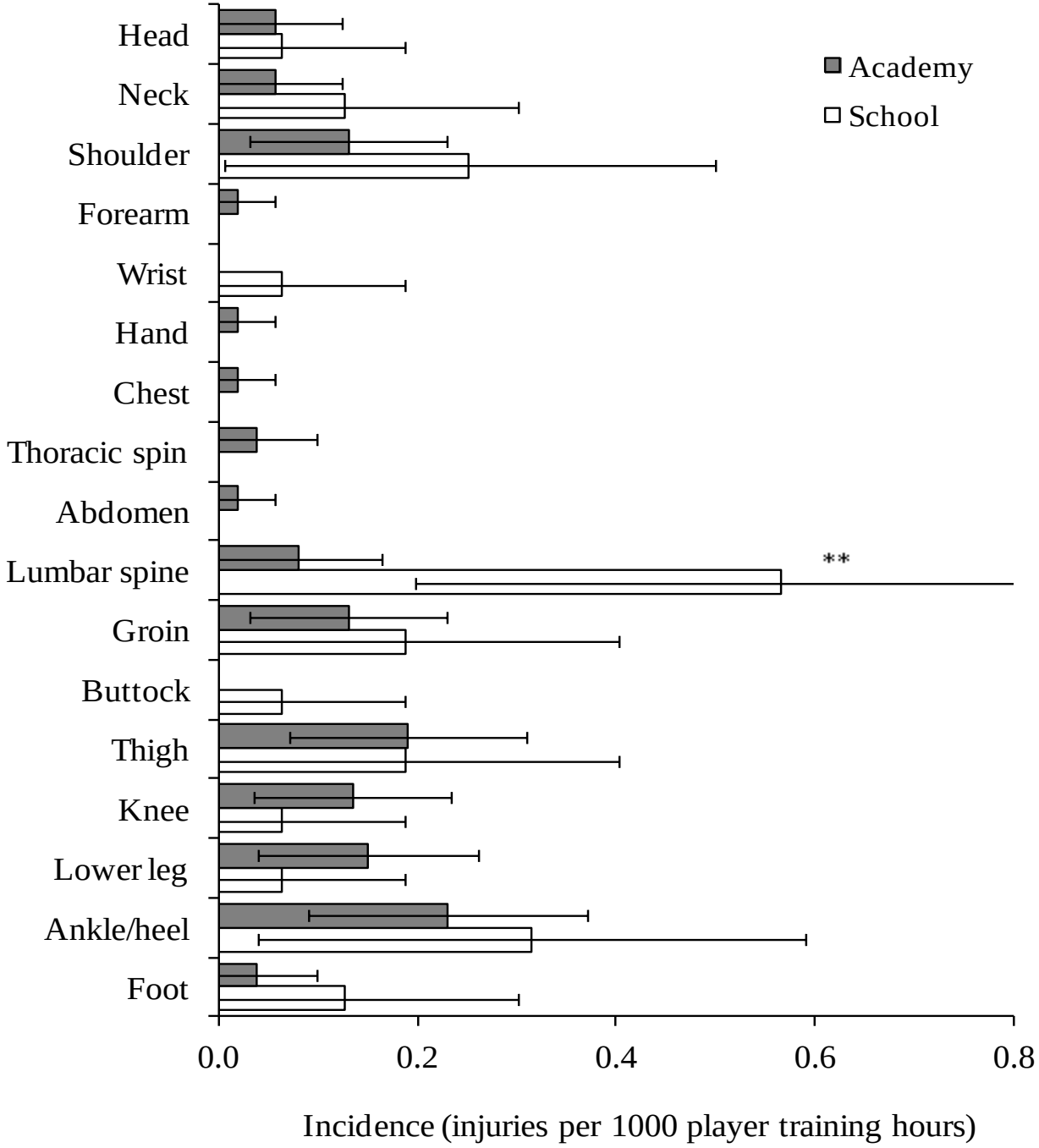
School (34 Injuries)

head & neck
9% (11 days)

upper limb
15% (42 days)

trunk
32% (43 days)

lower limb
44% (15 days)


Head
Neck
Shoulder
Forearm
Wrist
Hand
Chest
Thoracic spin
Abdomen
Lumbar spine
Groin
Buttock
Thigh
Knee
Lower leg
Ankle/heel
Foot
Academy
School
**
0.0
0.2
0.4
0.6
0.8
Incidence (injuries per 1000 player training hours)