



## Report on injury risk in English youth rugby union



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## Foreword

As Chairman of the Schools and Youth Governance committee, I was pleased to receive this valuable report which provides both information and actions to determine and address the injury risk faced by young rugby union players. It is a useful resource for all involved within the game and I hope that with sustained effort we can all work together to ensure that rugby union continues to flourish amongst children and young adults, whilst ensuring it remains at a low level of serious injuries in comparison to other sports. Sadly the only thing that hits the headlines are the high profile injuries within the game and rarely does the hard work by so many to monitor patterns and provide data analysis towards prevention get the recognition it richly deserves. This work is to be commended for its in depth look that will help the game to provide a safer and more enlightened view to all those involved.



Stuart Potts, Chair of RFU Schools and Youth Governance Committee

The focus on player welfare and player safety spans the complete game of Rugby Union with growing importance. For those that understand their physics and that  $\text{Force} = \text{Mass} \times \text{Acceleration}$  can recognise that as players become bigger and faster the contact forces are a multiple of the two elements and an increased risk of injury. This excellent report gives a solid baseline of 6370 playing hours over which the injury risks and effective measures of mitigating them have been measured and analysed. The key areas for potential injury reduction and improvements in rehabilitation are drawn from the research and these recommendations are commended to the game. Knowledge transfer, to ensure we effectively move forward, is still a challenge but one which must be addressed to ensure the positive output can be seen as true benefits in future injury surveys. The continued funding of research projects in this area to keep injury data current is essential. The adage of "what you can't measure you can't improve" was never so true.

May I add my thanks to those involved in delivering a valuable and timely report.



Paul Murphy, Chair of RFU Player Safety Committee

## Executive Summary

- The aim of this research was to determine the rate, severity, type and cause of injuries in English premiership academy and schools (16-18 year olds) rugby union.
- A two season injury surveillance study was conducted during seasons 2006/07 and 2007/08.
- Overall, the incidence of match injuries was approximately half that reported in senior elite club rugby union (Academy = 44/1000 player hours; School = 35/1000 player hours; Premiership = 87/1000 player hours; RWC2007 = 84/1000 player hours).
- The pattern of match injuries (body location and type) was similar to that previously reported for senior elite rugby union, with the lower limb being the most common injury location (Academy = 54% of injuries; School = 47% of injuries) and joint ligament sprains the most common type of injuries (Academy = 51% of injuries; School = 39% of injuries).
- The tackle was the match event most commonly associated with match injury for both academy (51% of injuries) and school (58% of injuries) youth rugby, which agrees with the findings of previous studies in senior elite rugby union.
- Contact-based training activities including attack, defence and ruck/maul drills resulted in the greatest injury incidence of all training activities.
- The overall number of training injuries was low, but comparison between the two groups highlighted:
  - Increased risk associated with recurrent (repeat) injuries in the School group
  - Increased incidence of scrummaging training injury in the School group
  - Increased incidence of weight training injury in the School group

## Background

- Previous injury surveillance studies have highlighted high injury incidence rates in senior elite rugby union in comparison with other team sports.
- Despite high participation rates, limited injury data has been available for youth rugby union, with no systematic studies previously conducted for any level of youth rugby union in England.
- It is important to establish the injury patterns in youth rugby in order to determine whether there are measures which could reduce injury risk in youth rugby.

## The Study

- The aim of this research was to determine the rate, severity, type and cause of injuries in English male youth rugby union.
- A two season (2006/07; 2007/08) injury surveillance study was conducted by researchers at the University of Bath on behalf of the RFU to investigate injuries in male youth (16-18 yrs) rugby union players.





- England nominated and elite player development group academy players were recruited from 12 English Premiership academies to form the 'Academy' group (274 players; 131 forwards, 143 backs). 1st XV players (plus reserves) were recruited from 7 rugby playing schools to form the 'School' group (222 players; 122 forwards, 100 backs).
- The two groups (Academy and School) were sampled to reflect two different levels of play within youth rugby, although 24 players had some involvement with both groups.
- Individual player, coach and parental consents were obtained prior to the study.
- Match and training injuries and exposure (amount of time spent in match and training activities) were reported using forms completed by medical support staff and rugby coaching/fitness staff working in the clubs and schools.
- Injury diagnosis was recorded using the Orchard (OSICS) sports injury coding system and data were analysed for injury incidence, nature and overall injury burden.
- Injury diagnosis was recorded to three levels (body location, pathology, detailed pathology) for the Academy group and to two levels (body location, pathology) for the School group in recognition of the potential differences in the level of medical support available. Only information from the first two levels has been used in this report.
- The injury definitions and data collection procedures utilised in this study are compliant with the IRB consensus statement for injury surveillance studies in rugby union (Fuller C.W. et al, *Clin. J. Sport Med.* 2007, 17: 177-181), allowing the results of this study to be compared with previous research.

- Overall, 92% of the expected match/training exposure forms and the individual injury forms were returned. For analyses, data from both seasons were combined.
- The study captured only the rugby exposure and injuries sustained by players during their participation for the teams involved in the project. Some players may have had rugby and other sport exposure outside the exposure analysed for this study.
- The School cohort came from very established rugby playing schools and so this group may not be representative of the wider Schools rugby population in England.

## Definitions

- **Injury** – 'any injury that prevented 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'.
- **Exposure** – the number of hours spent in a particular activity
- **Injury incidence** – the number of injuries sustained per 1000 player hours
- **Injury severity** – the mean number of days lost per injury
- **Injury burden** – a measure of the 'cost' of injuries, multiplying incidence by severity to give total numbers of days absence per 1000 player hours
- **95% CI** – are 95% confidence intervals, which give the range in which the true 'population' value will lie



## Match Injuries – Incidence & Severity

**Table 1** Match injury data for incidence and severity

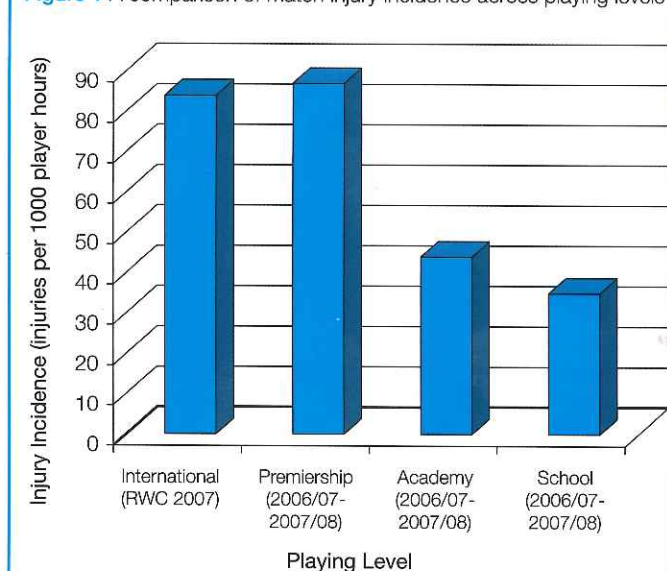
Group	Total number of player match hours	Total number of match injuries	Injuries per 1000 hrs (95% CI)	Injuries per club per match	Injuries per player per season (95% CI)	Average severity (days)	Days absence per club per match	Days absence per player per season (95% CI)
Academy	2527	111	44 (36-52)	0.9	0.4 (0.3-0.5)	32	28	13 (11-14)
School	3843	134	35 (29-41)	0.7	0.6 (0.5-0.7)	30	21	16 (15-16)

■ The Academy group had a lower absolute number of injuries and lower days absence per season per club than the School group due to lower match exposure even though the incidence rate was numerically higher in the Academy group.

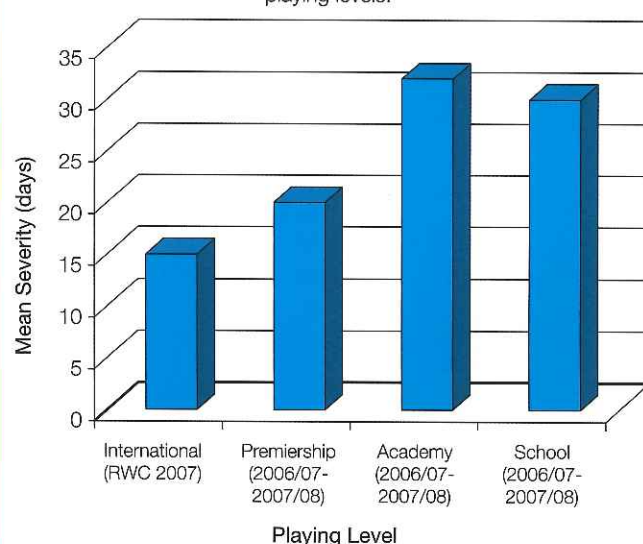
■ Match injury incidence was lower in youth rugby than elite senior rugby union (**Figure 1**).

■ The mean severity of injury was higher for Academy (32 days) and School players (30 days) than Premiership players (20 days) and International players (15 days) (**Figure 2**).

**Figure 1** A comparison of match injury incidence across playing levels



**Figure 2** A comparison of match injury mean severity across playing levels.



■ The breakdown of severity classifications for the Academy group, School group and comparisons with senior rugby are presented in **Table 2**.

**Table 2** Severity classifications for match injuries  
Percentage of Injuries in iRB Severity Categories

Injury Severity	International (RWC2007)	Premiership (2006/7-2007/8)	Academy (2006/7-2007/8)	School (2006/7-2007/8)
Slight (0-1 days)			2	6
Minimal (2-3 days)	25 (slight, minimal)	18 (slight, minimal)	9	6
Mild (4-7 days)	29	31	14	23
Moderate (8-28 days)	28	34	48	37
Severe (> 28 days)	18	17	27	28

- Due to higher injury incidence the injury burden is higher in Premiership rugby (1738 days absence/1000 player hours) than the Academy group (1388 days absence/1000 player hours) and the School group (1031 days absence /1000 player hours).
- With approximately double the injury incidence but approximately half the mean severity of injuries, International (RWC 2007) rugby has a similar injury burden (1232 days absence/1000 player hours) to youth rugby.
- Previous research studies from senior rugby union regarding positional effects on injury rates have produced equivocal results. This study observed no significant difference in match injury incidence between backs and forwards, for the Academy group (backs = 50.1 injuries/1000 player hours, forwards = 37.2 injuries/1000 player hours) and the School group (backs = 36.5 injuries/1000 player hours, forwards = 33.5 injuries/1000 player hours).

## Match Injuries – Injury Type

- The lower limb was the most common injury location for both Academy (54% of all injuries) and School (47% of all injuries) groups.

**Figure 3** Body location of match injuries for Academy and School players

### Academy

head & neck  
13.5%

upper limb  
27.9%

trunk  
4.5%

lower limb  
54.1%



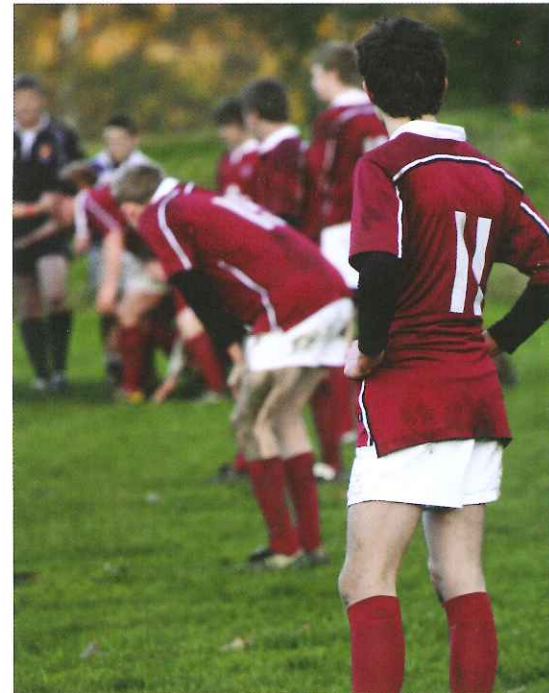
### School

head & neck  
17.8%

upper limb  
24.4%

trunk  
10.4%

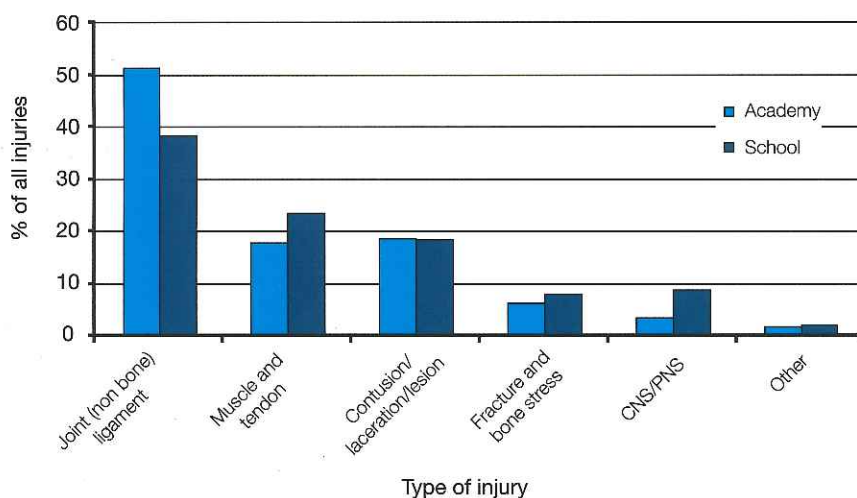
lower limb  
47.4%



- The most common type of injury were:  
 joint (non-bone) ligament injuries (Academy = 51%; School = 39%)  
 muscle/tendon injuries (Academy = 18%; School = 24%)  
 contusion/laceration injuries (Academy = 19%; School = 19%)

**Figure 4** presents the types of injuries observed in Academies and Schools in rank order, highlighting very similar trends.

**Figure 4** Types of injuries observed in Academy and School players



CNS – Central Nervous System  
 PNS – Peripheral Nervous System  
 Joint (non bone) ligament – joint cartilage and ligament sprains  
 Muscle and tendon – muscle and tendon tears/strains and overload  
 Contusion/laceration/lesion – cuts and bruises  
 Fracture and bone stress – fractures  
 CNS/PNS – concussion, spinal disc and nerve injuries

\* The Premiership data used for comparison throughout this report have been extracted from the information provided in the 'England Rugby Injury & Training Audit: 2008-2009 Season Report' published by Premier Rugby and the RFU, using data from seasons 2006-07 and 2007-08. The International data used for comparison has been published previously (Fuller C.W. et al, Br. J. Sports Med. 2008, 42: 452-459) and were obtained from RWC 2007.



## Match Injuries – Injury Type

- Regarding specific injury diagnoses, knee anterior cruciate ligament (ACL) injuries (Academy) and shoulder dislocation (School) injuries resulted in the greatest number of overall days lost (Table 3).

**Table 3** Match injuries causing the greatest overall days lost for Academies and Schools

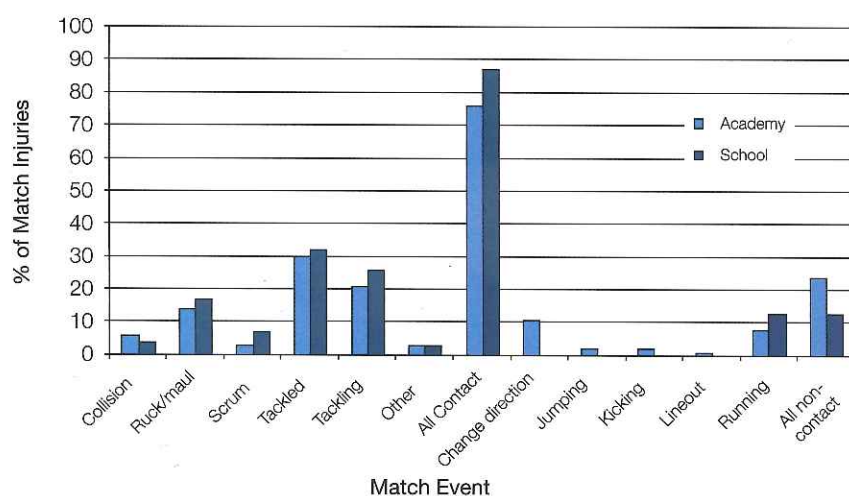
Academy			School		
Injury	Number of injuries	Days Lost	Injury	Number of injuries	Days Lost
Knee ACL	3	219	Shoulder dislocation/instability	8	257
Knee meniscus/cartilage	4	145	Shoulder general	14	204
Shoulder rotator cuff	6	118	Knee general	9	112

NB. 'general' injuries occur when a specific diagnosis has not been possible.

## Match Injuries – Injury Event

- The tackle was the match event most commonly associated with injury for both Academy (51% of all match injuries) and School players (58% of all match injuries), with slightly more injuries as a result of being tackled than tackling. The match events causing injury are presented in Figure 5.

**Figure 5** Proportion of injuries arising from particular match events



NB. Match events leading to non-contact injuries in schools were not coded to the same level of detail.

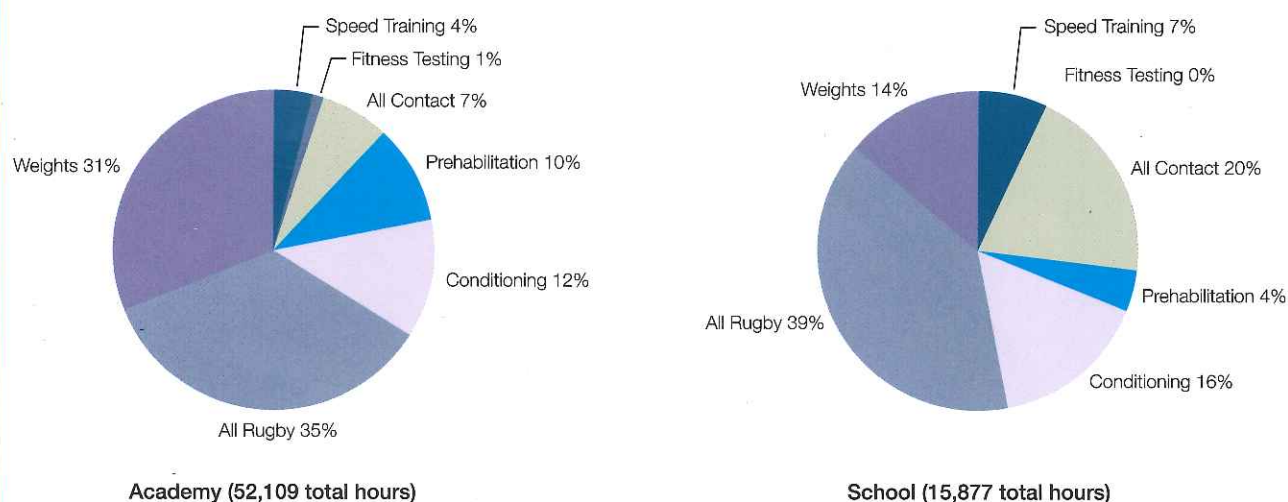
## Match Injuries – Recurrent Injuries

- Regarding the level of recurrent (repeat) injuries, the incidence of recurrent injuries for the Academy group was 5.1 (95% CI: 2.3 to 7.9) per 1000 player match hours; recurrent match injury incidence for the School group was 3.9 (95% CI: 1.9 to 5.9) per 1000 player match hours.
- These recurrence rates for Academy players (12%) and School players (11%) were similar to the recurrence rate for Premiership players (10%), indicating generally good rehabilitation completeness for youth players.
- However, the mean severity of recurrent (repeat) injuries was higher in Schools (mean of 46 days) when compared with the severity of new injuries in Schools (27 days), and higher than the severity of recurrent injuries in Academies (17 days), leading to the burden of recurrent match injury being significantly higher in School than Academy players.

## Training Injuries – Incidence, Severity & Type

- Academy players conducted over two and a half times the amount of training compared with School players on average (Academy: ~3.7 hours per week per player; School: ~1.4 hours per week per player), with a greater proportion of and absolute amount of time spent doing weight training and prehabilitation (injury prevention) training (Figure 6).

Figure 6 Distribution of training activities for academies and schools



- Training injury incidence for the Academy group was not statistically lower than the training injury incidence for the School group (Table 4).

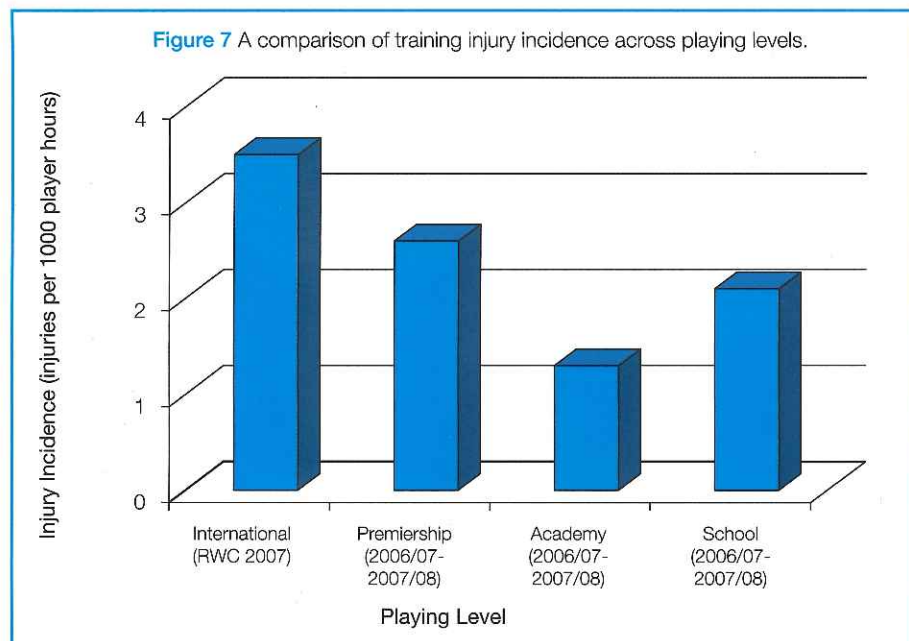
Table 4 Training injury incidence & severity

Group	Total number of training hours	Total number of training injuries	Injuries/1000 hrs (95% CI)	Average severity, days
Academy	52109	66	1.3 (1.0-1.6)	17
School	15877	34	2.1 (1.4-2.9)	19
Premiership			2.6 (2.4-2.9)	19





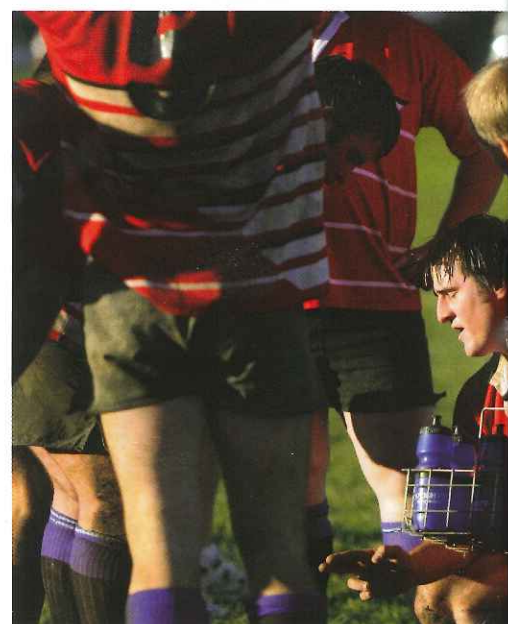
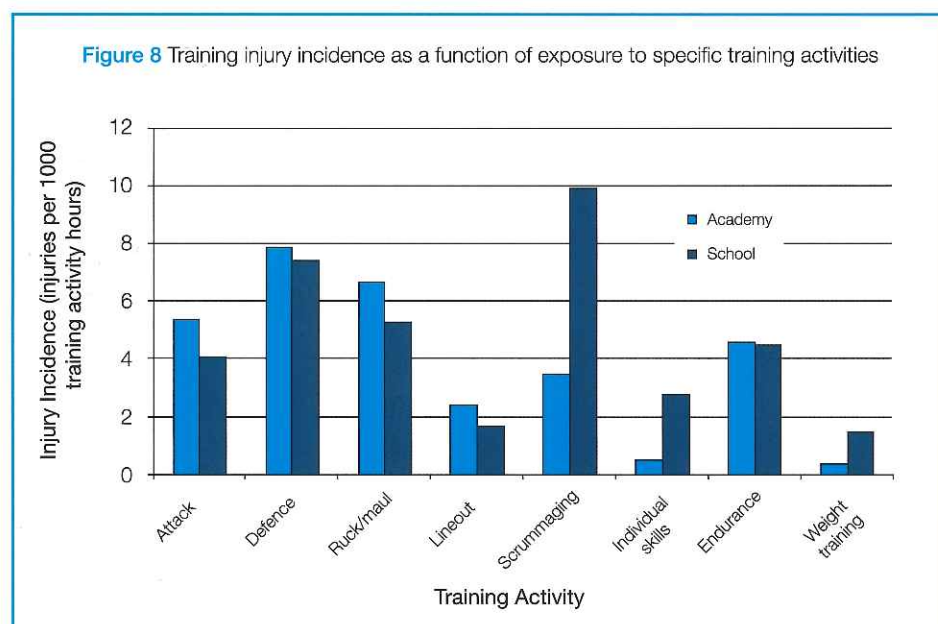
- Injury occurrence was considerably lower during training than matches for both the Academy group (match = 44 injuries/1000 player hours; training = 1.3 injuries/1000 player hours) and the School group (match = 35 injuries/1000 player hours; training = 2.1 injuries/1000 player hours).
- Training injury incidence was lower in youth rugby than elite senior rugby union (Figure 7).



- Overall, front row forwards were the most commonly injured of all position groups within training, with a significantly higher training injury incidence in School forwards than Academy forwards, mainly due to injuries resulting from scrummaging practice.
- The lower limb was the most common training injury location for the Academy group (67% of injuries) and the School group (44% of injuries).

### Training Injuries – Injury Event

- When corrected for the exposure to specific training activities, contact-based training drills exhibited higher injury incidence. This included simulated attack, simulated defence and ruck / maul training (Figure 8).
- Scrummaging training, weight training and individual skills training produced higher injury incidence in School than in Academy players (Figure 8).





## Training Injuries – Recurrent Injuries

The severity of recurrent (repeat) training injuries was higher in Schools (60 days) versus Academies (13 days), mirroring the situation with match injuries.

## Training Injuries – Injury Risk

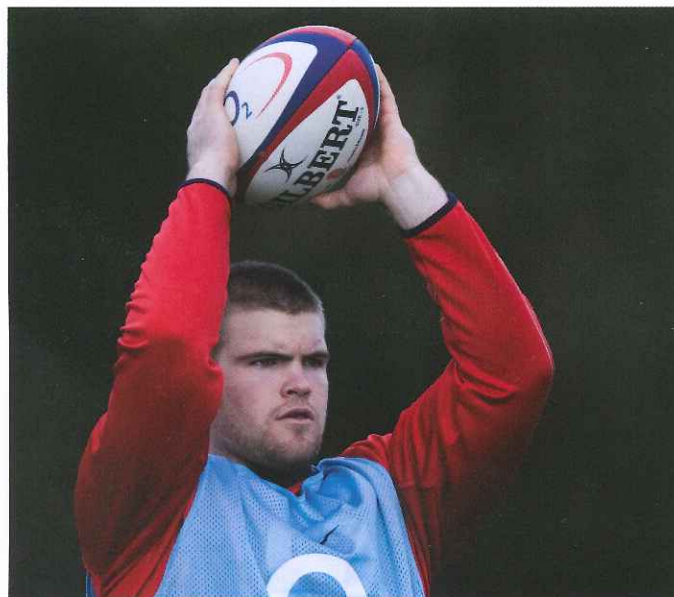
- The Academy group had a greater volume of training than the School group but the overall risk of training injury was significantly lower (Academy = 22 days absence/1000 player hours; School = 40 days absence/1000 player hours).

## External Risk Factors for Injury

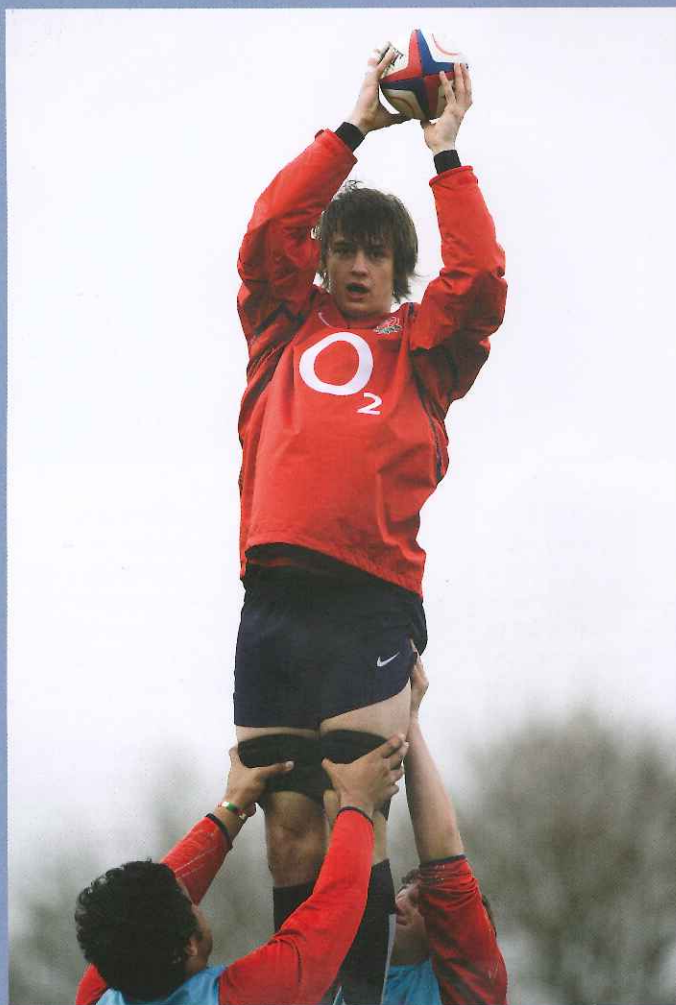
- The burden of shoulder injuries sustained during matches was not statistically lower when shoulder padding was worn for both the Academy group (Relative Risk = 0.63) and the School group (Relative Risk = 0.91).

## Discussion

- The incidence of injury in Academy and School youth rugby union is considerably lower than the incidence recorded for senior elite rugby union. This may reflect differences in the nature of the game such as players' physical characteristics and the 'pace' of the game being generally greater in senior rugby.
  - In general the injury patterns in youth rugby mirror those observed in senior rugby, in terms of types and causes of injury, particularly for the Academy group. However, there are certain areas where differences in injury patterns are beginning to emerge, for example a high shoulder injury burden in School players, a difference in the source of training injuries in School players, and higher than expected severity of recurrent injury in School players. These areas may require specific attention or strategies to manage the injury risk in youth rugby union.
- The higher mean injury severity observed in youth rugby compared with senior elite rugby may reflect a number of possible factors including: a) the presence of genuinely more severe injuries in youth rugby; b) less tendency/pressure for youth players to return to play earlier; c) less comprehensive treatment skills and resources available to youth players; and d) lack of musculoskeletal robustness in youth players due to lower maturity and training status.
  - The burden of recurrent match injury was significantly higher in School than Academy players. This finding reinforces the importance of complete rehabilitation prior to return to play so to avoid the risk of lengthy lay-offs with recurrent injuries.
  - Academies had a greater volume of training than Schools but the overall risk of training injury was significantly lower. There was little pre-season preparation training recorded within Schools compared with Academies and a greater proportion of training time during the competitive season was spent in contact training activities – these factors may have contributed to the higher burden of training injuries observed within the School group.







## Implications for the Future

■ Key areas for potential injury reduction may include:

- Refining coaching practice to optimise **player match technique** from a safety perspective. This should include:
  - appropriate coaching of contact technique for executing and receiving tackles
- Refining coaching practice to optimise **player training technique** from a safety perspective. This should include:
  - proper teaching and regular reinforcement of all contact-based skills
  - management of the amount of contact in training by considering which specific drills need to involve contact
  - a review of scrummaging technique development and scrummaging training activities in school rugby players
  - a review of weight training technique development and possibly levels of supervision during weight training in school rugby players
- Refining coaching practice to optimise the **design of team training and competition schedules** to ensure:
  - appropriate time is dedicated to the development of individual technique, particularly in contact skills
  - appropriate time is dedicated to following the progression from individual technique to individual skills and then to team skills, prior to exposing players to match situations
  - sufficient pre-season conditioning is conducted prior to the competitive season
  - opportunities for players to undertake prehabilitation (injury prevention) conditioning are incorporated throughout the season
  - youth players undertaking weight training are supervised at all times by individuals with suitable qualifications (e.g. S&C Level 2/BAWLA)
- Developing specific injury prevention (prehabilitation) training programmes designed to protect players from high risk injuries.
  - Injuries to the knee joint (ACL) within academies and shoulder joint within schools represented the greatest injury burden in both matches and training
  - Injury prevention conditioning and warm-up programmes have been successful in reducing specific injuries in other team sports. Specific programmes to target injury prevention to the knee and shoulder joints of youth rugby players may warrant investigation
- Improving diagnosis, treatment and rehabilitation for common, high risk and recurrent injuries. This may include:
  - the review, development and dissemination of best practice guidelines for selected injuries to medical and coaching practitioners
  - a review of return to play decision making guidelines and adherence to these guidelines
  - educating coaches to ensure players are fully rehabilitated from injury before they progressively return to training and match play in order to minimise the occurrence of recurrent injury





- All individuals involved in rugby should be aware of good practice guidelines for player welfare and injury management, e.g. IRB Rugby Ready  
[www.irbrugbyready.com](http://www.irbrugbyready.com)

## Useful Resources

The following links and resources should provide useful information for those wishing to find out more about some of the issues raised in this report or seeking to further develop their rugby knowledge in relation to player welfare.

### ■ Recommended Courses and Training:

The RFU Coaching hub for information on Foundation coaching courses, Qualification coaching courses and Continuous Professional Development (CPD) courses:  
[www.rfu.com/TakingPart/Coach.aspx](http://www.rfu.com/TakingPart/Coach.aspx)

Examples of pre-habilitation exercises for rugby:  
[www.rfu.com/TakingPart/PlayerHealth/InjuryPrevention.aspx](http://www.rfu.com/TakingPart/PlayerHealth/InjuryPrevention.aspx)

Details of RFU approved strength and conditioning qualifications: [www.rfu.com/TakingPart/Coach/CoachDevelopmentProgrammes/StrengthandConditioningCertificates.aspx](http://www.rfu.com/TakingPart/Coach/CoachDevelopmentProgrammes/StrengthandConditioningCertificates.aspx)

A course specifically designed to develop the coaching of safe and effective scrummaging technique:  
[www.rfu.com/TakingPart/Coach/ScrumFactory.aspx](http://www.rfu.com/TakingPart/Coach/ScrumFactory.aspx)

A link to the IRB Rugby Ready programme resources:  
[www.rfu.com/TakingPart/Coach/CoachResourceArchive/RugbyReadyInformation.aspx](http://www.rfu.com/TakingPart/Coach/CoachResourceArchive/RugbyReadyInformation.aspx)

Complete the IRB Rugby Ready programme:  
[www.irbrugbyready.com/](http://www.irbrugbyready.com/)

### ■ Recommended DVDs:

'Strength and Conditioning' DVD enquiries: [hollyhart@rfu.com](mailto:hollyhart@rfu.com)

'Tag to Tackle' DVD enquiries:  
[coachingresourceorders@rfu.com](mailto:coachingresourceorders@rfu.com)

## Acknowledgements

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- We are also most grateful for the support provided to the project by the following individuals and groups: Dr Mike England (RFU), Dr Karen Hood (RFU), Dr Colin Fuller (Nottingham University), Dr Simon Kemp (RFU), Dr John Brooks (RFU), Conor O'Shea (formerly RFU), RFSU, PRA, Premiership Rugby.

## Authors

Dr Debbie Palmer-Green, Dr Grant Trewartha & Dr Keith Stokes  
*Sport, Health & Exercise Science, University of Bath*