TACKLING IS A MAJOR MECHANISM OF PRE-SEASON TRAINING INJURIES IN ENGLISH NATIONAL DIVISION ONE RUGBY UNION PLAYERS
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Abstract

Objectives: To conduct a prospective epidemiological study of pre season training injuries sustained by semi-professional rugby union players in an English National Division One club. It is hoped that major mechanisms of injury and injury types will be identified and provide valuable information to the coaching and medical staff to enable them to make the training environment safer for the players.

Methods: A nine week prospective design was used to record information on pre season training injuries to all first team squad members of Launceston RFC (Cornish All Blacks). The clubs chartered physiotherapist recorded all injuries that were treated on a standardised injury report form. A set of guidelines were provided for the physiotherapist to refer to whilst completing the form. An injury was defined as ‘any occurrence during rugby related training for Launceston RFC that requires physiotherapist attention’.

Results: A total of 42 injuries were recorded over 22 training sessions. The overall incidence of injury occurrence was 1.68 injuries per session. Tackling (51%) was the most common mechanism of injury, with running the second most common, accounting for 33% of all injuries sustained. The majority of tackling injuries resulted in injury to the tackled player (81%). The major location of injury as a result of a tackle was the lower limbs (50%) and the majority of tackling injuries occurred in the second hour of a training session (77%). Muscle/tendon injuries were the most common type of injury (50%) and the vast majority were lower limb (90%). Outside backs were the most commonly injured players (62%).

Conclusions: Attention should be paid to the tackle area; in particular, the tackled player should be educated how to take contact on their own terms. Further standardised data collection is warranted to investigate pre season injuries in rugby union.
CHAPTER I

INTRODUCTION
1.0 INTRODUCTION

1.1 Problems with research into rugby union injuries

Currently there is no uniform definition of a “sports injury” and the research designs themselves have limitations. The use of different injury criteria as well as inconsistency in data collection and recording further complicate study comparisons (Van Mechelen et al., 1992 and Parkkari et al., 2001). The need for an international definition of “sports injury”, based on these two reports, would seem necessary for the reliability and validity of future research being applied to the field. It is important to be able to make intra-sport comparisons of injury rates, as it would help coaches, medical staff and players to identify weaknesses in the training or body. Brooks and Fuller (2006) suggested that inter study comparisons of incidence values are meaningless if injury definitions are not the same.

An example of the current problem is illustrated by two varying definitions of injury within rugby union research. Bathgate et al. (2002, p.265) defined an injury as ‘one that forced a player to either leave the field or miss a subsequent game’. However, Brooks et al. (2005b, p.768) defined an injury as,

\[
\text{any occurrence that prevents a player from taking a full part in all training activities typically planned for that day and match play for more than 24 hours from midnight at the end of the day the injury was sustained.}
\]

The variation in definitions and terms, as seen above, makes it difficult to compare accurately between and within sports (Walter et al., 1985).
There are many ways of classifying an injury, which itself leads to difficulties when trying to compare data and information from different studies. Van Mechelen et al. (1992) tried to address the issue of classification, with the Aetiology of Injuries Model that was intended to cover all conceivable causes of injury and place them into categories. In light of the previous problems highlighted by various authors, Fuller et al. (2007b) produced a consensus statement on injury definitions and data collection methods for studies of injuries in rugby union. The main outcomes from this included a standard injury definition and standardised report forms, which the author hoped, would improve the quality of data collected in future studies. The author also hoped that a standardised injury definition would help researchers make more accurate inter-sport comparisons of results.

1.2 Nature of rugby union

Rugby union is an invasion game that involves high levels of contact (Jones et al., 2004), with this comes the inevitable risk of injury. Nicholl et al. (1995) found that, of 13 popular sports played in England and Wales, rugby has been found to carry the greatest risk of injury. Wekesa et al. (1996, p.61) supports this by stating that, ‘rugby is considered to be one of the dangerous sports.’

As a result of the game turning professional in 1995, injury management and prevention have become even more important. Some researchers suggest that an increase in the number of injuries within the game has coincided with the game turning professional (Garraway et al., 2000 and Bathgate et al., 2002). This could possibly be due to clubs trying to maximise players time on the pitch due to increasing fixture lists, therefore players are more likely to have to play with minor injuries. The players themselves will feel the added pressure, as the sport becomes their livelihood not just their passion (Malcolm & Sheard, 2002). Some players may be on a ‘pay as you play’ contract and if they do not play they will not get paid and potentially be released from their contract.
1.3 Research on rugby union

Numerous studies have investigated injuries in rugby union, either prospectively (Bottini et al., 2000 and Brooks et al., 2005b) or retrospectively (Kew et al., 1991 and Wetzler et al., 1996). The results of studies in other invasion sports indicate that rugby has a higher rate of injury than other invasion games. Roberts et al. (1999) found that ice hockey produced 26.4 injuries per 1000 athlete exposures, Mckay et al. (2001) found that basketball and netball produced 18.2 and 17.3 per 1000 athlete exposures respectively. Bird et al. (1998) showed in their prospective study of rugby injuries that injury rates were 10.9 per 100 player exposures and Targett (1998) found that rugby injury rates were 120 per 1000 player exposures.

The objective of most research into rugby injuries is to identify the most common cause of injury, the most common anatomical sites of injury and the circumstances of the injuries experienced. All these are researched with a view to educating the coaches and medical staff within the game as to which types of training and match situations cause injuries. This can then help the planning of both specific conditioning and rugby training.

The majority of previous rugby union research has focused on match injuries (Brooks et al., 2005a) and training injuries (Brooks et al., 2005b) but very few have investigated pre season injuries in rugby union. It has been noted that there is an early season bias of injuries sustained (Gabbett, 2004) which may make a pre season study even more viable. Hawkins and Fuller (1999) have however looked at pre season injuries in football, and found that peak injury rate occurred after preseason training.

Lee et al. (2001) identified the importance of preseason training on existing and subsequent injury. Lee et al. (2001) found that those players who attended more pre season training and those players who were injured at the end of the previous season were more at risk of sustaining an injury during pre season. Unfortunately due to many confounding variables in this study the exact reason why players who attended more preseason training
were more likely to be injured was unable to be determined. A possible explanation for this could be the increased exposure time experienced by those who trained more regularly. So whilst there appears to be a gap in the current literature on pre season injuries, the importance of pre season training on subsequent injuries during the season has been highlighted.

1.4 Rationale for researching pre season training injuries in rugby union

Brooks and Fuller (2006) suggest that the information gained from studies within sports injuries is vital in enhancing injury prevention, treatment and rehabilitation plans. Whilst it is inevitable that injuries will occur in rugby union and other contact sports (Wekesa et al., 1996), ways of reducing the rate and more importantly the severity of these injuries is needed. The area is worth investigating as the growing number of injuries sustained is likely to lay a burden on the NHS. The government and businesses that employ rugby players will also lose money due to the time the individuals have to take off work. The cost of private medical treatments and consultations will also cost the players employers. Injuries are ending some players’ careers, so an awareness of how to prevent these injuries may help to reduce the number of players leaving the game due to serious injury. In the field of medicine and coaching, the findings could be detailed to physiotherapists and coaches to enlighten them on the possible areas of training in which most injuries occur. The information collated could help medical staff to develop pre-habilitation and rehabilitation programmes for specific areas of the body. The coaches could use the information collected to implement small rule changes during training sessions to lessen the risk of injury to players.

In the review of literature to follow, the multitude of components that make up an injury will be considered. Relevant and recent research will be identified and the major findings will be highlighted.
CHAPTER III

METHODOLOGY
3.0 METHODOLOGY

3.1 Subjects

Players were eligible to participate in the study if they were first team squad members, who had a professional contract with Launceston Rugby Football Club for the 2007/2008 season. In the period of time between the 1st of July and the 31st of August 2007, 50 players (27 forwards, 23 backs) took part in the study. On June 30th, all eligible players were invited to participate in the study. The researcher described the content of the consent form to each player, including any possible risks or benefits involved with taking part in the study and a right to withdraw without reason at any stage. The players were then asked to read the consent form for themselves, before being asked whether they understood what was being asked of them and what they were consenting to. If the player understood their role and agreed to take part in the study they provided their signature (appendix C). On providing consent, each player was assigned a player research number for the entire duration of the study in order to maintain players’ anonymity and ensure the confidentiality of any medical information recorded. Players were excluded from the study if they were below the age of 18 on commencement of the study or if they left the club during the research period. All players who were asked to take part in the study agreed to do so and gave their written informed consent. The University of Wales Institute Cardiff ethics committee approved all the experimental procedures (appendix D).
3.2 Procedure

The investigation was a prospective observation of rugby players in their natural training environment. For this reason the investigation should have high ecological and external validity, as the control of the experimental situation was limited. A broad definition of injury was applied during the study, ‘any occurrence during rugby related training for Launceston RFC that requires physiotherapist attention’. This definition excluded blisters and grazes. When a player required attention, the rugby clubs chartered physiotherapist reported the details of every injury using a modified version of the injury report form for rugby union, produced by Fuller et al. (2007b). It was modified due to the current study purely focusing upon pre season training injuries rather than match and training injuries throughout the season. The physiotherapist was asked to fill out the IRF (appendix A) as soon as possible after treating the injured player, and a set of guidance notes (Appendix B) were provided to the physiotherapist to refer to whilst completing the IRF.

3.3 Training Sessions

Players in the first team squad took part in two squad-training sessions each week during the study period and were asked by the coaches to carry out their own weights and conditioning. The squad-training was periodised with the first three weeks of preseason focusing on the fitness and conditioning required for the season, the second three week period introduced contact whilst focusing on skills and the third three week period included game scenarios whilst returning to some match specific conditioning. The duration of each training session was between 90 and 120 minutes; players participated in 22 pre season squad-training sessions.
3.4 **Pilot Study**

A pilot study was undertaken in February 2007, as Thomas and Nelson (2001) consider this an ideal means to identify the potential of problems with questions and develop ways to overcome these problems. The pilot study was carried out at the same club as the proposed study would take place at during pre-season in the 2007/2008 season. The same physiotherapist that has a contract at the club during the 2007/2008 season conducted the study and gave the researcher advice and guidance of possible changes that may make the investigation more valid in terms of face and content validity.

The pilot study consisted of a draft IRF (appendix E) being completed by the clubs physiotherapist, following the guidance notes that were provided (appendix F). A recommendation of the pilot study was that a section on protective equipment and training equipment should be included in the revised IRF. The physiotherapist also commented that the definition of an injury should encompass injuries as a result of rugby related training enforced by the club, and not just those sustained whilst training as part of the 1st team squad at the clubs premises.

The design of the IRF allows a specific space for the physiotherapist to provide extra information regarding any aspect of the injury should they feel it necessary and helpful. This also alleviates the problem with closed questions as De Vaus (1991) suggests that open-ended questions allow the person to formulate their own answers.
3.5 **Storage of the IRF’s**

The completed IRF’s will only be made available to the researcher and physiotherapist. The completed IRF’s will be filed in a multi–pocket file with each research number having a separate file, making it easier for the physiotherapist to refer back to the details previously recorded for each player. These will be kept locked in a cupboard to ensure data protection.

3.6 **Statistical Analysis**

The chi-squared ($\chi^2$) test was used to highlight any observed frequencies that were significantly greater or smaller than that of the expected value. The level of significance was set at $P<0.05$ and the results are reported as percentages (%) of the total number of injuries in the study or within a particular area. A statistical package known as SPSS (version 12.0.1) was used to analyse the findings, and Microsoft Excel (1997 edition) was used to create the graphical illustrations.
Prospective data was recorded from the 1st of July to August 31st 2007. During this time the Launceston RFC 1st team squad trained 22 times and played 3 pre season games. Each squad training session was approximately 2 hours long, but did vary between 1 hour 45 minutes and 2 hours. Fifty players participated throughout the nine weeks of pre season training and 42 injuries (backs, 28; forwards, 14) were recorded over this period. This is an average of 1.68 injuries per session. Results will be reported as follows, expected (E); observed (O) and significance is accepted at $P<0.05$.

4.1 Environmental Setting of Injury

![Figure 4](image_url)

Figure 4. Environment in which the injury occurred. Figure 4 shows insignificant differences between the expected and observed values of injuries sustained during conditioning ($E=21; O=16; P>0.05$) and rugby skills training ($E=21; O=26; P>0.05$).
4.2 Mechanism of Injury

Figure 5. Mechanisms of injury to Launceston RFC 1st team squad members.
*** Denotes that the tackle was responsible for significantly more injuries than expected (E= 7; O= 21; P<0.001).
*** Denotes that passing and kicking were responsible for significantly less injuries than expected (E= 7; O= 0; P<0.001).
4.3 **Tackle Injuries**

**Figure 6.** The role of the injured player in the tackle situation. **Denotes that Significantly more injuries were to the tackled player than expected (E= 11; O= 18; P<0.01).**

**Figure 7.** Direction from which the tackle was made. **denotes that significantly more injuries than expected were observed when the tackle was head on (E= 7.5; O= 15; P<0.01) and that significantly less injuries than expected were sustained as a result of tackles from behind (E= 7.5; O= 1; P<0.01).
Figure 8. Anatomical location of injuries sustained in a tackle. * Denotes that significantly more lower limb injuries were observed as a result of a tackle than expected (E= 5.5; O= 11; P<0.05).

Figure 9. Timing of tackle injuries sustained during training. * Denotes that significantly more tackle injuries occurred in the second 60 minutes of training than was expected (E= 11; O= 17; P<0.05).
4.4 Injury Type

Figure 10. Injury types.

*** Denotes that significantly more muscle/tendon injuries were sustained during the pre season period than was expected (E= 7; O= 22; P<0.001).
4.5 Muscle/Tendon Injuries

Figure 11. The anatomical area of muscle/tendon injuries. *** Denotes that significantly more muscle/tendon injuries occurred to the lower limbs than was expected (E= 10.5; O=19; P<0.001).

Figure 12. Muscle/tendon injuries and playing position. ** denotes that backs sustained significantly more muscle/tendon type injuries than expected during the pre season period (E= 10.5; O= 18; P<0.01), while forwards suffered significantly less muscle/tendon injuries than expected (E= 10.5; O= 3; P<0.01).
4.6 Conditioning Injuries

Figure 13. Conditioning activity and injury.
*** Denotes that significantly more injuries were sustained during sprint/speed activities than expected (E= 5.3; O= 13; P<0.001).

Figure 14. The gradient of the running surface in which sprint/speed injuries occurred. No significant increase or decrease on the expected values was observed (P>0.05).
4.7 Ground Conditions

Figure 15. Ground conditions at the time of the injury occurrence.

*** Denotes that significantly (P<0.001) more injuries occurred when the ground was soft (E= 10.5; O= 18) and when it was dry (E=10.5; O=17) than was expected. It also denotes that significantly (P<0.001) less injuries were observed than expected for both wet (E= 10.5; O= 4) and hard (E= 10.5; O= 3) ground conditions.

There was no significant relationship (P>0.05) between the type of injury sustained and the ground being soft, but a trend of muscle/tendon injuries (44%) was identified (P=0.056).

4.8 Protective Equipment

Figure 16. Protective equipment worn by players at the time of injury.

*** Denotes that significantly more injuries than was expected, occurred when a player wore no protective equipment (E= 10.5; O= 31, P<0.001).
Figure 17. Injured player ages. Neither the 25 and under (E= 33.6; O=29) age group or 26 and over group (E= 8.4; O= 13) were significantly different from the expected values (P>0.05).

Although the 25 and under group sustained 71.3% of the total number of injuries, this can be partly explained by the age group making up 80% of the total squad. This was taken into account when using the chi-square test, where the ratio was changed in accordance with the numbers in the two groups.
4.10 Playing Position

Figure 18. Playing positions of the injured players.

* Denotes that significantly more backs were injured in pre season than was expected ($P<0.05$).

*** Denotes that the outside backs were the most commonly injured players (62%), significantly more than was expected ($E = 10.9; O = 26; P < 0.001$).

After adjusting the ratios of the number of players in each playing position for the chi square test, outside backs, who made up 26% of the total playing squad, still had significantly more injuries than was expected.
References


APPENDICES
APPENDIX A

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APPENDIX B

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APPENDIX C

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APPENDIX D

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APPENDIX E

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APPENDIX F

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