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Incidence of injury in elite junior rugby union – a prospective descriptive study

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Abstract

The high incidence of injury in rugby union is well documented, particularly at elite levels of competition. This article describes the incidence and nature of all injuries sustained by elite Western Australian junior rugby union players during the 26 weeks up to and including the 1997 National Championship campaign. Informed consent was gained for each participant (n=44) prior to completion of an extensive baseline questionnaire. Exposure and injury data were collected at each training session and game. The injury incidence rate over the 26 week period was 13.26/1000 player hours. Injury data were analysed by phase of play, position, severity and if occurred at games or training. The incidence of injury was significantly associated with the position played (χ^2 = 67.49, p value = 0.008) and the phase of play in which the injury occurred (χ^2 = 8.07, p value = 0.042). Tackling was the most dangerous phase of play (52% of injuries) and the most common site of injury was the lower limb (37%). Most injuries occurred during games (56%) and the flanker was the position most at risk of injury (12%).

Further research is needed to identify the aetiology of injury at all levels of competition and to use these findings to develop effective injury prevention strategies in this sport. Position-specific risk factors should also be investigated, as should the mechanism of injury associated with tackling which is the phase of play in which significantly more injuries occur in rugby.

Introduction

The popularity of Rugby Union has increased internationally in recent times. Its profile throughout the world has increased dramatically following the 2003 World Cup, which drew an audience of approximately 3.3 billion[1]. With this increased profile, it is envisaged that there will also be an influx of players to the sport, particularly in the junior ranks.

Whilst this is an exciting prospect for Rugby Union, it raises concerns of the risk of injury associated with participation. It is documented that there is a high incidence of injury in rugby union in Australia[2]. To reduce the incidence of injury and to develop effective injury prevention strategies, it is important to investigate the aetiology associated with these injuries. The most important aspect of this process is the collection of valid data. One of the authors has previously developed a valid and reliable instrument for injury data collection in Rugby Union, the Rugby Union Injury Report Form – for Games and Training (RUIRF)[3]. Therefore the RUIRF was used as the data collection instrument in this study. This article describes an investigation of the incidence and nature of injury during the 1997 Junior Rugby Union National Campaign (n=26 weeks).

Methodology

All eligible state junior members from the 1997 Western Australian (WA) Under 15's (n=22) and Under 16's (n=22) National Championships squads were included in this study (hereafter known as the campaign). Before commencing the campaign, players completed a pre-season questionnaire detailing demographic information; rugby and sport experiences; training, equipment and warm-up patterns; injury experience; health, lifestyle and well-being; and rugby performance, attitudes, and opinions.

Ethics approval was granted by the Curtin University Human Research Ethics Committee. Informed consent was obtained from both the players and at least one of their parents or care givers before the commencement of the first training session. The campaign lasted 26 weeks, with players attending at least two training sessions and one match each week in each age group.

The lead author attended all training sessions and games, being responsible for the assessment and management of injuries in both squads. A separate RUIRF was completed for each injury sustained at

both training and games. Several players were referred to appropriate health professionals for additional injury management. Copies of reports from health professionals were attached to the appropriate RUIRF and any recommendations made included in injury rehabilitation programs.

Injuries were assigned the severity scores included on the RUIRF. These were: minor – able to return to game/training in which the injury occurred; mild – missed one week; moderate – missed two weeks; and severe – missed more than two weeks. At the completion of the campaign injury data were coded[3] entered and analysed using the Statistical Package for Social Sciences Version 10 (SPSS)[4]. Descriptive statistics and χ^2 tests were used to analyse the data. The α was set at $p=0.05$.

The incidence rates were calculated using the total number of injuries sustained by players as the numerator, and the number of hours players spent at training and games during the campaign as the denominator.

Limitations

Exposure rates were difficult to assess as several players participated in school and/or metropolitan competitions in addition to their state commitments. This study did not have the resources to collect and verify exposure data other than the actual campaign exposure time. However, the exposure time of each player over the campaign was individually documented for each training session and game attended. Furthermore, to minimize the risk of overestimating the incidence rate, any injury that recurred was counted as one injury.

Results

There were no significant differences between the nature and distribution of the injuries sustained by each squad therefore all data have been aggregated. Eighty four injuries were sustained by 44 players over the campaign period (at both training and games) resulting in an injury incidence rate of 13.26/1000 player hours. Forty four percent of the injuries (n=37 injuries) were sustained at training and 56% (n=47 injuries) during games. Forty percent of all injuries (n=34 injuries) were minor with these players returning to the training session or game in which the injury occurred (after receiving

treatment). Forty seven percent of injuries (n=39 injuries) resulted in players missing one game, 11% (n=9 injuries) missing two games and the remaining 2% (n=2 injuries) missing two or more games.

Insert Figure 1 here

The terrain (uneven ground) was identified (using data from the RUIFR) as a factor in 18% (n=15 injuries) of injuries and the weather (rain) in 12% (n=10 injuries). Tackling was the most dangerous phase of play with 52% (n=44 injuries) of all injuries occurring during this phase (see Figure 1). The most common site of injury was the lower limb (37%, n=28 injuries), followed by the head and neck (30%, n=24 injuries) then the shoulder (14%, n=12 injuries) (see Figure 2). Forty five percent of all injuries (n=31 injuries) were sustained by seven players, although most of the injuries sustained were minor in nature. Of the injuries that occurred during games (n=47 injuries), 60% (n=28 injuries) occurred in the first half of the game and the remaining 40% (n=19 injuries) during the second half (there was no extra time in any game played). All injuries occurred contesting the ball. One injury was the result of illegal play by the person who was injured.

Insert Figure 2 here

The severity of injury and position played were significantly associated ($\chi^2 = 67.49$, p value = 0.008). The most severe injuries occurred in tackles (n=5 injuries) to the lock, centre and halfback. The players at most risk of either moderate or severe injury tackles were the wings, centres, half back and flankers (n=4 each). The most frequent sites of moderate or severe injuries were the head (n=2 injuries), back (n=2 injuries) and shoulders (n=4 injuries). The positions sustaining the most injuries, regardless of severity, were the flankers (n=10 injuries), number eight (n=6 injuries), wings (n=6 injuries) and the hooker (n=5 injuries) (see Figure 3). The fullback was the position with the lowest injury rate (1%, n=1 injury). The majority of injuries sustained were evenly distributed throughout the season. However, half backs and number eights incurred more injuries at the beginning of the seasons, with injuries to hookers and five eights more common towards the end of the season. Fifty two percent (17/33 players)

of players who sustained an injury, went on to sustain an injury of greater severity (as per the limitations, these do not relate to recurrent injuries).

Insert Figure 3 here

Data were also analysed using position and phase of play as grouping variables. The distribution of injuries between backs and forwards was similar, with backs sustaining 43% (n=20 injuries) of the total injuries and forwards 57% (n=27 injuries). However, there was a significant difference in the phase of play in which these injuries occurred ($\chi^2 = 6.03$, p value = 0.014). Almost half of the injuries (45%, n=12/27 injuries) sustained by backs occurred in tackles compared with 80% (n=16/20 injuries) of the injuries sustained by forwards.

There was a significant difference between the site of injury and phase of play when analysed as grouping variables ($\chi^2 = 8.07$, p value = 0.042). Most injuries sustained in tackles resulted in injury to the head or shoulders (63%, n=28/44 injuries). Injuries sustained in other phases of play resulted in injury to the lower leg (48%, n=19/40 injuries) or to the head (28%, n=11/40 injuries). There was no significant difference between backs and forwards in relation to the site of injury.

There was a significant associated between the severity of an injury and the time of the season in which the injury was sustained ($\chi^2 = 36.51$, p value = 0.000). Almost all of the more severe injuries were sustained in the first four weeks of the season (73%, n=8 injuries) and the most prevalent period for injuries was the second month of the season (40%, n=34 injuries). The distribution of injuries between training and games was similar for the first half of the season (training n=26 injuries, game n=24 injuries), but more injuries occurred in the game in the second half of the season (training n=8 injuries, game n=26 injuries).

Discussion

The majority of published injury studies in Rugby Union have recorded only those injuries that occurred during games or where players have missed at least one week[1]. These injuries are usually categorised as mild, moderate or severe. However, as ever injury has the potential to affect

performance and may become more serious if left unattended[5-6], an additional category of minor injuries was included in this study. Minor injuries were classified as injuries sustained by players that required medical attention, however the player was able to return to the training session or game in which the injury occurred[3]. Players who sustained a minor injury towards the end of the game but did not return to play because there was insufficient time left in the game, were classed as sustaining a minor injury. The findings from this study supported this inclusive approach (including injuries regardless of severity) as 40% (n=34 injuries) of the injuries sustained were found to be minor. The collection of injury data from training sessions also seems justified as 44% (n=37 injuries) of the injuries occurred during this time.

Comparisons of the findings from this study with other research should be interpreted with caution due to the differing study designs and methodologies used. One large study of similar aged players also found that most injuries occurred during games (71%) and that tackling was the most dangerous phase of play (n=55% injuries)[7]. The players most at risk of injury were the number eight, prop and the lock. Injury to the lower limb was the most common site of injury. These findings were similar to this study, with the exception being the positional distribution of injury (there was a more even spread of injuries between backs and forwards in this study). The difference may be due, in part, to the changes in scrimmaging that were introduced in 1995, in an effort to reduce the serious incidence of injury sustained by forwards in scrums.

A more recent study conducted by Pringle et. al. [8], found that the majority of players who sustained an injury returned to competition the following week. The incidence rate of injury from the 1932 Rugby Union players included in the study was 15.5/1000 player hours. This is similar to the incidence of 13.26/1000 player hours found in this study. Comparison of injury incidence rates with other contact sports is problematic, however, there are some data available from similar aged-players that suggests the incidence of rugby league as 24.5/1000 players, soccer as 23.4/100 American football as 9/1000 player hours and Australian football as 8/1000 player hours[8-11]. It should be noted that the incidence rates for Australian and American football relate to injuries sustained in games only.

The calculation of incidence rates is critical to the development of effective sports injury prevention strategies[12]. Consequently, the accurate recording of exposure time, at both games and training, is important in the calculation of these rates[6,13]. As mentioned previously, the exposure time used in this study did not include additional exposure to rugby outside the campaign. Exposure diaries detailing individual player exposure times have been used successfully in some studies[6-13]. However, as the majority of the campaign involved a commitment of six days per week from players, it is expected that any additional exposure was minimal in this study.

The highest incidence of injury occurred among those players who were first to the ball (7/44 players). They had the greatest exposure to active passages of play and subsequently, the highest potential for injury. This finding is supported in the literature[14] with the higher level team players at most risk for injury being those who were the fastest and most mobile. The majority of injuries occurred as a consequence of tackling. This is the phase of play in Rugby Union with the highest incidence of injury, commonly resulting in injury to the lower limb and shoulder[15-17]. As tackling is an implicit component of the sport, future research must focus on ways to reduce injuries in this phase of play. The mechanism of tackles should be investigated and comparisons made between tackles that resulted in injury and those that did not contribute to an injury. This evidence may provide insights into the mechanism of injury in tackles and thereby provide evidence for the development of tackling techniques that minimize the high risk of injury associated with this phase of play.

Comparison of the findings from this study with those of more recent WA state squads is not possible as injury and exposure data was not collected from 1998 to 2002. Furthermore, only data relating to injuries sustained during the week of the Under 16's National Championships were recorded during the 2003 campaign[Pereira C. pers comm. October 2003]. Nonetheless, these data indicate that injury to the lower leg (12/17 injuries) was still the more frequent injury sustained by this age group and tackling remained the phase of play in which most injuries were sustained (14/17 injuries)[Pereira C. pers comm. October 2003]. Although not conclusive (due to the data collection methods used) these data appear to indicate that similar patterns of injury to those seen in 1997, are still evident in elite junior rugby player in Western Australia in 2003 and as such should be addressed. Injury to the lower limb injury remains a concern, as does tackling.

Finally, although some positions were at greater risk of injury at various times during the season, all but one of the moderate and severe injuries occurred in the first four weeks of the season. A possible reason for the increased risk of serious injury could be the addition of two training sessions and one practice game per week to the players' existing commitment of club or school training session/s and game/s each week. The majority of players reported they were training or playing rugby union seven days a week during the season. Other explanations for the increased risk of injury could include: involvement in a higher level of competition; vying for a place in the squad; different coaching methods; differing ground conditions throughout the season; and the enhancement of skills and performance as the season progresses. This level of commitment does not allow players to recover sufficiently between maximal efforts (which may lead to fatigue or injury) nor does it allow sufficient time for micro traumas to repair between sessions[18-20].

Conclusions

Findings from this study indicate that all injuries, regardless of severity, that occur should be recorded as they may impact on future performance and injuries. Exposure data should also be collected to ascertain the true incidence of injury in rugby union. Position-specific risk factors should be investigated further, as should the mechanism of injury associated with tackling. Knowing the factors that influence injury in tackles, and developing techniques to minimize these risk factors, should redress the current high rate of injury to the upper body in junior players.

The commitment required by elite junior rugby union players usually involves exposure through training or games on a daily basis throughout the season. As this level of exposure has the potential to increase the risk of injury to players, it is important from an injury prevention perspective, to monitor exposure periods in games and training. This information should then be utilized to ensure that adequate rest periods can be factored into game/training schedules.

Finally, although several small injury surveillance studies have been conducted in Australia, there is a need for a large prospective community-based injury study in Rugby Union. Firstly, to establish the

aetiology of injury in Rugby Union and secondly, to provide the evidence required for the development of effective injury prevention strategies in this sport.

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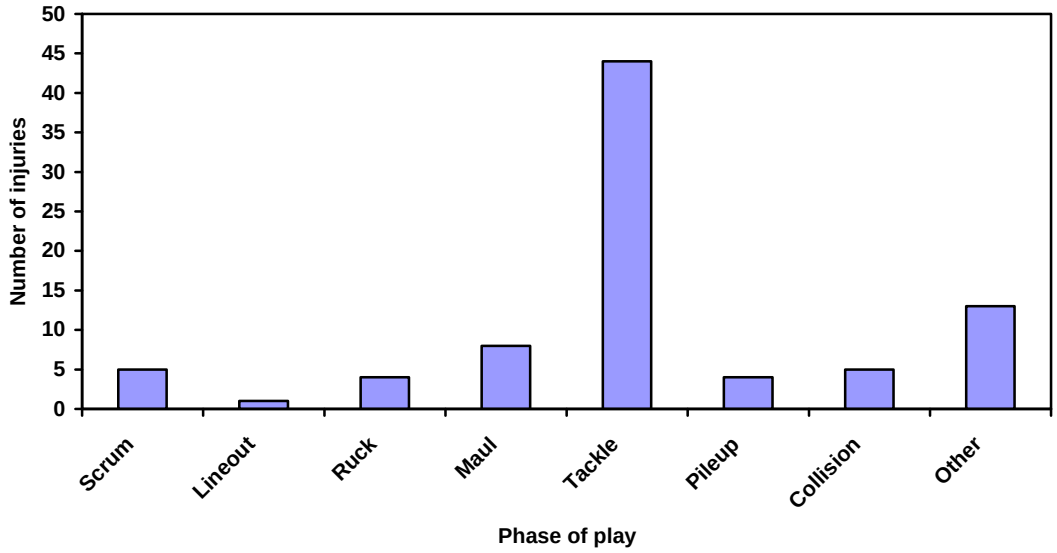

Figure 1. **Phase of play in which injuries occurred to Western Australian elite junior rugby union players in the 1997 National Championship campaign at training and games (n=84 injuries)**

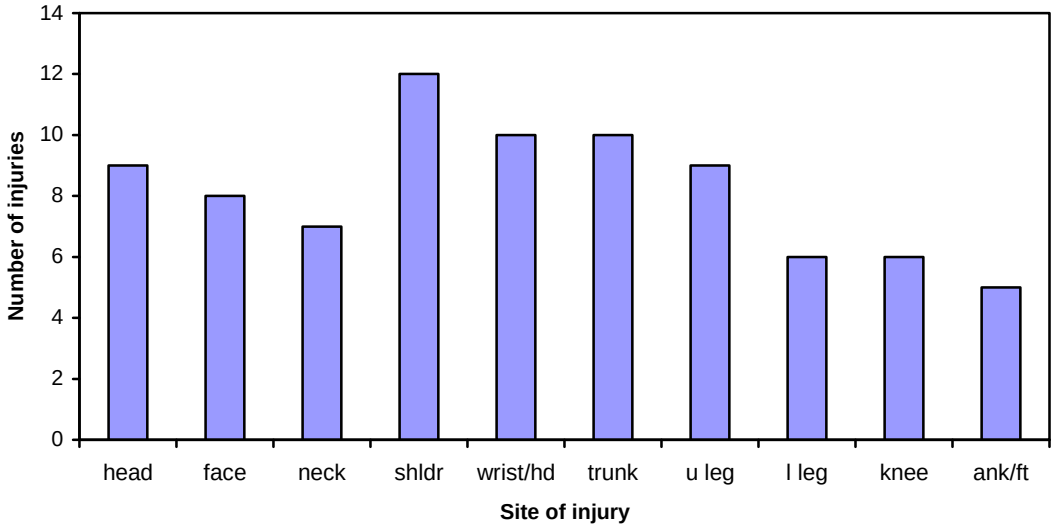

Figure 2. **Site of injury to Western Australia elite junior rugby union players during the 1997 National Championship campaign at training and games (n=84 injuries)**

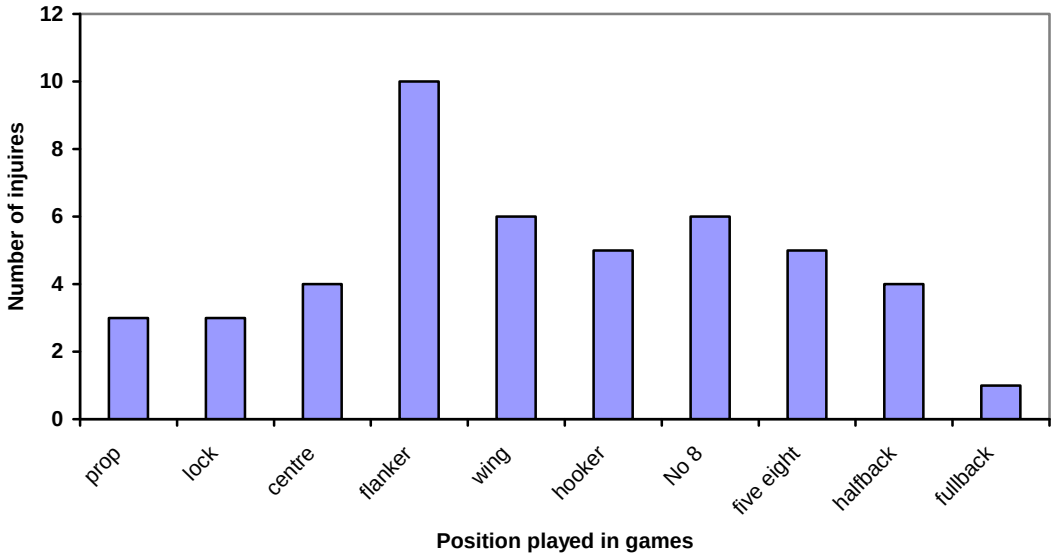

Figure 3. **Injuries sustained by Western Australian elite junior rugby union players in the 1997 National Championship campaign, by position, in games only (n=47 injuries)**