

Impact of professionalism on injuries in rugby union

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Abstract

Objectives—To measure the frequency and nature of injuries occurring in competitive matches since professionalism was introduced in rugby union.

Methods—The cohort study previously conducted in players from senior rugby clubs in the Scottish Borders in 1993–1994 when rugby union was an entirely amateur sport was repeated in 1997–1998. The same injury definition, outcome criteria, and method of calculating playing hours were used. In total, 803 (84%) of 960 eligible players participated, including all 30 adult players who played professionally for the Scottish Rugby Union or Border Reivers District. The 576 injury episodes in 381 of these players in competitive matches were compared with the 373 injuries in 266 players out of 975 (94%) who were eligible and registered with the same senior rugby clubs in 1993–1994. Outcomes were the occurrence of injury episodes, days away from playing or training for rugby, and time lost to employment or attendance at school/college as a consequence of being injured.

Results—The proportion of players who were injured almost doubled from 1993–1994 to 1997–1998, despite an overall reduction of 7% of the playing strength of participating clubs. Period prevalence injury rates rose in all age specific groups, particularly in younger players. This translated into an injury episode every 3.4 matches in 1993–94, rising to one in every 2.0 matches in 1997–1998. An injury episode occurred in a professional team for every 59 minutes of competitive play. Professional players sustained a higher proportion of recurrent injuries, particularly in the early part of the season. Some 56% of all their days lost to the game were caused by injuries to the muscles, ligaments, and joints of the knee, hip, and thigh.

Conclusions—The introduction of professionalism in rugby union has coincided with an increase in injuries to both professional and amateur players. To reduce this, attention should be focused on the tackle, where many injuries occur. The International Rugby Board should place a moratorium on the use of protective equipment in competitive matches until its contribution to player morbidity has been fully assessed.

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Professionalism was adopted by the international rugby board (IRB) after the second World Cup in South Africa in 1995. Professional players have had to adapt to the demands of increased physical and mental robustness as well as show the strength and pace expected of full time athletes. Expectations of increased standards have also filtered down to the continuing majority of amateur players. Yet little is known about the level and pattern of injuries occurring since rugby union became a professional sport. Experience is limited to a report of a New Zealand Super 12 rugby squad of 25 players, which described higher levels of injury than previously reported in first grade rugby.¹ Garraway and Macleod² conducted an epidemiological survey of rugby injuries during the 1993–1994 season when rugby union was an entirely amateur sport in Scotland. They concluded that rugby injuries constituted an important source of morbidity in young men. We now report on rugby injuries occurring during the 1997–1998 season and compare the results of this study with our previous findings.

Methods

The survey design, field staff, documentation, severity criteria, and outcome of injuries as well as the calculation of playing hours at risk were the same as in the study carried out in the 1993–1994 season.² A rugby injury was defined as one sustained during a competitive match which prevented the player from training or playing rugby from the time of the injury or from the end of the match in which the injury was sustained. An injury that allowed a player to return to rugby or rugby related practice within seven days of its occurrence was classified as transient.

All 26 Scottish Rugby Union (SRU) affiliated senior rugby clubs in the Border Reivers (previously called the South of Scotland) District were invited to participate. The players from three clubs were excluded because of lack of club cooperation. Two other clubs merged at the beginning of the season. Player registration details and playing exposures were available for 803 (84%) of the 960 eligible players, including all 30 adult professionals contracted to the SRU or the Border Reivers District. Senior rugby club amateur players participated in an average of 21.8 competitive matches (22 484 hours of play) and professionals in 25.1 competitive matches (1003 hours of play) during the season. A total of 576 injury episodes occurred in 381 of the 803 players. Players in the 1993–1994 survey registered with clubs who had disbanded, merged, or would not cooperate in the 1997–1998 survey were excluded. Thus 975 (94%) of the 1032 players who took part in the 1993–1994 survey were

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Table 1 Frequency and distribution of injury episodes occurring in competitive matches according to age

| Age group (years) | Players (hours played) | | Players injured (%) | | Injury episodes (%) | | Period prevalence per 1000 playing hours | | 95% CI for the difference in prevalence rates |
|-------------------|------------------------|-------------|---------------------|----------|---------------------|-----------|------------------------------------------|---------|-----------------------------------------------|
| | 1997-98 | 1993-94 | 1997-98 | 1993-94 | 1997-98 | 1993-94 | 1997-98 | 1993-94 | |
| <16 | 59 (1856) | 108 (3656) | 18 (31) | 14 (13) | 20 (3) | 17 (5) | 10.8 | 4.6 | 0.9 to 11.3 |
| 16-19 | 192 (6427) | 217 (6272) | 78 (41) | 44 (20) | 108 (19) | 65 (17) | 16.8 | 10.4 | 2.4 to 10.5 |
| 20-24 | 205 (6185) | 269 (6617) | 102 (50) | 91 (34) | 153 (27) | 135 (36) | 24.7 | 20.4 | 0.9 to 7.7 |
| 25-29 | 196 (5488) | 223 (5387) | 113 (58) | 73 (33) | 191 (33) | 103 (28) | 34.8 | 19.1 | 10.8 to 20.5 |
| 30-34 | 99 (2507) | 115 (2395) | 51 (52) | 34 (30) | 82 (14) | 43 (12) | 32.7 | 18.0 | 6.0 to 23.5 |
| ≥35 | 52 (1024) | 43 (897) | 19 (37) | 10 (23) | 22 (4) | 10 (3) | 21.5 | 11.1 | -0.9 to 21.6 |
| Total | 803 (23487) | 975 (25224) | 381 (47) | 266 (27) | 576 (100) | 373 (100) | 24.5 | 14.8 | 7.3 to 12.2 |

used to compare injury rates, an overall reduction of 7% in the playing strength of the 22 participating clubs. Kaplan-Meier estimates were used to calculate the median duration of absence from playing or training for rugby and time lost to employment or attendance at school or college as the result of injury in competitive matches. Injuries in both surveys were coded according to the International Classification of Diseases (ICD, 9th revision).

Results

FREQUENCY AND DISTRIBUTION

Table 1 summarises the age specific injury rates in 1993-1994 (when there were only amateur players) and 1997-1998 (for professional and amateur players). The number of hours of competitive rugby was lower in 1997-1998, particularly for players aged less than 16 years. Yet the overall proportion of players who were injured almost doubled, from 27% in 1993-1994 to 47% in 1997-1998. The rise was particularly high in teenage players. Period prevalence rates were raised in all age specific groups. The 95% confidence interval (CI) for the difference in prevalence between professional and amateur players was 29.5 to 60.9 injury episodes per 1000 player hours. Overall, these rates translate into an injury episode for every 3.4 matches in 1993-1994, rising to one in every 2.0 matches in 1997-1998. In the 1993-1994 season, new injuries predominated but this changed (table 2): 56% of all injury episodes for professional players in 1997-1998 were recurrent, compared with 29% for amateurs in 1997-1998 and 18% for all players in 1993-1994. Some 90% of all professionals were injured during the season despite participating in only 15% more hours of competitive play than amateurs. Such was the frequency of injury that a team of professional players experienced an injury episode to one of their team members for every 59 minutes of competitive play, the equivalent of 1.4 injuries per match.

Table 2 Frequency and distribution of injury episodes occurring in competitive matches according to player status

| Player status | No | Competitive matches per player | Players injured (%) | Injury episodes (New + recurrent) | Injury episode rates per 1000 playing hours | |
|-----------------------|-----|--------------------------------|---------------------|-----------------------------------|---------------------------------------------|----------------------------|
| | | | | | Incidence (95% CI) | Period prevalence (95% CI) |
| 1997-98 Season | | | | | | |
| Professional | 30 | 25.1 | 27 (90) | 30 + 38 | 29.9 (19.4 to 40.5) | 67.8 (52.3 to 83.4) |
| Senior club (amateur) | 773 | 21.8 | 354 (46) | 356 + 147* | 15.8 (14.2 to 17.5) | 22.6 (20.7 to 24.5) |
| All players | 803 | 21.9 | 381 (47) | 386 + 185* | 16.4 (14.8 to 18.1) | 24.5 (22.5 to 26.5) |
| 1993-94 Season | | | | | | |
| Senior club (amateur) | 975 | 19.5 | 266 (27) | 305 + 68 | 12.1 (10.7 to 13.4) | 14.8 (13.3 to 16.3) |

*Excluding five injury episodes where it was not known whether the injury was new or recurrent.

NATURE AND SITE OF INJURY

The distribution of injury episodes, classified as transient and mild (up to 28 days away from playing/training), moderate (up to 84 days), or severe (84 days or more), were similar in 1993-1994 and 1997-1998 and between professional and amateur players. The musculoskeletal system contributed the highest proportion of primary injuries in 1993-1994 and 1997-1998. Table 3 compares injury episode rates for dislocations, strains, and sprains according to the season, selected anatomical site, and players' contractual status. The incidence and period prevalence rates per 1000 playing hours for these injuries rose by 43% and 65% (in amateurs) and 152% and 405% (for professionals) between 1993-1994 and 1997-1998 respectively. The knee joint recorded the greatest increase in rates, particularly for professionals who showed five-fold and sevenfold rises compared with amateurs in 1997-1998 and 1993-1994 respectively. No spinal injuries were recorded in 25 224 playing hours in 1993-1994. Two neck dislocations (ICD 722.0 and 953.0) occurred in 23 487 playing hours in 1997-1998, one of which resulted in permanent neurological damage. Neck dislocations, strains, and sprains occurring in 1993-1994 and 1997-1998 were classified under ICD 722.0, 722.4, 839.0, 847.0, 848.2, 953.0, and 953.4.

INJURY ASSOCIATIONS

Injuries were more prevalent at the beginning of the 1997-1998 season than the end (95% CI for difference in period prevalence injury rates between August-October and March-May, 6.0 to 18.0) compared with 1993-1994 (95% CI, -2.4 to 6.6). Recurrent injury rates were stable throughout the season in 1993-1994, but were higher for professional players in the first half of the 1997-1998 season. Some 42% (16/38) of all recurrent injuries in professional players occurred in August-October while completing 290 hours (29%) of their seasons' competitive play. The highest proportion (48%) of injury

Table 3 Frequency of dislocations, strains, and sprains sustained in competitive matches according to player status

| Player status | Site of injury | Injuries | Injury rates per 1000 playing hours | |
|-----------------------|----------------|-----------------|-------------------------------------|----------------------------|
| | | New + recurrent | Incidence (95% CI) | Period prevalence (95% CI) |
| 1997–98 season | | | | |
| Professional | | | | |
| | Neck | 1 + 1 | 1.00 (–0.96 to 2.95) | 1.99 (–0.77 to 4.76) |
| | Shoulder | 1 + 3 | 1.00 (–0.96 to 2.95) | 3.99 (0.09 to 7.89) |
| | Upper limb | 2 + 0 | 1.99 (–0.77 to 4.76) | 1.99 (–0.77 to 4.76) |
| | Back | 0 + 1 | 0.00 — | 1.00 (–0.96 to 2.95) |
| | Hip and thigh | 4 + 6 | 3.99 (0.09 to 7.89) | 9.97 (3.82 to 16.12) |
| | Knee | 4 + 12 | 3.99 (0.09 to 7.89) | 15.96 (8.20 to 23.71) |
| | Ankle and foot | 4 + 5 | 3.99 (0.09 to 7.89) | 8.98 (3.14 to 14.81) |
| | All sites | 16 + 28 | 15.96 (8.20 to 23.71) | 43.88 (31.20 to 56.56) |
| Senior club (amateur) | | | | |
| | Neck | 24 + 8 | 1.07 (0.64 to 1.49) | 1.42 (0.93 to 1.92) |
| | Shoulder | 35 + 23* | 1.56 (1.04 to 2.07) | 2.62 (1.96 to 3.29) |
| | Upper limb | 11 + 2 | 0.49 (0.20 to 0.78) | 0.58 (0.26 to 0.89) |
| | Back | 16 + 15 | 0.71 (0.36 to 1.06) | 1.38 (0.89 to 1.86) |
| | Hip and thigh | 35 + 33* | 1.56 (1.04 to 2.07) | 3.07 (2.35 to 3.79) |
| | Knee | 53 + 21 | 2.36 (1.72 to 2.99) | 3.29 (2.54 to 4.04) |
| | Ankle and foot | 30 + 15 | 1.33 (0.86 to 1.81) | 2.00 (1.42 to 2.59) |
| | All sites | 204 + 117 | 9.07 (7.83 to 10.31) | 14.37 (12.81 to 15.92) |
| 1993–94 season | | | | |
| Senior club (amateur) | | | | |
| | Neck | 10 + 3 | 0.40 (0.15 to 0.64) | 0.52 (0.24 to 0.80) |
| | Shoulder | 26 + 17 | 1.03 (0.63 to 1.43) | 1.70 (1.20 to 2.21) |
| | Upper limb | 13 + 1 | 0.52 (0.24 to 0.80) | 0.56 (0.26 to 0.85) |
| | Back | 19 + 7 | 0.75 (0.41 to 1.09) | 1.03 (0.63 to 1.43) |
| | Hip and thigh | 27 + 9 | 1.07 (0.67 to 1.47) | 1.43 (0.96 to 1.89) |
| | Knee | 45 + 14 | 1.78 (1.26 to 2.30) | 2.34 (1.74 to 2.94) |
| | Ankle and foot | 20 + 8 | 0.79 (0.45 to 1.14) | 1.11 (0.70 to 1.52) |
| | All sites | 160 + 59 | 6.34 (5.36 to 7.32) | 8.68 (7.54 to 9.83) |

*Excludes one injury episode where it was not known whether the injury was new or recurrent. International classification of disease (ICD) codings for each injury site can be obtained from the authors.

episodes occurred in the tackle in professional and amateur players. More professional players (37%) were injured while being tackled than amateurs (26%), particularly playing in the wing forwards and number 8 positions. In the centre and wing three quarter positions, where tackle injuries were most frequent in 1993–1994 (74%), injury episodes in the tackle fell to 50% and 53% in professionals and amateurs respectively in 1997–1998. A further change in the tackle situation involved scrum halves. In 1993–94, 9/13 (69%) scrum halves were injured while being tackled. In 1997–1998, the situation had reversed, with 14/20 (70%) players in this position tackling when they were injured.

OUTCOME OF INJURIES SUSTAINED

In 1993–1994, 47/266 (18%) of injured players had not returned to playing/training by the end of the season compared with 73/353 (21%) of amateurs and 8/27 (30%) of professionals in 1997–1998. No information is available on the long term effects of the injuries or how many of these players retired from the game. If only injured players who returned to play/train before the end of the season are considered, 15 672 playing/training days were lost in 1993–1994, rising to 21 000 playing/training days lost in 1997–1998. The 1924 days lost by professionals represents 1.9 days away per player for every hour of competitive play. For amateurs, injuries to muscles, ligaments, and joints of the knee, hip, and thigh amounted to 40% and 39% of days lost in 1993–1994 and 1997–1998 respectively. In all, 1081/1924 days (56%) lost to playing/training by professionals were due to these injuries. The median time off playing/training was calculated for each injury episode. During the 1993–1994 season, the median (lower–upper quartile) was 23 (12–56) days. This was almost identical for amateurs in the 1997–1998 season. However, for profes-

sionals, the median time away from rugby was 17 (8–35) days. In 1993–1994, 97/266 players (36%) were absent from work/college as a result of rugby injuries, with median absences of 11 (5.5–25) days. This reduced to 8 (4–16) days for the 110/354 (31%) of players absent from work/college in the 1997–1998 season.

Discussion

The descriptive nature of the epidemiological surveys on which our findings are based do not allow firm conclusions to be drawn about the causal nature of factors associated with the occurrence of injuries. However, a number of these associations are worthy of consideration for further study. Although the number of professional players in the survey is limited compared with the much larger number of amateurs during the 1997–1998 season, the penalties for accepting the financial and other rewards accompanying professionalism in rugby union appear to include a major increase in player morbidity. Contrary to popular belief, professional players were not participating in a much higher number of competitive matches than amateurs, but, on average, an injury episode involving a professional player occurred for every 59 minutes of competitive play in which his team was involved. A higher level of recurrent injuries was observed during the early part of the season in professionals. This may be a reflection of the lack of an appropriate pre-season break from the sport because of match commitments fulfilled in the traditional close season. Overtraining or carrying existing injuries into the start of the season may have contributed. Monetary or other considerations could also explain why the median duration of absence from playing/training for professionals was lower than time spent away from the game by amateurs. On the other hand, this may be the result of better access to treatment and rehabili-

tation. Player substitution for injury replacement or tactical reasons is an accepted part of rugby, with up to seven substitutes nominated for each team of 15. The future implications for the size of team squads necessary to complete a season of international rugby has been reported after the injury experience of countries participating in the 1995 Rugby World Cup played in South Africa.³ If the number of competitive matches played by individual players employed by the SRU or Border Reivers remains constant at 25 per player per season, a reduction in the overall injury rate of 67.8 per 1000 playing hours for professionals to the level experienced by amateurs in the 1997–1998 season would require a squad of 45 players to be available for the 15 playing positions which make up a team for professional rugby union.

Different injury definitions, experience of observers, methods of recording events, and the use of various items of protective equipment by different sports make it difficult to draw conclusions about the relative frequency of injuries reported in rugby union, rugby league, and other collision based sports such as Australian Rules football.⁴ Where valid comparisons can be made, it appears that professional rugby union produces higher injury rates than professional rugby league. The highest injury rate reported in rugby league is 44.9 per 1000 player-position game hours, where injury is defined as any injury occurring in a competitive match that causes the player to miss a single game.⁵ The equivalent injury rate for professional rugby union players in this survey is 50% higher at 67.8 per 1000 playing hours. Many injuries occur in the tackle in both codes but changes in the laws of rugby union in recent years have been designed to encourage more open play. This has probably resulted in more tackles involving a higher degree of momentum or the use of greater force. Tackles coming in at high speed from behind the tackled player have recently been highlighted as an important factor in injuries occurring in rugby union.⁶

Changes in the Laws of the Game which have come into force since the first survey was carried out during the 1993–1994 season may have played a part in the major increase in the rate of injuries which have occurred in both professional and amateur players. The increased injury rates have not been accompanied by a change in the pattern of the injuries themselves. The advent of professionalism has resulted in more emphasis being placed on strength, speed, and stamina in all players. The extent to which these factors may be contributing to an increase in injuries requires further investigation, but the factor that is most likely to have contributed to the increased burden of injuries in competitive play and requires the most urgent attention is the almost universal adoption of protective

equipment in rugby union between the 1993–1994 and 1997–1998 seasons.

Using protective equipment in training to safeguard recovering injuries in rugby union was first reported from New Zealand.⁷ Protective equipment includes mouth guards, padded headgear and clothing, fingerless gloves, strapping, grease, support sleeves, shin guards, and ankle braces. Almost universally, players at the professional level have turned to the use of this equipment during competitive matches in the expectation that it will minimise the consequences of bodily impact and may even give them a psychological edge when using their increasing physical presence to tackle opponents. Amateur players are already following their example. Protective equipment has been used by players in rugby league for some years, but the influence this has had over time is not known in a sport where a higher proportion of low momentum head on tackles occur than under the present Laws of the Game in rugby union. With the exception of mouth guards to minimise dental injuries, there is no good scientific evidence to support the use of any of the other protective equipment for players that has been introduced into competitive matches in recent years. The principal concerns of the IRB in adopting professionalism have been to establish the sport's commercial viability and adapt organisational structures to manage it. More emphasis should now be placed on players' health and welfare. The IRB should place a moratorium on the further development of protective equipment until it has been established that it is not contributing to the substantial increase in player morbidity associated with the introduction of professional rugby union.

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Take home message

There has been a major increase in injury rates since the introduction of professionalism in rugby union. This disturbing trend requires urgent investigation.