ORIGINAL ARTICLE

Incidence of injury in amateur rugby league sevens

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Objectives: To investigate the incidence, site, and nature of injuries sustained in amateur rugby league sevens tournaments.
Methods: A total of 168 players competing in three amateur rugby league sevens tournaments were studied. All injuries sustained during matches were recorded. Information recorded included the name of the injured player and the time, cause, anatomical site, and nature of the injury.
Results: The incidence of injury was 283.5 per 1000 playing hours. Some 40% (113.4 per 1000 playing hours) of all injuries sustained were to the lower limb (χ^2 = 5.3, df = 1, p<0.05). Contusions were the most common type of injury (113.4 per 1000 hours, 40%, χ^2 = 9.5, df = 4, p<0.05), with most (198.4 per 1000 hours, 70%, χ^2 = 31.5, df =4, p<0.001) occurring in physical collisions and tackles. An increasing injury incidence was observed over the first (99.2 per 1000 hours), second (198.4 per 1000 hours), third (347.2 per 1000 hours), and fourth (694.4 per 1000 hours) matches played during the tournaments (χ^2 = 9.2, df = 3, p<0.05).
Conclusions: The results of this study suggest that amateur rugby league sevens tournaments, which require players to compete repeatedly on the same day, may hasten the onset of fatigue and predispose to injury.

Rugby league is an international collision sport. The game is physically demanding, involving two teams of 13 players, competing in a challenging contest over two 40 minute halves.[1] During a typical rugby league match, players are involved in numerous physical collisions and tackles.[1 2] As a result, musculoskeletal injuries are common.[2]

Several studies have documented the incidence of injury in professional rugby league players.[2–5] More recently the incidence of injury has been reported in amateur rugby league players.[6] Interestingly, most (70.8%) amateur rugby league injuries are sustained in the second half of matches, suggesting that fatigue contributes to these injuries.[6] The finding that fatigue contributes to injuries in amateur rugby league players may be expected, given that amateur players have considerably lower aerobic fitness, speed, and muscular power, and considerably higher percentage body fat than professional players.[7]

Rugby league sevens tournaments have become increasingly popular as a spectator sport. A game of rugby league sevens consists of two teams of seven players competing on a full sized rugby league field. Consistent with conventional rugby league,[8] most game time is spent in low intensity activities—for example, static poses, walking, and jogging—interspersed with short bouts of high intensity activities—for example, sprinting and tackling.[9] However, while the duration of matches (usually 7–10 minute halves) is considerably shorter than conventional rugby league matches, a typical tournament requires players to compete repeatedly on the same day, thereby increasing the physiological demands and hastening the onset of fatigue.[9] These findings would suggest that amateur rugby league players competing in sevens tournaments could be particularly susceptible to injury. However, no study has documented the incidence of injury in rugby league sevens. The purpose of this study therefore was to investigate the incidence, site, and nature of injuries sustained in amateur rugby league sevens tournaments.

METHODS

The incidence of injury was prospectively studied in 168 amateur rugby league players (from 12 teams) competing in three amateur rugby league sevens tournaments. The tournaments were played at the end (September) of three consecutive seasons (1995, 1996, and 1997) and included teams that were unsuccessful in reaching the grand final of the regular competition. Four teams competed in each tournament. All players were aged 18 years or over, and they received no payment for either training or playing. The methods and cohort of players used in this study were identical with those described previously.[6]

Each team played three matches per tournament. A fourth match (grand final) was played by teams with the best performance during the preliminary rounds. Each match was 14 minutes long (seven minutes per half), except for the grand final, which was 20 minutes long (10 minutes per half). All matches were played on the same day. A single head trainer, employed to provide first aid coverage to all clubs in the tournaments, assessed all injuries. The head trainer held tertiary qualifications in exercise and sport science and was nationally accredited in injury prevention, assessment, and management. Although individual team trainers were permitted to enter the field freely during the course of a match, the head trainer was prevented from doing so unless summoned by the referee. Therefore, for the purpose of this study, an injury was defined as any pain or disability suffered by a player that was subsequently assessed by the head trainer during or immediately after a rugby league sevens match.[6 10] Team trainers, coaches, and players were encouraged to consult the head trainer with all (including minor) injuries. All injuries sustained during matches were recorded regardless of severity. They were assessed and managed by established procedures.[11] Information recorded included the name of the injured player and the time, cause, site, and nature of the injury. Throughout the three tournaments, all teams were permitted a maximum of seven replacements, with no limit placed on the number of interchanges made during the match.

Injuries were classified according to the site: head and neck, face, thorax and abdomen, shoulder, arm and hand, knee, calf, ankle and foot, and "other". Injuries were also described according to the type (nature): haematomas and strains, contusions, concussions, joint sprains, fractures and dislocations, lacerations, abrasions, and "other". Contusions and haematomas were defined as injuries caused by direct contact to a body

Table 1 Observed and expected injuries for the first (1995), second (1996), and third (1997) amateur rugby league sevens tournament

	1995	1996	1997
Expected	6.7	6.7	6.7
Observed	4	5	11

Table 2 Observed and expected injuries for the first, second, third, and fourth matches played during the amateur rugby league sevens tournaments

	First	Second	Third	Fourth
Expected	5.7	5.7	5.7	2.9
Observed	2	4	7	7

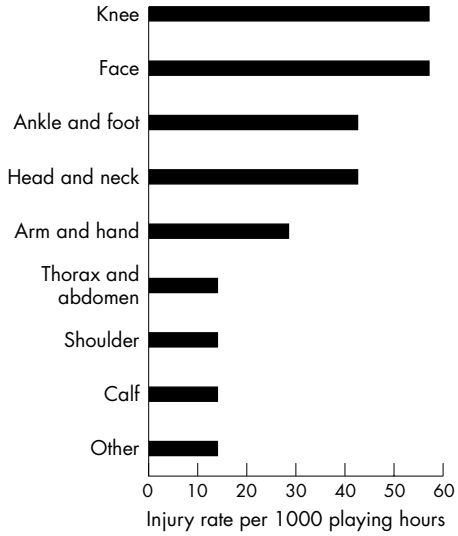

Figure 1 Site of injury in rugby league sevens.

site resulting in local damage and bleeding to that site. Contusions were characterised by minimal pain, tenderness, swelling, and no restriction of motion. Haematomas were characterised by intense pain, tenderness over a wide area, pronounced swelling, and severely restricted range of motion.[12] Finally, injuries were classified according to the cause: tackles (being tackled or while tackling), hitting the ground, being struck by an opposition player, falling or stumbling, overuse, overexertion, or "other".

Statistical analysis

Over the three rugby league sevens tournaments, 21 matches were played. Eighteen were 14 minutes (0.23 hours) long, and the remaining three were 20 minutes (0.33 hours) long. Therefore the average duration of matches was 14.4 minutes (0.24 hours). The overall injury exposure for all players was 70.56 playing hours at risk (7 players × 2 teams per match × 0.24 hours × 21 matches). Expected injury rates (tables 1 and 2) were calculated as described by Hodgson Phillips *et al*.[5] A one sample χ^2 test was used to determine whether the observed injury frequency was significantly different from the expected injury frequency. The level of significance was set at $p<0.05$.

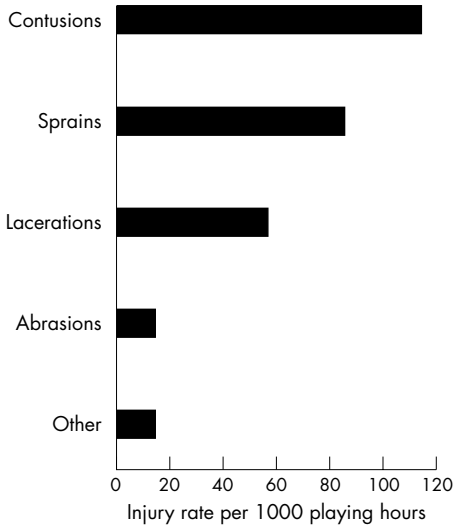

Figure 2 Nature of injury in rugby league sevens.

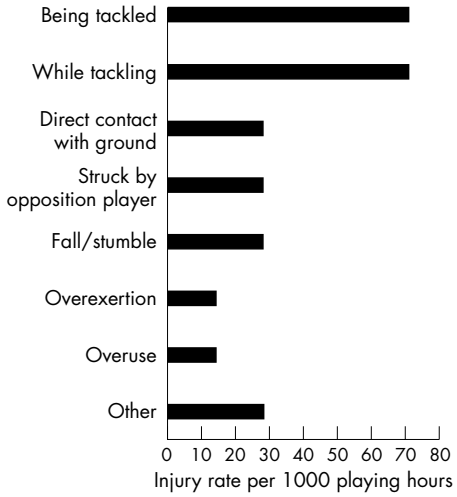

Figure 3 Cause of injury in rugby league sevens.

RESULTS

Over the three rugby league sevens tournaments, 20 injuries were recorded, with an overall incidence of injury of 283.5 (95% confidence intervals (CI) 173.2 to 436.6) per 1000 playing hours. In the 1995, 1996, and 1997 tournaments the numbers of injuries were 4 (20%), 5 (25%), and 11 (55%) respectively (table 1). All of the injuries sustained were new. The overall injury exposure for each tournament was 23.52 playing hours at risk. The most common sites of injury were the knee (56.7 (95% CI 15.4 to 145.2) per 1000 hours, 20%) and face (56.7 (95% CI 15.4 to 145.2) per 1000 hours, 20%) (fig 1). Some 40% (113.4 (95% CI 48.9 to 223.4) per 1000 hours) of the injuries sustained were to the lower limb (knee, 56.7 (95% CI 15.4 to 145.2) per 1000 hours, 20%; ankle and foot, 42.5 (95% CI 8.8 to 124.1) per 1000 hours, 15%; calf, 14.2 (95% CI 0.4 to 79.1) per 1000 hours, 5%). Injuries to the upper limb (42.5 (95% CI 8.8 to 124.1) per 1000 hours, 15%) were less common ($\chi^2 = 5.3$, df = 1, $p<0.05$).

Figure 2 shows the nature of injuries sustained. Contusions were the most common type (113.4 (95% CI 48.9 to 223.4) per 1000 hours, 40%), followed by joint sprains (85.0 (95% CI 31.2 to 185.3) per 1000 hours, 30%) and lacerations (56.7 (95% CI 15.4 to 145.2) per 1000 hours, 20%) ($\chi^2 = 9.5$, df = 4, $p<0.05$). Of the 20 injuries sustained, none were muscular haematomas or strains.

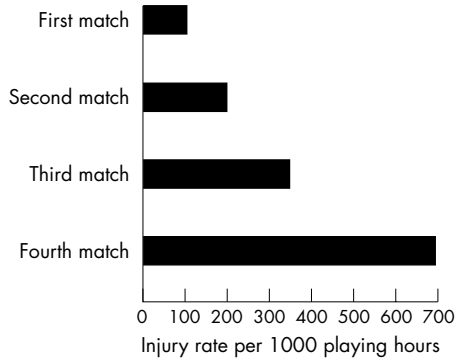

Figure 4 Time of injury in rugby league sevens.

Most (198.4 (95% CI 108.3 to 333.3) per 1000 hours, 70%, χ^2 = 31.5, df =4, p<0.001) injuries occurred in physical collisions and tackles (being tackled, while tackling, direct contact with ground, or struck by opposition player), with no differences found between tackled (70.9 (95% CI 23.0 to 165.2) per 1000 hours, 25%) and tackling (70.9 (95% CI 23.0 to 165.2) per 1000 hours, 25%) players. Overuse injuries were uncommon (14.2 (95% CI 0.4 to 79.1) per 1000 hours, 5%) (fig 3).

An increasing injury incidence was observed over the first (99.2 (95% CI 12.0 to 358.1) per 1000 hours), second (198.4 (95% CI 54.0 to 507.9) per 1000 hours), third (347.2 (95% CI 139.2 to 715.2) per 1000 hours), and fourth (694.4 (95% CI 278.5 to 1430.5) per 1000 hours) matches played during the tournaments (χ^2 = 9.2, df = 3, p<0.05) (fig 4).

DISCUSSION

This study of amateur rugby league sevens players found an overall injury rate of 283.5 injuries per 1000 playing hours, when recorded during three consecutive end of season tournaments. These injury rates are 76.5% higher than previously reported for the same cohort of conventional amateur rugby league players (160.6 per 1000 hours), using the same injury definition, during the same time period (1995–1997).[6] Furthermore, the incidence of injury increased significantly with the playing of successive matches. The results suggest that amateur rugby league sevens tournaments, which require players to compete repeatedly on the same day, may hasten the onset of fatigue and predispose to injury.

Most (55%) injuries occurred in the final tournament, despite similar rules being implemented in the first (1995), second (1996), and final (1997) tournaments. However, the incidence of injury during the same time period for the conventional rugby league season increased from 151.1 per 1000 playing hours (1995) and 150.3 per 1000 playing hours (1996), to 178.9 per 1000 playing hours (1997).[6] The increases in injury rates during the conventional rugby league season occurred despite the duration of the season (March–September) and rules being identical in the 1995, 1996, and 1997 seasons. It is possible that the amateur players in the 1997 season competed at a higher intensity than previous seasons, resulting in higher injury rates.[2 3] Alternatively, although all of the injuries sustained were new, the possibility of an injury sustained to one site contributing to an injury at a subsequent site cannot be discounted. However, it appears more likely that the higher injury rates observed in the final rugby league sevens tournament merely coincides with the higher injury rates of the same conventional rugby league season.

The finding that 40% of all injuries were to the lower limb is in conflict with a recent study that showed that most (25.3%) conventional amateur rugby league injuries were to the head and neck.[6] Although the physiological demands and intermittent nature of rugby league sevens and conventional rugby league are similar,[8 9] the number of players is obviously much lower in rugby league sevens. In addition, although physical contact is an important determinant of injury in collision sports,[13] the magnitude of physical collision will also be an important determinant of injury. Indeed, the level of physical contact would be expected to be considerably reduced in rugby league sevens, with greater emphasis on one on one tackles. Alternatively, it is not uncommon to observe several defenders effecting tackles in conventional rugby league, with the common goals of preventing the attacking player from offloading the football, and rolling the attacking player on his back ("turtling" attackers). Given the expected differences in defensive strategies, it is not surprising to observe different injury sites between rugby league sevens and conventional rugby league players.

This study found that contusions were the most common type of injury sustained. This finding differs from results of previous studies, which found that muscular injuries (haematomas and strains) were the most common type of injuries sustained by conventional rugby league players.[6 14–16] It is possible, however, that, had players been reviewed 24 hours after the initial injury event, greater tissue effusion may have been present and the preliminary injury diagnosis may have been altered. Alternatively, it is well documented that forwards sustain more injuries than backs, perhaps reflecting the greater involvement of forwards in physical collisions and tackles.[2 17] The finding of no reported muscular haematomas in the present study may reflect less positional structure in rugby league sevens or a decreasing emphasis on forward dominated play. However, because fewer players are on the field at any given time, players have more space in which to compete during rugby league sevens, suggesting that the numbers of physical collisions may be less than in conventional rugby league. Nonetheless, over half of all injuries sustained during rugby league sevens occurred in tackles, showing that, as with conventional rugby league, collisions are the most common cause of injury.

This study found higher injury rates with the playing of successive matches. The incidence of injury increased from 99.2 per 1000 playing hours during the first match of the tournament to 347.2 per 1000 playing hours during the third match of the tournament. Teams who progressed to the grand final of the tournament sustained the highest rate of injury (694.4 per 1000 playing hours). It is unclear whether the increased incidence of injury in the final match of the tournament is explained by the growing fatigue associated with the repetitive nature of rugby league sevens tournaments, or the longer match time and higher intensity associated with the grand final. However, the apparent fatigue induced increase in injury rates may be explained, in part, by the poor aerobic fitness of amateur rugby league players.[7] Although rugby sevens tournaments have been shown to have short periods of high intensity activity,[9] the poor aerobic fitness of amateur rugby league players would reduce recovery between these high intensity bouts and increase fatigue.[18] In addition, it would be expected that the ability to recover from matches played repeatedly throughout the day would be diminished in amateur players. Although results from more matches are required to confirm the present findings, they suggest that a sound level of aerobic fitness is required to perform optimally and avoid injury in amateur rugby league sevens tournaments.

Given the high incidence of injury in rugby league sevens compared with conventional rugby league, the present findings question the value of rugby league sevens tournaments. Although rugby league sevens tournaments have become increasingly popular as a spectator sport, the risks associated with competing in them may outweigh the benefits. There is recent evidence that injuries sustained while participating in conventional amateur rugby league are associated with significant direct and indirect costs.[14] Indeed,

Take home message

This study found a high incidence of injury in amateur rugby league sevens players. The incidence of injury increased significantly with the playing of successive matches. Fatigue may contribute to injuries in amateur rugby league sevens players.

players can lose a considerable amount of time from employment and study, training, and playing. Although the severity of injuries sustained in the present cohort of rugby league sevens players was not documented, given the high incidence of injury, it is conceivable that rugby league sevens injuries may also be associated with significant health and financial costs.

In summary, this study of amateur rugby league sevens players found a 76.5% higher incidence of injury than previously reported for conventional amateur rugby league players.[6] Furthermore, the incidence of injury increased significantly with the playing of successive matches. These findings suggest that amateur rugby league sevens tournaments, which require players to compete repeatedly on the same day, may hasten the onset of fatigue and predispose to injury.

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