Time-Loss Injuries Versus Non–Time-Loss Injuries in the First Team Rugby League Football: A Pooled Data Analysis

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Objective: To describe the injury rates in first team rugby league in terms of those injuries that require missed playing time and those that do not.

Design: A pooled data analysis from 2 independent databases.

Setting: Rugby league match and training environment over several seasons from 1990 to 2003.

Main Outcome Measures: Injuries were reported as rates per 1000 hours of participation and as percentages with their associated 95% confidence intervals (CIs).

Results: A total of 1707 match injuries were recorded. Of these injuries, 257 required players to miss the subsequent match. The remaining 1450 injuries did not require players to miss the next game. They represented 85% (95% CI, 83-87) of all injuries received and recorded. The ratio of non–time-loss (NTL) to time-loss (TL) injuries was 5.64 (95% CI, 4.96-6.42). There were 450 training injuries, of which 81 were TL injuries and 369 NTL injuries. The NTL training injury rate was 4.56 (95% CI, 3.58-5.79) times higher than TL injury rate.

Conclusions: Non–time-loss injuries represent the largest proportion of injuries in rugby league. If NTL injuries are not recorded, the workload of practitioners is likely to be severely underestimated.

Key Words: injury, injury incidence, rugby league, non–time-loss

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INTRODUCTION

Successful injury surveillance is dependent on clearly stated parameters and definitions.[1,2] When investigating injury in any environment, one of the first requirements is the definition of the subject of interest. Estimates of the incidence of injury in sport will vary depending on the definition of injury, which has further implications for comparisons, trend monitoring, and determining priorities in injury prevention.[3] Rugby league injury research has used several injury definitions,[4] which broadly fall into 2 categories: recording those injuries that require a player to miss a subsequent match[5–7] or a broader definition that records all reported injuries that required medical attention.[8–10]

Researchers have suggested that when reporting or describing injuries, it is important to know who the intended audience will be. Knowles et al[11] have suggested that this will determine how and what injury information needs to be reported. In rugby league terms, injuries that do not reach the 1 match missed definition (no time lost) account for between 70%[10] and 92%.[12] Powell and Dompier[13] have stated that both non–time-loss (NTL) injury rates and treatment rates are important because it is these rates that should guide health care management and the appointment and usage of primary care personnel. Any injury, whether it results in a missed match or not, has to be assessed, and a decision made with regard to severity, disposition, and any intervention necessary.[14] It may also require treatment and onward referral, all of which have resource implications for the practitioner.

The purpose of this study was to describe the injury rates in rugby league in terms of those injuries that require players to miss matches and those that do not. This will describe the sport practitioner's full workload and provide information that can guide decisions about resources and care management of injuries.

METHODS

Included Data

For this study, data that had been collected on the incidence of injury in rugby league from 2 sources were combined. These 2 sources provided the data for several articles.[6,8–10,15,16] The original definitions of injury that were used from the 2 sources were as follows: "the onset of pain or a disability resulting from either training for or playing rugby league"[10,15] and "pain, discomfort, disability, or illness (new or recurrent) that the player acknowledged after participating in a rugby-related activity/game, this also included any advice/intervention sought from the medical team."[8,9] From the original data, only data that concerned injuries to first team players, during first team match play and training, were analyzed and reported. Any injuries to second team and

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academy players were not included in the analysis for the following reasons. In some years there was a second team, but not in others. Also, the academy team is age group based and this was younger than 18 years, sometimes younger than 19 years, or not present, thus data were sporadic.

For each injury, the following details were extracted: the position of the player, the site of the injury, the nature of injury, and the time off (if any) as a result of injury. For match injuries, the population at risk was defined as the players who were selected to play for the first team in a given match, and the defined time at risk for calculating injury rates was the duration of the games multiplied by the number of players on the field of play (1.33 hours × 13 players), multiplied by the number of games played. Therefore, 13 players constituted 17.29 playing hours at risk during a game. For training injuries, exposure time was calculated as the average amount of time training in a week multiplied by the number of players in a squad multiplied by the number of weeks training. In combination, these databases reported injury data on a total of 503 games, which equates to an exposure of 8697 playing hours and 161 700 training hours. Injuries were separated into time-loss (TL) injuries (where players missed the subsequent game) and NTL injuries (injuries not requiring a player to miss the next game).

Statistical Analysis

As it was possible to have access to the original data, it was possible to recalculate injury rates per 1000 hours, proportions, and their respective 95% confidence intervals (CIs). Confidence intervals for rates were calculated using the substitution method,[17] and CIs for proportions were calculated using the Wilson method.[17] Each injury was treated as an independent event, and the data were assumed to follow a Poisson distribution. All statistics were carried out using the CIA[17] and VRP[18] statistical software packages.

RESULTS

When the data were pooled, there were a total of 1707 match injuries (196 per 1000 hours; 95% CI, 187-205). Of these injuries, 257 were TL injuries (30 per 1000 hours; 95% CI, 26.1-33.4). The remaining 1450 injuries (166 per 1000 hours; 95% CI, 158-176) were NTL injuries, representing 85% (95% CI, 83-87) of all injuries received. The NTL match injury rate was 5.64 (95% CI, 4.96-6.42) times higher than the TL injury rate. There were 450 training injuries (2.78 per 1000 hours; 95% CI, 2.53-3.05). Of these injuries, 81 were TL injuries (0.5 per 1000 hours; 95% CI, 0.40-0.62). The remaining 369 injuries (2.28 per 1000 hours; 95% CI, 2.25-2.56) were NTL injuries. The NTL training injury rate was 4.56 (95% CI, 3.58-5.79) times higher than the TL injury rate.

All match injuries (NTL and TL) coded by site and type are shown in **Supplemental Digital Content 1** (see **Table**, http://links.lww.com/JSM/A22). Joint sprains were the most common injury (36.8%; 95% CI, 34.6-39.2). They were followed by muscle strains (19.4%; 95% CI, 17.6-21.9) and hematomas (13.9%; 95% CI, 12.3-15.6). The highest number of injuries of any combined type and location were joint sprains to the knee (11.5%; 95% CI, 10-13) followed by muscle strains to the thigh and calf area (10.7%; 95% CI, 9.3-12.2).

In the vast majority of type and location categories, the training NTL injuries outnumbered TL injuries. Eighty-six percent (95% CI, 80-90) of muscle strains to the thigh and calf were NTL injuries. Similarly, 81% (95% CI, 75-86) of joint sprains to the knee were NTL injuries. For all hematomas, 83% (95% CI, 78-88) of injuries were NTL injuries. The figures were similar for muscle strains (87%; 95% CI, 83-90) and joint sprains (86%; 95% CI, 83-88). A small majority of fractures were NTL injuries (57%; 95% CI, 47-66). Lacerations that resulted in TL were rare, only 5 of 163 lacerations were classified as TL injuries (3.1%; 95% CI, 1.3-7). It is noteworthy that 77% (95% CI, 70-83) of the NTL lacerations were to the head and neck. Non–time-loss concussions accounted for 71% (95% CI, 58-80) of all concussions. A higher proportion of fractures and dislocations were TL compared with NTL [difference 13.8% (95% CI, 9.4-18.9)].

Training injuries (see **Table, Supplemental Digital Content 2**, http://links.lww.com/JSM/A23) showed that joint sprains were the most common, both for NTL (40.7%) and TL (32.1%). These were at a variety of body sites. The next most common injuries were muscle strains, which were mostly to the thigh and calf region. There was a higher proportion of TL ankle injuries at training compared with NTL [difference 9.0% (95% CI, 1.3-19.2)].

DISCUSSION

The major finding was that 85% of all playing injuries and 82% of training injuries were NTL. A previous estimate of NTL injuries in professional rugby league was reported as 70%,[10] but included both first team and second team match play. Orchard and Hoskins[19] have reported on injuries in State of Origin games (State vs State) saying that the NTL injury rate was 228 per 1000 hours compared with figure in the present study of 166 per 1000 hours. However, in percentage terms, injuries to their players[19] are the same as previous research[10] but lower than the present study. In amateur rugby league, 76% of all injuries do not require a player to miss a subsequent match.[20] Furthermore, Gabbett and Godbolt[21] stated that 54% of all rugby league training injuries did not result in lost playing time.

An NTL injury definition is less common than a TL definition. The present findings for NTL injuries are slightly higher than rugby union (69%)[2] and student athletes (77.5%)[13] but lower than those reported for youth US football (94.7%)[14] and multisport events.[22] The student athlete study[13] reported the ratio of NTL to TL injuries to be 3.5, whereas Athanasopoulos[22] reported that the risk of an injury lasting less than 7 days compared with one lasting longer was 5.5 times higher, similar to the present study (relative risk = 5.6). These studies report on several different sports and there are probably several possible reasons for the differences between their findings and the current study.

For example, youth football players wear helmets, league players generally do not wear headgear.[14] More exposed, unprotected heads in rugby league may account for the high proportion of lacerations to the head and neck seen in the present study. Soft helmets, of the type worn in rugby league, do reduce the number of lacerations to the head and the face, but they have not been shown to reduce the risk of concussive injury.[23] For this reason, they are not advocated in the game.[24] It is also noteworthy that before 2002 it was possible to be classified as having a concussion and not miss any playing time.[10]

King et al[25] suggested that using NTL injury definition in rugby league will result in a large proportion of head and neck injuries. In this study, 18.5% of all match injuries and 11% of training injuries were to the head and neck. If TL injuries alone are considered, the figures fall to 11.1% and 6.2%, respectively. Other categories produced more NTL injuries. Joint sprains accounted for 36.8% of all match injuries and 50% of training injuries. However, when NTL injuries are excluded, this falls to 17% and 29%, respectively. Knowing the number and type of NTL injuries is important because early management and treatment can potentially prevent an injury from becoming more serious, which may possibly result in missed playing time.[13]

Fractures and dislocations feature highly among rugby league injuries.[26] In the present study, 57% of these injuries were NTL, the majority of which were accounted for by noses and fingers, with some acromioclavicular injuries. Orchard[27] reported on players who play while carrying such injuries, 90% of which were successful in playing with no subsequent problems.

Investigators discuss whether NTL injuries are important.[28,29] Both definitions have been used in previous rugby league injury research, along with other definitions associated with health and safety.[16] Recently proposed methods for injury data collection suggested that all injuries should be recorded, irrespective of the need for match or training TL.[30]

An NTL injury requires no missed playing time but will involve a practitioner workload for assessment, treatment, and diagnosis, which has an influence on team resources.[25] Approximately 58% of practitioners' time is spent treating NTL injuries.[13] Lacerations in rugby league can be initially managed by the training team, with the use of gauze, gel, or tape. Sutures, staples, or skin glue are applied at the earliest opportunity. There would also be an additional treatment when the sutures had to be removed,[19] and in the case of staples, they would be removed post game and the wound sutured.[31] This saves interchanges or substitutions[19] but requires good practitioner skills. Similarly, using local anesthetic reduces lost playing time but requires medical intervention.[32,33]

Non–time-loss injuries are important; they affect a player's ability to perform. Players always wish to play and be available for selection, thus will play with injuries that would otherwise incur TL. Other aspects are also important, such as the early recognition and management of an injury, especially when they are considered in terms of the possible prevention of deterioration or repetitive injuries, which may take longer to heal and potentially result in lost playing time. To exclude these losses under-reports the true nature of sports participation.

Limitations

Any pooled analysis is limited by the available data sources. An injury investigation is also limited by the injury definition and by the fact that only injuries brought to the attention of the sports medicine team were recorded.[14] Potentially, some injuries will always go unreported. The current investigation was able to combine information from sources that used very similar injury definitions. The databases were maintained by 2 independent practitioners (L.H. and D.J.). No training for maintaining an injury database was provided, so the data collection relied on their professionalism and dedication.[13] Combining data from 2 sources allowed the fullest description possible. For the injury rates, a Poisson distribution was assumed, which may underestimate the width of the CI because injuries are correlated within subjects.[34]

An NTL definition means more injuries to record and more effort and dedication on the part of the recorder.[29] An NTL injury definition may have large variability between clubs.[29] Whether this is natural variation or due to differences between individual data recorders is still unclear. It should perhaps be the focus of future research.

CONCLUSIONS

Without injury information on the incidence of NTL injuries in rugby league, the practitioners' workload will be underestimated, making it impossible to fully describe their role and the work they carry out when attempting to keep players on the field of play. Information of this type could prove useful for training future practitioners. Both will ultimately make health care management and resourcing easier.[13] If the potential workload for all members of the sports medicine team remains underreported, so will the description of a player's injury profile. Future work could be directed at describing and quantifying the treatments provided by practitioners to players. This is the nature of sports medicine care and management and will identify both player and medical workforce needs.

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