The New Zealand Rugby Injury and Performance Project: II. Previous injury experience of a rugby-playing cohort

David F. Gerrard MB ChB*, Anna E. Waller ScD[†] and Yvonne N. Bird BPhEd(Hons)[†]

*School of Physical Education and [†]The Injury Prevention Research Unit, University of Otago, Dunedin, New Zealand

The Rugby Injury and Performance Project (RIPP) is a prospective cohort study by a multidisciplinary research group. Rugby injuries constitute an important area for research because rugby union is New Zealand's national sport and because of the considerable cost of all sports injury acknowledged by the Accident Rehabilitation and Compensation Insurance Corporation (ACC). The initial phase of data collection in the RIPP involved a pre-season questionnaire which, among other things, sought to establish variables relating to the past injury experience of players. The influence of previous injury, the use of safety equipment and the availability and significance of medical advice were among the variables identified by individual questionnaires. This paper analyses the responses to pre-season questions about injury experience in the previous 12 months. In so doing, it identifies baseline data which will be used to address a possible relationship between past injury experience and the prediction of injury during the season.

Keywords: Rugby, epidemiology

In New Zealand, rugby is not only the national sport: it also has the highest injury rate of all major sports¹. Because rugby union has high participation levels as well as a high injury rate, this sport results in more hospitalizations, visits to the accident and emergency departments of hospitals, and claims to the Accident Rehabilitation and Compensation Insurance Corporation (ACC) than any other sport².

There has already been research into rugby injuries in New Zealand³⁻⁶. Specific injuries such as spinal-cord injury⁷, dento-facial injury^{8,9}, shoulder injury¹⁰ and quadriceps haematoma¹¹ have received particular attention. Some preventive strategies have been suggested¹²⁻¹⁴, and certain interventions implemented and evaluated^{15,16}.

The Rugby Injury and Performance Project (RIPP) is using a prospective cohort design to study rugby union players in Dunedin, New Zealand. This project will attempt to identify risk factors and protective

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factors for rugby injury and will suggest preventive measures based on these findings. This paper describes the injury experience of the previous 12 months reported by the RIPP cohort at the beginning of the 1993 rugby season.

Methods

The methods used to study the RIPP cohort are described elsewhere¹⁷. To summarize, 356 rugby union players were enrolled in the RIPP cohort during the pre-season club training before the 1993 rugby season. Players were recruited from five clubs and four secondary schools with the assistance of local rugby football union administrators. The coaches of the senior A, senior B, senior women and under 21 grades for each club, two schoolboy first XV's and three schoolgirl teams also assisted in player recruitment. All cohort members attended a pre-season assessment evening during which they completed a questionnaire and a series of physical fitness tests, and undertook anthropometric measures.

The questionnaire was self-administered, with RIPP staff available to answer questions and assist where necessary. The questionnaire consisted of six parts including basic demographics, rugby playing history, off-season training and warm-up patterns, injury experience, general health and well-being, and sporting attitudes and behaviours. The questionnaires were completed before the physical assessment.

This paper presents the results of the injury experience section of the pre-season questionnaire only. Questions in this section asked about rugby-related injuries experienced in the previous 12 months that either required medical treatment or

Address for correspondence: David F. Gerrard, School of Physical Education, University of Otago, PO Box 56, Dunedin, New Zealand

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caused the player to miss at least one scheduled game or team practice. In addition, any non-rugby-related injuries experienced in the previous 12 months that required medical treatment were recorded. Players were also asked about current injuries which interfered with their ability to train for rugby, and any chronic injury problems which necessitated special protective precautions during play. Other questions in this section addressed the players' experiences of playing with injury.

Descriptive and comparative statistics are presented. Statistically significant differences between groups were determined at the $P < 0.05$ level. All RIPP data are managed and analyzed using PC/SAS software¹⁸.

Results

A total of 350 completed questionnaires were obtained from 92 female and 258 male rugby players. Only three people failed to complete the injury experience section of the questionnaire. A further 50 players (mainly women) had not played rugby in the previous 12 months, so many of the rugby-specific injury questions were not applicable to them.

Table 1 shows that most players who played rugby in the 1992 season (82%) experienced at least one rugby-related injury during that time. The number of rugby injuries experienced by any one player ranged from 0 to 11 different injuries. A cumulative total of 583 rugby-related injuries were reported. The 245 players reporting rugby injury in the 1992 season averaged 2.4 injuries each.

A significantly higher proportion of the male players (84.4%) reported at least one rugby injury in the 1992 season than to the female players (59.6%) ($\chi^2 = 15.7$, $P < 0.001$). When the frequency of injury was compared on the basis of the position played most often during the 1992 season, forwards were found to have suffered an average of 2.2 rugby-related injuries each in the previous 12 months, whereas backs had a reported mean of 1.8 injuries per player. This difference was not statistically significant.

Figure 1 presents the number of players who experienced injuries to different body sites. It is clear

Figure 1. Body site of rugby injuries in the previous 12 months (RIPP cohort, pre-season 1993). The numbers beneath each body site represent the number of players reporting injury to that site; percentages are shown in parentheses

that rugby injuries affect the entire body. Some players suffered multiple injuries to the same site. Figure 2 presents the 583 rugby-related injuries by type of injury. The 'other' type of injury category includes dislocations, haematomas, and those not well enough defined to assign a type.

Figure 2. Distribution of type of injury: rugby injuries experienced in the previous 12 months ($n = 583$) (RIPP cohort, pre-season 1993)

Table 1. Number of rugby injuries experienced by players in the previous 12 months (RIPP cohort, pre-season questionnaire, 1993)

Number of injuries	Players	
	n	(%)
1	93	(31)
2	73	(24)
3	35	(12)
4	19	(6)
5 or more	25	(8)
Total injured	245	(81)
None	52	(19)
Total*	297	(100)

*Excludes 50 people who did not play any rugby in previous season and three who did not respond to the question

Table 2. Common rugby injuries experienced by players in the previous 12 months (RIPP cohort, pre-season questionnaire, 1993)

Type/site of injury	Injuries	
	n	(%)
Closed head injury	29	(5)
Laceration of face/ear	53	(9)
Sprain/strain/tear		
Ankle	81	(14)
Upper leg (hamstring, quadricep)	58	(10)
Shoulder	55	(9)
Thumb(s)	53	(9)
Back	52	(9)
Knee	48	(8)
Lower leg (calf)	46	(8)
Neck	32	(6)
All others	74	(13)
Total	583	(100)

By far the most common types of rugby injury were sprains, strains and other soft-tissue injuries (*Figure 2*). The most common site of injury was the ankle, with sprained ankles being the most common injury, accounting for 14% ($n = 81$) of all rugby-related injuries reported (*Table 2*). Twenty-nine closed head injuries, or concussions, were reported.

Those who had played organized rugby before the 1993 season were far more likely to have reported at least one injury, either rugby-related or not, in the previous 12 months (86.6%) than those who had never played organized rugby (33.9%) ($\chi^2 = 76.49$, $P < 0.001$). Over half (61%) of the RIPP cohort had had no medically treated injuries in the previous year other than rugby-related ones. The number of non-rugby injuries reported ranged from 0 to 6. A total of 208 injuries were reported by 135 players, with an average of 1.5 injuries each.

The most common sites of non-rugby injury were the same as for rugby injuries: ankle (15%), wrist, hand and fingers (15%), knee (13%), shoulder and collarbone (12%), and back (11%). As with rugby injury, the most common types of non-rugby injury were sprains, strains, and other soft-tissue injury, accounting for two-thirds of the non-rugby injuries reported.

Of the 338 players who answered the question about current injuries affecting their ability to train, 99(29%) reported such an injury. The 108 current injuries reported included 19 knee injuries (18%), 14 ankle sprains (13%), and 12 shoulder injuries (11%). In response to a question about chronic (long-term) injuries or conditions that required the use of special safety gear such as strapping, thermoskin support sleeves or headgear, 77 (24%) players reported such an injury. The chronic injuries described included 22 head injuries, accounting for 28% of all the chronic injuries reported. Ankle and knee injuries accounted for 16% and 18%, respectively, of the chronic injuries. A total of 42% of the cohort reported either a current injury, a chronic injury, or both at pre-season.

Of those who played rugby in the 1992 season, 150 (55%) reported missing at least one game due to injury. Thirty-one players (12% of those who trained

in the off-season) reported suffering an injury during the off-season that caused them to miss at least two off-season training sessions. Thirty players (11% of those who had started pre-season training with their club) said they had missed at least two scheduled rugby team practices due to injury since the beginning of club pre-season training.

The RIPP cohort data indicate that it is something of a myth that rugby is a game played with no protective equipment. Although no equipment is required, the vast majority of those who had played rugby during the study period reported using some form of protective equipment (96%). *Figure 3* shows that the most common type of protective equipment was a mouthguard, used by 85% of those who had played in the previous year. Over half of the players used strapping (65%) and grease (60%). Grease is used by the players to prevent grazing and abrasions from contact with the ground as well as with other players.

The most common reasons given for using protective equipment were to prevent injury (57%) and because of a previous injury (53%). Medical advice was cited as a reason for using protective equipment by 21% of the RIPP players who used protective equipment. Players could indicate more than one reason for using protective equipment.

Strapping was widely used by the RIPP players to provide support and stabilization of body parts at high risk for injury. For those who had played rugby in the previous season, ankles were the most commonly strapped body part (29%) followed by thumbs (21%) and knees (20%). Hands and fingers were strapped by 15% of the players, and 14% strapped or taped their ears. Many people reported strapping multiple body parts.

Players were most likely to have had their strapping done by a team physiotherapist (42%) or to have done it themselves (43%). A team trainer or

Figure 3. Protective equipment used in the 1992 season by rugby players (RIPP cohort, pre-season 1993)

Table 3. Treatments used by players to enable them to play rugby while recovering from an injury (RIPP cohort, pre-season questionnaire, 1993)

Treatment	Players	
	n	(%)
Ultrasound	59	(55)
Painkillers	23	(21)
Anti-inflammatories	21	(19)
Injections	13	(12)
Acupuncture	9	(8)
Other forms of physiotherapy	7	(6)
Total	108	(100)

medic provided the strapping service for 24% of the players. Many players used a variety of sources to provide their strapping, and indicated that they used whoever was available and convenient.

Over a third (37%) of those who had played organized rugby before reported that they had used some sort of medication or physiotherapy to make it possible to play rugby while recovering from an injury. The most common treatment used was ultrasound (Table 3).

Although most players (95%) reported no difficulties in obtaining medical advice for their sporting injuries, two of every five players (39%) reported that they had played rugby against medical advice at some time in their careers.

Discussion

Rugby may be considered as the archetypal body-contact sport. Played typically by vigorous young people, it includes the skills of tackling, scrummaging, mauling and lineout play for which the game is popularly known. Such contact phases of play are associated with the identified pathomechanics of injury. These phases implicate extrinsic forces which are commonly associated with soft-tissue contusions, joint strains, fractures, dislocations, lacerations, grazes and head or spinal injury¹⁹.

Given the robust nature of the game, rugby players are likely to suffer at least one significant injury in the course of a season. The identification of such an event is best measured by the interruption of normal training or match participation or by the need for medical attention. Even using what many would consider to be a fairly stringent definition of injury, the players in this study reported an extremely high number of injuries resulting from their rugby participation in the previous 12 months. It should be noted, however, that multiple injuries of the same type to the same site (e.g. a sprained ankle) may have occurred, and our data collection method would have recorded only one such injury. Our results are, therefore, a conservative estimate of total injury experience.

Previous New Zealand studies have typically used Accident and Emergency (A&E) or hospitalization data to investigate sports injury^{2-4,6}. Rugby is reported to be the sport with the highest number of injuries presenting to these services. Injuries to the

Figure 4. The frequency of injury in women's rugby is significantly lower than in men's rugby. (Courtesy of Otago Daily Times)

head and lower limb predominate in these studies and sprains and strains are the most common type of injury reported, followed by fractures. Although the proportion of head injuries reported by the RIPP cohort is lower than in the studies based on hospital and A&E data, they are of great concern, especially because of the high number appearing as chronic injuries. The differences in injury patterns reported in the RIPP may reflect the greater severity level of injuries treated at hospitals and A&Es. The RIPP was designed to capture injuries across a wide spectrum of severity levels, including relatively minor ones, if they interfered with the players' ability to participate in their sport. The trend of the forwards in this study being injured more than backs, even though not statistically significant, is consistent with the work of Dalley *et al.*²⁰.

As a consequence of the extrinsic injuries associated with rugby, a significant number of players can be expected to carry the lingering consequences of previous trauma into the following season. This is apparent in the RIPP pre-season data, suggesting that players are keen to return for trial games and selection opportunities despite inadequate rehabilitation. It is reasonable to assume that players are unwilling to jeopardize selection by identifying

Figure 5. Immediate attention to injuries is essential to reduce their severity. (Courtesy of Otago Daily Times)

pre-season injury. Clearly, pressure from coaches or others to precipitate a premature return to activity is inappropriate and indefensible.

Chronic injury is often linked to the need for protection and the use of safety measures such as headgear, mouthguards and prophylactic strapping. The continued use of such measures advances the argument for continuing education in injury prevention, the best example of which appears to be the widespread acceptance by players for the use of mouthguards. Earlier New Zealand studies have investigated compliance of mouthguard use in schoolboy rugby players^{15,16,21}. All three studies have reported increases in the number of players regularly wearing mouthguards at the end of the rugby season. Two epidemiological rugby surveys based in Christchurch, New Zealand, report mouthguards being used by around 60% of players in the 15–30 year age group^{5,20}. In 1990, the 21-man All Black squad were deemed to accept the value of mouthguards, with 86% regularly wearing this form of protection and two-thirds of the squad favouring compulsory use²². The authors of the study concluded that these All Blacks provide a positive role model for young players. The level of mouthguard use in the RIPP cohort is consistent with the level of use by the 1990 All Blacks.

The disregard for medical advice reported by 39% of the RIPP cohort is a disturbing finding. For the most part, medical advice is interpreted by injured players as representing the conservative end of the therapeutic spectrum. A respect for the knowledge and opinion of the elected medical adviser eliminates the tendency for players to return to play against advice. The need for specialists in the diagnosis and management of sports injuries has never been greater and deserves recognition in the undergraduate curricula of medicine and physiotherapy.

The results reported in this paper are forming the basis for further analyses of the RIPP data. Information collected prospectively during the 1993 rugby season allows for predictive analyses of previous injury experience to injury during the season. Using the RIPP data, we hope to clarify the nature and extent of the relationship between previous injury experience and the chance of future injury.

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