Original Article

Injury incidence, characteristics and timing in amateur male rugby union: A prospective cohort study

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ABSTRACT

Rugby union has a high incidence of match injuries. However, there is limited information regarding the incidence and characteristics of match injuries in male amateur players. In particular, there is a lack of information regarding injury rates per match quarter. Investigating this may inform injury prevention strategies. The aim is to determine whether the rate and characteristics of injury vary with match quarter in male amateur rugby union players, regardless of whether the injury resulted in time loss from play. This prospective cohort study recorded and examined the number and characteristics of injuries during match quarters across a season of amateur rugby union. Team match exposure was recorded. Injuries were recorded by a team physiotherapist consistent with Rugby Injury Consensus Group guidelines. Matches were divided into quarters for data analysis, and statistical significance was determined using Chi-square analysis. 127 players sustained 207 injuries across 18 games. The injury incidence was 164 injuries/1000 match hours. There was a significant ($p<0.001$) difference in the number of injuries between match quarters, with the greatest number in the fourth, followed by the second, third, and first quarter. Forwards had a statistically significant higher rate of injury between quarters. Injury incidence in amateur rugby is higher than previously reported. Injury rates in amateur male rugby increase at the end of each match half, peaking in the fourth quarter. These findings contribute to the understanding of the aetiology of injury in amateur rugby union.
Keywords: Rugby union; Injury; Match timing.

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INTRODUCTION

Rugby union matches involve repeated physical challenges for ball possession. Players experience frequent high intensity contact and non-contact forces, such as sprinting and tackling, which accumulate throughout the game as match stress.(McLaren SJ et al., 2015) The degree to which a player is subjected to match stress, combined with their personal predisposition to injury and exposure to extrinsic risk factors, results in significant potential for injury during a match.(Bahr R & Krosshaug T, 2005; McLaren SJ et al., 2015; Meeuwisse et al., 2007) Consequently, rugby union has one of the highest rates of injury in all sports, 12.3 to 106 injuries per 1000 match hours for amateur rugby union players (Bathgate et al., 2002; Schwellnus et al., 2014; Swain et al., 2016; Williams et al., 2013; Williams et al., 2016) One component of match stress is volume of match play (minutes). Therefore, volume of match play is a biologically plausible contributor to rugby injury. This factor remains unevaluated in male amateur players. Investigating this may enhance understanding of the aetiology of injuries in male amateur rugby union, and subsequently inform injury prevention strategies.(Finch C, 2006).

A rugby union match is usually 80 minutes in duration.(Quarrie et al., 2001) Each match is split into two halves, between which players have a five-minute break from play (Quarrie et al., 2001) During a match, players accumulate stress as a product of the intensity and volume of work they perform. Access to equipment and staff are significant barriers to measuring match intensity at an amateur level.(Jones et al., 2015) In contrast, a player's exposure to volume of match stress may be easily measured by recording minutes of play. The association between a player's exposure to volume of match stress and injury has been explored in professional rugby union by examining intra-match timing of injuries. (Bathgate et al., 2002; Bottini et al., 2000; Schneiders et al., 2009; Takemura et al., 2007; Williams et al., 2013; Williams et al., 2016) This involves dividing a match into quarters and recording the number of injuries per quarter. In professional rugby union, injury rate has been shown to be highest during the third quarter of a match. (Bathgate et al., 2002; Bottini et al., 2000; Schneiders et al., 2009; Takemura et al., 2007; Williams et al., 2016) However, injury patterns in amateur rugby union may differ, as injury incidence varies with player experience and competitive level. (Roberts et al., 2013) To understand the association between injury and match timing in amateur rugby, investigation needs to occur at this level of play.

Investigating the association between injury and match time in amateur rugby union has the potential to provide new insight into injury at this level of the game. Match timing is a pragmatic factor that can be easily modified. Duration of match play can be measured efficiently and with minimal resources. If a relationship exists between timing and injury, monitoring duration of match play has the potential to inform injury prevention strategies.(Finch C, 2006) Understanding when injuries occur during an amateur match of rugby union may inform player return to play, and substitution decisions. (Schneiders et al., 2009; Takemura et al., 2007; Vaz L et al., 2012; Williams et al., 2013) Additionally, it may facilitate the development of specific conditioning practices to reflect identified at risk periods of play, and this has the potential reduce injury risk. (Best JP et al., 2005; Schneiders et al., 2009; Vaz L et al., 2012; Williams et al., 2013; Williams et al., 2016).

The aim of this study is to determine whether the number of injuries and injury characteristics vary with time during a match, expressed in quarters of the match, in male amateur rugby union players during a single competitive season. The hypothesis is that there will be a difference in the number of injuries sustained in each of the four quarters, with most injuries occurring in the final quarter. This investigation has potential to provide new insight into injury in amateur rugby union and may contribute to novel injury prevention strategies at this level of the game. (Fuller et al., 2007; Holtzhausen et al., 2006; Johnston et al., 2015; Rogalski et al., 2013; Takemura et al., 2007).

MATERIALS AND METHODS

Study Design

This prospective cohort study recorded and evaluated the number and characteristics of injuries that occurred in amateur male rugby union matches. Throughout a single competitive season, all injuries were recorded in all matches (n=18). The key outcomes were injury timing, specifically related to match quarter, and injury characteristics, such as injury type, location, and severity. This study was approved by the University of Newcastle Human Research Ethics Committee (H-252-0706).

Participants

Participants (n=127) were male amateur rugby union players from the University of Newcastle Rugby Club, which competed in the 2016 Newcastle and Hunter Rugby Union Competition (highest amateur, non-representative, non-professional level). The club fielded four male teams, which competed in four grades representing competitive levels of play (in descending order): Premier 1, 2, 3 (aged ≥20 year) and Premier Colts (aged <20 year). Players older than 20 years were graded by the coaching staff on the basis of fitness, performance and skill testing. Data for female players could not be recorded due to the schedule of the women's games in the corresponding season.

Injury Definition

The Rugby Injury Consensus Group (RICG) guidelines were used to define injury and associated subcategories. (Fuller et al., 2007) An injury was any physical complaint that was caused by a transfer of energy that exceeded the body's ability to withstand it. (Fuller et al., 2007) 'Injury' was further categorised by type, location, body side, recurrence, severity, as well as player position and body mass index (BMI). A contact injury was defined by any incident that involved tackling, mauling, rucking, lineouts, scrum, collision or contact with another player. The physiotherapist either through direct observation or patient interview determined this at the time of injury. A recurrent injury was one of the same type and site as an original injury that occurred after an athlete had returned to play. Recurrent injuries were 'early' if within two months of return to play, 'late' if between 2-12 months, and an injury greater than 12 months was classified as a 'delayed recurrence'. The severity of injury was determined by the number of days that elapsed from the date of injury to the date of the player's return to full participation in team training and availability for match selection. Injury severity was classified as follows: slight (0-1), minimal (2-3), mild (4-7), moderate (8-28) or severe (>28 days). (Finch C, 2006).

Data Collection

Data were recorded in the 18 competitive matches that made up the season for each of the four teams. Club administrative staff recorded the time in the match when players joined or left the field of play. Total player minutes were recorded by team officials. Date of injury, match round, mechanism, the quarter of the game the injury occurred in, injury type and severity, affected side of the body, new or recurrent, playing position, age, height and body mass were recorded by team physiotherapists trained in the RICG and using an RICG form. Height and body mass were used to calculate BMI in kg/m^2. If an injury was not witnessed directly by the recording physiotherapist, a thorough subjective history was completed with the injured athlete by the physiotherapist and the injury documented in accordance with the RICG.(Finch C, 2006).

Exposure

Total player match exposure measured as time in hours during the 2016 season for each of the four teams was calculated as (number of team matches played during the season, n =18) x (players in a team, n = 15) x (duration of match in minutes, which varied among grades). Exposure hours for each of the four teams

were summed to represent total exposure hours. The timing of match injuries was defined as the quarter of the match when the injury occurred.

Statistical Analysis

Descriptive statistics were used to describe the frequency of match injuries and history, mechanism, type, severity, and location of injury. Chi square analysis determined differences between match quarters for injury rates, types (including body location, mechanism of injury, new vs recurrent injury and severity), player BMI and position, with statistical significance set at $p<0.05$. SPSS v24.0 (IBM Inc., Armonk, USA) was used for all analyses.

RESULTS

During the 2016 season, 127 players represented four teams. Of these players, 87/127 (68.5%) sustained an injury. The characteristics of these individuals were (mean ± SD) age: 25.0 ± 3.3 years, height 185.0 ± 5.3 cm, weight 95.0 ± 11.7 kg and BMI 27.6 ± 3.0 kg/m^2. The total match exposure was 1260 hours.

Injury Incidence

Across 18 matches 207 injuries occurred. The match injury incidence for the season was 164 injuries/1000 match hours.

Injury Rates per Quarter

Injury rates varied among match quarters; 9% (n=18) occurred in the first quarter, 31% (n=65) in the second quarter, 21% (n=43) in the third quarter, and 39% (n=81) of injuries in the fourth quarter. There was a statistically significant difference in injury rates between quarters $\chi2$ (3, N=207)=43.42, $p<0.001$.

Injury Location

The greatest number of injuries occurred at the shoulder complex (15.3%, n =32), followed by the ankle (11.3%, n =24), then the knee and thigh (each 10.8%, n = 22). All categories had their greatest number of injuries in the second or fourth quarter. For further statistical analysis, data were collapsed into three categories: upper limb, lower limb, and head/face/cervical spine. The greatest number of injuries occurred in the lower limb (46.9%, n =97), followed by the upper limb (32%, n =67) and then the head/face/cervical spine (20.8%, n=43) (Table 1). There was no significant difference among quarters for body location of injury using these categories $\chi2$ (6, N=207)=2.288, p=0.891. A similar number of injuries occurred on each side of the body with 50.8% on the left and 49% on the right. There was no significance between quarters for body side, $\chi2$ (6, N=207)=12.360, p=0.54.

Injury Mechanism (Contact v Non-Contact)

There were 143 (69%) contact injuries and 64 (30.9%) non-contact injuries. For both, more injuries occurred in the fourth quarter followed by the second quarter. There was no significant difference between quarters for mechanism of injury, $\chi2^2$ (3, N=207)=2.29, p=0.515.

Table 1. Injuries (n,%) by match quarter for each body location of injury per RICG guidelines with collapsed body location categories for all recorded match injuries (n=207), and body side of injury for injuries that could categorised by side (n=167, i.e., excluding head and spinal injuries), for amateur rugby union players (n=127) over one season

	Match Quarter			
	1	**2**	**3**	**4**
Injury location				
Shoulder complex (n=32)	2 (6.3)	9 (28.1)	5 (15.6)	16 (50)
Ankle (n=24)	3 (12.5)	7 (29.2)	5 (20.8)	9 (37.5)
Cervical spine (n=22)	0 (0)	7 (31.8)	6 (27.3)	9 (40.9)
Knee (n=22)	1 (4.5)	8 (36.4)	3 (13.6)	10 (45.5)
Thigh (n=22)	4 (18.2)	8 (36.4)	0 (0)	10 (45.5)
Head/face (n=21)	2 (9.5)	8 (38.1)	5 (23.8)	6 (28.6)
Hand/finger/thumb (n=15)	1 (6.7)	5 (33.3)	2 (13.3)	7 (46.7)
Lower back/pelvis/sacrum (n=11)	0 (0)	2 (18.2)	3 (27.3)	6 (54.5)
Sternum/ribs/upper back (n=10)	0 (0)	5 (50.0)	1 (10.0)	4 (40.0)
Hip/groin (n=9)	2 (22.2)	1 (11.1)	4 (44.4)	2 (22.2)
Lower leg/achilles tendon (n=7)	0 (0)	3 (42.9)	2 (28.6)	2 (28.6)
Wrist (n=5)	1 (20.0)	1 (20.0)	3 (60.0)	0 (0)
Elbow (n=3)	1 (33.3)	0 (0)	2 (66.7)	0 (0)
Foot/toe (n=2)	0 (0)	1 (50.0)	1 (50.0)	0 (0)
Forearm (n=1)	1 (100)	0 (0)	0 (0)	0 (0)
Upper arm (n=1)	0 (0)	0 (0)	1 (100.0)	0 (0)
Collapsed Injury Location				
Lower limb (n=97)	10 (10.3)	30 (30.9)	18 (18.6)	39 (58.2)
Upper limb (n=67)	6 (9.0)	20 (29.9)	14 (20.9)	27 (40.3)
Head/face/cervical spine (n=43)	2 (4.7)	15 (34.9)	11 (25.6)	15 (34.9)
Body side of injury*				
Left (n=85)	10 (8.5)	23 (27.1)	12 (14.1)	40 (47.1)
Right (n=82)	8 (9.8)	30 (36.6)	19 (23.2)	25 (30.5)
Total (n=207)	**18 (8.7)**	**65 (31.4)**	**43 (20.8)**	**81 (39.1)**

**Excludes head and spinal injuries that could not be classified by body side.*

Injury Type

The highest number of injuries per RICG categories was in the category other (24%, n = 50), the most common of which was acute low back pain, followed by sprain/ligament (21.7%, n = 45), haematomas (19%, n = 40), then strain/muscular injuries (13%, n = 27) (Table 2). Most categories had the highest injury rate in the fourth quarter, followed by the second quarter. For statistical analysis, data were collapsed into four categories: soft tissue injuries; concussion plus other injury; hard tissue injuries; and haematoma/contusion/laceration. There was no significant difference between quarters for injury type when comparing these four categories, $\chi 2$ (9, N=207)=12.606, p=0.181.

New/Recurrent Injuries

Most injuries (75%, n=156) were initial, whereas 25% (n=51) were recurrent (Table 3). Initial injuries had the greatest number in the fourth quarter (42%, n=66) followed by the second quarter (29%, n=46). Recurrent injuries had the greatest number in the second quarter (37%, n=19), followed by the fourth quarter (29.4%,

n=15). There was no significant difference between quarters for injury recurrence, $\chi 2$ (3, N=207)=4.4, p=0.218.

Table 2. Injuries (n,%) by match quarter for each type of injury per RICG guidelines for all recorded match injuries (n=207), for amateur rugby union players (n=127) over one season

	Match Quarter			
	1	**2**	**3**	**4**
Type of Injury				
Sprain (ligament injury) (n=45)	5 (11.1)	12 (26.7)	9 (20.0)	19 (42.2)
Haematoma/contusion/bruise (n=40)	3 (7.5)	13 (32.5)	7 (17.5)	17 (42.5)
Strain (muscle injury) (n=27)	6 (22.2)	5 (18.5)	6 (22.2)	10 (37.0)
Dislocation/subluxation(joint injury) (n=13)	3 (23.1)	3 (23.1)	3 (23.1)	4 (30.7)
Fracture (bone injury) (n=8)	0 (0)	4 (50.0)	2 (25.0)	2 (25.0)
Laceration (n=8)	0 (0)	6 (75.0)	1 (12.5)	1 (12.5)
Concussion (+ or - LOC) (n=6)	0 (0)	0 (0)	3 (50.0)	3 (50.0)
Nerve injury (n=6)	0 (0)	2 (33.3)	2 (33.3)	2 (33.4)
Bursae injury (n=2)	0 (0)	1 (50.0)	0 (0)	1 (50.0)
Meniscus or cartilage injury (n=2)	0 (0)	1 (50.0)	1 (50.0)	0 (0)
Other injury (n=50)	1 (2.0)	18 (36.0)	9 (18.0)	22 (44.0)
Collapsed Injury Type				
Soft tissue injury (n=76)	11 (14.5)	19 (25.0)	16(21.1)	30 (39.5)
Concussion + other injury (n=62)	1 (1.61)	20 (32.3.)	14(22.6)	27 (43.5)
Hard tissue injury (n=21)	3 (14.3)	7 (33.3)	5 (23.8)	6 (28.6)
Haematoma/contusion/ laceration (n=48)	3 (6.3)	19 (39.6)	8 (16.7)	18 (37.5)
Type (initial vs recurrent)				
Initial (n=156)	15 (9.6)	46 (29.5)	29 (18.6)	66 (52.4)
Recurrent (n=41)	3 (7.3)	19 (46.3)	14 (34.1)	15 (36.6)
Total (n=207)	**18 (8.7)**	**65 (31.4)**	**43 (20.8)**	**81 (39.1)**

Injury Severity

Most injuries were mild (39.6%, n=82) or moderate (28.5%, n=59) severity when classified by RICG guidelines (Table 3). For statistical analysis, data were collapsed into three categories: slight/minimal (0-3 days until return to full participation); mild (4-7d); and moderate/severe (>7d). There was no statistically significant difference between quarters for injury severity when collapsed, $\chi 2$ (6, N=207)=9.979, p=0.126.

Table 3. Severity of injuries (n,%) by match quarter per RICG guidelines grouped by severity categories for all recorded match injuries (n=207), for amateur rugby union players (n=127) over one season

	Match Quarter			
	1	**2**	**3**	**4**
Collapsed Severity Categories				
Slight/Minimal (0-3 d*) (n=56)	2 (3.6)	22 (39.3)	12 (21.4)	20 (35.7)
Mild (4-7 d) (n=82)	5 (6.1)	23 (28.0)	16 (19.5)	38 (46.3)
Moderate/Severe (>7 d) (n=69)	11 (15.9)	20 (29.0)	15 (21.7)	23 (33.3)
Total (n=207)	**18 (8.7)**	**65 (31.4)**	**43 (20.8)**	**81 (39.1)**

Player BMI

When injuries were categorised by the BMI of the player sustaining the injury, the BMI category with the highest number of injuries was 25-30 kg/m^2 (65%, n=135), followed by BMI ≥30 (18%, n=38) and BMI 18.5-25 (16%, n=34). There was no significant difference between quarters for BMI category of injury, $\chi 2$ (9, N=207)=10.303, p=0.327.

Player Position

Forwards (55%, n=114) sustained more injuries than backs (45%, n=93) (Table 4). When injuries were categorised by the playing position at the time of injury, the position with the greatest number of injuries was the second row (19%, n=40), followed by the wing (13.5%, n=28) then loose head prop (12%, n=25). There was a significant difference between match quarters in the number of injuries sustained by forwards and backs, $\chi 2$ (3, N=207)=10.618, p=0.014, with the greatest number of injuries in the fourth and second quarters occurring in the forward positions. Backs also had the highest number of injuries in the fourth (39%, n=37) followed by the second quarter (30%, n=28).

Table 4. Injuries (n,%) during each match quarter for all recorded match injuries (n=207), for amateur rugby union players (n=127) over one season

	Match Quarter			
	1	**2**	**3**	**4**
Player position				
Forwards (n=114)	4 (3.5)	37 (32.5)	29 (25.4)	44 (38.6)
Backs (n=93)	14 (15.1)	28 (30.1)	14(15.1)	37 (39.7)
Total (n=207)	**18 (8.7)**	**65 (31.4)**	**43 (20.8)**	**81 (39.1)**

DISCUSSION

This study investigated the association between the number and characteristics of injury and time of occurrence during an amateur male rugby union match. Significant findings were that the number of injuries in amateur male rugby union increases at the end of each match half, peaking in the fourth quarter. Significantly, forwards had a higher rate of injury across the match, also peaking in the second and fourth quarter. The most common sites of injury were the shoulder, ankle, knee and thigh, however there was no significant association with injury location and match quarter. Most injuries were new, due to a contact mechanism and mild in severity, resulting in four to seven days' time lost. Similarly, there was no association between injury recurrence, injury mechanism or severity with match timing. These findings contribute to the understanding of injury aetiology in amateur rugby union, and may influence the development of specific injury prevention strategies such as player conditioning, staged return to play, and substitution. (Finch C, 2006; Schneiders et al., 2009; Takemura et al., 2007; Williams et al., 2013).

Injury Incidence

The injury incidence in this study was 164 injuries/1000 match hours. This is substantially higher than previous reports of injury incidence in amateur rugby union; 12.3 – 106 injuries/1000 match hours. (Bathgate et al., 2002; Schwellnus et al., 2014; Swain et al., 2016; Williams et al., 2013; Williams et al., 2016)This incongruity may be a reflection of the rigorous implementation of the RICG guidelines in this study. This meant that all injuries regardless of severity were recorded, and likely increased the detection of lower severity injuries. In fact, injuries resulting in less than one week duration accounted for 66% (n=138) of all injuries observed in the present study suggesting the detection of these injuries accounted for the higher injury incidence observed. (Fuller et al., 2007; Schneiders et al., 2009) This suggests the incidence of injuries

in male amateur rugby union players is greater than has previously been reported. Furthermore, injury incidence in this study is substantially greater than professional rugby union, reported as 74-81 injuries/1000 match hours.(Hughes DC & PA., 1994; Williams et al., 2013) Injury rates between professional and amateur levels may vary as professional players are better conditioned to play, have greater access to medical teams and rehabilitation, or may underreport injuries to avoid the perceived consequences of missed games (Garraway et al., 2000; Roberts et al., 2013). Additionally, variation may exist as the professional rugby union literature has previously defined 'injury' by time loss only, that is, an injury that 'forced a player to either leave the field or miss a subsequent game' and this may result is reduced sensitivity to detect less severe injuries.(Hughes DC & PA., 1994; Williams et al., 2013) Despite the minimal time lost to match play associated with less severe injuries they may result in reduced training time, impaired performance and predispose to future injury.(Freitag et al., 2015; Fulton et al., 2014) Therefore, the revelation of the higher injury incidence at this level of play than previously reported is important and adds to the current knowledge regarding the aetiology of injury in amateur rugby union.(Chalmers, 2002; Freitag et al., 2015; Fuller et al., 2007; Williams et al., 2013).

Injury Rates per Match Quarter

This study found significant differences in the number of injuries sustained between match quarters with most injuries occurring in the fourth (n=81, 39%) followed by the second (n=65, 31%) quarter. A similar pattern of intra-match injury timing has been has been demonstrated in a large prospective cohort study of English semi-professional, amateur and recreational rugby union athletes. (Roberts et al., 2013) In contrast, Swain et al (2017) found no difference in injury rates between match quarters. This may be due to sampling variation between the present study and that conducted by Swain et al (2017) as both studies investigated only one amateur club over one season. This limited the sample size of both studies, and potentially the generalisability of the results they produced. Furthermore, this study contrasts to professional rugby union, which found the highest number of injuries in the third quarter.(Bathgate et al., 2002; Bottini et al., 2000; Schneiders et al., 2009; Takemura et al., 2007; Williams et al., 2016) Previous work has suggested that this may result from reduced concentration, inadequate warm up following half time and greater substitution opportunities in the second half of a professional match, which may lead players to compete at a higher intensity, and consequently increase their injury risk.(Bathgate et al., 2002; Jones et al., 2015) The higher injury rate in the second and fourth quarter in this study may be explained by accumulation of match stress, or player exposure to a mechanism of injury whilst fatigued.(Bathgate et al., 2002; Schneiders et al., 2009) These drivers of injury may be amplified at the amateur level where players may: be less well conditioned; play multiple games on a single day, and endure fatigue due to limited ava (Deutsch et al., 2007; McLaren SJ et al., 2015) liability of substitute players. Results from the current study suggest that the number of injuries increases with volume of match play during each half of an amateur rugby union game; further research is required to completely understand this trend.

Player Position

Player position influenced injury rates among match quarters. Injury sustained by forwards (55%) were more common than injuries incurred by backs (45%). The higher injury rate may reflect the different physiological requirements of rugby positions during match play, which impact on match stress endured by players.(McLaren SJ et al., 2015) Rugby positions that are exposed to loads close to the ball in play, such as forwards, are subject to an increased number of high intensity efforts than peripheral players and rugby backs. (Deutsch et al., 2007; McLaren SJ et al., 2015) The increased intensity of work that forwards experience may result from their role in mauling, rucking, and scrummaging, which may contribute to higher rates of injury.(Deutsch et al., 2007) This contrasts to backs, who have greater involvement in moderate intensity running and less proximity to the ball in play, and thus less exposure to match stress.(Deutsch et

al., 2007) In the current study, there were greater numbers of injuries sustained by forwards in the fourth quarter, whereas the quarter with the most injuries sustained by amateur backs was the second. Therefore, forwards appear to be at greater risk for injury towards the end of an amateur match. This may be due to accumulation of match stress. This knowledge may inform coaches to target these players for substitution in the latter stages of each half, or develop conditioning strategies to improve forwards tolerance of match stress.(Gabbett et al., 2014).

Other injury characteristic rates per quarter

For all other injury characteristics; type, location, severity, mechanism and recurrence, there were no significant findings in regard to match timing. That is, a similar number of these injury characteristic categories occurred across all quarters. Likewise, a similar number of injuries occurred on each side of the body. The most common site of injury was the shoulder (15%), followed by the ankle (11.6%), then the knee and thigh (each 10.8%). Contact injuries (69%) occurred far more frequently than non-contact (31%). Contact injuries were highest in the fourth quarter, followed by the second quarter. This may have contributed to the higher number of forwards injured in these quarters, as they are exposed to more frequent contact. (Deutsch et al., 2007)The majority of injuries occurred in overweight players (65%). This finding may simply reflect the study sample, as the majority of players included in the current cohort belonged to the overweight BMI category.

Study Limitations

Due to scheduling and geographical remoteness imposed by the nature of the Newcastle and Hunter Rugby Union competition this study recruited a cohort from one amateur rugby union club, and followed them over one-season. This limited the sample size and may have affected the precision of the estimates reported and the generalisability of the findings. Due to the scarcity of medical professionals at the amateur level of rugby union in Australia, physiotherapists employed by the club collected all injury data. It would have been preferable to have independent physiotherapists complete this role; however this was not feasible. Finally, due to logistical constraints it was not possible to measure individual match exposure, nor was it possible to measure match intensity. This limits the capacity to draw more definitive conclusions regarding the relationship between exposure to match play and injury incidence from the findings of this study.

Future Research

This study used injury surveillance to improve the understanding of the timing of injuries in male amateur rugby union matches. Future studies should consider collecting and evaluating data from a larger sample, across a range of amateur rugby union clubs, and including both male and female players in order to improve the precision and generalisability of the findings. It would also be advisable to use independent data collectors, and to measure individual match exposure and match intensity to provide greater insight into the association between intra-match timing and injury. Subsequently, further research may explore the development and implementation of specific strategies to reduce injuries during high-risk periods of play, and the effectiveness of these potential interventions needs to be evaluated through repeat injury surveillance programmes. (Finch C, 2006).

CONCLUSION

This study demonstrated a high match-injury incidence in amateur male rugby union players. It also demonstrated a significant increase in injury rates at the end of each match half, peaking in the fourth quarter of the match. The high injury incidence, larger than previous amateur and professional rugby union findings, may reflect appropriate utilisation of RICG guidelines to record injuries regardless of severity. Injuries were more commonly associated with a player being positioned in the forwards, as compared to backs. These

findings provide a valid platform for future studies to compare results, and may inform the development of injury prevention programmes to reduce the impact of injury in amateur male rugby union.

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