

TITLE: Profile of the Portuguese male university rugby sevens championship.

RUNNING HEAD: Portuguese University rugby sevens

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ABSTRACT:

Introduction: Rugby Sevens is one of the fastest growing sports in the world, especially the sevens variant after its inclusion in the Summer Olympics' programme. The Portuguese University Sevens Championship is an amateur tournament that takes place every year.

Objectives: To gather a set of relevant data regarding the profile of the Portuguese university rugby sevens' players, as well as the epidemiology of injuries at this level of competition.

Methodology: Firstly, an observational study was conducted to collect data regarding each player anthropometry, individual experience, training habits and warm-up routines. Secondly, a prospective cohort study including all participating athletes was conducted, to identify and describe all injuries occurring during the competition. A follow-up period until the return to sport from all injured players was conducted.

Results: A total of 87 players from 8 teams competed in the tournament. On average, athlete's heighted 178.6 cm (\pm 6.65) and weighted 83.34 kg (\pm 11.22). Total match exposure was 53.67 player match-hours and the injury incidence rate was 186.2 per 1000 player match-hours (94.7-332.4, CI 95%). Average severity was 26.6 days (\pm 6.23). Most injuries occurred on the second half (n=6), following contact events with the opponent (n=8). Lower limb (n=6) and joint/ligament (n=7) injuries were the most frequent.

Discussion: The overall injury incidence rate was higher than any previously reported in the literature. Insufficient training and warm-up routines of the injured players strengthens the idea that these are key elements in injury prevention. The small sample limits the results' statistical significance.

Conclusions: Similar but larger studies must be conducted to gain better knowledge of the individual profile of the Portuguese university rugby player and the burden of injuries at this level of competition.

KEYWORDS: Football; Anthropometry; Athletic Injuries.

INTRODUCTION

Currently, Rugby is one of the world's most played sports, with approximately 8.5 million players in 120 countries (World Rugby 2016a). With its inclusion in the 2016 Olympic programme, a significant impact has been noticed in the number of players and media and academic attention given to the sevens variant (Cruz-Ferreira et al. 2017; Engebretsen & Steffen 2010).

Rugby is collective sport, traditionally played in two variants: one played by fifteen players (Rugby Union fifteens) and the one played by seven players in each team (Sevens). Both are played in a field with the same dimensions and with little variations in game laws, although a fifteens game lasts for 80 minutes (two halves of 40 minutes) while a game of sevens only lasts for 14 minutes (7 minutes each half). As Rugby Union fifteens (Williams et al. 2013; Brooks & Kemp 2008), sevens is described by authors as an intense, dynamic and fast contact sport (A. Ross et al. 2015). To achieve a successful performance, athletes must develop a complex set of physical, technical, psychological and tactical skills (Higham et al. 2012; Higham et al. 2013; Higham et al. 2014). Considering that the field has the same dimensions and that players are less in number, it is demonstrated that (for the same amount of time) players are exposed to a larger number of sprints (Suarez-Arrones et al. 2012) and contacts with opponents during the competition (Alex Ross et al. 2015).

Along recent years, World Rugby (the sports' governing body) has shown considerable interest in the improvement of players' health and welfare. A large number of studies has been published, in these past years, concerning Rugby Union fifteens injuries (Bird et al. 1998; Brooks et al. 2005; Schneiders et al. 2009; Haseler et al. 2010; Fuller et al. 2013; Fuller et al. 2008; Williams et al. 2013). However, regarding the sevens

variant, we can find a different reality as the available literature is clearly insufficient (Cruz-Ferreira et al. 2017). Nevertheless, according to a recently published review article, which summarized the available epidemiologic data from seven different prospective studies on sevens' male competitions we could see that the average injury incidence rate in elite athletes was 108.3 [100.6-116.6, Confidence Interval (CI) 95%] per 1000 player match-hours, mean severity was 44.2 days(40.6-48.1, CI 95%). Both injury incidence and severity were higher than the previously reported for rugby fifteens. The most frequent type of injury was joint/ligament, and the lower limb was the most frequent location of injury. Tackle (especially "being tackled") was the event leading to most of the injuries. Injuries also occurred more often in the second half of the game, and "backs" sustained the higher number of injuries, in comparison with the "forwards" (Cruz-Ferreira et al. 2017).

The Portuguese University Rugby Championship is annually organized and disputed in the sevens' variant by university teams from all the country. Portugal is classified by World Rugby as a Tier-3 Nation (which defines game level and development potential as a nation according to the World Rugby Ranking) (World Rugby 2016c) and this competition can be classified as an amateur competition, as no professional players take part.

We were not able to find any paper regarding the profile of the Portuguese University rugby sevens player, neither the epidemiology of injuries at this level. Even at international level, there is only one study with data from American non-University amateur athletes (Lopez et al. 2012) and one partially presenting data from injuries in a group of Hong Kong college players (Mirsafaei Rizi et al. 2017). Thus, we aimed to

conduct the first study on Portuguese University rugby sevens and open a path for further investigations.

The aims of this study were to determine the anthropometrical profile, individual experience, training and warm-up routines of the Portuguese University Sevens' players, as well as to determine the injury incidence rate, as well as its severity, type, anatomical location, recurrence, preceding event, match period, field location, play legality and the number of previously played matches.

METHODS

This study comprised two phases and was a test for the methodology used by one of the authors in a recently published paper on the epidemiology of injuries Portuguese in senior male rugby sevens (Cruz-Ferreira et al. 2018).

In the first phase, we conducted an observational study assessing the anthropometric profile and individual characterization of all the athletes disputing the tournament. Each athlete was asked to fill a form providing data regarding their body weight, height and Body Mass Index (BMI). They were also asked to provide their rugby experience (consisting in the number of years playing the sport; the number of years playing the sevens variant; and if they also played in non-University official competitions). Data regarding each player training and warm-up routines was also collected. Athletes were requested to provide details on: the number of rugby field training hours per week during the fifteens' season; gym training hours per week during the fifteens' season; number of field training hours per week during the sevens' season; and the number of gym training hours per week during the sevens' season.

Concerning warm-up routines, average warm-up duration before sevens' training sessions were collected, as well as average warm-up duration before a sevens' tournaments and the second game/subsequent games during that tournament.

The second phase was a prospective cohort study, where all athletes were included and the occurrence of injuries during the sevens' matches in the group was recorded. Injured players were then followed until their return to practice and match competition.

Match-injuries were identified and reported to the researchers either by the team managers of the competing squads or even by the researcher present on the field of play. After the identification of an injured player, an interview was conducted and a form filled for every occurred injury to collect relevant data. This form followed the recommendations of the "*Consensus Statement on Injury definitions and data collection procedures for studies in rugby union*" (Fuller et al. 2007), and designed to obtain relevant data. It includes questions on the number of matches played in the same day; the match half when the injury occurred; as well as the field location, the warm-up duration, the anatomical location of the injury, type of injury, type of event and if the injury was caused by contact. It also collected data regarding a previous injury of the same type in the same location (recurrence), and if the referee considered the play to be fault or dangerous (Law 10.4) (World Rugby 2016b).

Concerning injury severity, two groups were created: "Medical Attention Injuries", that comprises situations in which the athlete needs medical assistance but has the ability to immediately return to the game; and "Time-loss Injuries" that includes injuries severe enough to force the athlete to stop competing. "Time-loss injury" was defined as "*any physical complaint sustained by a player during a Rugby Sevens match*

that prevented the player from taking a full part in training and/or match play for more than one day following the day of injury” (Fuller et al. 2010).

Total match exposure (in hours) was estimated using the following formula:
number of games x number of minutes of each game x number of athletes in each game / 60 minutes.

Injury incidence rate (per 1000 player match-hours) was calculated using the following formula: *number of injuries / total match exposure x 1000.*

This study protocol was presented and approved by “Portuguese Federation of University Sports” organizing committee. Each team medical staff were informed and their cooperation was guaranteed. All clarifications were given and informed consent obtained for all athletes, before and during the tournament.

Statistical Analysis

The statistical analysis was performed using IBM® SPSS® Statistics v.19 software.

Quantitative variables values are presented as average (\pm standard deviation).

Normality by injury group was tested using the Kolmogorov-Smirnov test (for the non-injured group – n=75) and Shapiro-Wilk test (for the injury group – n=10).

Student t-test was used to compare the weight and BMI between positions and to compare the recovery time for the following variables: athletes position, match half, injured body part, type of injury, recurrence and type of event.

Mann-Whitney U test was used to compare warm-up routines, training routines and rugby individual experience between the injured and non-injured groups. The same test was applied to compare the height between Backs and Forwards.

Pearson coefficient was computed to assess the existence of correlation between the recovery time and the following variables: BMI, Sevens' weekly gym and field training hours and average warm-up time before the second game/subsequent games of the tournament.

Spearman coefficient was computed to assess the existence of correlation between the recovery time and the following variables: fifteens weekly gym and field training hours, average warm-up time before sevens' training and average warm-up time before sevens' tournaments.

RESULTS:

A total of 87 athletes from 8 teams competed in the tournament. Forty-four of this athletes played as forwards (50.6%) and 43 as backs (49.4%).

Anthropometric Characteristics

Athletes, on average, had the following measures: 178.6 cm in height (± 6.65), 83.34 kg in weight (± 11.22) and BMI of 26.09 kg/m² (± 3.05). Considering their playing position, the height, weight and BMI were significantly different between Forwards and Backs [(U = 574.0; p = 0.004), (t (83) = 6.134, p < 0.01) e (t (83) = 4.545, p < 0.01), respectively].

Rugby Individual Experience

On average, athletes had 7.79 years of experience of Rugby Union's (± 4.82) and 4.33 years of experience in Sevens (± 3.11). A total of 68% played for a FPR federated club.

Training Routines

During the fifteens season, athletes trained, on average, 2.64 hours in the field (± 2.4) and 1.96 hours in the gym (± 2.28) per week. During the sevens' season, athletes trained, on average, 2.66 hours in the field (± 2.16) and 1.71 hours in the gym (± 2.11) per week. Fifty-five percent did specific training for sevens – on average, 1.89 hours (± 2.3). From these group of athletes, 88% did specific field training during the sevens season, 38% gym training, 12% track training and 8% other type of training.

Warm-up Routines

Average warm-up duration before the sevens' trainings was 16.24 minutes (± 9.27), average warm-up duration before sevens' tournaments was 22.45 minutes (± 9.49) and before the second game/subsequent games of the tournament was 14.58 minutes (± 6.68).

Injured Players' Study

The number of identified injuries was 15, of those, 5 were considered “Medical Attention Injuries” and 10 “Time-Loss Injuries”. This study only analyzed “Time-Loss Injuries”. Total match exposure was 53.67 player match-hours and the injury incidence rate was 186.32 per 1000 player match-hours (94.7-332.4, CI 95%). The injury incidence rate by position was 173.91 per 1000 player match-hours in Forwards and 195.63 per 1000 player match-hours in Backs.

Injury severity was, on average, 26.6 days (± 6.23) and the athletes had played an average of 1.5 matches before the injury (± 1.65).

Rugby Individual Experience

Injured players had an average of 6 years of experience in rugby fifteens (± 2.67) and 3.8 years of experience in sevens (± 2.1). Most players ($n=6$) did not previously compete in a non-university competition. Comparing individual experience, injured players, on average, played fifteens and sevens for less time than non-injured athletes. However, these differences were not statistically significant [(U = 284.5; $p = 0.179$); (U = 364.5; $p = 0.783$), respectively].

Position

Backs were the most injured players ($n=6$), and for this group of players, injuries were also more severe (31 ± 9.37 days). Forwards time to recovery (20 ± 6.87 days) was smaller, but not statistically different from the Backs' [$t(10) = -0.852$, $p = 0.419$].

Anthropometric Characteristics

Injured players, on average, had the following anthropometric measures: 179.2 cm in height (± 6.76), 81.9 kg in weight (± 6.89) and BMI of 25.56 kg/m² (± 2.33). According to BMI categories, half of them were “Normal” and the other half “Overweight”. There was no statistically significant correlation between recovery time and BMI ($r=-0.196$, $p=0.587$).

Training Routines

Comparing training routines between non-injured and injured players, on average, the last trained less during the fifteens season and more during the sevens (see Table 1). However, these differences were not statistically significant. There was no correlation between severity and training hours for the injured players [($\rho= -0.056$, $p=0.879$; ($\rho=0.286$, $p=0.423$); ($r= -0.034$, $p=0.925$); ($r=0.328$, $p=0.355$), respectively].

Warm-up Routines

Injured players, on average, spent less time on warm-up than non-injured players. However, these differences were not statistically significant. No correlation was found between severity and warm-up duration for the injured players (see Table 2).

Match Half

Four injuries occurred in the first half and 6 in the second half. Severity of injuries occurring in the former group (13.75 ± 2.66 days) was different (but not significantly) from the latter group (35.17 ± 8.76 days) [$t(10) = -1.921, p = 0.091$].

Field Location

Four injuries occurred inside the 22 meters defensive line; 2 injuries between the 22 meters defensive line and midfield; 3 injuries between midfield and the 22 meters offensive line; 1 injury inside the 22 meters offensive line.

Injured Anatomical Location

Regarding the anatomical location of injuries and the severity of injuries, those occurring in the upper limb lead to a greater absence from training and competition, when compared to those on the lower limb injuries [$t(10) = 1.825, p = 0.106$] (see Table 3).

Type of Injury

Muscle/tendon injuries were the most severe [$t(10) = -0.723, p = 0.490$], but the joint/ligament type was the most frequent (see Table 3).

Injury Recurrence

Half of the “time-loss injuries” were recurrent. No statistically significant differences were found between recurrent and non-recurrent injuries [$t(10) = 0.335$, $p = 0.746$] (see Table 4).

Event

Overuse injuries were least severe than trauma injuries (but no statistical difference was found) [$t(10) = -1.351$, $p = 0.214$] (see Table 4). The most frequent type of event ($n=5$) was “being tackled”.

Play Legality and Dangerous Play

No injury was associated with foul play or was considered dangerous by the referee (Law 10.4). (World Rugby 2016b)

Number of previously disputed games

More frequently ($n=4$), injured players had not disputed any game previously.

Warm-up time

Half of the injured players spent less than 20 minutes warming-up prior to the match where the injury occurred (see Table 5).

DISCUSSION

Total match exposure (53.67 player match-hours) was clearly smaller than every study previously published for elite level, which ranged from 866.3 to 6480.6 player match-hours (Cruz-Ferreira et al. 2017). Even when compared with the only epidemiological study with amateur rugby players, with 866.3 player match-hours (Lopez et al. 2012), this tournament presents a smaller exposure.

When comparing with international elite sevens' athletes (Ross et al. 2014), the Portuguese university athletes have, on average, less 4.4 kg in weight and less 6.7 cm in height.

Injury incidence rate (186.36 per 1000 player match-hours) is the greatest ever described in the available literature, both for elite level (100.6-116.6 per 1000 player match-hours (Cruz-Ferreira et al. 2017), CI 95%) as for the only study performed at amateur level (74.7 per 1000 player match-hours (Lopez et al. 2012)).

However, the average severity of injuries (26.6 ± 6.3) was smaller than the reported for every previous studies at elite level, which can be as high as 44.2 days (40.6-48.1, CI 95%) (Cruz-Ferreira et al. 2017).

Comparing warm-up and training routines between injured and non-injured players, with exception of the number of training hours the during sevens' season, the results were as expected: injured players, overall, train and warm-up for smaller periods of time than non-injured players, although no statistical significance had been reached. This strengthens the idea that training and warm-up routines are key-elements in injury prevention.

The most frequent type of injury in this study was joint/ligament, which was also found for elite international tournaments (Cruz-Ferreira et al. 2017), unlike the reports from the only amateur tournament, in which the most prevailing injury was muscle/tendon (Lopez et al. 2012) – which comes second in this study. The latter type, however, was associated with more severe injuries (although without statistical significance).

As it occurs in elite tournaments, lower limb injuries were the most frequent in our group of athletes (Cruz-Ferreira et al. 2017). However, for the amateur tournament previously mentioned, the most frequent anatomical location was the head/neck, followed by the upper limb (Lopez et al. 2012). On this study, no head/neck injuries were reported, namely concussions, that can be potentially dangerous to the player's physical integrity (Bird et al. 1998). This can occur due to a number of reasons, being the lack of specialized medical assistance during the university games, which could help in the detection of suspicious situations, one of the most plausible causes.

Tackle is arguably recognized as the most prone event to cause injuries in a rugby match (Brooks & Kemp 2008; Bird et al. 1998), which was also true for this tournament. Specifically, it is interesting to notice that “being tackled” was more associated with injuries than “to tackle”. This is also in accordance with previous data (Cruz-Ferreira et al. 2017).

As it occurs at elite tournaments (Cruz-Ferreira et al. 2017), injuries were more frequent in the second half. These were also more severe (although without reaching statistical significance), which could indicate an association between accumulated fatigue and the severity of injuries.

Backs were the group of players suffering the higher number of injuries during the tournament. This is also consistent with the literature available for both elite and amateur tournaments (Cruz-Ferreira et al. 2017).

Unexpectedly, there was no injuries sanctioned as foul or dangerous play according to the referee, since this type of actions are associated with potentially severe injuries, as concussions (Bird et al. 1998).

This was a pioneer study in its multiple strands: describes for the first time the profile of the athlete and the burden of injuries in Portuguese university male rugby sevens; assesses its severity and describes the type, location and event causing the sports injury.

There are, however, clear limitations to our study that must be acknowledge. Firstly, the small sample of players and injuries (n=10) markedly conditions the results of the injury study. Consequently, none of the inferential analysis about injuries reaches statistical significance, which constitutes a considerable limitation. Secondly, all data results from a single tournament. Additionally, several of the athletes do not play rugby sevens regularly

Therefore, the results found can be justified by the accentuated amateurism that still prevails at university level, where games and athletes are sparse, players have little experience, poor physical conditioning and bad training and warm-up routines. Although none of the tests used have shown statistical significance, it is safe to state that all these variables were smaller among injured players.

Thanks to the recent growth of sevens' notoriety, there is an increased interest from the medical and scientific community concerning injury prevention and athlete's welfare. This should lead to a larger discussion involving all rugby agents to discuss the rules of the game and propose changes, if necessary. Does training and warm-up routines, match time or field dimensions have any influence on injuries?

Similar and larger studies should be conducted in the future for a better athlete and injury characterization. At amateur and university level, it is key to educate not only today's players, but also future ones, whereby this study recommendation is to spread the sport, its training and injury prevention principles in a premature stage of students' academic education. This way, beyond contributing to lower injury incidence, we could ensure more prepared university athletes and more competitive tournaments in the future.

CONCLUSIONS

We provide the first ever data on the epidemiology of injuries in a European university male competition, providing benchmark values for the incidence, severity, type and location of injuries. Injury incidence rates and severity found for this group of athletes were very different from the literature, but some explanations have already been presented: e.g. small sample, single tournament, not all the athletes were engaged in regular preparation for rugby sevens. The methodology used tested the protocol of a larger study conducted by one of the authors on the epidemiology of injuries in senior male rugby sevens players, and was consistent with the consensus statement for studies on rugby union, and also followed previous injury surveillance studies in rugby. Therefore, we hope that other researchers chose to assess the burden of injuries among

college/university athletes in other countries, so we are able to gather a larger body of evidence that will allow us to better describe this problem.

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Table 1 - Training routines for non-injured and injured athletes

		Non-injured	Injured	<i>p</i> value
Fifteens'	Hours of weekly field training	2.71 ± 2.36	2.10 ± 2.76	0.571
Season	Hours of weekly gym training	1.98 ± 2.19	1.80 ± 2.98	0.558
Sevens'	Hours of weekly field training	2.62 ± 2.15	2.90 ± 2.37	0.728
Season	Hours of weekly gym training	1.62 ± 2.03	2.43 ± 2.72	0.304

Table 2 – Warm-up routines for non-injured and injured athletes.

	Non-injured	Injured	<i>p</i> value
Warm-up time before field trainings (min)	16.82 ± 9.42	11.8 ± 6.84	0.113
Warm-up time before tournaments (min)	22.72 ± 9.55	20.3 ± 9.24	0.510
Warm-up time before the second game/ subsequent games of the tournament (min)	14.74 ± 6.92	13.3 ± 4.35	0.536

Table 3 – Recovery time by anatomical location and type of injury.

Anatomical Location	Number of injuries (n)	Recovery time (days)
Head/Neck	0	-
Upper Limb	4	39 ± 11.63
Trunk	0	-
Lower Limb	6	18.33 ± 5.3
Type of Injury	Number of injuries (n)	Recovery time (days)
Bone	0	-
CNS/PNS	0	-
Joint/Ligament	7	23.57 ± 8.44
Muscle/Tendon	3	33.67 ± 6.89
Skin	0	-
Other	0	-

Table 4 – Recovery time by injury event and recurrence.

Injury Cause	Number of injuries (n)	Recovery Time (days)
Overuse	2	10.5 ± 3.5
Trauma	8	30.63 ± 7.09
Injury Recurrence	Number of injuries (n)	Recovery time (days)
Recurrent injury	5	24.4 ± 6.9
Non recurrent injury	5	28.8 ± 11.15

Table 5 – Warm-up time before the match where the injury occurred.

Warm-up time (min)	Number of injuries (n)
0-9	3
10-19	2
20-29	4
>=30	1