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Profile of an American Amateur Rugby Union Sevens Series

Victor Lopez Jr,^{*} DO, Gregory J. Galano,[†] MD, Christopher M. Black,^{*‡} MPH, Arun T. Gupta,[§] MD, Douglas E. James,^{||} BA, Kristen M. Kelleher,[¶] ATC, and Answorth A. Allen,^{***} MD
Investigation performed at the Hospital for Special Surgery, New York, New York

Background: Rugby union will enter the Olympic arena as Rugby Sevens in 2016.

Purpose: To investigate the injury rate, injury type, and nature of injuries sustained in an amateur American rugby union sevens tournament series.

Study Design: Descriptive epidemiology study.

Methods: The rate, demographics, and characteristics of injury were evaluated in 1536 rugby union sevens players, from 128 sides, competing in 4 amateur 1-day tournaments in a USA Rugby local area rugby union.

Results: Forty-eight injuries occurred over 4 tournaments, for an injury rate of 55.4 injuries per 1000 playing hours. Head and neck injuries were most common (33.3% of injuries), followed by upper extremity (31.3%), trunk (18.8%), lower extremity (14.6%), and physiologic injuries (2.1%). The most common type of injury was ligament sprain (25.0%); followed by concussion (14.6%), hematoma/contusion (12.5%), muscle strain (10.4%), and abrasion (8.3%). Tackling was the most common mechanism of injury (74.5%). Males were injured at a significantly higher rate than females (RR, 7.5, $P < .01$), but no significant difference was observed based on player position ($P = .08$).

Conclusion: Injuries are common among American amateur rugby athletes, with a substantial proportion involving the head and neck region.

Clinical Relevance: Understanding injury patterns in an American rugby union will be important for formulating future injury prevention, assessment, and treatment protocols.

Keywords: rugby sevens; rugby union; sports injuries; epidemiology

Rugby Sevens, also defined as rugby union sevens, is an international contact sport that will enter the Olympic arena in 2016. Rugby union sevens differs from rugby union ("fifteens") in the number of players on the field (7 vs 15), match length (7- vs 40-minute halves), and match frequency (3-6 matches per day vs 1-2 matches per week). Another version of sevens is termed rugby league sevens, which differs from rugby union sevens in that there are stoppages when a player is tackled.

International rugby union sevens is played in an annual men's Sevens World Series consisting of 8 tournaments played across 5 continents, with 2- to 3-day competitions, where an average of 3 and often up to 6 games are played in 1 day by each team. International matches occur over a 7-month period, beginning in December and ending in May, with varying degrees of temperatures. Men's and women's Rugby World Cup Sevens are conducted every 4 years.^{6,7,10,20} This grueling schedule is reflected by an amateur local area rugby union sevens tournament series in America.

The game of Rugby Sevens is physically and aerobically demanding. During a typical rugby union fifteens match, many physical collisions and tackles occur. A sevens match has an increase in sudden stops and open field sprints compared with fifteens. Several studies have documented the rate of injury in rugby union fifteens and rugby league players,^{3-5,7,12-14,16,18,20} but very little has been documented in the literature about rugby union sevens or sevens tournament series.^{10,11} The majority of studies have been conducted in Europe, Australasia (Australia, New Zealand, and surrounding islands), and South Africa, and no research has been conducted on rugby union sevens in America. This study reflects the first assessment of injury rates seen in American amateur rugby union sevens. The purpose of this study is to introduce a new injury reporting

***Address correspondence to Answorth A. Allen, MD, Hospital for Special Surgery, 535 East 70th Street, New York, NY 10021 (e-mail: allena@hss.edu).

*Rugby Research and Injury Prevention Group, New York, New York.

†Lenox Hill Hospital, New York, New York.

‡University of Medicine and Dentistry of New Jersey, School of Public Health, Newark, New Jersey.

§Alberta Health Services, Medical Psychiatry, Calgary, Canada.

||Tulane University, School of Medicine, New Orleans, Louisiana.

¶Professional Orthopaedic and Sports Physical Therapy, New York, New York.

#Hospital for Special Surgery, New York, New York.

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system, the Rugby Injury Survey and Evaluation (RISE), which was used to record injuries during 1 American amateur rugby union sevens tournament series. We hypothesize that musculoskeletal injuries will be common during this series and that the injury pattern may be unique to our American cohort.

METHODS

The rate of injury was prospectively studied in 1536 rugby union sevens players, entering 128 sides, competing in 4 amateur 1-day tournaments in a USA Rugby local area union (LAU). Eight hundred seventy-eight players were male, while the remaining 658 were female, with women playing in a separate division. One tournament was played at the end of June, followed by a 1-week break, and the remaining 3 tournaments took place on consecutive Saturdays during the month of July in 2010. The tournaments were conducted over 3 venues in the northeast United States (New York and New Jersey). Two tournaments were conducted on natural grass and 2 were conducted on artificial turf. Players received no payment for either training or playing. Each team played at least 3 matches per tournament, and the 2 teams with the best performance played an additional finals match. Each match was 14 minutes long (7 minutes per half) with a 2-minute half time, including the finals.

The methods used in this study were modeled after the International Rugby Board (IRB)–Rugby Injury Consensus Group (RICG).^{8,9} A research coordinator who was also a certified athletic trainer (AT) and a tournament physician provided first aid coverage to all clubs in the tournaments and assessed all injuries. Although individual team athletic trainers evaluated athletes initially, the research coordinator and tournament physician also evaluated all injured athletes after removal from the pitch. All evaluations were conducted in the medical tent during or immediately after a rugby union sevens match, except for one unconscious patient, who needed attention on the pitch. Therefore, for the purpose of this study, an injury was defined according to the RICG^{8,9} as “any physical complaint caused by transfer of energy that exceeded the body’s ability to maintain its structural and/or functional integrity, sustained by a player during a rugby match.” An injury that resulted in a player receiving medical attention was further defined as a “medical attention” injury, and an injury that resulted in a player being unable to take full part in future rugby match play as a “time loss” injury. Team athletic trainers, coaches, and players were encouraged to consult the research coordinator and/or the tournament physician with all (including minor) injuries. All injuries sustained during matches over the 4 tournaments that were seen or referred were recorded, regardless of severity. Sports medicine standards of care were followed in assessing, managing, and treating the injured athletes.¹⁹

The RISE report was created by the authors and takes into consideration many factors that are necessary to evaluate rugby injuries (see the Appendix, available online at

<http://ajs.sagepub.com/supplemental/>). This format also provides an efficient approach to ask injured players the risk factors associated with their injury. This document was intended not to replace the RICG but to incorporate what the RICG created and assess further the needed data to evaluate the mechanism of rugby union sevens injuries. We recorded descriptive player and injury information, as well as game, field, and weather conditions when the injury occurred. When the athlete was further evaluated for additional medical assistance, a provisional diagnosis was assigned. The athlete and/or team athletic trainer was subsequently contacted after the tournament to determine the ultimate actual diagnosis and to assess playing time lost due to the injury, thereby rating the severity of the injury. The RICG severity scale employed was as follows: slight (0-1 days playing time lost), minimal (2-3 days), mild (4-7 days), moderate (8-28 days), and severe (>28 days).^{8,9} In addition to data recorded using the RICG format, the RISE report also included (1) an extra category for physiological injuries, such as heat stroke/exhaustion; (2) treatment provided, caregiver, and treatment outcome; (3) tackle type involved in injury; and (4) protective equipment used. An AT or team physician completed all RISE report forms, to receive the standard of data collection necessary to truly evaluate the injuries. Approval was obtained from the Institutional Review Board at the Hospital for Special Surgery (IRB#11025). Written informed consent was obtained by the AT or physician at the time of injury assessment. Assent was obtained for those younger than 18 years old in addition to parental consent. All injured athletes consented to the study.

Statistical Analysis

Over the 4 tournaments a total of 276 matches were played, each lasting 14 minutes (0.23 hours) in length. The overall injury exposure for all players was 866.18 playing hours (7 players per side \times 2 teams per match \times 0.23 hours per match \times 276 matches). Player injury data were reported as proportion (%), mean (SD), and rate of injury as injuries per 1000 playing hours. Ninety-five percent confidence intervals (95% CI) were calculated for proportions and injury rate. Rate ratios were calculated to compare the rate of injuries between subgroups. A single-sample chi-square test was used to test the difference between the observed and expected values for certain variables. Fisher exact 2-sided test was used to assess injury differences stratified by position groupings. The level of significance was set at $P < .05$. All calculations and analyses were performed using SPSS version 18 (SPSS Inc, Chicago, Illinois).

RESULTS

The minimum number of games played during a tournament was 43, while the maximum was 78 (Table 1). The weather conditions varied from sunny to sunny/overcast and the temperature ranged from 81°F to 96°F. Over 4

TABLE 1
Descriptive Tournament Information

Tournament	Sides Entered	Games Played	Injuries	Playing Hours	Rate of Injuries per 1000 Playing Hours	Weather	Surface Type
1	35	78	8	251.2	31.9	Sunny, 82°F	Grass
2	35	73	16	235.1	68.1	Sunny, overcast, 81°F	Artificial turf
3	40	75	14	241.5	58.0	Sunny, 93°F	Grass
4	18	43	10	138.5	72.2	Sunny, overcast, 96°F	Artificial turf

rugby union sevens tournaments, 48 injuries were recorded, with an overall injury rate of 55.4 per 1000 playing hours (95% CI, 42.3-68.5). The individual tournament injury totals were 8 (CI, 14.8-60.5), 16 (CI, 40.9-108.2), 14 (CI, 32.0-95.0), and 10 (CI, 36.7-128.7) for the first, second, third, and fourth, respectively. A slightly larger proportion of injuries occurred in the second half of matches (52.4%, 46.2 per 1000 playing hours), compared with the first half (47.6%, 55.4 per 1000 playing hours), although this was not statistically significant ($P = .76$). The type of injury that occurred at the highest rate was ligament sprain (25.0%, 13.9 per 1000 playing hours; CI, 7.5-23.6), followed by concussion (14.6%, 8.1 per 1000 playing hours; CI, 3.5-16.0), hematoma/contusion (12.5%, 6.9 per 1000 playing hours; CI, 2.8-14.4), muscle strain (10.4%, 5.8 per 1000 playing hours; CI, 2.1-12.8), and abrasion (8.3%, 4.6 per 1000 playing hours; CI, 1.5-11.1). Fractures, joint dislocations/subluxations, and lacerations represented an injury rate of 3.5 per 1000 playing hours each (CI, 0.9-9.2), while tendon injuries had an injury rate of 2.3 per 1000 playing hours (CI, 0.4-7.6). Meniscus injury, nerve injury, and exertional heat illness each had an injury rate of 1.2 per 1000 playing hours (CI, 0.1-5.7; Figure 1). Head and/or neck was the most commonly injured body area (33.3% of injuries, 18.5 per 1000 playing hours; CI, 10.9-29.4), followed by upper extremity (31.3%, 17.3 per 1000 playing hours; CI, 10.1-27.9), trunk (18.8%, 10.4 per 1000 playing hours; CI, 5.1-19.1), lower extremity (14.6%, 8.1 per 1000 playing hours; CI, 3.5-16.0), and physiologic (2.1%, 1.2 per 1000 playing hours; CI, 0.1-5.7; Figure 2). The physiologic injury was exertional heat illness. In terms of severity, slight injuries, which resulted in no playing time loss, had an injury rate of 13.9 per 1000 playing hours (CI, 7.5-23.6). The remaining injuries were considered time loss minimal (3.6 per 1000 playing hours; CI, 0.9-9.2), mild (12.7 per 1000 playing hours; CI, 6.7-22.1), moderate (18.5 per 1000 playing hours; CI, 10.9-29.4), and severe (6.9 per 1000 playing hours; CI, 2.8-14.4). The majority of injuries (87.5%) were new onset injuries (48.5 per 1000 playing hours; CI, 25.5-64.9), while 12.5% were reinjuries (6.9 per 1000 playing hours; CI, 2.8-14.4).

In terms of playing surface, 54.2% of injuries occurred while playing on artificial turf (69.6 per 1000 playing hours; CI, 46.4-100.5), while the remaining 45.8% occurred on natural grass (44.6 per 1000 playing hours; CI, 46.4-100.5; $P = .12$). The age of injured players varied from 16 to 49, with a mean age of 25.1. One injury occurred in

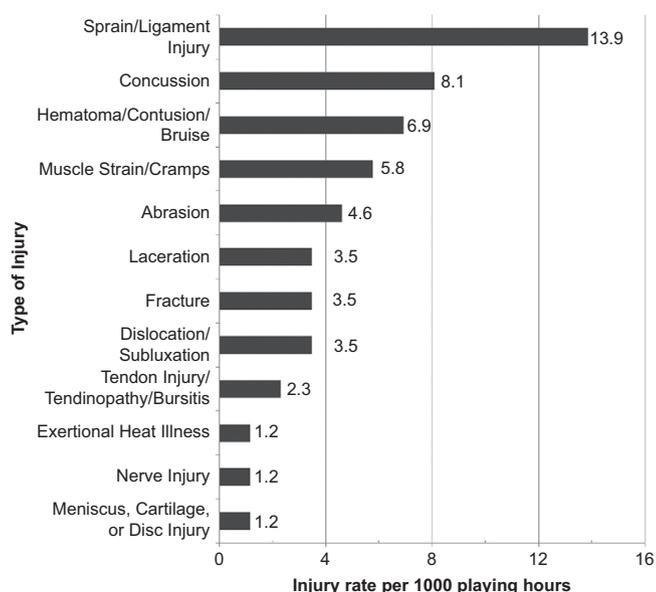


Figure 1. Injury rate by type.

the under 19 division, while the rest occurred in the adult divisions. Males were injured at a significantly higher rate than females (RR, 7.5; CI, 2.7-20.7; $P < .01$), at 74.7 and 10.0 injuries per 1000 playing hours, respectively. There was no gender difference in the average age of injured players ($P = .81$), however, backs on average were younger than forwards ($P = .02$)—23.7 and 28.4 years, respectively. In terms of player position, backs had a higher rate of injury (64.7 per 1000 playing hours; CI, 45.0-90.2) as compared with forwards (37.7 per 1000 playing hours; CI, 21.5-61.8), which approached statistical significance (RR, 1.7; CI, 0.9-3.2; $P = .08$). There was no difference between backs and forwards in the rate of injuries by body region (Table 2) ($P = .17$), type of injury ($P = .08$), injury severity ($P = .54$), or injury grouping ($P = .10$).

With regard to mechanism of injury, 72.9% of injuries (47.3 per 1000 playing hours; CI, 28.6-55.6) occurred during impact with an opposing player (Table 3). In terms of in what phase of play traumatic injuries occurred, tackling had the highest rate of injury (40.4 per 1000 playing hours; CI, 28.6-55.6), followed by running (6.9 per 1000 playing hours; CI, 2.8-14.4). Rucking and kickoff phases were

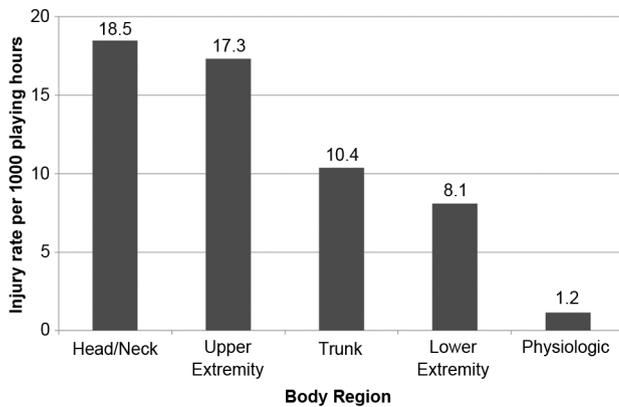


Figure 2. Injury rate by body region.

involved in 2 injuries each (2.3 per 1000 playing hours; CI, 0.4-7.6), while mauls and scrums were involved in 1 injury each (1.2 per 1000 playing hours; CI, 0.1-5.7). In terms of the type of tackle involved in the injury, injured players most commonly characterized the tackle as a shoulder type (23.1 per 1000 playing hours; CI, 14.5-35.0), followed by collision (19.6 per 1000 playing hours; CI, 11.8-30.8) and above shoulder tackles (1.2 per 1000 playing hours; CI, 0.1-5.7). For direction of tackle, front tackle was most common at 18.5 per 1000 playing hours (CI, 10.9-29.4), followed by side tackle at 13.9 per 1000 playing hours (CI, 7.5-29.4), and finally tackles from the back at 10.4 per 1000 playing hours (CI, 5.1-19.1). There were no significant differences in the mechanism of injury and characteristics of injuries: tackle type

($P = .26$), direction of tackle ($P = .26$), phase of play ($P = .83$), and contact-related injuries ($P = .72$). In terms of protective equipment, only 43.8% of the injured players reported that they used a custom mouthguard (24.2 per 1000 playing hours; CI, 15.4-36.4), and only 6.3% of players wore scrumcaps (3.5 per 1000 playing hours; CI, 0.9-9.4). Ninety-four percent of injured players perceived their injury as occurring accidentally (50.8 per 1000 playing hours; CI, 37.4-67.6), while 6.3% of injured players thought their injury occurred as the result of a deliberate act (4.6 per 1000 playing hours; CI, 1.5-11.4).

DISCUSSION

Our study population represents American amateur rugby union sevens athletes who sustained injuries during the course of a sevens tournament series season. Two prior studies have chronicled rugby union injuries in America at the high school and collegiate levels, and both of these studies dealt exclusively with full side (fifteens) rugby matches.^{5,18} The only 2 studies documenting injury rates in sevens rugby are an analysis on an International Rugby Sevens series¹⁰ and a study documenting injuries in a small cohort of Australian rugby league athletes.¹¹ The potential comparisons to our study are therefore limited.

In addition to the current paucity of data about American rugby union sevens injuries, no current standard rugby injury reporting system exists in America. In Europe, the IRB established such a system as part of the RICG, as described by Fuller et al in 2007.^{8,9} One goal of the current study was to establish such a reporting system, which we

TABLE 2
Characteristics of the Sustained Injuries^a

	All Players (N = 48)		Backs (n = 32)		Forwards (n = 14)	
	%	95% CI	%	95% CI	%	95% CI
Chronicity of injury						
Reinjury (chronic)	12.5	3.0-22.0	84.4	72.0-97.0	92.9	79.0-100.0
New (acute)	87.5	78.0-97.0	15.6	3.0-28.0	7.1	0.0-21.0
Injury severity						
Mild (4-7)	22.9	11.0-35.0	15.6	3.0-28.0	28.6	5.0-52.0
Minimal (2-3)	6.3	0.0-13.0	6.3	0.0-15.0	7.1	0.0-21.0
Moderate (8-28)	33.3	20.0-47.0	40.6	24.0-58.0	21.4	0.0-43.0
Severe (>28)	12.5	3.0-22.0	15.6	3.0-28.0	7.1	0.0-21.0
Slight (0-1)	25.0	0.0-37.0	21.9	8.0-36.0	35.7	11.0-61.0
Injury definition						
Medical attention	25.0	13.0-37.0	21.9	8.0-36.0	35.7	11.0-61.0
Time loss injury	75.0	63.0-87.0	78.1	64.0-92.0	64.3	39.0-89.0
System injured ^b						
Bone	6.3	0.0-14.0	9.4	0.0-20.0	0.0	—
Joint	22.9	12.0-37.0	25.0	10.0-40.0	21.4	0.0-43.0
Muscle and tendon	37.5	23.0-54.0	34.4	18.0-51.0	42.9	17.0-69.0
Skin	14.6	5.0-26.0	9.4	0.0-20.0	28.6	5.0-52.0
Brain/spinal/PNS	16.7	7.0-29.0	21.9	8.0-36.0	0.0	—
Other	2.1	0.0-7.0	0.0	—	0.0	—

^aTwo players did not indicate their position. CI, confidence interval; PNS, peripheral nervous system.

^bMissing values for 3 players.

TABLE 3
Mechanism of Injury^a

	All Players (n = 47) ^b	
	%	95% CI
Contact	72.9	59.0-83.0
Noncontact	27.1	15.0-39.0
Phase of play		
Tackle	74.5	60.0-85.0
Maul	2.1	3.0-11.0
Ruck	4.3	1.0-14.0
Kickoff	4.3	1.0-14.0
Running	12.8	6.0-25.0
Scrum	2.1	3.0-11.0
Tackle type (n = 38)		
Above shoulder	2.6	0.0-13.0
Collision	60.7	30.0-60.0
Shoulder	52.6	37.0-68.0
Tackle direction (n = 37)		
Back	24.3	13.0-40.0
Front	43.2	29.0-59.0
Side	32.4	20.0-49.0

^aCI, confidence interval.

^bOne injury did not occur during play.

termed the Rugby Injury and Survey Evaluation. The RISE incorporates many of the features of the RICG with some additional information, which includes mechanism and type of tackle, applied treatment characteristics, a category for physiologic injuries, and protective equipment used.

We found an overall injury rate of 55.4 injuries per 1000 playing hours (95% CI, 42.3-68.5). Fuller et al¹⁰ found an injury rate of 106.2 injuries per 1000 playing hours in a cohort of international rugby union sevens athletes. Our injury recording system may have under-recorded in comparison, as that study had extensive personnel responsible for identifying and recording even the most minor injuries. One additional explanation for the higher injury rate in that study is that international sevens is a more competitive level than amateur, exposing players to higher speed and more forceful collisions.

The majority of injury data on rugby union athletes has involved fifteens. Haseler et al¹⁵ reported on a cohort of English youth rugby union athletes and found an injury rate of 24 injuries per 1000 playing hours. In that study, the risk and severity of injury increased with age. Bird et al² followed injuries in a New Zealand rugby union during a competitive club season and found an injury rate of 9.9 injuries per 100 player-games. Our study's injury rate per 100 player-games was nearly double at 18.5. Targett²¹ found an injury rate of 120 injuries per 1000 playing hours in his study of professional New Zealand rugby union athletes. Bathgate et al¹ followed a professional Australian rugby union team from 1994 to 2000 and found an injury rate of 69 injuries per 1000 player hours.

The most common injury type in the current study was a ligament sprain, which represented 25% of all injuries recorded. Fuller et al,¹⁰ again reporting on an international sevens cohort, found the most common injury type

to be joint/ligament at 52%. Pooling ligament and joint injuries in our cohort would have made them the most common injury type, but at a lower proportion (31.3%). Head and/or neck injuries represented the most commonly injured area of the body (33.3%), with concussions representing the second most common injury type (14.6%). Both of these findings are in agreement with multiple prior studies that indicate head injuries are one of the most common rugby injuries.^{15,17}

The primary limitation of our current study was the relatively small sample size, thus restricting the statistical power and potentially preventing us from demonstrating statistical differences in various injury categories. For instance, we found a higher injury rate in backs versus forwards, but we were not able to prove significance. Another limitation is that the original form of the RISE questionnaire did not record in which of the successive games during a given day the injury occurred. This restricts the conclusions that can be made with regard to injuries due to fatigue. The questionnaire has since been altered to record these data. We introduced and implemented the RISE questionnaire, and although it underwent approval by the Local Area Rugby Union Sevens Series Tournament Director, it has not yet been validated. This is the proposed subject of future studies.

In Europe, the IRB conducts annual meetings in which medical experts, player representatives, and rugby administrators gather to discuss rugby injuries. This is in part facilitated by the fact that they have a proposed universal system of injury reporting and data on injury rate and type. They have devised policies on areas including concussion management, cardiac screening and training, and education of best medical practice. Their goal is to drive policy making and disseminate information to those playing, coaching, and officiating rugby union athletes. Going forward, an emphasis on injury prevention, safe play, and proper medical treatment is needed in American rugby, and it is hoped that the data gathered from this study can help guide this mission.

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