

Comparison of performance in official rugby competitions by group and match time

ALEJANDRO PASTOR¹, RODRIGO VILLASECA-VICUÑA², ÁLVARO SEGUEIDA-LORCA³, PEDRO ZUÑIGA⁴

¹ Catapult Group International Ltd, AUSTRALIA.

² Facultad de Educación, Escuela de Ciencias y Tecnología, Pedagogía en Educación Física, Universidad Católica Silva Henríquez (UCSH), CHILE.

³ Ciencias del Deporte y Actividad Física, Facultad de Salud, Universidad Santo Tomás, CHILE.

⁴ Escuela de Biología, Universidad de Barcelona, ESPAÑA.

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Abstract

Introduction: Rugby union (RU) is characterized by being a decision-making-based, open-skilled, chaotic and unpredictable sport. The RU has an average game length of 80 minutes, with two halves of 40 minutes and a 15-minute half-time break. **Objective:** This study aimed to compare the mechanical and locomotive demands of specific playing positions and for the two halves of the game of Argentine male amateur rugby senior players. **Methods:** Thirty-two rugby players ($n = 32$) participated in this study. Wearable devices with embedded microtechnology (Catapult Sports, OptimEye S5) were used to examine movement patterns during eighteen ($n=18$) games. Players were divided into specific playing groups Forwards (Hooker, Prop, Lock and Back Row) vs Backs (Scrum Half, Fly Half, Centre, Wing and Fullback). The locomotive parameters analyzed were total distance (TD), relative total distance (TDr) (m/min), high-speed running >18km/h (HSR), relative high-speed running >18km/h (HSRr). Game-specific and mechanical parameters were the number of contacts, number of RHIE bouts, number of average efforts per RHIE bout (AVG Eff RHIE) and maximum number of efforts per RHIE bout (MAX Eff RHIE). **Results:** The backs made a significantly higher locomotive effort ($p < 0.001$) and RHIE ($p < 0.001$) than the forwards. Reductions in each of the parameters measured were observed from the first to the second half for each and every of the positional groups. **Conclusions:** Significant differences were found between positional groups when compared with locomotive, mechanical, and game-specific parameters. Likewise, a deterioration was found in the parameters studied between the halves of the game for all the positional groups.

Keywords: Rugby Union – Wearable technology - Game demands – Positional demands – RHIE – Training.

Introduction

Rugby union (RU) is characterized by being a decision-making-based, open-skilled, chaotic and unpredictable sport (Donkin et al., 2020; Dubois et al., 2017; Lindsay et al., 2015a; Pollard et al., 2018; Read et al., 2017; Reardon et al., 2015; Yamamoto et al., 2020a). The RU became a professional sport in 1995 (Cahill et al., 2013) allowing researchers to invest time and resources into the study of the game demands (Austin et al., 2011b; Donkin et al., 2020; Hogarth et al., 2016; Reardon et al., 2017). The RU has an average game length of 80 minutes, with two halves of 40 minutes and a 15-minute half-time break (Sheehan et al., 2022). During the games, the players repeat multidirectional actions (accelerations, decelerations, reactive agility, and evasion maneuvers), high-speed running efforts, tackles and collisions in a random environment played on a grass, hybrid, or synthetic field of 100 meters in length and 70 meters in width (Cahill et al., 2013a; Cunningham et al., 2018a; Pollard et al., 2018; Quarrie et al., 2017). A RU team is 15 players a side, divided into two groups: 1) Forwards (8 players) and 2) Backs (7 players) (Deutsch et al., 2007a; Fornasier-Santos et al., 2021; Owen et al., 2015; Yamamoto et al., 2020b). The Forwards (Fwds) participate in numerous collisions with opposition and acceleration-based movements, such as line-out, scrummaging, rucking, pushing, pulling, tackling, mauling and ball carrying (Cahill et al., 2013a; Rampinini et al., 2022; Sheehan, Malone, Walters, et al., 2022a). Meanwhile, the Backs (Bks) are engaged in running-based actions, involving a higher number of high-speed running (HSR), maximal velocity and reactive agility efforts (Cahill et al., 2013b; Cunningham et al., 2018b; Deutsch et al., 2007b, 2007c; Lindsay et al., 2015b; Yamamoto et al., 2020c).

Wearable technology of Global Positioning System (GPS) is the most used equipment to detect and analyze performance in RU (Sheehan et al., 2022; Villaseca-Vicuña et al., 2021). Wearable devices provide accurate information about the effort characteristics from the three principal areas: Locomotive, Mechanical and Game Specific. (Austin et al., 2011a; Sheehan, Malone, Walters, et al., 2022a). The total distance covered during RU games is ~ 5500 m and ~ 7000 m for Fwds and Bks, respectively (Bridgeman & Gill, 2021; Posthumus et al.,

2020; Sheehan, Malone, Walters, et al., 2022a). The HSR distance ($> 18 \text{ km/h}^{-1}$; $> 5 \text{ m/sec}^{-1}$) is higher for Bks ($\sim 715 \text{ mts}$) compared to Fwds ($\sim 320 \text{ m}$) (Sheehan, Malone, Walters, et al., 2022; Yamamoto et al., 2020a). The Bks performed higher speed efforts and reached the best scores on this parameter (Cahill et al., 2013; Yamamoto et al., 2020). Bouts of successive linear locomotive high-intensity actions with short rest between them have been identified during games and researchers named this ability the Repeated Sprint Ability (RSA) (Edg et al., 2005; Spencer et al., 2004c, 2004a).

Those players with a better ability to perform Repeated Sprints are going to have positive results (e.g., breaking the opposition's defensive line, accurate tackle actions, scoring attempts, etc.) during the games and succeed over those with less capacity (Bishop et al., 2011; Spencer et al., 2004b). This concept has been reviewed and evolved into a locomotive, mechanical and multidirectional concept, adding impacts, tackles, accelerations, decelerations, jumps, and change-of-direction, renamed to Repeated-High Intensity Efforts (RHIE) (Gabbett, 2015, 2015; Gabbett and Gahan, 2016; Vachon et al., 2021; Rampinini et al., 2022; Sheehan et al., 2022). The research of Austin et al. (2011), found an average of 11-16 RHIE per match (1 RHIE every 6 minutes). The RHIE was position-dependent and ranged from two (Props) to 21 (Back three = Wing and Fullback) (lasting 28 to 52sec) (Sheehan et al., 2022; Vachon et al., 2020, 2021a).

It was mentioned that the structure of the RHIE is linked with the player's positional group, with the backs completing more locomotive and mechanical efforts compared to the forwards (Sheehan et al., 2022). In contrast, the forwards have a higher number of RHIE constituted by mechanical and sports-specific efforts (Gabbett & Wheeler, 2015; Vachon et al., 2020, 2021a). A decrease in RHIE bouts was also highlighted between the first and the second half (Gabbett & Gahan, 2016a; Sheehan et al., 2022).

Finally, the possibility of obtaining successful results in RU is associated with the ability to execute repeated-all-out-efforts, this factor is widely accepted as a key performance indicator in team sports, especially in RU (Gabbett & Gahan, 2016b; Gabbett & Wheeler, 2015; Sheehan et al., 2022; Vachon et al., 2020, 2021b, 2022). However, no comparisons have currently been made between specific positions and playing times for Rugby Union Latin American athletes. It is for this reason that this study aimed to compare the mechanical and locomotive demands of specific game positions over the two halves of the game of Argentine male amateur rugby senior players.

Materials and Methods

Design

This longitudinal, observational, intragroup-intergroup, descriptive and comparative study was based on a quantitative approach.

Participants

Thirty-two rugby players [(mean $\pm$ SD) 24.6 ± 4.7 years; height $1.81 \pm 0.07 \text{ m}$; body mass $94.1 \pm 14.7 \text{ kg}$] participated in the study. In addition, for the comparative analysis by positions, they were divided according to the functions within the game (Figure 1).

There were 18 games in the official League "A" Unión Buenos Aires during the 2022 season (March to September). All games were held on Saturdays between 2:00 p.m. and 5:00 p.m. and they were played on 12 different homologated grass rugby fields (Home and Away facilities). Before the matches, the players were advised to continue with their usual diet and habits, with special emphasis on carbohydrate intake, hydration and sleep quality.

The inclusion criteria included: 1) not presenting any musculoskeletal injury during the study period and 2) completing the full time of each half of the game. The participants had at least three years of participation in provincial competitions. Before giving informed consent, all participants and club board members received information describing the rationale, potential applications, and procedures associated with the research. The study was carried out following the guidelines of the Declaration of Helsinki (WMA, 2013).

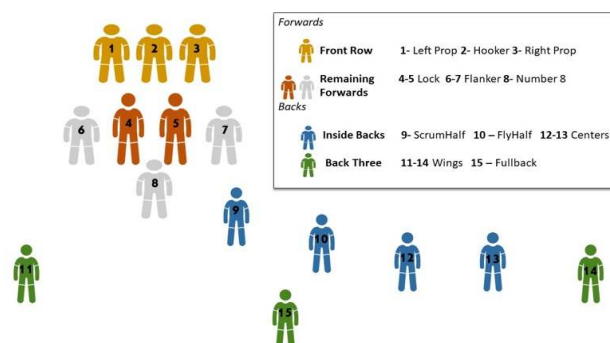


Figure 1. Playing positions in rugby union.

Procedures and variables

During matches, each athlete wore a trunk-mounted (strapped to the chest) custom microsensor device. Global Positioning Devices (GPS) (10 Hz) Optimeye S5, Catapult Innovations, (Melbourne, Australia, firmware version 7.42) were used to examine movement patterns in official matches. To minimize between-unit error, each athlete used the same device at project completion (Varley et al., 2012; Crang et al., 2021). The horizontal dilution of precision (HDOP) was 0.8 ± 0.1 and the average satellite count was 14 ± 1.2 , throughout the data collection process. The portable devices were turned on thirty minutes before the start time, following the manufacturer's recommendations. In addition, before each match, the players underwent a standardized warm-up directed by the club's physical trainer (15-20 minutes).

The GPS signal provides information on velocity, distance, position and acceleration, and the built-in 100Hz triaxial accelerometer, magnetometer and gyroscope enabled player load, contact engagements and explosive efforts to be quantified. Specific metrics included total distance (TD), relative total distance (TDr) (m/min), high-speed running >18km/h(HSR), relative high-speed running >18km/h (HSRr), number of contacts, number of RHIE bouts, number of average efforts per RHIE bouts (AVG Eff RHIE) and maximum number of efforts per RHIE bout (MAX Eff RHIE). RHIE ability, in the context of rugby union, was analyzed in line with previous research RHIE combat includes multiple movement patterns that are more contextualized to RU game scenarios. RHIE is defined as three or more efforts with less than 21 seconds of rest between them and incorporates the three main areas of physical performance in competition a) Locomotive, b) Mechanical and c) Game Specific (Figure 2) (Gabbett & Wheeler, 2015; Sheehan et al., 2022). The players who completed the total time of the game (80 minutes) were considered in the study. Data was extracted and partitioned into the relative periods from the devices, using the Catapult OpenField software (version 3.7.3) (Catapult; Melbourne, Australia). The information was then extracted as a CSV file for further cleaning in Microsoft Excel before being analysed.

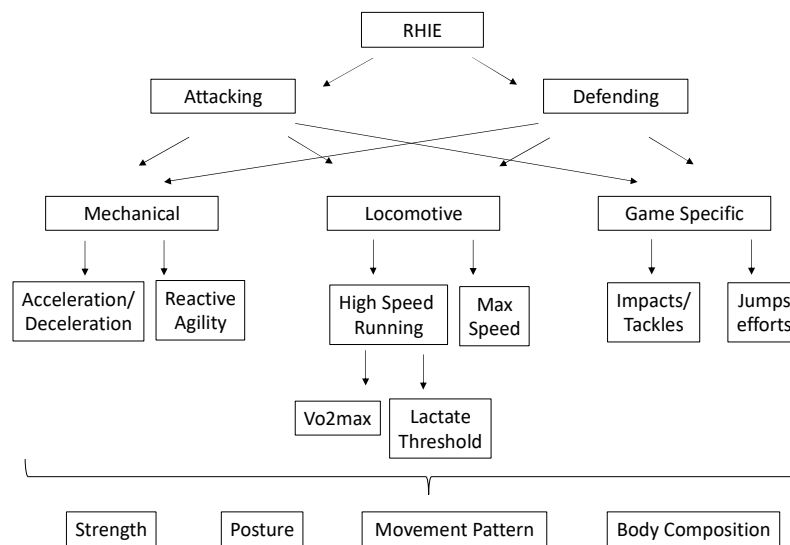


Figure 2. RHIE Mechanical model and its components

Statistical analysis

To perform the descriptive analysis, the mean and standard deviation were calculated. The Shapiro-Wilk test was used to analyze whether the variables follow a normal distribution. Furthermore, the homogeneity of the variances was verified through the Levene test. To analyze the differences by playing position, a one-way ANOVA was applied. For the post hoc analyses between playing positions, the Tukey or Games-Howell test was used, depending on the homogeneity of the variances.

The effect size (ES) was calculated using partial eta² and the following threshold values were used: small (0.01 – 0.05), medium (0.06 – 0.13) and large (> 0.14). For the comparison between game halves (First vs Second Half) a T of related samples was used and in the case of non-normality the Wilcoxon test was used. The Effect Size (ES) was calculated using the following Cohen threshold values: trivial (< 0.2), small (0.2 – 0.6), moderate (0.6 – 1.2), large (1.2 – 2), very large (2 – 4) and extremely large (> 4) (Hopkins et al., 2009). The significance level was established for a p-value ≤ 0.05, and the 95% confidence interval (CI) was calculated for all measurements. The statistical analysis was carried out using the SPSS IBM® software (Version 22, New York, USA).

Table 1. Comparison of variables obtained with GPS in relation to the playing position

Variable	Forwards (n = 14)					Backs (n = 18)					Comparison between positions	
	Hooker (n = 3)	Prop (n = 3)	Lock (n = 3)	Back Row (n = 5)	Scrum Half (n = 3)	Fly Half (n = 3)	Centre (n = 5)	Wing (n = 5)	Fullback (n = 2)		p	eta ²
Locomotive parameters	TD (m)	4639.17 ± 647.84 ^{efghi}	4635.03 ± 454.36 ^{defghi}	5438.54 ± 714.22 ^b	5085.09 ± 538.14 ^g	5582.05 ± 842.69 ^{ab}	5604.07 ± 500.84 ^{ab}	5659.02 ± 507.27 ^{abc}	5489.27 ± 1314.76 ^{ab}	5872.88 ± 532.48 ^{ab}	< 0.001	0.212
	TD _r (m/min)	52.28 ± 5.20 ^{defghi}	54.48 ± 5.26 ^{defghi}	62.52 ± 8.16 ^{ab}	57.88 ± 5.76 ^g	64.84 ± 9.44 ^{ab}	64.24 ± 5.64 ^{ab}	64.50 ± 5.47 ^{abc}	62.74 ± 14.42 ^{ab}	66.06 ± 4.08 ^{ab}	< 0.001	0.217
	HSR (m)	77.57 ± 36.55 ^{cdefghi}	63.16 ± 91.68 ^{cdefghi}	250.24 ± 106.23 ^{abfghi}	213.48 ± 104.88 ^g	412.48 ± 141.69 ^{abcd}	467.23 ± 154.38 ^{abcde}	464.80 ± 121.28 ^{abcde}	526.38 ± 199.14 ^{abcde}	255.28 ± 97.01 ^{abfghi}	< 0.001	0.620
	HSR _r (m/min)	0.88 ± 0.43 ^{cdefghi}	0.75 ± 1.10 ^{cdefghi}	2.89 ± 1.28 ^{abfghi}	2.43 ± 1.18 ^{abfghi}	4.79 ± 1.73 ^{abcd}	5.37 ± 1.96 ^{abcde}	5.30 ± 1.36 ^{abcde}	6.05 ± 2.34 ^{abcde}	2.86 ± 1.05 ^{abfghi}	< 0.001	0.606
Mechanical parameters	Contacts (#)	23.46 ± 13.46	19.73 ± 11.30 ^h	27.33 ± 13.71 ^{efhi}	28.00 ± 14.08 ^{efghi}	14.28 ± 7.89 ^{cd}	9.58 ± 6.38 ^{bcd}	16.87 ± 9.73 ^c	10.87 ± 6.62 ^{bcd}	12.50 ± 10.21 ^{cd}	< 0.001	0.289
	RHIE	3.07 ± 1.84 ^{cdefghi}	1.86 ± 3.33 ^{cdefghi}	9.66 ± 3.45 ^{abfghi}	8.11 ± 3.54 ^{abfghi}	14.07 ± 2.49 ^{abcd}	15.17 ± 4.40 ^{abcd}	16.09 ± 5.11 ^{abcde}	17.93 ± 6.47 ^{abcde}	10.40 ± 4.11 ^{abfghi}	< 0.001	0.614
	AVG Efforts	3.02 ± 1.41 ^{efghi}	2.11 ± 1.80 ^{cdefghi}	4.40 ± 0.72 ^{bgh}	3.97 ± 0.85 ^{bfigh}	4.76 ± 0.82 ^{ab}	5.11 ± 0.56 ^{abcd}	5.03 ± 0.66 ^{abcd}	4.94 ± 1.06 ^{abc}	4.70 ± 0.71 ^{ab}	< 0.001	0.469
	MAX Efforts	3.76 ± 2.00 ^{cdefghi}	2.56 ± 2.79 ^{cdefghi}	7.45 ± 2.28 ^{abfghi}	6.15 ± 2.41 ^{abfghi}	9.57 ± 3.22 ^{abc}	9.82 ± 2.03 ^{abcd}	9.58 ± 2.52 ^{abcd}	9.90 ± 2.95 ^{abcd}	7.90 ± 2.72 ^{ab}	< 0.001	0.494

Data reported as mean ± standard deviation, Eta²: Effect size, Different of; ^aHooker, ^bProp, ^cBack Row, ^dLock, ^eFullback, ^fWing, ^gCentre, ^hFly Half, ⁱScrum Half.

Table 2 shows the comparison of the mechanical and locomotive demands for the two halves of the game.

Table 2. The positional demands of rugby union concerning subgroups across the game

Table 2: The postural demands strategy when performing a game across the game							
Variable		Backs			Forward		
		First Half	Second Half	Comparison between half	First Half	Second Half	Comparison between half
		M±SD	M±SD	ES; 90% CI; Inference	M±SD	M±SD	ES; 90% CI; Inference
Locomotive parameters	TD (m)	2882.20± 497.43	2815.20± 462.08	0.05; -0.13-0.23; Trivial	2599.10± 364.18	2543.23± 411.74	0.19; 0.03-0.41; Trivial
	TD _r (m/min)	65.37± 10.88	63.93± 9.23*	0.08; - 0.09-0.26; Trivial	59.18± 8.08	56.58± 8.30*	0.33; 0.12-0.53; Small
	HSR (m)	4.85± 2.05	3.79± 2.55*	0.47; 0.27-0.68; Small	167.64± 107.13	82.88± 70.95*	0.84; 0.60-1.09; Moderate
	HSR _r (m/min)	218.56± 92.26	170.65± 115.01*	0.47; 0.27-0.68; Small	3.72± 2.38	1.84± 1.57*	0.67; 0.44-0.90; Moderate
	Contacts (#)	4.31± 3.75	3.81± 3.63	0.14; 0.05-0.33; Trivial	2.82± 2.80	2.48± 2.16	0.05; -0.21-0.30; Trivial
Mechanical parameters	RHIE	8.48± 3.22	7.43± 3.26*	0.31; 0.11-0.52; Small	3.50± 2.50	3.21± 2.65	0.23; 0.03-0.48; Small
	AVG Efforts	5.00± 1.04	5.00± 1.08	0.08; -0.18-0.33; Trivial	3.40± 1.70	3.40± 1.84	0.07; -0.20-0.35; Trivial
	MAX Efforts	8.37± 2.67	8.36± 2.57	0.06; -0.15-0.27; Trivial	4.44± 2.63	4.56± 3.12	0.05; -0.22-0.33; Trivial

Data reported as mean ± standard deviation; TD: Total distance; HSR: High-speed running; r: relative per minute; ES: Effect size. *Significant difference ($p \leq 0.05$) between halves of play

Discussion

This study aimed to compare the mechanical and locomotive demands of specific game positions for the two halves of Argentine male amateur rugby senior players during championship games.

The main findings of this study in the locomotive variables (Table 1) indicate a significant difference between players' positions in distances covered, efforts in HSR and RHIE bouts variables evaluated in this study. These results are of great value to assess the game demands for positional groups, thus being able to design specific training strategies adjusted to the positional needs and game demands. The data shows that the forward's

distance covered between 4639.17 ± 647.84 and 5438.09 ± 714.22 m with a relative rate of work between 52.28 ± 5.20 and 62.52 ± 8.16 m/min. The groups of hookers and props obtained the main differences ($p < 0.001$) concerning the other players. The back groups showed a mean distance between 5489.27 ± 1314.76 and 5872.88 ± 532.48 m with a relative rate of work between 62.74 ± 14.42 and 66.06 ± 4.08 m/min. In this group of players, the main differences were obtained by the centres. These results are similar to what was published by Sheehan et al. (2022). They found a similar difference for the forwards in TD 4613 ± 1249 and 6319 ± 1134 and for backs with a distance covered between 6319 ± 1134 and 6631 ± 881 m. The differences between the reported values could be related to the level of professionalism of the players evaluated.

For the HSR, the forwards completed between 63.16 ± 91.68 (Props) and 250.24 ± 106.23 m (Back Row) and the backs 255.28 ± 97.01 (Fullback) and 526.38 ± 199.14 m (Wing). Similar differences were found for Sheehan et al. (2022), ($p < 0.05$) with European professional rugby players, they reported the forwards' values of HSR between 42 ± 30 and 168 ± 82 and backs 256 ± 108 and 511 ± 158 m. These differences between the game positions players are favorably established in the scientific literature (Smart et al., 2014; Swaby et al., 2016; Zúñiga-Vergara et al., 2022). The main reason to justify these findings could be that the backs are involved in a higher number of open-field plays, requiring a greater amount of running and multidirectional speed actions compared to the forwards. However, the forwards participate in static exertion actions, adding extra load to their game demands. From a practical perspective, the coaches could analyze and use this data to recognize the key performance indicators of locomotive variables to plan and periodize the training process. Developing game scenarios during training sessions that simulate these game demands could be implemented by the coaches to produce positive outcomes.

Regarding RHIE bouts, our data show that positional differences in the number of total RHIE bouts and the number of efforts per RHIE were found after the analysis of 18 matches. Currently, there has been a change in the analysis of the physical demands of the match, because rugby involves high-intensity running, jumping, accelerations and collisions (Austin et al., 2011c). For the groups of forwards, the total number of RHIE bouts values is observed between 1.86 ± 3.33 (Prop) and 9.66 ± 3.45 (Lock). Where the lock and back row players obtained the main differences with all groups of players. The back results show total numbers of RHIE bouts between 10.40 ± 4.11 (Fullback) and 17.93 ± 6.47 (Wing). The number of contacts was between 19.73 ± 11.30 (Prop) and 28.00 ± 14.08 (Back Row) within the forwards group and 9.58 ± 6.38 (Fly Half) and 16.87 ± 9.73 (Center) for the backs during the study. The wing group obtained the main differences from the rest of the backs group. These findings are similar to the report of Sheehan et al. (2022c) who evaluated elite rugby union players, finding positional differences for the numbers of RHIE bouts in the forwards between 2 ± 2 and 9 ± 5 RHIE bouts and for the backs values between 12 ± 4 and 18 ± 6 . These findings are similar to those found in professional European players, where values for the numbers of RHIE bouts for forwards are between 2.3 ± 1.7 and 8.6 ± 4.4 and backs data of 14.3 ± 4.2 and 17.8 ± 6.1 . The data of the forwards show values between 2.56 ± 2.79 and 7.45 ± 2.28 and for the Backs values between 7.90 ± 2.72 and 9.90 ± 2.95 for MAX effort RHIE. These numbers are similar to those reported by professional European rugby union players (Austin et al., 2011c; Sheehan et al., 2022). These results show that both forwards positions and both positions for backs complete more RHIE bouts, contacts and MAX effort RHIE compared to all players.

This analysis illustrates the positional difference of RHIE during games and could assist the coaching staff in the design of training drills and activities to pursue locomotive, mechanical and game-specific aims during the practices. These results showed that the backs participated in a higher number of RHIE bouts and a rugby-back-specific drill must be implemented by the coaching staff. It is important to find the architecture of the RHIE bouts about the locomotive and mechanical nature for the optimal development of positional-specific drills. The proximity of the opposition, the context of the games, the 'game plan' executed by the team and the importance of ball possession during the matches could be the reasons to explain these results. Furthermore, for the development of progressive complexity in drills and architecture, it is suggested that the coaches design training sessions from low-contact exercises (close decision-making, non-fatiguing, small-sided games and reducing the number of players) to full-contact activities (open decision-making, complete pitch and high-intensity conditioning games). Using a variety of small-sided games to full-pitch conditioning games can be implemented during the training sessions. Understanding the sport from a holistic point of view is crucial in coaching. During the last decade, many authors collaborated in the evolution of this philosophy (Roberts et al., 2008; Pollard et al., 2018; Lokteff et al., 2020; Rampinini et al., 2022; Sheehan et al., 2022).

Between halves

This investigation showed a significant decrease ($p < 0.05$) in both positions of players in the physical capacities of locomotion of rugby players across two halves of play. The results of the total distance rate were as follows: for backs (ES = 0.08) and forwards (ES = 0.33), HSR for backs (ES = 0.47) and forwards (ES = 0.84), HSRr for backs (ES = 0.47) and forwards (ES = 0.67). This means that during the second half, there was a decrease in the physical and locomotor performance of all positions of the player. These results are in line with those published by Sheehan et al. (2022c).

For the RHIE bouts, the data shows a significant decrease for the backs ($ES = 0.31$). The forwards showed a small decrease during the second half of the game. Both positional groups had reductions in Contacts, AVG Eff RHIE and MAX Eff RHIE and observed a decrease in locomotive variables during the second half. In line with the other authors, the RHIE bouts performance showed a reduction in performance between both halves (Black & Gabbett, 2014; Johnston et al., 2016; Sheehan, Malone, Weldon, et al., 2022). These findings may be related to the nature of the attacking and defensive phases of the game and the intensity of the match. On the other hand, previous studies have reported an increase in total distance and HSR performance during the second half of play (Sheehan et al., 2022). These contradictory features may be subject to the level of competence and championship position. According to recent investigations, it was suggested that the Top 4 teams in the ranking performed a significant part of very short rest (< 10 sec) compared to the Bottom 4 teams (Black & Gabbett, 2014; Gabbett, 2014).

Understanding and finding which positional groups and specific players are more affected by fatigue are important for planning the training process. Considering that RHIE bouts is one of the key performance indicators in RU, it is decisive for coaches to plan these kinds of efforts. Planning actions that mitigate these effects on players can be a useful tool to improve game performance. Additionally, identifying the player who presents great decreases can be a useful tactical strategy for coaches to make substitutions. The coaching staff may consider connecting RHIE bouts with offensive and/or defensive situations for training periodization and planning. Small-sided games and open-field situations with different numbers of players per group and duration may be included during practices. However, a progression in the structure of the RHIE bouts is suggested. Position-specific drills and extra fitness training ("On-feet" or "Off-Feet") are recommended to guarantee positive adaptations with those players showing an augmented decay in performance during the game and/or between halves. The design of drills including accelerations, contacts, combat situations, set-pieces, change-of-direction and high-speed running must be seriously considered during the development of the exercises.

Conclusion

This research aims to assess the game profile of amateur male rugby union players through Repeated High-Intensity Efforts and create a descriptive analysis of this variable between positional groups during games. During the research, significant differences were found when the groups and positional groups were locomotive, mechanical and game-specific parameters were compared. Also, it found a deterioration in the studied parameters between the halves of the game for all groups and positional groups.

In conclusion, a positional-specific architecture considering the number of locomotives, mechanical and rugby-specific movements about RHIE bouts may be recommended for the development of positional-specific drills and fitness games. These activities must pursue holistic adaptations to increase the athletes performance, avoiding a decay of the physical and rugby capacities during the second halves of the games.

Limitations

Considerable limitations of the study results should be discussed. First, the research was completed using only one amateur male rugby union team in a local Buenos Aires Rugby Union competition. This sample cannot represent the reality of the global Rugby Union male environment. Secondly, the selection of absolute speed bands, acceleration and contact thresholds could be limited as everyone has an individual physical profile. Third, all the matches' game plans are outside of external control, which could affect the player's performance and outcomes. However, the data was collected over 26 games. Therefore, these results provide an acceptable analysis of the competitive game demands at the senior amateur team level.

Practical Application

Knowledge and understanding of the playing demands of rugby players could help coaches, sports scientists and strength and conditioning coaches to develop precise programs to improve performance, reduce injury risk, assist in the return process to the game and develop a long-term player development strategy. The present results increase the understanding of movement demands during amateur rugby competitions.

Conflicts of interest

The author(s) declared no have conflict of interest concerning this work, authorship, and/or publication of this paper.

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