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Research article

Comparison of Ball-in-Play Running Demands Across Game Phases and The Relationship between Physical and Technical Variables: An Analysis of The 2024 Female Super Sevens Tournament

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Abstract

Quantifying the most intense periods of Rugby Sevens matches is essential for optimizing training and improving performance. This study aimed to: (i) compare ball-in-play (BIP) running demands across game phases (attack, defense, and transition), and (ii) examine correlations between BIP duration and physical and technical variables. Eighteen professional female Rugby Sevens athletes were monitored across 18 matches in the 2024 Super Sevens Championship (Brazil) using 10-Hz GPS units and post-match video analysis. Friedman tests revealed significant phase differences for sprint distance per minute, $\chi^2(2, N = 310) = 11.98$, $p = .003$, $\eta^2 = .032$; sprints per minute, $\chi^2(2, N = 310) = 7.45$, $p = .024$, $\eta^2 = .018$; and decelerations per minute, $\chi^2(2, N = 310) = 10.00$, $p = .007$, $\eta^2 = .026$. Post hoc analyses showed greater sprint output during the attacking phase ($p < .05$). No significant differences were found for distance per minute or accelerations per minute ($p > .05$). Spearman correlations indicated negative relationships between BIP duration and sprints ($\rho = -.125$, $p = .027$) and accelerations per minute ($\rho = –.191$, $p < .001$). Conversely, BIP duration showed significant positive correlations with several technical actions, including tackles ($\rho = .578$, $p < .001$), passes ($\rho = .325$, $p < .001$), and rucks ($\rho = .321$, $p < .001$). These findings underscore the importance of game-phase-specific conditioning and suggest that longer BIP durations are characterized by reduced physical intensity but increased technical engagement.

Key words: Rugby, physical demands, external load, training load, match performance, athletic performance, performance analysis.

Introduction

Rugby sevens gameplay is characterized by repeated high-intensity collisions and running efforts interspersed with periods of low-intensity activity and rest. The ability to perform high-intensity efforts is linked to success in the sport (Roberts et al., 2008; Austin et al., 2011; Koudela et al., 2025). Every match is played with seven players per team, in two halves of 7 minutes each, and players can play up to six matches during a single weekend. Rugby is composed of three game phases: attack, defense, and transition (attack-to-defense or defense-to-attack) (Guerrero et al., 2024; Koudela et al., 2025; Nicholls et al., 2024). Players require well-developed aerobic and anaerobic fitness to meet the sport's intermittent high-intensity demands, given the necessity of performing multiple technical and tactical actions as tackling, passing, running, etc., in an unpredictable environment (Guerrero et. al, 2024; Higham et al., 2012; Wintershoven et al., 2023). Repeated high-intensity efforts across multiple games can significantly impair player performance. Vescovi and Goodale (2015) found that athletes in the later stages of matches and tournaments exhibit reduced total running distances and fewer sprint efforts, largely due to accumulated fatigue. In a similar vein, Granatelli et al. (2014) reported a decline of 11,2% in total distance covered per minute between the first and second halves, reinforcing the notion that fatigue may influence match outcomes. It is noteworthy that intervals between matches can range from 1 hour and 20 minutes to as long as 3 hours during Rugby Sevens tournaments. Additional studies have indicated a decline in work rates not only throughout tournaments but also within individual matches and game-based training sessions. Evidence suggests that the short rest periods during matches and the standard two-minute halftime break do not allow players to maintain intensity (Ball et al., 2019; Bicudo et al., 2024a; Goodale et al., 2017).

Assessing game demands provides coaches with a clearer understanding of player requirements (Ziv and Lidor, 2016) and helps establish physical standards to work towards. Several methods are commonly used for workload monitoring and control in rugby. Global positioning systems (GPS) are widely employed to assess external load (EL) (Lacome et al., 2019), recording various player actions, such as distance covered, sprint distance, accelerations, and decelerations (Granatelli et al., 2014). Metrics registered by these devices are generally compared to match data to evaluate whether the prescribed workloads during training sessions, particularly in drills and skill-based games, are being applied as planned (Tee et al., 2016).

Although GPS-derived data are useful for quantifying player workload and demand experienced by players during a game, measuring movement demands using half or whole-game averages may obscure peak intensity periods (Delaney et al., 2018; Ullersperger et al., 2022; Bicudo et al., 2024a). On this matter, ball-in-play times (BIP

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method) provide an alternative for a more in-depth analysis of the EL experienced by Rugby Sevens players during a match (Reardon et al., 2017; Ullersperger et al., 2022).

The BIP method, as described by Pollard et al. (2018), analyzes each BIP segment independently, excluding moments when the ball is out of play. The BIP method proved more sensitive in detecting EL variations across matches and halves, as well as determining peak demands on matches (Bicudo et al., 2024a; Cunningham et al., 2018; Ullersperger et al., 2022). According to Read et al. (2018), while BIP analysis is a valid and accurate approach to quantifying external load, there is potential to further dissect match periods to gain deeper insights into situational workload patterns. The most obvious subdivision involves separating BIP segments into offensive and defensive periods, as coaches often train for these two scenarios separately (Read et al., 2018). According to Rennie et al. (2020), being able to understand the differences in locomotor and collision loads between those types of play can help coaches to develop more accurate training protocols. A study by Ungureanu et al. (2019) examined the technical and tactical profiles of professional rugby union teams and found that, in close games, winning teams spent more time defending. Successful outcomes were often associated with effective tackling and scrummaging, along with line breaks during attacking phases. Further dissecting and analyzing these play types may enhance match success (Stevens et al., 2024).

Accurate quantification of these demands enables coaches and practitioners to design training sessions that replicate match scenarios across all game phases, thereby improving athlete preparation (Furlan et al., 2015). Although data on EL across different phases of play can deepen our understanding of match demands, to the best of our knowledge, only two studies have addressed this topic—one of which focused on rugby union (Bicudo et al., 2025a; Stevens et al., 2024). Therefore, this study had two primary aims: (i) to compare BIP running demands (distance per minute, sprints per minute, sprint distance per minute, accelerations per minute, and decelerations per minute) across different game phases (attack, defense, and transition) during all matches of the Super Sevens 2024 championship; and (ii) to examine the correlations between BIP durations and physical and technical actions, to determine whether these demands vary with BIP duration.

Methods

Participants

This study was conducted with 18 full-time professional female Rugby Sevens players (mean age 25.4 ± 6.03 years; mean Rugby Sevens experience 63.4 ± 22.7 months; mean professional Rugby Sevens experience 33.4 ± 13.7 months) from the same team, who competed at both national (Brazil) and international levels. Athletes were recruited through convenience sampling. Participants followed a weekly routine consisting of four strength training sessions (60 minutes each), five to seven on-field training sessions (45 - 75 minutes each), and two rest days (Wednesday and Sunday). Data collection was carried out during the four tournaments of Super Sevens 2024 (Brazilian First Division National Championship of Rugby Sevens), held every 3 - 4 weeks between October and December 2024. Athletes were monitored in all 20 matches played in the championship. Of these, the team recorded 18 victories and 2 defeats, which occurred in the final matches of the first and fourth tournaments. The team won both the second and third tournaments undefeated, ultimately winning the national title. To be eligible for the study, participants were required to meet the following criteria: (i) participation in at least one match of the Super Sevens 2024 championship; (ii) absence of injuries or illnesses before and during the experiment; and (iii) participating in the team before the study's commencement. Athletes who were injured at the time of the study or who did not participate in the championship were excluded from the study.

Measures

The EL was measured using 10 Hz global positioning system (GPS) devices (Catapult Playertek, Catapult Sports, Australia), equipped with a triaxial accelerometer and a gyroscope, which captured information on collisions and high-intensity efforts. The GPS devices were secured in a small harness worn on the player's upper back. The devices were activated 15 minutes before the start of each match and deactivated immediately after its conclusion by the primary investigator. The validity and reliability of this specific device have been communicated by World Rugby for athletes' monitoring during training sessions and practices. Additionally, during lab-based trial tests, non-significant differences were observed between criterion measures and registered metrics for total distance and sprint distance (Mooney et al., 2021). Additionally, Playertek GPS devices showed no significant differences between actual and recorded distances during straight-line running protocols (Graham, 2021). The athletes were already familiar with the equipment, having used it regularly during their daily training sessions.

Following previous studies (Bicudo et al., 2025a; Bicudo et al., 2025b; Pollard et al., 2018; Stevens et al., 2024; Ullersperger et al., 2022), the time of BIP, distance per minute (m/min), number of sprints per minute, and sprint distance per minute (meters at speeds above 18 km/h), number of accelerations per minute (accelerations above 3.0 m/s^2), and number of decelerations per minute (above 3.0m/s^2) were analyzed. To identify and analyze match demands, the BIP method was employed. This method differentiates every ball-in-play by creating time cuts, which start when the ball-in-play begins and end when the ball-in-play concludes.

To register the number of technical actions, a post-match video analysis was conducted using Focus Software (SBG Sports, London, UK), following the definitions and recommendations from Hendricks et al. (2020). Recordings were provided by a professional company, and the footage is publicly available on the Brazilian Rugby Confederation’s channels. Due to technical issues, two group-stage matches (the third match of the second stage and the first match of the fourth stage) could not be analyzed and were excluded.

Design and procedures

An observational study design was used to examine the BIP physical demands and the number of technical actions performed during Super Sevens 2024 matches. The study was approved by the Ethics Committee on Research with Humans of the University (number 6.052.619; CAAE: 67661823.7.0000.8124) and was conducted following the principles of the Declaration of Helsinki (2013). Prior to their participation, the athletes were thoroughly briefed on the study's design, potential risks, and benefits. Subsequently, they provided written and signed consent to participate in the study.

Super Sevens Tournament Structure

The championship consisted of four tournaments, each comprising five matches. On the first day of each tournament, three pool stage matches were played, followed by two knockout matches on the second day (semi-finals and final). All matches followed the official Rugby Sevens rules, with each game consisting of two 7-minute halves and a 2-minute interval between halves. The number of matches analyzed during the tournament was as follows: pool stage (first day) matches (n = 10) and knockout (second day) matches (n = 8). Eighteen official matches were analyzed, including data from all 12 players in each match (n = 240 match files).

Data analysis process

To complete the data analysis, the BIP demands from every match were presented as means, minimum, maximum, median, and standard deviation. A session was created for each match, and during the matches, a researcher recorded the time splits to differentiate each BIP moment, and the external load of every BIP was analyzed. Only players actively involved during BIP moments were included in the analysis. Players participated in 2 to 5 matches per stage of the championship.

Prior to the commencement of matches, a standardized warm-up protocol was applied, including mobility exercises, dynamic stretches, strength and speed activation, and rugby-specific drills. All data regarding the warm-up and half-times were excluded from data analysis. After each match, GPS data were downloaded using Go.Playertek® software, exported to an Excel® file, and compiled into a database for statistical analysis.

Video files were then downloaded and imported into Focus software for post-match coding. The analysis was performed independently by two evaluators with at least five years of experience. When discrepancies occurred (n = 8), the arithmetic mean of the two values was used. Technical definitions are listed below. An intra- and inter-operator reliability study was not performed.

The descriptive technical variables according to World Rugby and Diedrick and Van Rooyen (2011) are: *Kick receiving*: Any kick from hand or floor (general play, free kick, mark, penalty) kicked by the opposition team, which is caught or picked up by the analyzed team; *Passes*: When a player throws a ball apart from the throw in to a line out or scrum; *Offloads*: When a player throws the ball whilst in the process of being tackled. In an event where a player who has brought to ground and manages to pass the ball before a ruck is formed is also deemed to have completed an offload; *Ball Carries*: A player touching the ball who engages in contact with the opposition; *Linebreaks*: When the attacking player in possession of the ball manage to break through the defense line of the opposition team; *Rucks*: Total of rucks won and lost by the analyzed team; *Kicks*: Possession kicked includes any kick out of hand or from the ground in general play. It doesn't include penalty kicks, free kicks, marks, drop goals and conversions; *Tackles*: Defender who has attempted and succeeded in making a tackle and as a result has gone to ground; *Jackal*: When the first arriving defending player attempts to get his/her hands on the ball after a tackle has been made; *Counter ruck*: Total of actions in which the analyzed team has disputed ball possession during a ruck formed by the opposite team; *Turnover conceded*: Total of turnover conceded by the analyzed team at the open play; *Turnover won*: Total of turnover conceded by the opposition at the open play; *Penalty conceded*: Total of penalties conceded by the analyzed team; Penalty awarded: Total of penalties conceded by the opponent team; *Try scored*: A try is scored by the analyzed team when the referee adjudges that a player grounds the ball, in a controlled fashion, over the opponent's goal line. This includes penalty tries; and *Try conceded*: A try is conceded when the opponent team grounds the ball, in a controlled fashion, over the analyzed team's goal line. This includes penalty tries.

Statistical Analysis

Physical and technical variables were descriptively reported as means, standard deviation, median, minimum, and maximum values. The normality and homoscedasticity of the data were assessed using the Kolmogorov-Smirnov test and Levene's test, respectively. These tests revealed significant deviations from normality and a violation of the homogeneity of variances assumption across the investigated variables. Therefore, to compare BIP running demands across game phases, the Kruskal-Wallis test for between-group comparisons, with η^2 (eta squared) as the effect size measure was employed. Eta squared (η^2) effect sizes were reported, with small (0.01), medium (0.06), and large (0.14) effects considered, based on Cohen (1992). Post-hoc pairwise comparisons with Dunn-Bonferroni correction were performed when Kruskal-Wallis was significant. The relationship between BIP duration and all physical/technical variables was assessed using Spearman's rank-order correlation coefficient (ρ). Correlation strength was interpreted using Cohen's (1992) criteria: ρ = 0.10-0.29 (small), 0.30 - 0.49 (medium), and ≥0.50 (large). The level of statistical significance was set at $p < .05$ for all analyses. Statistical analyses were conducted using IBM SPSS v.21.0 (SPSS Inc., Chicago, IL, United States).

Results

The analyses of BIP running demands across game phases (Table 1) revealed significant differences for sprint distance per minute, $\chi^2(2, N = 310) = 11.98$, $p = 0.003$; number of sprints per minute, $\chi^2(2, N = 310) = 7.45$, $p = 0.024$; and decelerations per minute, $\chi^2(2, N = 310) = 10.00$, $p = 0.007$. Post hoc analyses indicated that sprint

distance per minute was greater in the attacking phase compared to the defensive phase (p = 0.002); the number of sprints per minute was also higher in the attacking phase than in the defensive phase (p = 0.034); and decelerations per minute were less frequent during the attacking phase compared to the defensive phase (p = 0.005). Conversely, no significant differences across game phases were observed for distance per minute, $\chi^2(2, N = 310) = 3.84$, p = 0.147, and accelerations per minute, $\chi^2(2, N = 310) = 5.16$, p = 0.076.

The correlation between ball-in-play (BIP) duration and all physical (Table 2) and technical variables (Table 3) was investigated using Spearman's rank correlation coefficient. Analyses of the physical variables revealed significant negative correlations between BIP duration and both sprints per minute, $\rho(308) = -0.125$, p = 0.027, and accelerations per minute, $\rho(308) = -0.191$, $p < 0.001$. No significant correlations were found between BIP duration and distance per minute, $\rho(308) = -0.039$, p = 0.494; sprint distance per minute, $\rho(308) = -0.071$, p = 0.214; or decelerations per minute, $\rho(308) = 0.089$, p = 0.119.

Regarding the technical actions performed, BIP duration showed significant positive correlations with passes, $\rho(308) = 0.325$, $p < 0.001$; offloads, $\rho(308) = 0.146$, p = 0.010; ball carries, $\rho(308) = 0.298$, $p < 0.001$; linebreaks, $\rho(308) = 0.144$, p = 0.011; rucks, $\rho(308) = 0.321$, $p < 0.001$; kicks, $\rho(308) = 0.137$, p = 0.015; tackles, $\rho(308) = 0.578$, $p < 0.001$; Jackals, $\rho(308) = 0.138$, p = 0.015; counter rucks, $\rho(308) = 0.384$, $p < 0.001$; ball recoveries, $\rho(308) = 0.260$, $p < 0.001$; and tries scored, $\rho(308) = 0.148$, p = 0.009. No significant correlations were found between BIP duration and kick receiving, $\rho(308) = -0.009$, p = 0.876; Turnovers concededs, $\rho(308) = -0.023$, p = 0.687; penalties conceded, $\rho(308) = -0.013$, p = 0.821; penalties awarded, $\rho(308) = -0.084$, p = 0.140; or tries conceded, $\rho(308) = -0.023$, p = 0.690.

Discussion

The present study investigated the running demands across different game phases and the relationship between BIP duration and physical and technical variables in professional female Rugby Sevens players. The results revealed significant differences in sprint distance, number of sprints, and decelerations per minute between attack, defense, and transition phases, with the attacking phase exhibiting greater sprint outputs and fewer decelerations compared to defense. Additionally, longer BIP durations were associated with reduced sprint and acceleration frequencies, while technical actions such as tackles, passes, and rucks increased significantly. These findings suggest that the physical intensity of play decreases during extended BIP periods, whereas technical involvement intensifies.

Table 1. Descriptive and inferential statistics of BIP running demands across game phases.

BIP running demands / Game Phase		Attack	Defense	Transition	χ^2	p	η^2
Distance per minute	Mean	129.54	121.2	121.99	3.84	.147	.006
	SD	39.24	41.83	40.94			
	Median	133.35	120.35	129.96			
	Maximum	226.37	247.57	229.28			
	Minimum	22.11	26.80	13.74			
Sprint distance per minute	Mean	34.64	24.12	27.01	11.98	.03	.032
	SD	29.37	29.25	22.45			
	Median	28.73	13.65	23.72			
	Maximum	120.92	151,55	86,02			
	Minimum	0	0	0			
Sprints per minute	Mean	1.19	0.95	1.07	7.45	.024	.018
	SD	1.17	1.35	0.97			
	Median	1.05	0.54	0.94			
	Maximum	6	8.33	4.28			
	Minimum	0	0	0			
Accelerations per minute	Mean	1.74	2.15	2.07	5.16	.076	.01
	SD	1.32	1.62	1.42			
	Median	1.5	1.84	1.97			
	Maximum	8	8.33	7.14			
	Minimum	0	0	0			
Decelerations per min	Mean	1.61	2.14	1.93	10.00	.007	.026
	SD	1.07	1.27	1.16			
	Median	1.57	2.06	1.84			
	Maximum	4.28	6.54	5.14			
	Minimum	0	0	0			

SD = Standard deviation

Table 2. Spearman's rank correlation coefficients between BIP duration and physical variables (n = 310).

Variable 1	Variable 2	ρ	p
BIP duration (seconds)	Distance per minute	–.039	.494
	Sprint distance per minute	–.071	.214
	Sprints per minute	**–.125**	**.027**
	Accelerations per minute	**–.191**	**.001**
	Decelerations per min	.089	.119

ρ = Spearman's rank correlation coefficient. p values refer to two-tailed tests. Statistically significant correlations (p < .05) are presented in bold.

Table 3. Spearman's rank correlation coefficients between BIP duration and technical variables (n = 310).

Variable 1	Variable 2	ρ	p
BIP duration	Kick receiving	–.009	.876
	Passes	**.325**	**.001**
	Offloads	**.146**	**.01**
	Ball carries	**.298**	**.001**
	Linebreaks	**.144**	**.011**
	Rucks	**.321**	**.001**
	Kicks	**.137**	**.015**
	Tackles	**.578**	**.001**
	Jackals	**.138**	**.015**
	Counter ruck	**.384**	**.001**
	Turnovers conceded	–.023	.687
	Turnovers won	**.26**	**.001**
	Penalty conceded	.013	.821
	Penalty awarded	–.084	.14
	Try scored	**.148**	**.009**
	Try conceded	–.023	.69

ρ = Spearman's rank correlation coefficient. p values refer to two-tailed tests. Statistically significant correlations ($p < .05$) are presented in bold.

Understanding game demands is essential for coaches in developing and prescribing appropriate training regimens (Quarrie et al., 2013; Read et al., 2018). The present study contributes to this area by providing detailed information on BIP demands across distinct phases of play, offering valuable insights for strength and conditioning coaches aiming to optimize training specificity based on match intensities. Notably, the findings are consistent with those of Bicudo et al. (2025b), who reported average values during BIP of 131.77 m/min for relative distance, 36.02 m/min for relative sprint distance, and 2.33 accelerations per minute among female athletes.

Regarding the phases of play, the present study shows that during the attacking phase, players cover greater sprint distances and perform a higher number of sprints compared to the defensive and transition phases. Conversely, in the defensive phase, players perform a greater number of decelerations than in other phases. These findings differ from a previous study conducted in the same championship during the previous season, which found no significant differences across any analyzed variable (Bicudo et al., 2025a). However, our results align with findings from rugby union and rugby league studies, which report that attacking players typically exhibit higher locomotor demands (measured in meters per minute) than defensive players (Stevens et al., 2024; Gabbett, 2013).

This suggests that in rugby sevens, attacking players may operate at higher intensities than their counterparts in rugby union or rugby league. One explanation is that attacking players in sevens must run at high intensities to maintain structure and continuity. For instance, following a ruck, players need to reposition rapidly to rejoin play. Additionally, ball carriers often increase their running intensity to explore open spaces, while supporting players must stay close to the ball carrier to offer passing options.

In contrast, defensive players may cover similar total distances per minute but achieve lower sprint distances, likely due to the need to maintain a structured defensive formation. Also, during the defensive phase, players performed a higher number of decelerations per minute. This is likely due to the nature of defensive movements, where players must repeatedly close spaces as the ball is passed, and then decelerate to establish a solid defensive platform, crucial for avoiding missed tackles in response to sudden directional changes by attackers. Additional contributors to the frequency of decelerations could include tackling situations, which naturally involve a rapid reduction in speed, and the movements of non-tackling defenders, who often decelerate to maintain the defensive line or retreat to an onside position.

Interestingly, although the average sprint distance and number of sprints were higher during the attacking phase, all peak values for distance per minute, sprint distance per minute, sprints per minute, accelerations per minute, and decelerations per minute were recorded during the defensive phase. This suggests that peak physical demands may occur during moments of defensive urgency, where players may abandon structure to perform repeated high-intensity efforts to prevent an opposition try. Such insights are crucial for coaches aiming to design training sessions that reflect these intermittent peak demands.

In terms of the relationship between BIP duration and physical outputs, the data indicate a decrease in the number of sprints and accelerations per minute during longer BIP periods, while other variables remained unaffected. Previous research in rugby sevens has shown that game intensity increases with competition level (Brosnan et al., 2024; Black and Gabbett, 2014; Gabbett, 2013). Notably, BIP periods containing repeated high-intensity efforts tend to be more frequent and intense against stronger opposition (Black and Gabbett, 2014; Bicudo et al., 2025b). This reinforces the idea that game context heavily influences locomotor demands (Brosnan et al., 2025). Therefore, players must be conditioned not only to tolerate high intensities but also to sustain performance during prolonged BIP phases. A reduction in sprints and accelerations during extended bouts may reflect the difficulty of maintaining such outputs under metabolic stress, highlighting the importance of training these capacities to minimize performance drop-off during critical match situations (Granatelli et al., 2014).

BIP and technical variables

When BIP duration was correlated with variables, results showed that as the BIP duration increases, the number of

technical actions such as passes, offloads, ball carries, line breaks, rucks, kicks, tackles, Jackals, and counter rucks tend to increase too. Those results allow coaches to identify technical patterns of BIP, and the nature of the game seems to naturally impose the relative number those of technical actions performed during matches independently of BIP duration. However, for some variables, BIP duration seems not to correlate with the number of actions (ie., Kick receiving, turnovers and penalties conceded, penalties awarded and try conceded) performed, and therefore, those actions seem to be influenced by tactical choices and for technical capacity of the team and of the opponent. One of these variables was kick receiving, and a possibility to explain the lack of increase regarding this action is that when opposition teams have ball possession, they apparently tend to not kick the ball, even on the longest BIP periods, in order to maintain ball possession and potentially, score a try.

Gabbett and Gahan (2016) highlight that teams with stronger defensive skills and better ball retention during attack are more likely to produce longer BIP periods, thereby increasing the number and intensity of actions required during these phases. Other exceptions occurred for turnovers conceded, but not for turnovers won, which means that during longer BIP periods, opponents tend to lose ball possession (ie., concede more turnovers) more frequently than the analyzed team. Furthermore, there is a positive correlation between BIP duration and tries scored, but the same correlations were not found for tries conceded. Therefore, longer BIP periods appear to present a favorable scenario for the analyzed team. If such trends are identified during the season, this information could assist coaches in developing tactical plans-such to choose for quick taps from penalties or to continue playing during penalty advantages. These strategies aim to capitalize on prolonged BIP opportunities, contributing to a more holistic understanding of Rugby Sevens gameplay.

Limitations of the present study include the analysis of a single team in a single competition, which restricts the generalizability of the results. Although comparisons were made with a prior study from the same competition, differences in locomotor demands suggest that phase-specific demands may depend on other contextual variables, such as competition level, ball possession, opposition quality, and tactical strategies (Brosnan et al., 2025). These factors may influence the dynamics of the analyzed variables. Additionally, a position-specific analysis was not conducted because the analyzed team regularly changes formations, using several players as forwards and backs, making this kind of analysis difficult to perform. Another limitation is the lack of an inter- and intra-operator reliability study, which could have strengthened the consistency and reproducibility of the data analysis. Future research should consider these methodological and contextual elements to improve the understanding of phase-specific demands and enhance the robustness of data collection and interpretation in Rugby Sevens.

In summary, the findings offer valuable information on locomotor demands across different phases of play, emphasizing the importance of tailoring training to match specific game demands. Future research should build upon these results and address current limitations to develop a more comprehensive understanding of the physiological and technical demands of the sport.

Conclusion

The study found differences in locomotor demands across game phases during various BIP periods in Rugby Sevens. During the attacking phase, players performed a greater number of sprints and achieved greater sprint distances compared to the defensive phase. Conversely, during the defense phase, players performed more decelerations, indicating that distinct locomotor outcomes emerge from different tactical contexts during training sessions and matches. Regarding the BIP durations, during longer bouts of BIP, there seems to be a decrease on the number of sprints per minute and on the number of decelerations per minute. Therefore, it is recommended that training programs periodically expose players to extended BIP efforts to enhance their ability to sustain match-level intensity. Practically, training strategies should emphasize the capacity to perform repeated high-intensity efforts in alignment with game demands. Finally, BIP duration showed positive correlations with most of the technical variables analyzed, suggesting a technical pattern shaped by the nature of the game. This type of analysis offers valuable insights for coaches, supporting the design of game plans tailored to their team's specific characteristics. Furthermore, these findings underscore the importance of maintaining technical performance during longer BIP periods, as the relative frequency of most technical actions remains stable. By understanding both the physical and technical demands of Rugby Sevens, coaches can optimize training sessions and enhance athlete preparation for competition through game-phase-specific conditioning.

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Key points

- Game-phase analysis revealed higher sprint output in attack compared with defence and transition.
- Longer BIP periods were associated with lower external load.
- Extended BIP durations were positively correlated with most of the technical variables analyzed.

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