JOMH
Journal of Men's Health

ORIGINAL RESEARCH

Performance determinants in elite men's sport: a tactical analysis of ball possession effectiveness at the 2023 Rugby World Cup

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Abstract

Background: Ball possession (BP) is one of the most influential performance indicators in rugby union. However, few studies have analyzed its effectiveness at the Men's Rugby World Cup (RWC) level. This study aimed to examine the effectiveness of BP in the 2023 Men's RWC, comparing winning and losing male national teams to identify key tactical patterns associated with success. **Methods**: A total of 2645 BP phases from 38 matches involving 20 men's national teams were analyzed through a retrospective observational design. Statistical analyses included chi-square tests with *post hoc* standardized residuals, Cramer's V to measure effect sizes, and a binary logistic regression model (pseudo $R^2 = 0.00616$) to assess the probability of winning or losing based on BP effectiveness. **Results**: Significant differences were found between winning and losing male teams at the beginning of BP sequences. Winning teams showed higher-than-expected frequencies of effective possessions initiated by lineout plus ruck or maul, ruck, and own kick (residuals ranging from 2.02 to 4.32). In contrast, losing teams exhibited more ineffective possessions when play began from restarts or opposition kicks (residual = 3.46). During BP development, winning teams demonstrated superior effectiveness in actions involving both backs and forwards, and in attacking through channel 1 and channel 2. These teams also showed greater efficiency when one to four or more players were involved in coordinated offensive actions. **Conclusions**: The findings highlight that successful male rugby teams optimize BP during critical moments of the game, efficiently converting initial phases into scoring opportunities. Versatility in attack and the ability to maintain possession under different tactical contexts appear to be key performance indicators associated with success in elite men's rugby competitions.

Keywords

Team sport; Performance indicator; Tactical analysis; Ball possession; Match profile; Effectiveness

1. Introduction

Rugby is a cooperative-opposition sport characterized by the complexity of its actions, mainly due to the great diversity of playing styles that define successful teams from unsuccessful ones [1], with ball possession (BP) being one of the most determining indicators [2–4]. In men's rugby union, this complexity is further accentuated by the high physical and tactical demands typical of male elite competition.

In team sports, BP is a fundamental concept that influences technical, tactical, and regulatory roles [5–7] and has been associated with other conditional variables [8]. However, in men's rugby, its definition and operationalization present challenges due to the lack of a univocal description in the official regulations. Although the World Rugby regulations do not provide a precise definition, they establish the mechanisms by which teams acquire, contest, and retain BP [9].

From an analytical perspective, several studies have identified BP as a key factor in male rugby team performance and its impact on competition outcomes [10–14]. The systematic review by Guerrero-Esteban *et al.* [15] and Colomer *et al.* [16] highlighted differences in BP between winning and losing teams. Winning male teams exhibit a greater number of BPs initiated in static phases [17, 18], recover more balls [19], and tend to initiate BPs in areas close to the try zone [20, 21]. Furthermore, during the development phase of BP, winning teams tend to use fewer rucks and reduce their duration [14, 18, 22], which optimizes their offensive effectiveness.

Therefore, performance in men's rugby can vary significantly depending on the type of competition and the level of play [19, 23]. Differences in BP have been observed in

international tournaments such as the Men's Rugby World Cup (RWC) [18, 20, 22, 24–28], the Six Nations Championship (men's category) [14, 29] as well as in regional and local men's leagues [30, 31]. However, comparison between these studies is difficult due to the different samples represented, level of play, changes in regulations, differences in data collection, and the statistical treatments used.

Several studies have analyzed BP in different editions of the Men's RWC, finding differentiating patterns between winning and losing male teams. For example, van Rooyen *et al.* [20] analyzed the 2003 Men's RWC and found differences in BP duration, points scored, and turnovers. In the 2007 Men's RWC, Diedrick & van Rooyen [26] identified that 81% of winning male teams scored more tries than their opponents. Bennett *et al.* [24] found that in the 2015 Men's RWC, lineouts won, scrums won, line breaks, and hand kicks were key performance indicators. More recently, in the 2019 Men's RWC, Bunker & Spencer [22] showed that winning male teams achieved more carrying meters and broke defensive lines more frequently in the pool and play-off stages. On the other hand, studies such as the one developed by Callinan *et al.* [32], which analyzed key performance indicators between winning and losing teams, concluded that winning teams were characterized by greater efficiency in ball disposal, greater ruck speed, more successful conversions, more chances created, and more appropriate on-field tactics. Conversely, losing teams reported less effective kicking and a greater number of lost rucks.

A recurring limitation across studies is the diversity in data collection and analysis methods in response to the different specific actions presented in rugby [16]. Video analysis software, official statistics, digital platforms, and notational analysis have been used, but many studies do not detail the observation instruments used. According to Colomer *et al.* [16], performance analysis in men's rugby still fails to consider confounding variables such as opponent behavior, field location, match period, and variables determined by the differences between winning and losing teams. In this regard, Villarejo *et al.* [33] designed and validated a specific observation sheet for BP in professional rugby, structured into 96 items that assess the onset, development, and completion of BP. However, its application in scientific research has been diverse [34–36], while its use in male rugby studies has been limited.

Despite the differences in the RWC editions, data collection methods, and statistical analyses employed, the available evidence supports the hypothesis that there are significant differences in BP between winning and losing male teams [37]. However, to date, no studies have been identified that analyze the effectiveness of BP at the 2023 Men's RWC. Consequently, the primary aim of this study was to examine the effectiveness of Ball Possession (BP) in the 2023 Men's RWC, differentiating between winning and losing teams. Based on previous literature, we hypothesized that winning teams would demonstrate significantly higher effectiveness in specific phases of BP initiation and development compared to losing teams.

2. Materials and methods

2.1 Design

The study used a retrospective design [38] to analyze performance in elite men's rugby. Historical records and existing data were utilized to examine performance outcomes, identify patterns, and gain insights into past performance in men's World Rugby competitions, specifically the 2023 Men's Rugby World Cup (RWC).

2.2 Sample

The sample comprised 38 matches involving 20 distinct men's national teams in the 2023 Men's RWC. All analyzed matches corresponded exclusively to the male category of the tournament, ensuring that no women's or mixed matches were included. A total of 2645 phases of ball possession were analyzed, corresponding to the entirety of BP phases generated across the 38 matches, ensuring a comprehensive analysis of the game dynamics.

2.3 Instrument

In the present research, the observation instrument designed and validated by Villarejo *et al.* [33] was used. The unit of analysis was the ball possession phase, defined as the period that begins when a player is the first to play the ball after a phase of gaining possession, and ends when the referee signals a foul, a point of contact occurs (ruck or maul), or a kick is made in normal play. To provide greater clarity on the categorization criteria, Table 1 details the dependent (outcome) and independent (situational) variables analyzed.

2.4 Procedure

In this investigation, video recordings of the 2023 Men's Rugby World Cup matches were utilized. The matches— each corresponding to elite men's national teams—were visualized employing VLC Media Player video analysis software (VideoLAN, 2023). The data recording process was executed following the methodological framework proposed by Villarejo [33]. Three observers, each holding a level three coaching certification from the International Rugby Board and possessing 10 years of experience in rugby training and analysis, conducted the observational analyses. Before the analytical phase, the observers underwent a rigorous training protocol with the observation instrument, adhering to the guidelines delineated by Losada and Manolov [39]. This protocol yielded minimum inter-observer reliability values of 0.96. The observers performed independent analyses of the matches, systematically recording the technical-tactical actions inherent in the ball possession phases. The data recording was frequency-based, quantifying the number of occurrences of each specific technical-tactical action within the analyzed phases.

2.5 Data analysis

To analyze the relationship between ball possession effectiveness and match outcome (winning *vs.* losing male teams), an independent chi-square test was performed. Frequencies, percentages, *p*-values, and effect sizes,

T A B L E 1. Definition of variables related to the initiation, development, and effectiveness of ball possession.

Type of Variable	Variable	Categories/Definitions
Outcome Variable		
	Possession Effectiveness	Effective: Possession ends with points scored (try, penalty goal, drop goal) OR a penalty won (clear advantage) OR crossing the gain line while retaining possession (clean break). Less Effective: Possession ends with a tactical or neutral benefit without scoring. Includes: (1) Gain in line with loss of possession (tactical kicking for territory), or (2) No gain in line but retention (maintenance/recycling). Ineffective: Possession ends with no gain in line and loss of possession (turnover, handling error, interception) or conceding a penalty.
Situational Variables		
	Initiation of Possession	Set-pieces/Restarts: Scrum (S), Line-out (L), Restart from opposition drop kick (OP), Restart from own drop kick (OW). Open Play: Ruck (R), Line-out maul or ruck (LMR). Turnovers: Scrum turnover (ST), Line-out turnover (LT), Ruck turnover (RT), Breakpoint turnover (BT), Kick turnover from opposition (KP), Kick turnover from own kick (KW).
	Development of Possession	Grouping: Backs (B), Forwards (F), Backs and Forwards (BF). Attacking Channel: Channel 1 (C1), Channel 2 (C2), Channel 3 (C3). Volume: One player (1P), Two players (2P), Three players (3P), Four or more players ($\geq$4P).

determined using Cramer's V, were reported. To determine the degree of association between variables, Cramer's V was used as a measure of effect size, with values interpreted as follows: very weak (0.00–0.10), weak (0.10–0.20), moderate (0.20–0.30), strong (0.30–0.40), and very strong ($>$0.40) [40]. When significant associations were found, a *post hoc* analysis was performed by inspecting standardized residuals, considering absolute values greater than 1.96 as indicators of significant differences between the categories analyzed. To evaluate the relationship between ball possession effectiveness and the probability of winning or losing a match, a binary logistic regression model was used. This model allowed estimating the probability of a male team losing the match ("Loser" category) based on the level of BP effectiveness (Effective, Ineffective). The pseudo coefficient of determination R^2 (0.00616) was calculated. The goodness of fit of the model was evaluated using the likelihood ratio test, and the significance of the coefficients was determined through Wald (Z) tests, with p values less than 0.05 considered statistically significant. Estimated marginal means were calculated for each level of BP effectiveness, to graphically represent the relationship between this variable and the probability of losing possession. Data analysis was performed using Jamovi software version 2.6.26 (Jamovi project, 2023, Sydney, Australia). A significance level of $p < 0.05$ was adopted, rejecting the null hypothesis in cases of significant differences.

3. Results

Tables 2 and 3 show the frequencies and percentages of effectiveness, p-values, and effect sizes for the variables "start" and "development" of ball possession men's national rugby teams.

At the start of the BP, the *post hoc* analysis revealed differences in effectiveness between winning and losing male teams. Winning male teams had higher observed than expected frequencies of effective possessions in the variables: line out plus ruck or maul (winner = 2.0196 *vs.* loser = −2.0196), ruck (winner = 4.3196 *vs.* loser = −4.3196), and own kick (winner = 2.2488 *vs.* loser = −2.2488). Losing male teams showed a higher-than-expected frequency of ineffective possessions in the variables restart or opposition kick (winner = −3.4621 *vs.* loser = 3.4621).

In the development of BP, *post hoc* analysis revealed differences in effectiveness between winning and losing male teams. In particular, and in winning male teams, greater observed frequencies than expected of practical possessions in the variables: backs (winner = 2.739 *vs.* loser = −2.739), forwards (winner = 3.955 *vs.* loser = −3.955), backs and forwards (winner = 4.232 *vs.* loser = −4232), channel 1 (winner = 4.227 *vs.* loser = −4.221), channel 2 (winner = 3.996 *vs.* loser = −3.996), one player (winner = 2.621 *vs.* loser = −2.2621), two players (winner = 3.102 *vs.* loser = −3.102), three players (winner = 3.024 *vs.* loser = −3.024) and four or more player (winner = 2.034 *vs.* loser = −2.034). Losing male teams showed higher observed than expected frequencies of ineffective possessions in the variables: backs and forwards (winner = −4.121 *vs.* loser = 4.121), channel 1 (winner = −3.598 *vs.* loser = 3.598), channel 2 (winner = −3.412 *vs.* loser = 3.412), player 1 (winner = −2.400 *vs.* loser = 2.400), three players (winner = −3.094 *vs.* loser = 3.904) and four or more player (winner = −2.472 *vs.* loser = 2.472) and ineffective possessions in the variables back (winner = −2.190 *vs.* loser = 2.190) and two players (winner = −3.495 *vs.* loser = 3.495). Fig. 1 shows the distribution of turnover probabilities based on ball possession efficiency.

TABLE 2. Start of possession: effectiveness and match result.

Category	Effective				Less effective				Not effective				p	ES
	Winner		Loser		Winner		Loser		Winner		Loser			
	n	%	n	%	n	%	n	%	n	%	n	%		
S	81	32.8	67	24.5	125	50.6	147	53.6	41	16.6	60	21.9	0.071	0.10
ST	4	40.0	1	100.0	3	30.0	0	0.0	3	30.0	0	0.0	0.382	0.42
L	99	42.3	71	33.2	86	36.8	96	44.9	49	20.9	47	22.0	0.115	0.10
LMR	68	38.6	47	28.3	92	52.3	92	55.4	16	9.1	27	16.3	0.042	0.14
LT	31	38.3	20	43.5	38	46.9	18	39.1	12	14.8	8	17.4	0.696	0.08
R	551	35.9	483	28.7	838	54.6	1018	60.6	147	9.6	179	10.7	<0.001	0.08
RT	23	34.8	20	37.7	37	56.1	31	58.5	6	9.1	2	3.8	0.513	0.11
OP	14	48.3	14	41.2	10	34.5	12	35.3	5	17.2	8	23.5	0.786	0.09
OW	102	44.5	44	33.3	111	48.5	80	60.6	16	7.0	8	6.1	0.080	0.12
BT	62	47.3	49	34.5	60	45.8	81	57.0	9	6.9	12	8.5	0.098	0.13
KP	129	27.3	120	25.7	288	60.9	283	60.6	56	11.6	64	13.7	0.949	0.03
KW	34	56.7	18	35.3	19	31.7	21	41.2	7	11.7	12	23.5	0.050	0.23

S: Scrum; ST: scrum turnovers; L: line-out; LMR: line-out maul or ruck; LT: line-out turnovers; R: ruck; RT: ruck turnovers; OP: restart from opposition drop kick; OW: restart from own drop kick; BT: breakpoint turnover; KP: kick turnover from opposition kick; KW: kick turnover from own kick; ES: effect size; n: frequency; %: percentages; p: p value.

TABLE 3. Possession development: effectiveness and match result.

Category	Effective				Less effective				Not effective				p	ES
	W		L		W		L		W		L			
	n	%	n	%	n	%	n	%	n	%	n	%		
B	493	29.3	399	25.0	1034	61.4	1010	63.4	156	9.3	185	11.6	0.006	0.0559
F	414	48.0	408	39.0	339	39.3	487	46.5	110	12.7	152	14.5	<0.001	0.0907
BF	423	49.0	303	44.0	368	42.6	414	52.7	73	8.4	68	8.7	<0.001	0.1073
C1	490	51.1	480	41.9	386	40.3	551	48.1	82	8.6	114	10.0	<0.001	0.0922
C2	210	43.3	140	30.7	213	43.9	251	55.0	62	12.8	65	14.3	<0.001	0.1316
C3	146	52.3	96	46.2	103	36.9	95	45.7	30	10.8	17	8.2	0.136	0.0904
1P	594	42.4	602	37.3	657	46.9	819	51.3	151	10.8	177	11.1	0.028	0.0487
2P	301	28.3	227	22.3	692	65.0	676	66.5	72	6.8	113	11.1	<0.001	0.0943
3P	208	41.0	149	31.7	240	47.3	269	57.2	59	11.6	52	11.1	0.005	0.1035
≥4P	209	57.1	12	48.8	128	35.0	113	44.8	29	7.9	16	6.3	0.046	0.0997

W: Winner; L: loser; p: p value; n: frequency; %: percentages; ES: effect size; B: backs; F: forwards; BF: backs and forwards; C1: channel 1; C2: channel 2; C3: channel 3; 1P: one player; 2P: two players; 3P: three players; ≥4P: four or more players.

4. Discussion

The objective of this study was to analyze the differences in BP effectiveness between winning and losing male teams at the 2023 Men's Rugby World Cup (RWC). Data obtained through a notational analysis were used, utilizing a selection of variables from the instrument developed by Villarejo *et al.* [33]. Eleven variables related to the onset of BP and 10 variables linked to its development were analyzed. The results revealed statistically significant differences between winning and losing teams in the onset and development of BP. This focus on men's rugby is justified by the fact that the Men's RWC represents the highest level of competitive performance and tactical complexity in the sport, offering a reference model for elite male play.

At the onset of BP, winning male teams showed significant associations in the variables line-out maul or ruck (LMR) (p = 0.042, effect size (ES) = 0.14), ruck (R) ($p < 0.001$, ES = 0.08), and kick turnover from own kick (KW) ($p = 0.05$, ES = 0.23). Previous studies [14, 18, 22, 39] have reported better performance of winning teams in the variable R. Van Rooyen *et al.* [28] (2010) study on the 2007 Men's RWC indicated that winning teams had a higher amount of R in the group stage, but a lower amount in the play-off stages. Similarly, Bunker & Spencer [22] found that winning teams performed better in the 2019 Men's RWC.
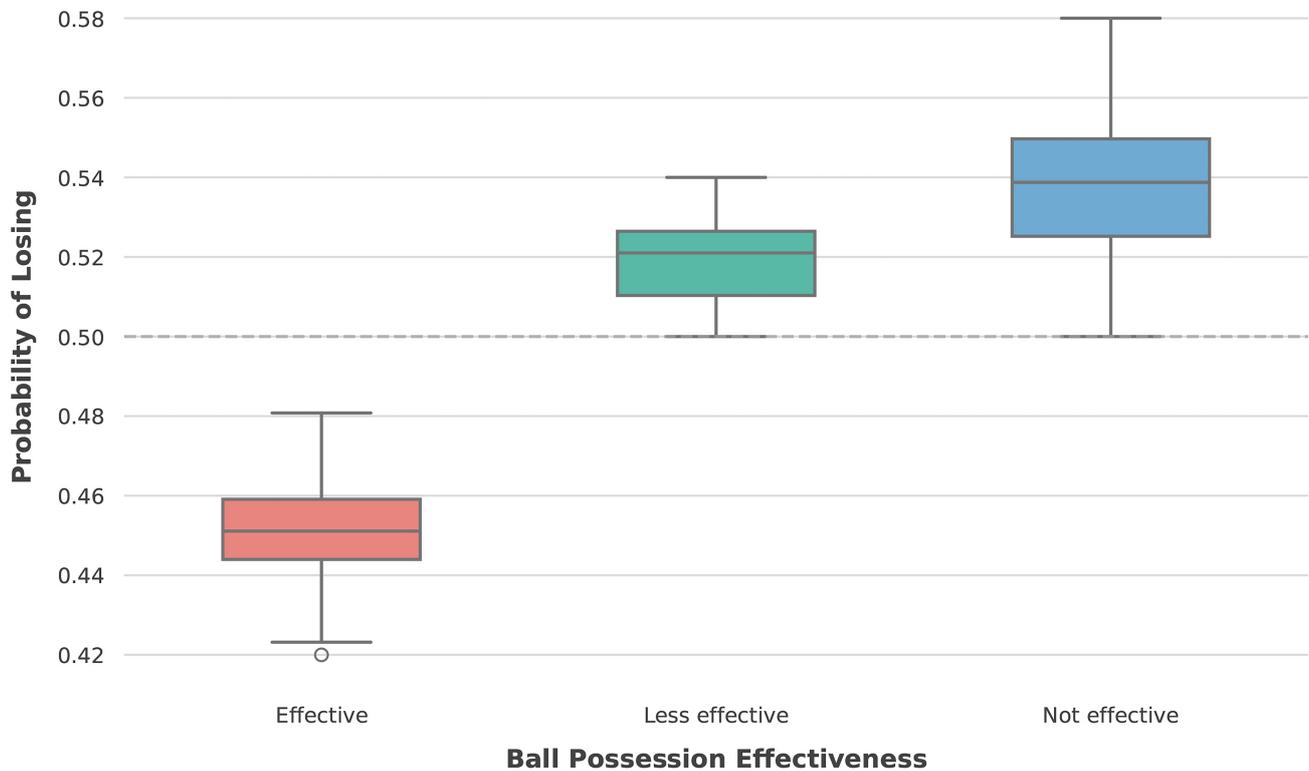
F I G U R E 1. Distribution of turnover probability based on ball possession efficiency.

Regarding L, studies such as Bennett *et al*. [24] and Hughes *et al*. [27] on the 2015 Men's RWC found significant associations between the variable line-out (L) and winning teams. Although comparison with other studies is complex due to differences in data collection and analysis methodology, the findings of this study suggest that the ability to manage BP in key phases of the game (LMR, R, and KW) is a relevant contributing factor of competitive success. It is important to note that while statistically significant differences were found ($p < 0.05$), the effect sizes (Cramer's V) ranged predominantly from low to moderate (0.08–0.23). This indicates that while distinct tactical patterns exist—such as winning teams' efficiency in rucks and turnovers—these variables are contributing factors within a complex system. In elite men's rugby, match outcomes are multifactorial, depending also on defense organization, discipline, and individual technical execution, which interact with the possession structure analyzed here. Therefore, possession effectiveness should be viewed as a significant but not solitary determinant of success.

Post hoc analysis revealed that winning male teams recorded a significantly higher frequency of practical possessions in LMR (+2.02), R (+4.32), and KW (+2.25). In contrast, losing male teams had a higher frequency of ineffective possessions in the restart from opposition drop kick (OP) variable (+3.46). These results suggest that the ability to optimize BP during moments of tactical reorganization and ball recovery allows for maintaining stability in the game and generating offensive opportunities more frequently. In the development of BP, winning male teams showed significant associations with variables backs (B) ($p = 0.006$, ES = 0.06), forwards (F) ($p < 0.001$, ES = 0.09), backs and forwards (BF) ($p < 0.001$, ES = 0.11), channel 1 (C1) ($p < 0.001$, ES = 0.09), and channel 2 (C2) ($p < 0.001$, ES = 0.13). Previous research has reported that the effectiveness of BP is closely related to the ability to involve both B and F players in building offensive play [41]. In high-level competitions, successful teams tend to evenly distribute BP among different playing positions, optimizing progression and generating scoring opportunities [17, 42, 43]. Although the effect size in most comparisons was low to moderate, the data suggest that winning teams structured more effective possessions through the coordinated use of players and attacks in specific areas of the field (channel 1 and channel 2). This finding is consistent with previous research demonstrating the relationship between game continuity and improved competitive performance [10, 41].

Post hoc analysis indicated that winning male teams had significantly higher frequencies of efficient possessions in B (+2.739), F (+3.955), BF (+4.232), C1 (+4.227), and C2 (+3.996), as well as possessions with one (+2.621), two (+3.102), three (+3.024), and four or more players (+2.034). In contrast, losing male teams had higher frequencies of inefficient possessions in BF (+4.121), C1 (+3.598), C2 (+3.412), one player (+2.400), three players (+3.904), and four or more players (+2.472), as well as inefficient possessions in B (+2.190) and two players (+3.495). These results reinforce the importance of strategic ball possession management in competitive performance Guerrero *et al*. [44]. The higher frequency of effective possession observed in winning teams suggests a link to improved offensive continuity in the game. The coordinated participation of multiple players could favor a greater generation of attacking options [45]. In contrast, the difficulties of losing male teams in managing ball possessions, especially during moments of offensive reorganization, indicate the need for training strategies focused on improving

attack transition and consolidation [46].

The results of the logistic regression analysis show a significant association between effectiveness and the probability of losing the match. In particular, the estimated marginal means plot shows a progressive increase in the probability of losing the match as transition effectiveness decreases. Possessions classified as ineffective have the highest probability of losing (0.537), followed by those classified as ineffective (0.520), while effective possessions have the lowest probability of losing (0.453). This trend suggests that productive BP significantly reduces the risk of losing the match, which is consistent with previous studies highlighting the importance of BP quality [17].

Although the model presents a low pseudo R^2 coefficient of determination (0.00616), indicating low explained variability, the statistical significance of the effect of BP effectiveness ($p < 0.001$) suggests that this factor is associated with the match outcome. In this sense, the findings highlight the need to optimize the different ways of obtaining and utilizing BP, as it may contribute to optimizing the team's performance.

4.1 Limitations and future research directions

This study presents certain limitations that should be considered when interpreting the results. First, the sample size, although representative of the 2023 Men's RWC, could restrict the generalization of the findings to other competitions or levels of play. Future research could expand the sample to include matches from different tournaments and contexts. Furthermore, future studies could utilize this dataset to compare variables based on team rankings (*e.g.*, elite *vs.* mid-tier teams) rather than solely on match outcomes, as suggested by the performance gaps observed in international tournaments. Second, the nature of notational analysis, although supported by high inter-observer reliability, introduces a degree of inherent subjectivity to the interpretation of game actions. The use of automatic players and ball-tracking technologies could minimize this limitation in future studies, providing more objective and detailed data. Third, the observation instrument, although validated for the analysis of ball possession, focuses on technical and tactical aspects. Future research could incorporate contextual variables, such as fatigue, the emotional state of the players, or weather conditions, to gain a more holistic understanding of performance. Finally, the statistical analysis focused on comparing averages between winners and losers and on predictive models [47]. Analyzing game sequences using mixed models could reveal more complex and dynamic patterns in ball possession [48].

4.2 Practical implications

The findings of this study have significant practical implications for men's rugby coaches and players. The identification of key phases of play (LMR, R, KW) where winning male teams displayed greater effectiveness suggests the importance of focusing training on these specific situations. The winning teams' superiority in possession management during play, particularly in coordination between backs and forwards and the use of different attacking channels, highlights the need

to develop versatile and adaptable offensive strategies. The identification of ineffective playing patterns in losing male teams, such as difficulty managing possession in OP or lack of coordination in offensive reorganization situations, provides valuable information for designing targeted training interventions. In summary, this study provides empirical evidence supporting the importance of ball possession effectiveness as a performance determinant at the 2023 Men's RWC. Coaches can use these findings to optimize their coaching strategies and improve their teams' performance [49].

5. Conclusions

This study analyzed differences in ball possession effectiveness between winning and losing male teams at the 2023 Men's Rugby World Cup (RWC), using a rigorous observational and statistical approach. The results revealed significant differences in the initiation and development of possession, highlighting the importance of strategic management and quality of possession in competitive performance. Winning male teams demonstrated greater effectiveness in key phases of play such as LMR, R, and KW, and a greater ability to coordinate offensive play in the development of possession. These findings suggest that the ability to optimize possession at critical moments of the game and versatility in attack are determining factors for success in elite men's rugby. This study contributes to scientific knowledge on men's rugby performance by providing empirical evidence on the importance of ball possession effectiveness at the 2023 Men's RWC. The findings have practical implications for male rugby coaches and players and open new avenues of research to better understand game dynamics and optimize competitive performance.

ABBREVIATIONS

BP, ball possession; RWC, Rugby World Cup; LMR, line-out maul or ruck; R, ruck; KW, Kick turnover from own kick; OP, restart from opposition drop kick; B, backs; F, forwards; BF, backs and forwards; C1, channel 1; C2, channel 2; C3, channel 3; 1P, one player; 2P, two players; 3P, three players; $\geq$4P, four or more players; S, scrum; ST, scrum turnover; L, line-out; LT, Line-out turnover; RT, ruck turnover; BT, breakpoint turnover; KP, Kick turnover from opposition; OW, Restart from own drop kick; ES, effect size; p, p-value; R^2, coefficient of determination.

AVAILABILITY OF DATA AND MATERIALS

The data confirming the results obtained are available through the corresponding authors.

AUTHOR CONTRIBUTIONS

DHVG—designed the research study and developed the introduction; prepared the discussion and conclusions. DHVG, CNM and JPO—conducted the methodology. DHVG and JPO—performed the data analysis and obtained the results. DHVG, and JPO—wrote and prepared the

manuscript. DHVG, BABP, CNM and JPO—contributed to the revision and editing of the final version. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Since this study retrospectively analyzed publicly available competition data, the requirement for ethical approval and informed consent was waived by University of Murcia.

ACKNOWLEDGMENT

Not applicable.

FUNDING

This research received no external funding.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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