

Variables associated with the performance of a male European professional rugby team. Analysis of the regular season

Variables asociadas al rendimiento de un equipo europeo de rugby profesional masculino. Análisis de la temporada regular

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Abstract. The main objective of this study was to identify the relationship between performance parameters and a team's probability of winning and losing during regular season matches. A retrospective observational study of a professional rugby team with thirty players and sixteen regular season matches was carried out. The analyses included the following metrics: carries in open play, gainline success, gainline unsuccess, good pass, average pass, bad pass, good kick, average kick, bad kick, effective ruck, ineffective ruck, dominant tackle, neutral tackle, passive tackle, tackle assist, tackle missed, defender in position, good offload, kick fielded successfully, kick fielded unsuccessfully, ball lost, intercept, turnover made, linebreak, yellow card, red card, a penalty conceded, try scored, injury, player off, player on, successful kick at goal, unsuccessful kick at goal, lineout, lineout won, scrum, scrum won, return to play, ruck speed and tackle completion. No single parameter could be directly related to wins or losses. Nevertheless, four parameters when pooled could be associated with winning during the analysed season ($r = 0.897$, $r^2 = 0.805$, r adjusted = 0.635, $p < 0.05$): gainline success ($p < 0.002$), effective ruck ($p < 0.009$), dominant tackle ($p < 0.018$) and tackle assist ($p < 0.029$). On this specific context, coaches and practitioners should pay more attention to these specific actions to improve team performance.

Keywords: Performance, breakdown, gainline, ruck, tackle

Resumen. El objetivo principal de este estudio fue identificar la relación entre los parámetros de rendimiento y la probabilidad de que un equipo gane o pierda durante los partidos de la temporada regular. Se realizó un estudio observacional retrospectivo de un equipo de rugby profesional con treinta jugadores y dieciséis partidos de temporada regular. Los análisis incluyeron las siguientes métricas: acarreo en juego abierto, éxito en la línea de ganancia, fracaso en la línea de ganancia, buen pase, pase promedio, mal pase, patada buena, patada promedio, patada mala, ruck efectivo, ruck ineficaz, tackle dominante, tackle neutral, tackle pasivo, tackle asistido, tackle fallado, defensor en posición, buena descarga, patada fildeada con éxito, patada fildeada sin éxito, balón perdido, intercepción, pérdida de balón realizada, rotura de línea, tarjeta amarilla, tarjeta roja, penal concedido, try anotado, lesión, jugador fuera, jugador encendido, patada exitosa al gol, patada fallida al gol, lineout, lineout ganado, scrum, scrum ganado, regreso al juego, velocidad del ruck y finalización del tackle. Ningún parámetro único podría estar directamente relacionado con ganancias o pérdidas. Sin embargo, cuatro parámetros cuando se agruparon podrían estar asociados con ganar durante la temporada analizada ($r = 0.897$, $r^2 = 0.805$, r ajustado = 0.635, $p < 0.05$): éxito en la línea de ganancia ($p < 0.002$), ruck efectivo ($p < 0.009$), tackle dominante ($p < 0.018$) y tackle asistido ($p < 0.029$). En este contexto específico, los entrenadores y profesionales deberían prestar más atención a estas acciones específicas para mejorar el rendimiento del equipo.

Palabras clave: rendimiento, desglose, ganancia, ruck, placaje

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Introduction

Rugby is a territorial invasion team sport in which teams compete for the possession of the ball and territory with the objective of scoring. This competition occurs through high-intensity actions involving individual contests and physical contact, generating an extremely dynamic and variable environment, making rugby a highly complex team sport (Batista et al., 2019; Colomer et al., 2020). In recent years, performance analysis has evolved in identifying and measuring performance parameters at an individual and collective level to offer a greater quantity of information and training tools to improve play (García-Chaves et al., 2023; Sella et al., 2019). As a result of various studies, many parameters have been identified that can differentiate between winning and losing teams at the professional level.

Performance indicators in rugby can be differentiated as collective or individual parameters depending on the

nature of the action itself and the number of players involved in performing the action (Bennett et al., 2019). Despite the possible relationship between the two, individual actions tend to be more related to technical components, whilst collective actions are more associated with the tactical aspect of play (Sella et al., 2019).

Within the collective parameters, those studied most frequently are the initial location and source of possession and rucks (Vaz et al., 2019). The most used individual performance indicators are runs with the ball, metres gained, line breaks and tackles (Mosey & Mitchell, 2020; Olivera & Vásquez-Gómez, 2022; Vaz et al., 2011). All the actions previously mentioned, both collective and individual, are related to the breakdown. Breakdowns are all those situations of play generating competition between the attacking and defending team for space, time and the ball following and around the tackle. (Bennett et al., 2021; Bremmer et al., 2013). This play area is relevant in rugby analysis, as many breakdowns are produced during

games (Kraak et al., 2016).

Van Rooyen et al. (2006) indicated that the location in the field of play where possession begins might determine the options for scoring during a sequence of play, concluding that the closer a team gets to the opposition's scoring zone whilst in control of the ball, the greater the probability of their scoring during the sequence of play. Obtaining possession of the ball in the opposition's 22m zone is a determining factor in differentiating winning and losing teams, as the former acquires possession twice as often as the latter (Watson et al., 2017).

Related to the location of the start of possession is the source of possession. In other words, the action through which the attacking team gains control of the ball. The static phases of play; turnovers and turnovers from static phases, are the origins of possession which have the highest relationship with a higher success percentage and probability of scoring points in a sequence of play (Schoeman y Schall, 2019; Vaz et al., 2019). Possession which begins with static phases of the game inside the opponent's 22m zone, has been identified as the origin of possession with the highest percentage of success (Coughlan et al., 2019).

Bunker y Spencer (2020) indicated rucks, in terms of their number and efficiency, to be a technical-tactical action of play which can be used to differentiate between winning and losing teams. The efficiency of these game phases proves to be a critical factor in the effectiveness of possessions and the ability to score points (Ungureanu et al., 2019). Higher ruck speed and fewer player involvement allow the attacking team to play at a higher speed with more attacking options in open play (Kraak & Welman, 2014; Schoeman & Schall, 2019). In terms of the number of rucks, Bunker & Spencer (2020), Vaz et al. (2011) & Vaz et al. (2019) observed that winning teams generated fewer rucks than losing teams, with the former having an average of fewer than 78 phases per game.

The number of tackles is a differentiating indicator between winning and losing teams. Winning teams report a higher number and percentage of completed tackles. Greater tackle efficiency increases winning probability (Vaz et al., 2011; Watson et al., 2017).

Other determining factors in differentiating between winning and losing teams are runs with the ball, line breaks, and the number of metres gained whilst in possession of the ball (Watson et al., 2017). These three indica-

tors are mutually related as a higher number of runs with the ball produces an increase in defensive line breaks and, at the same time, promotes more metres gained (Mosey & Mitchell, 2020; Rodríguez-Baena & Gálvez-González, 2021). This increase in runs makes it more likely that points will be scored in the phases of play following these attacking gains (Bennett et al., 2019; Bunker et al., 2020; Wheeler et al., 2010).

Line breaks have the most impact on the probability of victory, being the performance indicator that allows the most precise differentiation between winning and losing teams (Schoeman & Schall, 2019; Watson et al., 2017).

Performance factors analysed in isolation do not generate sufficient information regarding a team's capabilities. This suggests that the analysis of various indicators together may generate more relevant information about a team's performance and, in this way, address the complexity of play and the possible interrelation and interdependence of some variables concerning others (Bishop y Barnes, 2013; Torrents & Balagué, 2006; Watson et al., 2017).

Despite the many studies of performance factors in different leagues and elite international competitions, there is a lack of information about Spanish national competitions. The objective of this study is to analyse which performance parameters have the most significant impact on the results in the male *División de Honor* league to optimise training.

Method

Design of the study

A retrospective observational study was carried out during a professional rugby season. Data were collected between September 2021 and June 2022, which was the period during which the *División de Honor* league 2021/22 was played. Data were obtained from a total of 16 regular season games. The team won the competition. The performance variables analysed were obtained from the Statspro company website Prepare to Win (<https://playpro.co.za>): Statspro is responsible for analysing the competition (Statspro, SA). Using the database, specific information was compiled on each match and each player selected. The 34 performance parameters presented by the company which analysed the matches were chosen (see Table 1), and they were linked to the variables Win / Loss.

Table 1.

Description of the performance variables analysed

Performances variables (https://playpro.co.za)			
Name of variable	Acronym	Description	Units
Carries in Open Play	COP	Run made by player in possession in open play	Total number (n)
Gainline Success	G_Suc.	Ball carry which gets over gainline	Total number (n)
Gainline Unsuccessful	G_Unsuc.	Ball carry which doesn't get over gainline	Total number (n)
Good Pass	GP	Pass which reaches teammate without interference	Total number (n)
Average Pass	AP	Pass which reaches teammate with interference (bounce, rebound from opponent)	Total number (n)
Bad Pass	BP	Pass which does not reach teammate or is forward	Total number (n)
Good Kick	GK	Kick that gains territory for kicking team whether or not possession is maintained	Total number (n)
Average Kick	AK	Kick that maintains possession for kicking team but does not gain territory	Total number (n)
Bad Kick	BK	Kick that allows opposing team to regain possession with no gain in territory for kicking team	Total number (n)
Effective Ruck	Eff_R	Rucks in which possession is retained	Total number (n)

Ineffective Ruck	Ineff_R	Ruck in which possession is lost due to ball being recovered by opponent	Total number (n)
Dominant Tackle	DT	Tackle in which defender gains metres	Total number (n)
Neutral Tackle	NT	Tackle in which neither defender nor attacker gain metres	Total number (n)
Passive Tackle	PT	Tackle in which attacker gains metres	Total number (n)
Tackle Assist	T_Ass.	Defending player helps teammate tackle opponent	Total number (n)
Tackle Missed	T_Mis.	Missed tackle by defender who is unable to stop attacker	Total number (n)
Defender in Position	DP	Defender who re-establishes themselves in the defensive line following ruck, tackle or maul	Total number (n)
Good Offload	GO	Well-executed pass in the defensive line	Total number (n)
Bad Offload	BO	Badly-executed pass in the defensive line	Total number (n)
Kick Fielded Successfully	KF_Suc.	Reception of kick from opponent or teammate which begins or maintains possession	Total number (n)
Kick Fielded Unsuccessfully	KF_Unsuc.	Reception of kick from opponent or teammate which prevents possession from beginning or being maintained	Total number (n)
Ball Lost	BL	Ball lost during attacking sequence	Total number (n)
Intercept	Int.	Ball recovered by defence having intercepted a pass between two attackers	Total number (n)
Turnover Made	TO_Ma.	Ball recovered by defence during defensive sequence	Total number (n)
Line break	LB	Line break made by player in possession	Total number (n)
Yellow Card	YC	Temporary 10' send-off from field of play	Total number (n)
Red Card	RC	Definitive send-off	Total number (n)
Penalty Conceded	PC	Number of penalties awarded against team analysed	Total number (n)
Try Scored	TS	Number of tries scored by team analysed	Total number (n)
Injury	Inj.	Definitive change due to injury	Total number (n)
Player Off	Pl_Off	Player leaves field and is replaced, due to injury, for medical attention or temporary send-off	Total number (n)
Player On	Pl_On	Player enters field as replacement, after medical attention or after temporary send-off	Total number (n)
Kick at Goal Successfully	KG_Suc.	Successful kick at goal, whether conversion, penalty kick or drop goal	Total number (n)
Kick at Goal Unsuccessfully	KG_Unsuc.	Missed kick at goal, whether conversion, penalty kick or drop goal	Total number (n)
Lineout	LO	Total number of lineouts awarded to team	Total number (n)
Lineout Won	W_LO	Number of lineouts in which team regains possession successfully	Total number (n)
Scrum	Scr.	Total number of scrums awarded to team	Total number (n)
Scrum Won	W_Scr.	Number of scrums in which team regains possession successfully	Total number (n)
Return to Play	RTP	Time elapsed between player being on the ground and being again available to participate in play	Seconds (s)
Ruck Speed	RS	Time elapsed between player being tackled and ball emerging from ruck	Seconds (s)
Tackle Completion	TC	Percentage of team's completed tackles	(DT+NT+PT)/Tackle total*100 (%)

Note. All parameters are quantified numerically except Return to Play and Ruck Speed, measured in seconds (s), and Tackle Completion, calculated as a percentage (%).

A total of 30 professional players from the UE Santboiana first team were included in the study. In each match, data were analysed from the 23 players selected, comprising 13 forwards and 10 backs. The criteria for inclusion for all subjects in the study were: to be over 18 years old, be part of the first team and have been selected for at least one of the matches.

All players were evaluated as part of their training routine. The players and the club were informed of the risks and benefits of the study and agreed to participate. Players always had the right to withdraw from the study and the right to object to the use of their personal data. The use of personal data followed the standards of the Helsinki Declaration (World Medical Association, 2013) and received the institutional approval of the *Comitè d'Ètica d'investigacions Clíniques de l'Administració Esportiva de Catalunya* (Number 012/CEICGC/2022).

Performance variables

The variables analysed (Effective Ruck, Gainline Success, Carry in Open Play, Tackle assists, RTP, Dominant Tackle and Ruck Speed) were reliable, showing the following intraclass correlation coefficient (ICC) 95% CI = 0.73-0.3; variation coefficient interval values (CV) to 95% CI = 0.08 - 0.48), and size effect (S) = Cohen's d 0.242 - 0.89.

Periodisation

According to the competition calendar, the regular season was divided into six competition mesocycles (see Figure 1). In mesocycle 2, the focus was placed on the beginning of the official competition, and three regular league matches were played. The first matches against direct rivals in the standings were played in mesocycle 3. In mesocycle 4, there was the first break in local competitions for national matches and the Christmas holidays. During mesocycle 5, the most demanding part of the season took place with four matches in succession. Mesocycles 6 and 7 were focussed on the final stages of the regular league with multiple matches against direct rivals in the classification, alternating with some rest weeks for the European Championships (REC 2022).

The regular season lasted 31 weeks. The planning of workload, both conditioning and technical-tactical, was designed with a structure as similar as possible between mesocycles and duration of 5 ± 1 weeks. The periodisation of the mesocycles followed the model of block periodisation (Issurin, 2008), and the progression of contents was divided into four orientations (general, directed, specific, and competitive) (Schelling & Torres-Ronda, 2013).

The standard structure of each of the microcycles in each mesocycle was as follows: Monday rest and active recovery; Tuesday and Wednesday: double session with

strength and individual technique work in the morning and a group training session in the afternoon; Thursday rest; Friday: double session with strength and individual technique work in the morning and a group pre-match training session in the afternoon; Saturday: travel, rest or match in the afternoon; Sunday: midday match (see Table 2). In

addition, each player was provided with an individualised preventive programme, a strength task, or a practice to be performed before the group training sessions. Players with the lowest competitive loads received a compensatory training session on Mondays (Gabbett, 2016; Caparrós et al., 2018).

U.E. SANTBOIANA DHA - 2021/22 REGULAR SEASON																																								
Month	September					October					November					December					January					February					March					April				
Mesocycle	M2 - 5w - Special					M3 - 6w - Competition					M4 - 4w - Competition					M5 - 5w - Competition					M6 - 5w - Competition					M7 - 6w - Competition														
Orientation microcycle	E	C	C	C	R-D	E	C	C	R-E	C	R-D	E	C	R-D	E	C	C	C	R-G	D/E	C	R-E	C	R-D	E	C	R-E	C	R-E	C										
N° Microcycle	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31									
Opponent		Gernika	Cisneros	La Vila			Abelles	Barça		Salvador				VRAC				ARU	Cisneros	Ciencias	La Vila			Barça		Burgos			Salvador		ARU		Ondiz							
Home/Away		H	A	H			A	A		H				H				A	H	A	A			H		H			A		H		A							

Figure 1. Chronology of the regular season, mesocycles and orientation of mesocycles.

Note. M2: Mesocycle 2; M3: Mesocycle 3; M4: Mesocycle 4; M5: Mesocycle 5; M: Mesocycle 6; M7: Mesocycle 7; G: General; D: Directed; E: Specific; C: Competitive; R-D: Recovery-Directed; R-E: Recovery-Specific; R-G: Recovery-General; D-E: Directed-Specific; H: Home match; A: Away match

Table 2. Model of weekly microcycle planning

Weekly microcycle planning model							
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Morning	Off	Strength (60') + Individual technique (45')	Strength (60') + Individual technique (45')	Off	Strength (60') + Individual technique (45')	Off / Travel	Game
	Recovery	Technical-tactical team training (90')	Technical-tactical team training (90')	Off	Technical-tactical team training (60'/90')	Game	Off

Statistical methods

Data are presented as mean ± standard deviation (SD). After conducting a descriptive study of central tendency and considering the normality of the sample, an independent T-test was used to assess the effects of game performance parameters (independent variables) on dependent variables (win or lose). To do this, we used the average parameter value recorded per match. Finally, we ran multiple linear regression analyses of the game results (win or lose) as the dependent variable, while the game performance parameters operated as independent predictors. Statistical analyses were performed with JASP software version 0.11.1 (The Jasp Team, Amsterdam, Netherlands). The significance level was set at p < .05.

Results

Sixteen rugby matches were analysed, corresponding to a regular Spanish Rugby "División de Honor" season. During the study period, the team won 12 matches (75%) and lost four (25%)

The variables analysed in the 16 matches were taken in units (n) except RS and RTP, which were taken in seconds (s) and TC in percentage (%). The mean values (+/- SD) of the analysed variables were: COP: 19.75 +/-5.689; G_Suc: 36.75 +/-11.375; Eff_R: 122.875 +/- 23.717; DT: 45.188 +/- 22.034; T_Ass: 14.625 +/- 6.917; RTP: 3.15 +/- 0.278; RS: 4.612 +/- 1.097; G_Unsuc: 15.063 +/-5.767; AP: 3.5 +/- 1.875 +/- 1.455; GK: 9.875 +/- 2.941; AK: 7.688 +/- 4.413; BK: 2.063 +/-

1.843; Ineff_R: 4.563 +/- 3.010; NT: 23.5 +/-6.683; PT: 41.375 +/- 16.954; T_Mis: 20.563 +/- 8.374; DP: 74.438 +/- 27.621; GO: 7.188 +/- 3.692; BO: 1.563 +/- 1.413; KF_Suc: 16.375 +/- 4.177; KG_Unsuc: 1.563 +/- 1.094; LO: 12.375 +/- 2.964; W_LO: 9.75 +/- 2.817; Scr: 7.188 +/- 2.588; W_Scr: 6.438 +/- 3.076; TC: 85.9 +/- 3.627; GP: 74.5 +/- 15.689; KF_Unsuc: 3.063 +/- 1.436; BL: 12.438 +/- 4.718; Int: 0.938 +/- 0.929; TO_Ma: 5.313 +/- 3.61; LB: 3.563 +/- 2.308; YC: 0.875 +/- 0.806; RC 0 +/- 0; PC: 12.125 +/- 4.603; TS: 3.438 +/- 2.097; Inj: 2.438 +/- 1.788; Pl_Off: 7.75 +/- 2.62; Pl_On: 8 +/- 2.477 KG_Suc: 4 +/- 1.414 (Table 3).

Table 3. Mean, Standard derivation (SD), Coefficient of variation (CV) and suma of the performance variables

	Mean	SD	CV	Sum
Carries in Open Play	19.750	5.686	0.288	316.000
Gainline Success	36.750	11.375	0.310	588.000
Effective Ruck	12.875	23.717	0.193	1966.000
Dominant Tackle	45.188	22.034	0.488	723.000
Tackle Assist	14.625	6.917	0.473	234.000
RTP	3.150	0.278	0.088	50.400
Ruck speed	4.612	1.097	0.238	73.800
Gainline unsuccessful	15.063	5.767	0.383	241.000
Avg Pass	3.500	1.862	0.532	56.000
Bad Pass	1.875	1.455	0.776	30.000
Good Kick	9.875	2.941	0.298	158.000
Avg Kick	7.688	4.143	0.539	123.000
Bad Kick	2.063	1.843	0.893	33.000
Ineffective Ruck	4.563	3.010	0.660	73.000
Neutral Tackle	23.500	6.683	0.284	376.000
Passive Tackle	41.375	16.954	0.410	662.000
Tackle Missed	20.563	8.374	0.407	329.000
Defender in Position	74.438	27.621	0.371	1191.000

Good Offload	7.188	3.692	0.514	115.000
Bad Offload	1.563	1.413	0.904	25.000
Kick Fielded Successfully	16.375	4.177	0.255	262.000
Kick at Goal Un Successful	1.563	1.094	0.700	25.000
Lineout	12.375	2.964	0.239	198.000
Lineout won	9.750	2.817	0.289	156.000
Scrum	7.188	2.588	0.360	115.000
Scrum won	6.438	3.076	0.478	103.000
Tackle completion	85.900	3.627	0.042	1374.400
Good Pass	74.500	15.689	0.211	1192.000
Kick Fielded Unsuccessful	3.063	1.436	0.469	49.000
Ball Lost	12.438	4.718	0.379	199.000
Intercept	0.938	0.929	0.991	15.000
Turnover Made	5.313	3.610	0.679	85.000
Line break	3.563	2.308	0.648	57.000
Yellow Card	0.875	0.806	0.921	14.000
Red Card	0.000	0.000	NaN	0.000
Penalty Conceded	12.125	4.603	0.380	194.000
Try Scored	3.438	2.097	0.610	55.000
Injury	2.438	1.788	0.733	39.000
Player off	7.750	2.620	0.338	124.000
Player on	8.000	2.477	0.310	128.000
Kick at Goal Successful	4.000	1.414	0.354	64.000

In the descriptive analyses, at the individual level, there was an average of 19.75 (\pm 5.686) of carries in open play, gainline success of 36.75 (\pm 11.375), effective ruck 122.875 (\pm 22.034), dominant tackle of 45.188 (\pm 6.917) and tackle assist 14.625 (\pm 6.917). At the collective level, statistical description of RTP was obtained with

a mean of 3.15 (\pm 0.278) and ruck speed of 4.612 (\pm 1.097).

The coefficient of variation (CV) showed very significant (almost perfect) correlations in collective data: RTP (0.088) and Ruck speed (0.0238). On the other hand, the individual data: dominant tackle (0.488) and tackle assist (0.473) lat average is unrepresentative. In the rest of the variables described, there is little variability in the data, and the sample is very compact (Table 3).

A multiple linear regression analysis was performed to select the most promising independent variables (effective ruck, gainline success, carries in open play, dominant tackle, tackle assist, RTP and ruck speed). The procedure revealed that these variables together explained 63.5% of the result of winning throughout the season ($r = 0.897$, $r^2 = 0.805$, *adjusted r* = 0.635, $p < 0.05$), showing no differences between winning or losing.

Only the variables effective ruck ($p < 0.009$), gainline success ($p < 0.002$), tackle assist ($p < 0.029$) and dominant tackle ($p < 0.018$) have values of $p < 0.05$. Regarding the diagnoses of collinearity, it is observed in the variance inflation factors (VIF), with some predictors correlated since their value is > 5 in all the variables (Table 4).

Table 4.
Linear regression of the performance variables

		Coefficients				Collinearity Statistics		
Model		Unstandardised	Standard Error	Standardised	t	p	Tolerance	VIF
H ₀	(Intercept)	0.750	0.112		6.708	<0.001		
H ₁	(Intercept)	1.356	0.862		1.572	0.155		
	Effective Ruck	-0.014	0.004	-0.732	-3.447	0.009	0.540	1.853
	Gainline Success	0.049	0.011	1.249	4.416	0.002	0.304	3.292
	Carries in Open Play	-0.032	0.016	-0.409	-1.976	0.084	0.567	1.764
	Tackle Assist	0.045	0.017	0.693	2.656	0.029	0.357	2.801
	RTP	-0.605	0.293	-0.376	-2.061	0.073	0.730	1.369
	Dominant Tackle	0.013	0.004	0.645	2.950	0.018	0.509	1.963
	Ruck speed	0.125	0.093	0.307	1.351	0.214	0.470	2.129

Discussion

The present study analysed the possible relationship between technical-tactical performance parameters and win-loss outcomes for a team during the regular season. The most significant finding of this study is that the parameters "Gainline success", "Effective ruck", "Dominant tackle", and "Tackle assist" in combination are the most determinant factors for team performance, having a greater relationship with winning results. This demonstrates that dominance in contact and at the breakdown, both offensively and defensively, are determinant factors for team performance, as they allow a team to advance, invade the opponent's territory and deny them time for reorganisation. The study did not identify any single parameter linked directly to wins or losses. Still, a group of actions were observed that together could be interpreted as a playing style, and the main actions of this group were related to the breakdown (Bennett et al., 2021; Bremmer et al., 2013).

The results shown that the "Gainline success" parameter could be related with better aspects of team performance. The action of getting over the gainline allows the attacking team to approach the scoring zone, and the greater the number of line breaks, the more opportunities to score the attacking team has, which could have direct effect on results (Bunker et al., 2020; Mosey y Mitchell, 2020). This could be because gainline success leads to a breakdown of defensive structure, as the attacking team manages to invade the territory of the defending team, causing the latter to restructure its organization, making the defense have a smaller number of players to involve in these fixation phases, and can provide that the attacking side could generate fewer but higher quality rucks (Ungureanu et al., 2019; Watson et al., 2017).

The findings could indicate that the "Effective ruck" parameter is also related to better team performance. This is conditional on the duration and number of players involved in these play situations (Vaz et al., 2011). With

fewer attackers involved in the ruck, the attacking team has more players and space to attack, giving them more options to give continuity to their attacking play (Schoeman et al., 2017). This, together with a quicker ball from the ruck, could reduce the defence's capacity to reorganise and stresses the defensive structure (Kraak y Welman, 2014; Ungureanu et al., 2019).

A close relationship between these two possession performance parameters can be observed, as getting over the advantage line increases the quality of attacking rucks. At the same time, the team in possession has more options to get over the advantage line once more, thus increasing the possibilities of scoring. (Bunker y Spencer, 2020; Ungureanu et al., 2019).

The results could show that the parameters "Dominant tackle" and "Tackle assist" directly influence the improvement of team performance. These two variables related to tackling could give the defence the ability to generate dominant breakdowns, allowing the defending team more time to organise their defensive structure without losing metres (Vaz et al., 2011). These situations of defensive dominance around the ball increase the amount of time the attack invests in rucks and the involvement of a greater number of players to retain possession (Schoeman y Schall, 2019).

These results could establish a correlation between the "Gainline success" and "Effective ruck" parameters, as the combination of both offensive variables could generate a greater number of actions of continuity and progress in possession of the ball towards the end zone (Bunker & Spencer, 2020; Kraak et al., 2016), whilst the principal objective of the "Dominant tackle" and "Tackle assist" parameters are to stop the advance of the attacking team and slow down the continuity of play, allowing through these defensive variables to maintain the defensive structure and try to regain possession of the ball (Vaz et al., 2011).

The main limitations of this study are that, although it comes from a high-level "División de Honor" team, the data extracted considers a single team and a single regular season, which limits generalisability, but it presents a working method that could help to interpret the playing profile of each team. Despite the small sample size, it is noted that in rugby, regular seasons are limited due to the need for recovery and the risk of injury (Murias-Lozano et al., 2022; West et al., 2021), but the results presented here could be valid and applicable to this specific context, offering a longitudinal view of the competition, and the possibility of applying them to other contexts as well.

Identifying performance variables through the results obtained, could be a useful tool for improving the design of training tasks and the analysis of game actions. In addition, providing data on physical demands in future studies could improve the overall view of game variables.

Conclusions

In the study, no single action was found to have a di-

rect relationship with winning or losing. Still, it was observed that the group of parameters comprising "Gainline success", "Effective ruck", "Dominant tackle," and "Tackle assist" had a positive impact on the results and explained 63.5% of the variance of won games throughout the season. Although in a multiple regression analysis we assume that there are no major correlations between the independent variables, when pooled together, these factors could help coaches to determine which performance factors are most relevant to succeed in professional rugby. Further studies aimed at reducing dimensionality can establish if the results from this piece of research can be used to identify relevant patterns.

Practical Applications

Our results show that superior performance around the breakdown and the tackle lead to better competitive results. The analysis of performance indicators, both in attack and in defence, improves the understanding of team performance strengths or weaknesses. Training to enhance the evasion techniques and how to advance in contact, get over the gainline, and impede the opponent's advance by tackling may have a relevant impact on team performance. Further studies need to be carried out to validate these findings and elaborate on how to implement training systems to improving these areas.

Compliance with Ethical Standards

The use of personal data followed the standards of the Helsinki Declaration (World Medical Association, 2013) and received the institutional approval of the Comitè d'Ètica d'investigacions Clíniques de l'Administració Esportiva de Catalunya (Number 012/CEICGC/2022).

Competing Interests

The authors have no conflict of interests to declare.

References

- Batista, M., Catarino, J., Fernandes, H., Vaz, L., Serrano, J., & Honório, S. (2019). Anxiety levels in «Under 18» and «Under 20» Elite Rugby Players of National Teams in different field positions Niveles de ansiedad en jugadores de Elite de equipos de Rugby «Sub-18» y «Sub-20» en diferentes posiciones de campo. *Retos. Nuevas tendencias en Educación Física, Deporte y Recreación*, 35, 369-373.
- Bennett, M., Bezodis, N. E., Shearer, D. A., & Kilduff, L. P. (2021). Predicting performance at the group-phase and knockout-phase of the 2015 Rugby World Cup. *European Journal of Sport Science*, 21(3), 312-320. <https://doi.org/10.1080/17461391.2020.1743764>
- Bennett, M., Bezodis, N., Shearer, D. A., Locke, D., & Kilduff, L. P. (2019). Descriptive conversion of performance indicators in rugby union. *Journal of Science and Medicine in Sport*, 22(3), 330-334. <https://doi.org/10.1016/j.jsams.2018.08.008>
- Bishop, L., & Barnes, A. (2013). Performance indicators that discriminate winning and losing in the knockout stages of the

- 2011 Rugby World Cup. *International Journal of Performance Analysis in Sport*, 13(1), 149-159. <https://doi.org/10.1080/24748668.2013.11868638>
- Bremmer, S., Robinson, G., & William, M. (2013). A retrospective evaluation of team performance indicators in rugby union. *International Journal of Performance Analysis in Sport*, 13(2), 461-473. <https://doi.org/10.1080/24748668.2013.11868662>
- Bunker, R., Fujii, K., Hanada, H., & Takeuchi, I. (2020). Supervised sequential pattern mining of event sequences in sport to identify important patterns of play: an application to rugby union. <https://doi.org/10.1371/journal.pone.0256329>
- Bunker, R. P., & Spencer, K. (2020). Performance Indicators Contributing To Success At The Group And Play-Off Stages Of The 2019 Rugby World Cup. *Journal of Human Sport and Exercise*. <https://doi.org/10.31236/osf.io/ndtak>
- Colomer, C. M. E., Pyne, D. B., Mooney, M., McKune, A., & Serpell, B. G. (2020). Performance Analysis in Rugby Union: a Critical Systematic Review. En *Sports Medicine - Open* (Vol. 6, Número 1). Springer. <https://doi.org/10.1186/s40798-019-0232-x>
- Coughlan, M., Mountfield, C., Sharpe, S., & Mara, J. K. (2019). How they scored the tries: applying cluster analysis to identify playing patterns that lead to tries in super rugby. *International Journal of Performance Analysis in Sport*, 19(3), 435-451. <https://doi.org/10.1080/24748668.2019.1617018>
- García-Chaves, D. C., Corredor-Serrano, L. F., & Díaz, S. (2023). Relación entre la fuerza explosiva, composición corporal, somatotipo y algunos parámetros de desempeño físico en jugadores de rugby sevens. *Retos. Nuevas tendencias en Educación Física, Deporte y Recreación*, 47, 103-109.
- Kraak, W. J., & Welman, K. E. (2014). Ruck-play as performance indicator during the 2010 six nations championship. *International Journal of Sports Science and Coaching*, 9(3), 525-537. <https://doi.org/10.1260/1747-9541.9.3.525>
- Kraak, W., Venter, R., & Coetzee, F. (2016). Scoring and general match profile of Super Rugby between 2008 and 2013. *International Journal of Performance Analysis in Sport*, 16(2), 786-805. <https://doi.org/10.1080/24748668.2016.11868923>
- Mosey, T. J., & Mitchell, L. J. G. (2020). Key performance indicators in Australian sub-elite rugby union. *Journal of Science and Medicine in Sport*, 23(1), 35-40. <https://doi.org/10.1016/j.jsams.2019.08.014>
- Murias-Lozano, R., Mendía, L., Sebastián-Obregón, F. J. S., Solís-Mencia, C., Hervás-Pérez, J. P., Garnacho-Castaño, M. V., Maté-Muñoz, J. L., & García-Fernández, P. (2022). The Epidemiology of Injuries in Spanish Rugby Union División de Honor. *International Journal of Environmental Research and Public Health*, 19(7). <https://doi.org/10.3390/ijerph19073882>
- Olivera, N., & Vásquez-Gómez, J. (2022). Rugby seven femenino en el centro-sur de Chile- asociación entre fuerza explosiva, velocidad, agilidad y estado nutricional. *Retos. Nuevas tendencias en Educación Física, Deporte y Recreación*, 43, 683-689.
- Rodríguez-Baena, J., & Gálvez-González, J. (2021). Análisis de las demandas de Sprint en competición por puestos específicos en el rugby 7 femenino. *Retos. Nuevas tendencias en Educación Física, Deporte y Recreación*, 39, 46-51.
- Schoeman, R., Coetzee, D., & Schall, R. (2017). Suid-Afrikaanse Tydskrif vir Navorsing in Sport. *South African Journal for Research in Sport, Physical Education and Recreation*, 39(3), 135-144.
- Schoeman, R., & Schall, R. (2019). Team performance indicators as predictors of final log position and team success in Aviva Premiership, Guinness Pro 14, French Top 14 and Super Rugby. *International Journal of Performance Analysis in Sport*, 19(5), 763-777. <https://doi.org/10.1080/24748668.2019.1655337>
- Sella, F. S., McMaster, D. T., Serpiello, F. R., & la Torre, A. (2019a). Match analysis in Rugby Union: Performance indicators of Rugby Championship and Super Rugby teams. *Journal of Sports Medicine and Physical Fitness*, 59(8), 1306-1310. <https://doi.org/10.23736/S0022-4707.18.08448-7>
- Sella, F. S., McMaster, D. T., Serpiello, F. R., & la Torre, A. (2019b). Match analysis in Rugby Union: Performance indicators of Rugby Championship and Super Rugby teams. *Journal of Sports Medicine and Physical Fitness*, 59(8), 1306-1310. <https://doi.org/10.23736/S0022-4707.18.08448-7>
- Torrents, C., & Balagué, N. (2006). Dynamic systems theory and sports training (Número 1).
- Ungureanu, A. N., Brustio, P. R., Mattina, L., & Lupo, C. (2019). "How" is more important than "how much" for game possession in elite northern hemisphere rugby union. *Biology of Sport*, 36(3), 265-272. <https://doi.org/10.5114/biolsport.2019.87048>
- van Rooyen, K. M., Lambert, I. M., & Noakes, D. T. (2006). A Retrospective analysis of the IRB statistics and video analysis of match play to explain the performance of four teams in the 2003 Rugby World Cup. *International Journal of Performance Analysis in Sport*, 6(1), 57-72. <https://doi.org/10.1080/24748668.2006.11868355>
- Vaz, L., Hendricks, S., & Kraak, W. (2019). Statistical Review and Match Analysis of Rugby World Cups Finals. En *Journal of Human Kinetics* (Vol. 66, Número 1, pp. 247-256). Sciendo. <https://doi.org/10.2478/hukin-2018-0061>
- Vaz, L. M., Carreras Villanova, D., & Mouchet, A. (2011). Variables del juego que mejor discriminan la victoria y la derrota en los partidos igualados de rugby. *Apunts Educación Física y Deportes*, 105, 51-57. [https://doi.org/10.5672/apunts.2014-0983.es.\(2011/3\).105.06](https://doi.org/10.5672/apunts.2014-0983.es.(2011/3).105.06)
- Watson, N., Durbacha, I., Hendricks, S., & Stewart, T. (2017). On the validity of team performance indicators in rugby union. *International Journal of Performance Analysis in Sport*, 17(4), 609-621. <https://doi.org/10.1080/24748668.2017.1376998>
- West, S. W., Starling, L., Kemp, S., Williams, S., Cross, M., Taylor, A., Brooks, J. H. M., & Stokes, K. A. (2021). Trends in match injury risk in professional male rugby union: A 16-season review of 10 851 match injuries in the English Premiership (2002-2019): The Professional Rugby Injury Surveillance Project. En *British Journal of Sports Medicine* (Vol. 55, Número 12, pp. 676-682). BMJ Publishing Group. <https://doi.org/10.1136/bjsports-2020-102529>
- Wheeler, K. W., Askew, C. D., & Sayers, M. G. (2010). Effective attacking strategies in rugby union. *European Journal of Sport Science*, 10(4), 237-242. <https://doi.org/10.1080/17461391.2010.482595>