

# “How” is more important than “how much” for game possession in elite northern hemisphere rugby union

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**ABSTRACT:** The present study aimed to analyse technical and tactical aspects of rugby teams competing in the 2016/17 PRO12 Championship (12 professional club teams from Wales, Scotland, Italy, and Ireland) according to: margin of victory (close and balanced games, 1–9 and 10–26 points of difference in final score, respectively), ranking position [the four best placed clubs from each nation (the 1<sup>st</sup>–4<sup>th</sup> team) and the three following ranked clubs (the 5<sup>th</sup>–7<sup>th</sup> team)], and game outcome and ranking combined (winning and losing performances in the 1<sup>st</sup>–4<sup>th</sup> and 5<sup>th</sup>–7<sup>th</sup> team subgroups). One hundred and thirty-two games were analyzed according to 20 key performance indicators. A non-parametric approach was applied to evaluate differences ( $p \leq 0.05$ ) between teams. In close games, winning teams reported less possession ( $p = 0.039$ ), defended more (tackles made,  $p = 0.039$ ), and carried the ball less than losing counterparts ( $p = 0.05$ ), whereas in balanced games, winning teams were found to be much better than losers in “tries for” ( $p < 0.0001$ ) as well as “tries against” ( $p < 0.0001$ ), and “clear breaks” ( $p = 0.0003$ ). The teams of the 1<sup>st</sup>–4<sup>th</sup> subgroups were found to be more oriented to provide a solid defence than the 5<sup>th</sup>–7<sup>th</sup> winning teams, which were more offensive oriented (possession,  $p = 0.01$ ; gain line carries,  $p = 0.001$ ; passes,  $p < 0.0001$ ). Finally, a similar scenario to that of balanced games emerged for winning and losing performances in the 1<sup>st</sup>–4<sup>th</sup> and 5<sup>th</sup>–7<sup>th</sup> team subgroups. Coaches and physical trainers of elite northern hemisphere rugby union teams should be aware that successful performances mainly consist of a strong defence, tackling, scrumming, breaking the defensive line and high occurrences of possessions during the attacking phase.

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## INTRODUCTION

The current improvement of professionalism in rugby union is characterized by technological progression, which makes training more individualized and effective in terms of physical performance, even minimizing the risk of overtraining [1]. At present, the use of technology is focused on the analysis of technical and tactical patterns oriented to the game success [2, 3, 4, 5, 6], as well as on the physiological demands occurring during the game [7].

In rugby union, key performance indicators (KPIs) have been selected and combined with the aim of discriminating winning and losing performances in national [2, 8] and international [4, 9, 10, 11] games. Among the latter category of studies, Ortega et al. [4] reported interesting findings about the 2003–06 Six Nations editions, where the success of games was principally associated with loss of fewer balls in the scrummage and line-out phases; playing more with their feet; using the maul and breaking the defensive line; and recovering more balls and completing more tackles. Moreover, for the

same Championship, Vaz et al. [12] also demonstrated that home teams benefit from the advantage in terms of penalty goals overall, successful penalty goals, rucks/mauls won, and passes completed. In another study on World Cup Rugby [9], the winning outcome of games was especially characterized by the possession retained, number of points scored in the second half, and the propensity to lose possession in areas of the field from which the opposition is likely to score. In contrast, Vaz et al. [10, 11] have investigated successful performances in international championships, including northern and southern hemisphere national teams (i.e., Six Nations, Tri Nations and World Cup), and in international club competitions exclusively including southern hemisphere teams (i.e., Super 12 Championship). The studies showed for the first subgroup of games that no difference between winning and losing teams emerged in close games (i.e., when the final score difference between teams is 15 points or less), highlighting that national teams of the northern

and southern hemisphere used to play with no particular playing tendency. Conversely, a different scenario is associated with club competitions, which tends to link a kicking based game plan to success, even in close games [11].

Therefore, it is difficult to recognize a common playing style in rugby, confirming the fact that team games have to be analysed in relation to specific conditions [13]. In line with this perspective, Jones *et al.* [2, 8] provided two studies on the analysis of technical and tactical aspects exclusively related to a professional European rugby union team.

In one of these studies [8], specific long-term performance standards were highlighted in order to provide useful information when a single game is compared to others (i.e., the average level of the previous performances). In another study [2], technical and tactical analyses of teams were considered according to a balanced number of home and away games, reporting effects only for two team performance indicators (i.e., lineouts won on opposition's throw and tries scored) among the twenty-two considered in the study. Therefore, these findings confirm the hypothesis for which a model to predict future performances in rugby union should be structured only considering a specific competitive level.

Although Vaz *et al.* [11] reported data about a club international championship exclusively related to the southern hemisphere (i.e., S12), no investigation was provided for the same competition level in the northern hemisphere. Top 14 (France), Premiership Rugby (England), and PRO12 (Wales, Scotland, Italy and Ireland) represent the three main championships. However, only the PRO12, named PRO14 after the involvement of two South African teams in the 2017–18 edition, championship is characterized by the involvement of professional teams from four European countries. Based on the final ranking (i.e., the four best placed clubs from each nation plus the three highest ranked clubs not qualified thereafter), the best seven teams of this championship can access the European Rugby Champions Cup (ERCC) with thirteen other teams from French and English leagues.

It seems reasonable to hypothesize that the technical and tactical aspects are influenced by the final outcome, but the margin of victory can provide deeper information on the game. At present, elite men's club rugby competing in the northern hemisphere has not been investigated according to this rationale, and the above-mentioned game variables can only be inferred from the analyses of previous studies [11].

Therefore, considering the lack of research on technical and tactical aspects on international club competition related to the northern hemisphere, the aim of the present study was to analyse team performance in the PRO12 Championship verifying: i) the difference between winning and losing teams in close games (1–9 points in the final score) and in balanced games (10–26 points between teams in the final score); ii) the difference between the four best placed clubs from each nation (1<sup>st</sup>–4<sup>th</sup> team) and those of the three highest ranked clubs not qualified thereafter (the 5<sup>th</sup>–7<sup>th</sup> team); and iii) the

combination of game outcome and ranking position (i.e., comparison between winning and losing performances in the 1<sup>st</sup>–4<sup>th</sup> team subgroup and in the 5<sup>th</sup>–7<sup>th</sup> teams).

## MATERIALS AND METHODS

### *Design*

This study comprised all 132 games (22 rounds per 6 games each) played during the 2016/17 PRO12 regular season by 12 professional teams from four countries (Wales, Scotland, Italy, Ireland). In particular, archival data were obtained from the Ultimate Rugby web domain (<https://www.ultimaterugby.com/#>). According to the literature [14], all data reported in this Web domain were collected by professional analysts, who applied a reliability test (kappa coefficients) on 12 games of the above-mentioned sample of games. The results of this test showed coefficients of agreement of 1.0 for passes and tackles made for both teams in each game. The local institutional review board approved this study.

### *Procedure*

Each of the 132 considered games types was divided according to the final score difference as previously suggested [15, 16]. Specifically, according to Sampaio *et al.* [17] and Vaz *et al.* [11] the final score difference in each game was clustered by the k-means clustering method. This method produced 3 different category clusters of the greatest possible distinction according to game final score differences [17]: 1–9 points of difference in the final score (close game); 10–26 points of difference in the final score (balanced game); more than 26 points of difference in the final score (unbalanced games). Thus, to provide a first reference on technical and tactical aspects classified according to specific margins of victory for PRO12 teams only the close games and the balanced game clusters were selected for the final analysis. In particular, the exclusion of draw games is due to the impossibility of establishing winning and losing teams, whereas unbalanced games were not considered because no surprising results were expected for this type of competitive condition.

Moreover, since the final ranking in the regular PRO12 Championship season leads to the qualification for the ERCC in accordance with two conditions (i.e., the first best ranked 4 teams from each country then the 3 highest ranked clubs not qualified thereafter), technical and tactical differences between teams were also expected in relation to the final ranking. Therefore, a comparison between winning teams' technical and tactical performances related to the 1<sup>st</sup>–4<sup>th</sup> and the 5<sup>th</sup>–7<sup>th</sup> teams were also compared, as well as between winning and losing performances (regardless of margin of victory) in the 1<sup>st</sup>–4<sup>th</sup> and the 5<sup>th</sup>–7<sup>th</sup> team subgroups.

According to previous studies [10, 11, 12], the KPIs presented in Table 1 were considered for the analysis. A further three KPIs (i.e., points scored over clean break, defenders beaten over try and offloads over defenders beaten), which were expressed as ratios (following a combination of two KPIs), were added to the analysis to provide additional and more accurate information of the performance.

**TABLE 1.** Description of all key performance indicators (KPIs) used for analyzing rugby games

#	KPI	Description
1	Possession (%)	Percentage ratio expressed by playing time handling the ball over total time
2	Territory (%)	Percentage ratio expressed by playing time in the opponent half of the pitch over total time
3	Tries for (n)	Occurrence of tries scored during a game (penalty tries included)
4	Tries against (n)	Occurrence of tries received (by the opponent team) during a game (penalty tries included)
5	Distance gained on possession (m)	Amount of metres covered by each player carrying the ball in the direction of the try line
6	Defenders beaten (n)	Occurrence of evasive ball carried by acting a side step or even pushing away the tackler resulting in missed tackle for the defence
7	Clean breaks (n)	Occurrence of offensive carries leading to a break in the first defensive line and to engage a defender from the second defensive line
8	Gain line carries (n)	Occurrence of ball carries leading to gain the advantage line
9	Passes (n)	Occurrence of completed (i.e., performed from a player to another team mate) passes
10	Offloads (n)	Occurrence of completed passes performed from the ball carriers, after being in contact with the tackler
11	Turnovers won (n)	Occurrence of possessions regained from the opponents
12	Kicks from hand (n)	Occurrence of possessions kicked during the ball in play time
13	Tackles made (n)	Occurrence of tackles completed
14	Tackles missed (%)	Percentage ratio expressed by missed tackles (i.e., without stopping of the ball carriers advancing) over total tackles performed
15	Ruck success (%)	Percentage ratio expressed by possession retained by means of the offenders intervention on the ruck situation over total rucks
16	Lineout success (%)	Percentage ratio expressed by the possession retained by means of the offenders on the lineout situation over total occurrence of lineout
17	Scrum success (%)	Percentage ratio expressed by the possessions retained by the offenders on the scrum situation over total occurrence of scrum
18	Points scored over clean break (n)	Ratio expressed by points scored during a clean break and total occurrence of clean break (which represents the offensive effectiveness because it consists into a clear attacking advantage which potentially leads to score points by performing a try or even gaining a penalty)
19	Defenders beaten over try (n)	Ratio expressed by the defenders beaten (i.e., evasive ball carries by acting a side step or even pushing away the tackler resulting in missed tackle for the defence) and tries for (i.e., tries scored during a game; penalty tries included)
20	Offloads over defenders beaten (n)	Ratio expressed by the offloads (i.e., completed passes performed by ball carriers, after being in contact with the tackler) and the defenders beaten (i.e., evasive ball carries by acting a side step or even pushing away the tackler determining a missed tackle of defence)

### Data Analysis

For each KPI, medians (Mdn) and 95% confidence limits were calculated for winning and losing teams. After applying the Shapiro-Wilk normality test for each KPI and assuming that normality was not confirmed ( $p \leq 0.05$ ), the non-parametric Mann-Whitney U test was used for all 20 KPIs to evaluate the differences between winning and losing teams in close and balanced games, the 1<sup>st</sup>–4<sup>th</sup> and 5<sup>th</sup>–7<sup>th</sup> winning teams, and all (i.e., regardless of game outcome) the 1<sup>st</sup>–4<sup>th</sup>

and the 5<sup>th</sup>–7<sup>th</sup> teams. Finally, to provide meaningful analysis for significant comparisons from small groups, the *phi* ( $\phi$ ) value was calculated for significant differences considering 0.1, 0.3, and 0.5 as small, medium, and large effect sizes, respectively [18]. The difference between medians (95% confidence interval) was reported only for those significantly different. Statistical analysis was conducted using GraphPad Prism (V6.0, GraphPad Software) and the criterion for significance was set at  $p \leq 0.05$ .

**RESULTS**

From the whole sample of games, 100 (38%, mean score difference = 4), 120 (45%, mean score difference = 15), and 44 (18%, mean score difference = 40) were close, balanced, and unbalanced, respectively. No game reported a draw final score.

*Winning and losing teams in close and balanced games*

Table 2 shows the descriptive statistics (i.e., medians and 95% confidence limits) of the 20 KPIs in relation to winning and losing games specifically related to close and balanced games.

Considering close games, a significant difference was observed in possession, gain line carries, and tackles made between winning and losing. Specifically, the winning team presented a higher score in tackles made [Mdn difference = 14, 95%CI (1–31),  $p=0.039$ ,  $\varphi=0.2$ ] and a lower score in possession [Mdn difference = -4, 95%CI (-6 to -1),  $p=0.0039$ ,  $\varphi=0.2$ ] and gain line carries [Mdn difference = -14, 95%CI (-23 to -1),  $p=0.05$ ,  $\varphi=0.2$ ] compared to the losing team. In contrast, in balanced games the winning team presented a higher score in tries for [Mdn difference = 3, 95%CI (2–3)  $p<0.0001$ ,  $\varphi=0.7$ ], metres gained in possession [Mdn

difference = 36, 95%CI (9–92),  $p=0.016$ ,  $\varphi=0.2$ ], clean breaks [Mdn difference = 2, 95%CI (1–4),  $p=0.0003$ ,  $\varphi=0.3$ ], offloads [Mdn difference = 2, 95%CI (1–4),  $p=0.05$ ,  $\varphi=0.2$ ], turnovers won [Mdn difference = 1, 95%CI (1–2),  $p=0.05$ ,  $\varphi=0.2$ ], kicks from hands [Mdn difference = 3, 95%CI (1–6),  $p=0.03$ ,  $\varphi=0.2$ ], scrum success [Mdn difference = 7, 95%CI (1–9),  $p=0.03$ ,  $\varphi=0.2$ ], points scored over clean break [Mdn difference = 1, 95%CI (1–2),  $p<0.0001$ ,  $\varphi=0.1$ ], and lower score in tries against [Mdn difference = -3, 95%CI (-3 to -2),  $p<0.0001$ ,  $\varphi=0.7$ ], tackles missed [Mdn difference = -4, 95%CI (-4 to -1),  $p<0.009$ ,  $\varphi=0.2$ ] and defenders beaten over try [Mdn difference = -4, 95%CI (-5 to -3),  $p<0.001$ ,  $\varphi=0.2$ ] compared to the losing team.

*Difference between the 1<sup>st</sup>–4<sup>th</sup> and 5<sup>th</sup>–7<sup>th</sup> winning teams*

Possession [Mdn difference = -6, 95%CI (-10 to -1),  $p=0.001$ ,  $\varphi=0.3$ ], gain line carries [Mdn difference = -25, 95%CI (-33 to -12),  $p=0.001$ ,  $\varphi=0.4$ ] and passes [Mdn difference = -38, 95%CI (-57 to -26),  $p<0.0001$ ,  $\varphi=0.5$ ] were lower in the 1<sup>st</sup>–4<sup>th</sup> compared to the 5<sup>th</sup>–7<sup>th</sup> team subgroup.

**TABLE 2.** Medians (95% confidence limits) of all performance indicators in relation to winning and losing performances in close (0–9 score difference) and balanced (10–26 score difference) games.

#	Performance indicators	Close games (1–9 points)		Balanced games (10–26 points)	
		Winning	Losing	Winning	Losing
1	Possession (%)	48 (45, 52)	52 (48, 55)*	53 (47, 54)	47 (46, 53)
2	Territory (%)	49 (45, 51)	52 (49, 55)	50 (46, 57)	48 (43, 53)
3	Tries for	2 (2, 3)	2 (2, 3)	4 (3, 4)	1 (1, 2)****
4	Tries against	2 (2, 3)	2 (2, 3)	1 (1, 2)	4 (3, 4)****
5	Metres gained on possession	390 (366, 460)	363 (341, 443)	401 (393, 450)	365 (324, 403)*
6	Defenders beaten	16 (13, 18)	15 (15, 17)	17 (14, 18)	14 (12, 17)
7	Clean breaks	7 (5, 8)	7 (5, 8)	8 (7, 10)	6 (5, 7)***
8	Gain line carries	115 (103, 129)	129 (118, 137)*	121 (107, 133)	120 (108, 141)
9	Passes	147 (131, 169)	153 (136, 163)	150 (136, 169)	162 (146, 173)
10	Offloads	9 (7, 10)	10 (7, 11)	10 (9, 12)	8 (7, 11)*
11	Turnovers won	6 (6, 7)	6 (5, 7)	7 (6, 8)	6 (5, 7)*
12	Kicks from hands	25 (21, 28)	25 (20, 27)	24 (21, 27)	21 (18, 23)*
13	Tackles made	137 (125, 145)	123 (104, 132)*	130 (106, 152)	121 (113, 139)
14	Tackles missed (%)	12 (11, 13)	13 (11, 14)	10 (9, 12)	14 (11, 15)**
15	Ruck success (%)	96 (96, 97)	96 (95, 96)	96 (96, 97)	96 (95, 97)
16	Lineout success (%)	92 (89, 94)	91 (85, 95)	90 (85, 94)	88 (86, 90)
17	Scrum success (%)	100 (100, 100)	100 (100, 100)	100 (100, 100)	93 (85, 100)**
18	Points scored over clean break	3.3 (2.5, 4.3)	3 (2.3, 3.6)	3.3 (2.9, 4.1)	2.2 (1.7, 2.7)****
19	Defenders beaten over try	6 (5.2, 7)	7.5 (5.5, 9.5)	4.5 (4, 5.4)	8 (7, 9.5)****
20	Offloads over defenders beaten	0.58 (0.5, 0.63)	0.6 (0.44, 0.74)	0.68 (0.54, 0.72)	0.64 (0.56, 0.74)

Note: \* ( $p \leq 0.05$ ), \*\* ( $p \leq 0.01$ ), \*\*\* ( $p \leq 0.001$ ), \*\*\*\* ( $p \leq 0.0001$ ) differences with respect to winning performances.

**TABLE 3.** Medians (95% confidence limits) of all performance indicators in relation to the 1<sup>st</sup>–4<sup>th</sup> and 5<sup>th</sup>–7<sup>th</sup> winning team subgroups, and winning and losing teams in the 1<sup>st</sup>–4<sup>th</sup> and 5<sup>th</sup>–7<sup>th</sup> subgroups.

#	Performance indicators	Winning		1 <sup>st</sup> –4 <sup>th</sup> team		5 <sup>th</sup> –7 <sup>th</sup> team	
		1 <sup>st</sup> –4 <sup>th</sup> team	5 <sup>th</sup> –7 <sup>th</sup> team	Winning	Losing	Winning	Losing
1	Possession (%)	47 (43, 51)	53 (47, 54)*	47 (43, 51)	51 (46, 56)	53 (47, 54)	53 (47, 56)
2	Territory (%)	48 (43, 53)	51 (46, 57)	48 (43, 53)	53 (45, 60)	51 (46, 57)	51 (46, 53)
3	Tries for	3 (2, 4)	3.5 (3, 4)	3 (2, 4)	2 (1, 2)***	3.5 (3, 4)	2 (1, 2)****
4	Tries against	2 (1, 2)	1 (1, 2)	2 (1, 2)	3 (3, 4)****	1 (1, 2)	3 (2, 4)***
5	Metres gained on possession	389 (341, 442)	439 (396, 470)	389 (341, 442)	359 (312, 454)	439 (396, 470)	383 (329, 445)
6	Defenders beaten	16 (13, 18)	16 (13, 20)	16 (13, 18)	15 (12, 18)	16 (13, 20)	17 (15, 21)
7	Clean breaks	7 (6, 9)	8 (7, 10)	7 (6, 9)	6 (4, 8)	8 (7, 10)	7 (7, 8)
8	Gain line carries	105 (98, 114)	130 (121, 139)***	105 (98, 114)	124 (108, 146)*	130 (121, 139)	136 (126, 154)
9	Passes	135 (119, 143)	173 (155, 189)***	135 (119, 143)	153 (124, 172)	173 (155, 189)	173 (158, 198)
10	Offloads	9 (7, 10)	10 (8, 12)	9 (7, 10)	9 (7, 12)	10 (8, 12)	11 (7, 12)
11	Turnovers won	7 (6, 8)	7 (6, 7)	7 (6, 8)	6 (5, 8)	7 (6, 7)	7 (5, 8)
12	Kicks from hands	27 (22, 30)	23 (21, 24)	27 (22, 30)	23 (18, 27)	23 (21, 24)	23 (16, 27)
13	Tackles made	143 (122, 151)	131 (119, 153)	143 (122, 151)	115 (96, 141)*	131 (119, 153)	131 (112, 164)
14	Tackles missed (%)	11 (10, 14)	11 (8, 13)	11 (10, 14)	15 (12, 16)*	11 (8, 13)	12 (7, 16)
15	Ruck success (%)	96 (95, 97)	96 (96, 97)	96 (95, 97)	96 (95, 97)	96 (96, 97)	96 (95, 98)
16	Lineout success (%)	92 (86, 93)	93 (85, 100)	92 (86, 93)	90 (85, 92)	93 (85, 100)	88 (83, 90)
17	Scrum success (%)	100 (100, 100)	100 (100, 100)	100 (100, 100)	100 (86, 100)	100 (100, 100)	100 (80, 100)*
18	Points scored over clean break	3.1 (2.7, 4.1)	3.3 (2.7, 4.1)	3.1 (2.7, 4.1)	2.8 (2, 3.8)	3.3 (2.7, 4.1)	2.1 (1.5, 2.9)**
19	Defenders beaten over try	5 (4.5, 6)	5.5 (4.3, 6.7)	5.2 (4.5, 6.5)	8 (7, 10)***	5.5 (4.3, 6.7)	8.5 (7, 16)****
20	Offloads over defenders beaten	0.58 (0.44, 0.68)	0.65 (0.54, 0.71)	0.58 (0.44, 0.68)	0.67 (0.47, 0.8)	0.65 (0.54, 0.71)	0.57 (0.38, 0.65)

Note: \* ( $p \leq 0.05$ ), \*\* ( $p \leq 0.01$ ), \*\*\* ( $p \leq 0.001$ ), \*\*\*\* ( $p \leq 0.0001$ ) differences with respect to the 1<sup>st</sup>–4<sup>th</sup> team subgroup (in the 1<sup>st</sup>–4<sup>th</sup> vs 5<sup>th</sup>–7<sup>th</sup> winning performance comparison), and with respect to winning performances (in winning and losing performance comparison singularly related to the 1<sup>st</sup>–4<sup>th</sup> and 5<sup>th</sup>–7<sup>th</sup> team subgroups).

#### *Difference between winning and losing performance in the 1<sup>st</sup>–4<sup>th</sup> and 5<sup>th</sup>–7<sup>th</sup> team subgroups*

Considering the 1<sup>st</sup>–4<sup>th</sup> teams, winning performances presented a higher score in tries for [Mdn difference = -1, 95%CI (-2 to -1),  $p < 0.0001$ ,  $\varphi = 0.5$ ] and tackles made [Mdn difference = -29, 95%CI (-35 to -1),  $p = 0.05$ ,  $\varphi = 0.2$ ] and a lower score in tries against [Mdn difference = 1, 95%CI (1–2),  $p < 0.0001$ ,  $\varphi = 0.6$ ], gain line carries [Mdn difference = 19, 95%CI (3–32),  $p = 0.016$ ,  $\varphi = 0.3$ ], tackles missed [Mdn difference = 4, 95%CI (1–5),  $p = 0.02$ ,  $\varphi = 0.3$ ] and defenders beaten over try [Mdn difference = 3, 95%CI (1–4),  $p = 0.0009$ ,  $\varphi = 0.4$ ]. For more details see Tables 3.

Considering the 5<sup>th</sup>–7<sup>th</sup> teams, winning performances showed a higher score in tries for [Mdn difference = 2, 95%CI (1–2),

$p < 0.0001$ ,  $\varphi = 0.5$ ], scrum success [Mdn difference = 1, 95%CI (1–13),  $p = 0.04$ ,  $\varphi = 0.2$ ], and points scored over clean break [Mdn difference = 1, 95%CI (1–2),  $p = 0.006$ ,  $\varphi = 0.2$ ], and a lower score in tries against [Mdn difference = -2, 95%CI (-2 to -1),  $p = 0.0002$ ,  $\varphi = 0.5$ ] and defenders beaten over try [Mdn difference = -3, 95%CI (-7 to -2),  $p < 0.0001$ ,  $\varphi = 0.1$ ]. For more details see Tables 3.

#### **DISCUSSION**

The aim of this study was to identify differences between winning and losing teams according to final game scores (i.e., margin of victory) and ranking position (i.e., the 1<sup>st</sup>–4<sup>th</sup>, the 5<sup>th</sup>–7<sup>th</sup> teams) in the northern hemisphere international club competition PRO12. As the main findings, PRO12 winning teams performing close games showed

a restricted number of KPI differences (i.e., possession, gain line carries, and tackles made) in comparison with losing teams, whereas several aspects can be considered to show the successful performance in balanced games. In addition, the three parameters that discriminate winning and losing teams in close games are characterized by a small effect size (which is regularly 0.2), partially confirming the first hypothesis for this specific game subgroup. In fact, despite the victory, the technical and tactical performance of winning teams is characterized by lower possession, defending more, and carrying the ball less than losing counterparts, even reporting similar occurrence of tries.

By contrast, in balanced games, winning teams were found to be clearly better than losing teams (due to large effect sizes) for the KPIs “tries for”, and consequently for “tries against”, and “clean breaks” (whereas “points scored over clean break”, and “defenders beaten over try” did not show strong significance or large effect sizes). The higher number of KPIs discriminating winning and losing teams in balanced games shows more similarities to the results reported in previous studies [4, 11], where kicking away possession and defending more effectively make winning teams able to prevent opponents from scoring tries, completing successful tackles, and obtaining more turnovers. In addition, these findings are in line with those reported by Jones *et al.* [2], who found that successful performances are systematically characterized by the winning of more turnovers. Nevertheless, an opposite scenario was reported in Super 12 [11], for which winners actually won fewer turnovers than losers, thus suggesting how technical and tactical analyses should regularly be conducted in relation to specific performance contests.

For the attacking side, it could be supposed that winners of balanced games are more skilled in running and decision making, considering the better performances in terms of tries for, clean breaks, and points scored over clean break. Therefore, this scenario could be related to the evidence reported by Wheeler and colleagues [19], for whom effective attacking strategies consisted of a specific side-stepping pattern for the straightening of the running line. In addition, ball carriers' ability, tackle-breaks, line-breaks, and offloading in the tackle were reported to promote try-scoring ability and positive phase outcomes as well [6, 20, 21, 22]. Finally, winning teams made less effort in beating defenders per action and obtained a better score point each break-line. Therefore it could be speculated that the higher values regarding tries for and clean breaks reported by winning teams during balanced games can be associated with a more efficient tactical plan which allows one to avoid contact, to break the line, to offload the ball, and therefore to score more points [23]. As a consequence, differently from close games, the first hypothesis can be accepted in consideration of the balanced game subgroup.

Since the final ranking in the regular PRO12 Championship season affects the qualification for ERCC, performances in the 1<sup>st</sup>–4<sup>th</sup> and the 5<sup>th</sup>–7<sup>th</sup> team subcategories were compared as well. In particular, the winning performances of the 5<sup>th</sup>–7<sup>th</sup> teams showed higher possession ( $\varphi = 0.3$ ), gain line carries ( $\varphi = 0.4$ ), and passes

scores ( $\varphi = 0.5$ ) compared to 1<sup>st</sup>–4<sup>th</sup> teams. In other words, the 1<sup>st</sup>–4<sup>th</sup> team subgroup is more oriented to providing a solid defence (also due to a lower value of possession) than the 5<sup>th</sup>–7<sup>th</sup> teams winning counterparts, which proved to be more offensive oriented. However, in general, the winning performances of the 1<sup>st</sup>–4<sup>th</sup> and 5<sup>th</sup>–7<sup>th</sup> team subgroups were quite homogeneous, leading to the rejection of the second experimental hypothesis.

In this study, a combination of game outcomes and ranking positions has also been provided, analyzing winning and losing performances in the 1<sup>st</sup>–4<sup>th</sup> and 5<sup>th</sup>–7<sup>th</sup> team subgroups. Main effects (medium ESs) emerged for the tries for (more in winning), and tries against (more in losers) KPIs, as well as for defenders beaten over try and tackles missed (more in losers) only in the 1<sup>st</sup>–4<sup>th</sup> teams. Therefore, a similar scenario with respect to the balanced game samples emerged (the same three large differences in the 1<sup>st</sup>–4<sup>th</sup> and 5<sup>th</sup>–7<sup>th</sup> team subgroups of the four ones that emerged for balanced games), thus supporting the third hypothesis of the study.

In conclusion, the present study revealed that in the PRO12 Championship: i) although only small differences can be identified between winning and losing performances in close games, the same comparison in balanced games seems to be based on scrum success, higher evasion skills that leads to more offloads, more breaklines and more metres gained in possession, a kicking based game plan and higher attacking efficiency (more points scored per each breakline and less technical individual work rate per try); ii) the 1<sup>st</sup>–4<sup>th</sup> winning teams are more oriented to a defensive game plan (less possession, fewer passes and carries) than those of the 5<sup>th</sup>–7<sup>th</sup> subgroup; and iii) winning and losing teams in the 1<sup>st</sup>–4<sup>th</sup> and 5<sup>th</sup>–7<sup>th</sup> team subgroups reported quite similar technical and tactical differences, which were similar to those of the balanced subgroup.

However, the exclusive consideration of the final ranking of teams instead of considering the progressive ranking at the time of games can represent a limitation for the present study. In fact, possible fluctuations during the competition could crucially alter the playing styles of teams throughout the season. As a consequence, further studies should be focused on the influence of current team ranking on playing style as well as concurrent physiological factors (i.e., heart rate responses), time motion parameters (i.e., indicators editable from global positioning systems), neuromuscular effects (i.e., strength and power of upper and lower limbs), psychometric questionnaire (i.e., rating of perceived exertion), tending to promote an integrated approach, which is able to more deeply investigate the real effect of the rugby union performance.

## CONCLUSIONS

The present study demonstrated how technical and tactical aspects are influenced in relation to the game outcome and ranking position. In consequence, coaches and physical trainers should be aware that the effectiveness of international winning teams depends on a strong defence, tackling, scrumming, breaking the defensive line and performing more possessions during the attacking phase. Nevertheless,

according to van Rooyen and colleagues [24], the amount of attacking possession does not absolutely predict success in rugby union. Therefore, the effective training strategy should be oriented on “how” to effectively use possession instead of “how much” possession a team should gain. In line with this point of view, strength and conditioning training should be focused on enhancing isometric strength to support effective scrumming. In addition, improvements in dynamic strength could primarily favour explosive movements and repeated sprint ability with and without change of direction, and consequently improve the capability to gain distance (meters) during possessions as well as to perform effective tackles during defending phases.

In line with the findings of this study, coaches could train the offensive game actions with the aim of scoring a try or obtaining a penalty kick for every single line break performed. Consistently with this training scenario, coaches could also practise training skills to

quickly offload the ball once the line break is achieved, arranging both the ball carriers and the closest carriers’ supporters to maintain the momentum and tend to score a try. For example, the combination of cognitive (i.e., the ability to quickly recognize the defensive setting and to identify the gaps to attack) and conditioning (i.e., by delaying the supporters’ action once the ball carriers start to play) workouts could effectively stimulate players in performing offensive actions, which could determine line breaks.

Practically, a progression from simple to complex tasks (i.e., from a low to high number of involved players) to quickly create the breakline and keep the momentum could stimulate players from a technical and tactical point of view as well as in terms of physical conditioning (i.e., strength, repeated sprint ability with and without the ball, cognitive exercises).

## REFERENCES

- Halsol SL. Monitoring training load to understand fatigue in athletes. *Sports Med.* 2014;44(2):139–147.
- Jones NM, Mellalieu SD, James N. Team performance indicators as a function of winning and losing in rugby union. *Int J Sports Physiol Perf.* 2004; 4(1):61–71.
- McKenzie AD, Holmyard DJ, Docherty D. Quantitative analysis of rugby: factors associated with success. *J Hum Mov Stud.* 1989;17:101–113.
- Ortega E, Villarejo D, Palao JM. Differences in game statistics between winning and losing rugby teams in the Six Nations Tournament. *J Sports Sci Med.* 2009;8(4):523–527.
- Ungureanu AN, Condello G, Pistore S, Conte D, Lupo C. Technical and tactical aspects in Italian youth rugby union in relation to different academies, regional tournaments, and outcomes. *J Strength Cond Res.* 2019;33(6):1557–1569.
- Wheeler KW, Askew CD, Sayers MG. Effective attacking strategies in rugby union. *Eur J Sport Sci.* 2010; 10(4):237–242.
- Blair MR, Elsworth N, Rehner NJ, Button C, Gill ND. Physical and Physiological Demands of Elite Rugby Union Officials. *Int J Sports Physiol Perf.* 2018;13(9):1199–1207.
- Jones NM, James N, Mellalieu SD. An objective method for depicting team performance in elite professional rugby union. *J Sports Sci.* 2008; 26(7):691–700.
- van Rooyen KM, Lambert IM, Noakes DT. 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. *Int J Perf Anal Sport.* 2006; 6(1):57–72.
- Vaz L, Mouchet A, Carreras D, Morente H. The importance of rugby game-related statistics to discriminate winners and losers at the elite level competitions in close and balanced games. *Int J Perf Anal Sport.* 2011; 11(1):130–141.
- Vaz L, Van Rooyen M, Sampaio J. Rugby game-related statistics that discriminate between winning and losing teams in IRB and Super twelve close games. *J Sports Sci Med.* 2010;9(1):51–55.
- Vaz L, Carreras D, Kraak W. Analysis of the effect of alternating home and away field advantage during the Six Nations Rugby Championship. *Int J Perf Anal Sport.* 2012;12(3):593–607.
- Lupo C, Tessitore A. How important is the final outcome to interpret match analysis data: The influence of scoring a goal, and difference between close and balance games in elite soccer: Comment on Lago-Penas and Gomez-Lopez (2014). *Percept Mot Skills.* 2016; 122(1):280–285.3
- Lupo C, Condello G, Tessitore A. Notational Analysis of Elite Men’s Water Polo Related to Specific Margins of Victory. *J Sports Sci Med.* 2012; 11(3):516–525.
- Hopkins WG, Hawley JA, Burke LM. Design and analysis of research on sport performance enhancement. *Med Sci Sports Exerc.* 1999;31(3):472–485.
- Hughes MD, Bartlett RM. The use of performance indicators in performance analysis. *J Sports Sci.* 2002; 20(10):739–754.
- Sampaio J, Janeira M. Statistical analyses of basketball team performance: understanding teams’ wins and losses according to a different index of ball possessions. *Int J Perf Anal Sport.* 2003;3(1):40–49.
- Huck SW, Cormier WH, Bounds WG. Reading statistics and research. New York, NJ: Harper & Row, 1974.
- Wheeler K, Sayers M. Contact skills predicting tackle-breaks in rugby union. *Int J Sports Sci Coa.* 2009; 4(4):535–544.
- Correia V, Araujo D, Craig C, Passos P. Prospective information for pass decisional behavior in rugby union. *Hum Mov Sci.* 2011;30(5):984–997.
- den Hollander S, Brown J, Lambert M, Treu P, Hendricks S. Skills associated with line breaks in Elite Rugby Union. *J Sports Sci Med.* 2016; 15(3):501–508.
- Sayers MG, Washington-King J. Characteristics of effective ball carries in Super 12 rugby. *Int J Perf Anal Sport.* 2005;5(3):92–106.
- Hendricks S, Roode B, Matthews B, Lambert M. Defensive strategies in rugby union. *Percept Mot Skills.* 2013; 117(1):65–87.
- van Rooyen KM, Noakes DT. Movement time as a predictor of success in the 2003 Rugby World Cup Tournament. *Int J Perf Anal Sport.* 2006;6(1):30–39.