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Performance metrics that matter: assessing winning and losing teams in women's Rugby union

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ABSTRACT

The aim of this study was to identify key performance indicators (KPI) that differentiated winning and losing teams, and how KPI may vary in balanced and unbalanced matches in Australian domestic women's Rugby Union (RU). Four seasons of the Buildcorp Super W competition (2019–2022), round and final matches ($n = 47$) were analysed by an experienced performance analyst using computerised notational analysis software (Hudl SportsCode) to identify various KPI that occurred throughout a match. Findings showed that winning teams had greater ball-carrying efficiency, quick ruck speed, greater field-based tactics, greater successful conversions, and created more scoring opportunities while losing teams had poorer goal-kicking performance, greater number of rucks lost, and unsuccessful set piece performance. However, in balanced matches, only greater scoring opportunities, possession, and kicking performance discriminated between winning and losing teams. Winning teams in unbalanced matches had greater scoring opportunities, kicking performance, possession, territory, ball-carrying efficiency, and ruck performance, whilst losing teams had a greater number of rucks lost and lineouts lost. These results suggest some performance metrics can differ between balanced and unbalanced matches. Coaches may use these findings to help evaluate match performances based on scoring differential, as well as influence possession-in-territory, and kicking tactics, to increase scoring opportunities.

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Performance analysis; Rugby union; performance indicators; match outcome

1. Introduction

Performance analysis (PA) is becoming common practice in professional team sports, with previous research highlighting the benefits to coaching practices, improving training outcomes, and assisting in team selections (M. Hughes & Bartlett, 2002; L. Hughes et al., 2017). The capacity to collect and interpret data into meaningful information for coaches is an important aspect of a performance analyst's role, as it allows coaches to

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make more informed technical and tactical decisions (Lyle, 2002). One approach to delivering meaningful information to coaches involves quantifying important on-field events, known as key performance indicators (KPI). Performance indicators are defined as a group of variables that can contribute to the overall performance (M. Hughes & Bartlett, 2002; Ortega et al., 2009). Previous studies have investigated the use of KPI in predicting match outcomes in men's XV's international and domestic rugby union (RU) competitions (Bishop & Barnes, 2013; Jones et al., 2004; Ortega et al., 2009; Vaz et al., 2010, 2011); however, there has been very little research exploring the utility of KPI in women's XV's domestic RU competitions (Barkell et al., 2017; A. Hughes et al., 2017).

Previous research has investigated a large number of KPI used to identify which are the best predictors of the match outcome and those that are crucial to a team's success (Bishop & Barnes, 2013; A. Hughes et al., 2017; Jones et al., 2004, 2008; Mosey & Mitchell, 2020; Schoeman & Schall, 2019). For example, Jones et al. (2004) investigated the efficacy of team KPI to predict winning and losing in domestic professional European men's RU. They found that a greater number of tries scored and lineouts won from the opposition's throw successfully distinguished between winning and losing teams (Jones et al., 2004). Jones et al. (2004) also suggested that while only two KPI were significant, winning teams generally had better success rates across all KPI. Atkinson (2003) previously emphasised that statistical and practical significance are both important in sports performance. Therefore, KPI such as turnovers won and lineout success, while not statistically significant, practically saw winning teams have greater success rates than losing teams which also supports similar work from M. Hughes and White (1997) who reported lineout performance as an indicator of match outcome. Ortega et al. (2009) examined the differences between winning and losing teams in the Six Nations competition and highlighted that winning teams had a higher tackle completion percentage, more linebreaks, fewer turnovers, and possessions kicked. While in contrast, other studies found different KPI contributed to team success when playing for territory rather than possession, such as conceding a lower number of penalties, more kicks in play and set piece success (Bishop & Barnes, 2013; A. Hughes et al., 2017; Mosey & Mitchell, 2020). In addition, another study in rugby sevens also found various KPI that can differentiate between winning and losing teams including 22 m entries and conversion percentage, total tackles, passes and rucks, greater tackles completion percentage (Higham et al., 2014). This variability in KPI differentiating between winning and losing teams is likely due to differences in the contextual factors of elite Rugby Union, such as playing styles between hemispheres, different competitions (e.g. domestic and international games) or men's and women's playing styles (A. Hughes et al., 2017; Kraak & Welman, 2014; Ortega et al., 2009; Schoeman & Schall, 2019; van Rooyen, 2012; Vaz et al., 2011). However, little research has been conducted to investigate the impact of KPI in distinguishing match outcomes in women's domestic XV RU competitions.

Despite current research investigating the ability of KPI to discriminate between winning and losing teams, this body of work has predominately been focused on men's competition. Previous studies have compared the physical demands of men's and women's RU and reported that men covered greater distances during a match at a higher average speed, spent more time in the high-intensity running zone, and had a greater average number of impacts than the female game (Cunniffe et al., 2009; Suarez-Arrones et al., 2014). A. Hughes et al. (2017) investigated differences in KPI that

discriminate between winning and losing teams in both men's and women's RU from the 2014 Rugby World Cups and reported differential KPI predicting match outcome. For example, only total kicks and ruck performance discriminated between winning and losing teams in the men's game, while total carries, line breaks, tackle breaks, and ruck performance were all discriminatory KPIs in the women's game (A. Hughes et al., 2017). A. Hughes et al. (2017) also found that regardless of sex, lineouts won off the opposition's ball was also an important KPI that discriminated between winning and losing teams. While one study has investigated the women's game at the international level, there has been no empirical investigation at the professional domestic level. This is despite the plethora of literature examining the men's game and the exponential growth within the women's game and the increasing professional contracts available for women in professional RU competitions.

The recent entry into the professional sport may also create large performance differences initially between women's teams, which may impact the utility of analysing KPI to discriminate between winning and losing teams. For example, some domestic organisations had already implemented well-developed pathways and semi-professional female players, whilst others may not have developed supported player developmental systems. For example, in 2019, England and France were the first countries to fully professionalise their women's game, while a number of other international teams are yet to follow suit offering players full-time contracts. This creates some challenges for performance analytics, as there may be greater than expected performance discrepancies, particularly during the early years of the competition, which can skew certain KPI (Carroll, 2013; McDermott et al., 2021). A large range in individual experience, skill levels, and player depth within a team can cause large variances in the strength of opposition, causing large differences in the score-line and leading to balanced (i.e. close scoring matches) and unbalanced matches (i.e. large points differential between teams). Therefore, the aim of this study was to identify those KPI that best differentiate winning and losing teams in a domestic women's RU competition. Additionally, to investigate KPI during both balanced and unbalanced matches that result in large score-line discrepancies between counterparts' performance. Gaining a greater understanding of KPI that differentiate between winning and losing teams in the women's game can assist coaches and support staff in evaluating match performance and developing and implementing technical and tactical approaches to improve their chances of team success.

2. Methods

2.1. Design & sample

Matches across four seasons of the Australian domestic competition, the Buildcorp Super W, from 2019 to 2022 were retrospectively analysed using computerised notational analysis software (Hudl SportsCode Elite software v 12.4, Australia). Across the four seasons, a total of $n = 47$ matches were played including rounds ($n = 43$) and finals ($n = 4$). A total of seven teams competed across the four seasons, with four of these teams appearing consistently through the seasons, and the expansion of the competition from a five-team competition to a six-team

competition in 2021 and 2022. Various team KPI were analysed and collated across all teams within the competition.

2.2. Performance indicators

Based on a previous study by Callinan et al. (2023) in which various coaches were interviewed and the following KPI were identified as being important to coaches. Therefore, the KPI collected included: try scored, successful conversion, unsuccessful conversion, penalty conversion made, penalty conversion missed, linebreaks, gainline carries, total kicks in play, penalties won, penalties conceded, turnover conceded, rucks won, rucks lost, quick ruck speed, average ruck speed, slow ruck speed, lineouts won, lineouts lost, scrums won, and scrums lost (Table 1). Additionally, teams' total possession and territory throughout a match were also calculated. Total possession was calculated by the total length in time of instances in row "Team Phase Ball" for each respective team. Total territory was calculated by the total length in time of instances in rows "Team1 A", "Team1 B", "Team2 C", and "Team2 D" and vice versa for Team 2. From this, territory percentage was also calculated by splitting the field into four "zones", attacking 22 m (A Zone), attacking 22 m-50 m (B Zone), defensive 50-22 m (C Zone), and defensive 22 m (D Zone). Finally, the number of entries into the 22 m/A zone and

Table 1. Key performance indicator definitions.

Key Performance Indicator	Definition
Try Scored	Attacking team grounds, the ball over the opponent's goal line.
Successful Conversion	Successfully kicking the ball between the two posts and over the cross bar.
Unsuccessful Conversion	Unsuccessful attempt kicking the ball between the two posts and over the cross bar.
Penalty Conversion Made	A team that has been awarded a penalty opts for a shot at goal and successfully kicks the ball between the two posts and over the cross bar.
Penalty Conversion Missed	A team that has been awarded a penalty opts for a shot at goal and is unsuccessful.
Linebreaks	Ball carrier breaks through the defensive line without being tackled.
Gainline Carries	Ball carrier advances past an imaginary line across the pitch that separates both teams.
Total Kicks in Play	The total number of times a team kicks the ball within a match.
Penalties Won	A disciplinary sanction awarded by the referee to a team when the opposition commits an infringement.
Penalties Conceded	A disciplinary sanction awarded by the referee against a team when they commit an infringement.
Turnover Conceded	Possession of the football shifts from the attacking team to the defending team via an error.
Rucks Won	A ruck is formed, and the attacking team recycles the football and retains possession.
Rucks Lost	A ruck is formed, and the attacking team does not recycle the football and losses possession.
Quick Ruck Speed	The football is recycled from a ruck between 0-3seconds.
Average Ruck Speed	The football is recycled from a ruck between 3-6seconds.
Slow Ruck Speed	The football is recycled from a ruck greater than 6seconds.
Lineouts Won	A lineout is used to restart play after the football has gone outside the field of play, and possession is retained by the team throwing the football back into the field of play.
Lineout Lost	A lineout is used to restart play after the football has gone outside the field of play, and possession is lost by the team throwing the football back into the field of play and gained by the opposition.
Scrums Won	A scrum is used to restart play after a stoppage in the field of play, and possession is retained by the team feeding the scrum.
Scrums Lost	A scrum is used to restart play after a stoppage in the field of play, and possession is lost by the team feeding the scrum and gained by the opposition.

percentage points conversion from 22 m entries were calculated by the number of successful entries (points scored) divided by the total number of entries into the 22 m/A zone.

2.3. Procedure

All matches were analysed by an experienced (>5 years professional experience) performance analyst with an in-depth understanding of rugby union using an analysis template of various KPI which created a code and timeline of events that took place during each match. All data collected from the match were then exported to Microsoft Excel (Microsoft Corporation, Washington, U.S.A.) and collated across all 47 matches for both teams resulting in 94 data sets. Intra-rater reliability was conducted on a random sample of matches (~10%) separated by at least 6-months. Intraclass correlation coefficient (ICC) were run on all KPI individually, with all ICC reporting Good to Excellent inter-rater reliability categories (0.805–1 ICC).

In order to control for the contextual variable of match type, a two-step cluster model was run and identified two types of matches based on points difference in the score: balanced (16.2 ± 11.7 points; $n = 36$) and unbalanced (65.3 ± 22.1 points; $n = 11$) games.

2.4. Statistical analysis

Firstly, data normality assumptions were assessed using the Shapiro-Wilk test ($p > 0.05$). Then, descriptive results were presented as mean and standard deviation (SD) for winning and drawing/losing teams in all variables for each context: all, balanced and unbalanced games. Secondly, a t-test for independent samples was run for identifying univariate differences between win vs draw/lose. Thirdly, a discriminant analysis model was performed to identify the performance indicators that best discriminate winning and drawing/losing teams in all, balanced and unbalanced games. By checking the structural coefficients (SC) identified in the model where SC differences above $|0.30|$ were considered significant (Pedhazur, 1982). Validation of discriminant models was conducted using leave-one-out classification (NorušNorušIs, 2004). The cross-validation was also tested using the leave-one-out classification analysis, taking the percentage of correct classification obtained (Tabachnick & Fidell, 2007).

All analyses were run using the statistical software IBM SPSS for McIntosh, version 26.0 (IBM Corp., Armonk, NY) and statistical significance was set at $p < 0.05$.

3. Results

Table 2 presents the means and SD for the KPI for winning and drawing/losing teams during all games. The results of univariate analysis for independent samples showed statistically significant differences between winning and drawing/losing teams, with higher values for winning teams in successful and missed conversions, possession, territory, 22 m entries, 22 m conversion%, line breaks, gain line carries, total kicks, and quick ruck speed than drawing/losing teams (Table 2). On the contrary, drawing/losing teams showed higher values than winning teams in penalty conversion missed, rucks lost, lineout lost, and scrum lost (Table 1).

Table 2. Mean and standard deviations for KPI and univariate differences for winning and drawing/losing teams in all games of a women's domestic XV RU competition between 2019 and 2022.

Performance indicator	Won		Draw/Lost		p
	Mean	SD	Mean	SD	
Conversion Successful	3.42	2.94	0.76	0.88	<0.001#
Conversion Missed	2.42	1.41	0.73	0.73	<0.001#
Penalty Conversion Successful	0.33	0.60	0.20	0.41	0.223
Penalty Conversion Missed	0.02	0.15	0.20	0.50	0.021*
Possession	53.78	7.10	46.53	6.91	<0.001#
Territory	54.31	11.75	46.04	11.63	0.001**
22m Entries	13.89	5.18	7.57	4.45	<0.001#
22m Conversion %	43.81	20.42	18.48	15.08	<0.001#
Linebreaks	5.80	4.24	2.22	1.75	<0.001#
Gainline Carries	60.76	13.62	47.33	16.11	<0.001#
Total Kicks	10.69	4.48	8.80	3.80	0.029*
Penalty Won	11.42	4.66	11.88	4.78	0.642
Turnover Conceded	14.56	4.36	14.29	4.08	0.757
Ruck Won	69.64	17.51	67.55	19.27	0.584
Ruck Lost	1.58	1.16	2.41	1.72	0.008**
Quick Ruck Speed	42.69	14.20	34.59	13.59	0.006**
Average Ruck Speed	19.20	6.97	20.00	8.17	0.612
Slow Ruck Speed	10.42	7.64	13.27	7.49	0.072
Lineout Won	3.42	2.94	7.67	3.81	0.944
Lineout Lost	2.42	1.41	3.22	2.17	0.002**
Scrum Won	0.33	0.60	7.57	3.42	0.681
Scrum Lost	0.02	0.15	1.78	1.62	0.021*

* $p < 0.05$; ** $p < 0.01$; # $p < 0.001$.**Table 3.** Mean and standard deviations for KPI and univariate differences for winning and drawing/losing teams in balanced ($n = 36$), and unbalanced ($n = 11$) games of a women's domestic XV RU competition between 2019 and 2022.

Performance indicator	Balanced				p	Unbalanced				
	Won		Lost			Won		Lost		
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Conversion Successful	2.21	1.41	0.92	0.91	<0.000#	7.18	3.28	0.18	0.41	<0.001#
Conversion Missed	2.00	1.10	0.79	0.74	<0.000#	3.73	1.49	0.55	0.69	<0.001#
Penalty Conversion Successful	0.41	0.66	0.24	0.43	0.182	0.09	0.30	0.09	0.30	1.000
Penalty Conversion Missed	0.03	0.17	0.24	0.54	0.036*	0.00	0.00	0.09	0.30	0.329
Possession	51.79	6.38	48.39	6.09	0.024*	59.91	5.74	40.09	5.74	<0.001#
Territory	53.00	12.69	47.32	12.40	0.059	58.36	7.22	41.64	7.22	<0.001#
22m Entries	12.68	4.58	8.53	4.38	<0.000#	17.64	5.30	4.27	2.97	<0.001#
22m Conversion %	36.75	15.54	19.93	14.53	<0.000#	65.63	18.56	13.48	16.61	<0.001#
Linebreaks	4.35	3.07	2.50	1.78	0.002**	10.27	4.34	1.27	1.27	<0.001#
Gainline Carries	57.26	12.50	51.34	15.59	0.082	71.55	11.46	33.45	8.57	<0.001#
Total Kicks	11.00	4.42	9.26	3.86	0.080	9.73	4.71	7.18	3.25	0.156
Penalty Won	12.15	4.98	12.18	5.05	0.975	9.18	2.52	10.82	3.74	0.243
Turnover Conceded	14.74	4.69	14.47	4.23	0.804	14.00	3.26	13.64	3.64	0.807
Ruck Won	67.35	16.42	72.39	18.57	0.229	76.73	19.64	50.82	10.48	0.001**
Ruck Lost	1.68	1.20	2.26	1.59	0.084	1.27	1.01	2.91	2.12	0.032*
Quick Ruck Speed	40.03	11.63	36.29	13.84	0.222	50.91	18.50	28.73	11.39	0.003**
Average Ruck Speed	18.74	6.81	21.61	8.15	0.112	20.64	7.61	14.45	5.61	0.042*
Slow Ruck Speed	11.74	8.27	14.95	7.64	0.091	6.36	2.69	7.45	2.30	0.319
Lineout Won	7.94	3.50	8.29	4.02	0.698	6.64	1.91	5.55	1.81	0.184
Lineout Lost	2.12	1.59	3.13	2.04	0.023	1.55	1.04	3.55	2.66	0.031*
Scrum Won	8.26	4.35	7.42	3.31	0.355	6.73	2.69	8.09	3.91	0.352
Scrum Lost	1.24	1.30	1.63	1.44	0.227	0.55	1.04	2.27	2.15	0.026

* $p < 0.05$; ** $p < 0.01$; # $p < 0.001$.

Table 4. Discriminant analysis structure coefficients for KPI of winning and drawing/losing teams in all ($N = 47$), balanced ($n = 36$), and unbalanced ($n = 11$) games of a women's domestic XV RU competition between 2019 and 2022.

Performance indicator	All	Balanced	Unbalanced
Conversion Successful	0.43*	0.35*	0.02
Conversion Missed	0.52*	0.36*	-0.00
Penalty Conversion Successful	0.09	0.10	0.00
Penalty Conversion Missed	-0.16	-0.16	-0.16
Possession	0.35*	0.18	0.03
Territory	0.24	0.15	0.02
22m Entries	0.45*	0.30*	0.03
22m Conversion %	0.48*	0.36*	0.02
Linebreaks	0.38*	0.24	0.02
Gainline Carries	-0.24	0.13	0.03
Total Kicks	0.16	0.14	0.01
Penalty Won	-0.03	-0.01	-0.00
Turnover Conceded	0.02	0.19	0.00
Ruck Won	0.38*	-0.09	0.01
Ruck Lost	-0.19	-0.13	-0.01
Quick Ruck Speed	0.20	0.09	0.01
Average Ruck Speed	-0.36*	-0.12	0.01
Slow Ruck Speed	-0.13	-0.13	-0.00
Lineout Won	-0.01	-0.03	0.01
Lineout Lost	-0.23	-0.18	#
Scrum Won	0.03	0.07	#
Scrum Lost	-0.16	-0.09	#
Eigenvalue	2.22	2.49	4.23
Wilks Lambda	0.31	0.29	0.00
Canonical correlation	0.83	0.85	1
χ^2	94.79	73.76	87.68
df	22	22	19
p	<.001	<.001	<.001
Reclassification %	80.9	81.9	100

*Structure coefficients discriminant value $\geq |0.30|$.

#= For unbalanced matches the variables lineout lost, scrum won and scrum lost were excluded from the model.

During balanced and unbalanced games, winning teams had more successful and missed conversions, possession, 22 m entries, 22 m conversion%, and line breaks, than drawing/losing teams (Table 3). During balanced matches ($n = 36$) winning teams also obtained more penalty conversions than drawing/losing teams (Table 3). Additionally, during unbalanced games ($n = 11$), winning teams showed higher values in territory, gain line carries, rucks won, quick ruck speed, and average ruck speed, and the losing teams had more rucks lost and lineout lost (Table 3).

The discriminant analysis models were statistically significant (all $p < 0.001$) and allowed to differentiate between winning and drawing/losing teams (see Table 4). The cross-validation percentages obtained were 80.9% for all games, 81.9% for balanced games, and 100% for unbalanced games. The most powerful KPI discriminating between winning and drawing/losing teams during all games were the conversion successful (SC = 0.43), conversion missed (SC = 0.52), possession (SC = 0.35) 22 m entries (SC = 0.45), 22 m conversion% (SC = 0.48) linebreaks (SC = 0.38), rucks won (SC = 0.38), and average ruck speed (SC = -0.36). For unbalanced games, only successful conversions (SC = 0.35), conversions missed (SC = 0.36), 22 m entries (SC = 0.30), and 22 m conversion% (SC = 0.36)

discriminated between winning and drawing/losing teams. Lastly, the unbalanced matches did not show any discriminant KPI between winning and drawing/losing teams.

4. Discussion

The purpose of this study was to investigate KPI that best differentiated winning and losing teams in a women's domestic XV RU competition between 2019 and 2022. Additionally, we sought to control for balanced and unbalanced matches, to provide practitioners with more contextually relevant information regarding KPI discriminating match outcomes. The results showed that winning teams demonstrated greater ball-carrying efficiency (e.g. more gainline carries, and linebreaks), faster ruck speed, and better field-based tactical strategy (e.g. greater possession, territory, and total kicks), superior kicking performance (more successful conversions) and created more scoring opportunities (e.g. greater linebreaks, 22 m entries & 22 m conversion percentage). Alternatively, losing teams had poorer goal kicking (e.g. missed penalty conversions and conversions) and ruck performances (e.g. rucks lost) whilst also ineffective set piece performances (e.g. lineouts and scrums lost). This information can allow coaches to make informed decisions when developing and evaluating match tactics and assist in highlighting areas of team performance that could impact the match outcome. However, in balanced matches fewer KPI were identified and only included greater scoring opportunities, possession, and kicking performance (successful and missed conversions). However, it should be noted that missed conversions was analysed as an absolute number, rather than a percentage of total conversions. Similarly, winning teams in unbalanced matches saw greater scoring opportunities, kicking performance, possession and field position, ball-carrying efficiency, and ruck performance, whilst losing teams experienced a greater number of rucks and lineouts lost. Common to winning teams in either balanced or unbalanced matches, possession and kicking performance likely increased scoring opportunities. Therefore, coaches should consider this information when planning these technical and tactical aspects of RU and should implement match tactics and training strategies targeted to improve these KPI to increase the likelihood of a favourable match outcome.

The capacity for teams to achieve gainline carries and create more linebreaks throughout a match can lead to greater try-scoring opportunities (Bracewell, 2003; Bremner et al., 2013; A. Hughes et al., 2017). Our results showed that greater gainline carries and linebreaks were KPI that clearly differentiated between winning and losing teams. This is supported by A. Hughes et al. (2017) on their findings in the women's game at an international level, in which winning teams were shown to have a greater number of gainline carries and linebreaks. Previous research in men's RU has also reported similar findings, speculating that the winning teams' linebreaks were likely linked to lower tackle completion percentage by their opposition (Bishop & Barnes, 2013; A. Hughes et al., 2017; Jones et al., 2004). Bracewell (2003) also found that teams that created greater linebreak opportunities were able to promote try-scoring opportunities in the subsequent phases, and that greater gainline carries were more successful at creating try-scoring opportunities than their opposition (Bennett et al., 2019; Bremner et al., 2013; Sasaki et al., 2007). A team's ability to create linebreak opportunities and make gainline carries

have previously been associated with team success in the men's game and are characteristics of a strong ball-carrying team (Bennett et al., 2019). Therefore, coaches should look to develop an attacking playing style that promotes more gainline carries and creates linebreaks.

A team's ability to retain possession of the ball and control territory were also shown to be distinguishing factors between winning and losing teams in the women's domestic competition. The results of this study show that winning teams have greater field-based tactics (territory and possession), assisted by a dominant kicking game. Winning teams in the men's game have been shown to achieve greater possession, territory, and total kicks than their opposition (A. Hughes et al., 2017; Ortega et al., 2009; Vaz et al., 2011, 2015). Specifically, Ortega et al. (2009) found that winning teams had a greater number of possessions that ended in kicks or kicks to touch than the losing teams, which suggests that a more possession driven tactic was implemented by the winning teams. Other studies also suggest that teams that kick away possession and can limit opposition to their own territory, were able to regain possession in a better field position (Vaz et al., 2011, 2015). A. Hughes et al. (2017) suggested that men's teams had successful match outcomes when tactical kicking in game was used to apply pressure to the opposition, resulting in the attacking team forcing a turnover or gaining territory that enabled greater scoring opportunities. In contrast, during the women's RU World Cup, A. Hughes et al. (2017) reported that winning teams preferred to use a possession-based strategy when in the opposition's half, rather than kicking for territory. However, the results from this study show that in the women's domestic game, winning teams preferred playing a kick dominate game to gain greater territory and possession which could present a tactical point of difference of coaches within that domestic competition compared to the international game.

Supporting the successful adoption of a kick dominant game style and forcing turnovers was evident in the current study by the greater number of 22 m entries and 22 m conversion percentage. The ability to enter the opposition's defensive 22 m is suggested to contribute to a team's success, as it provides an ideal scoring opportunity for linebreaks or gainline carries. This study found that winning teams had a greater number of 22 m entries throughout a match and were able to score points more often than the opposition when entering this zone. Previous studies have shown that a team's ability to enter their 22 m zone more often than the opposition was more likely to score points and therefore score more points overall (Hunter & O'Donoghue, 2001; Jones et al., 2004; Watson et al., 2017). Watson et al. (2017) found that in both men's elite domestic and international RU, winning teams averaged double the number of points when possession started within the opposition's 22 m and when the increased time was spent in this area. Therefore, the increased number of 22 m entries and 22 m conversion percentage identified within this study for the successful teams supports the notion of this style of play leading to team success in women's domestic competitions.

The increased propensity to score tries through 22 m entries naturally allows teams the opportunity for a shot at goal-kicking post-try to potentially increase a team's score line. This study found that winning teams had greater goal-kicking performance than losing teams. Surprisingly, very little research has been conducted investigating the effect of goal-kicking on match outcomes. Quarrie and Hopkins (2015) investigated goal-kicking and found that 45% of points scored during a match were the result of a successful

conversion and, in 5.7% of matches, the match outcome relied on the outcome of the goal-kicking attempt. Therefore, a team's ability to enter their opposition 22 m and successfully convert a goal can place them in a better position to achieve a successful match outcome.

The results of this study also found that quick ruck speed was a distinguishing factor between winning and losing teams. The speed at which possession is maintained, the ball is "recycled" through the ruck, and transferred to the next phase of play is referred to as recycle speed. A team's ability to achieve a quick recycle speed at the ruck can create further opportunities for gainline carries and linebreaks throughout a match as it gives the opposition less time to set into position and create a strong defensive line (Bracewell, 2003; Jones et al., 2004; Wheeler et al., 2010). Watson et al. (2017) found that winning teams were more successful around the breakdown with more frequent "quick ruck speed" and fewer rucks lost than their opposition. Conversely, losing teams reportedly have more rucks lost than their opposition (Watson et al., 2017). The inability to maintain possession at the ruck then provides the opposition with greater opportunities with the ball in hand, which can be detrimental to team performance if points are conceded as a result of (Kraak & Welman, 2014; van Rooyen et al., 2010). Therefore, women's teams that can maintain possession, greater frequency of quick ruck speed, and produce more gainline carries and linebreaks are more likely to win matches than their opposition.

Finally, set piece success, such as lineout and scrum success, was much lower for the losing team than their opposition. A team's ability to maintain possession from their own set piece is crucial to creating point-scoring opportunities. Previous studies have found that winning teams were more successful in winning opposition lineouts and scrums (Jones et al., 2004; Ortega et al., 2009). This suggests that the importance of set-piece success should be emphasised to teams, if a team is not regaining possession, they are spending less time with the ball in hand and limiting their potential attacking opportunities and reducing their likelihood of success.

4.1. *Balanced and unbalanced matches*

The impact of one-sided matches can lead to decisive and the potential for a massive point differential score line during a match. The idea of balanced and unbalanced matches can potentially mean that KPI previously mentioned above could be less relevant when differentiating winning and losing teams, or that KPI are skewed due to the score line differential. The results of this analysis showed that there were only 7 KPI that contributed to differentiating between winning and losing teams in a balanced match, while there were 13 KPI identified for unbalanced matches. While some KPI remained significant irrespective of score-line differential, (such as kicking performance and scoring opportunities), other KPI such as ruck performance, territory, and possession were the only significant indicators in unbalanced matches. Conversely, for the losing team in balanced matches, only the penalty conversions missed KPI was significant, while in unbalanced matches both rucks lost, and lineouts lost, were discriminating indicators. From the 47 matches assessed across the Super W competition, 36 were balanced and 11 were unbalanced. Currently there is no research in RU that has examined balanced and

unbalanced matches, however, there is in other sports such as soccer and basketball (García et al., 2014; Méndez-Domínguez et al., 2019) which, similarly to this study, identified that KPI vary between winning and losing teams in balanced and unbalanced RU matches.

Our findings suggest that ruck performance and the potential it can create for greater scoring opportunities can differentiate between winning and losing teams in unbalanced matches. As mentioned previously, teams that can produce quick recycle speed at the ruck can create the potential to break open the opposition's defence, creating greater opportunities for linebreaks, gainline carries (Bracewell, 2003; Jones et al., 2004; Wheeler et al., 2010), while also potentially improving a team's territory and subsequently, scoring opportunities. It has also been shown that winning teams are more successful at the breakdown with faster ruck speeds and fewer rucks lost than the opposition (Watson et al., 2017). This also supports our findings as the number of rucks lost by the losing team in unbalanced matches was greater than the opposition. Therefore, while there are several potential KPI that can distinguish between winning and losing teams in unbalanced matches, ruck performance appears to be the major contributing factor that can then go onto influence match outcome.

4.2. Practical application & limitations

The findings of this study can practically support coaches using objective information that allows them to make informed decisions surrounding team performance and match strategy. For example, poor set piece and ruck performance was seen as a contributing factor for losing teams, therefore through further improvement in set piece success rates and ruck performance teams may be in a better position for a successful match outcome. Therefore, teams that implement match tactics and training strategies to target key areas of the game such as increasing ball carrying efficiency, improving quick ruck speed and overall ruck performance, greater possession and field territory, improved goal conversion performance, greater try scoring opportunities and set-piece success are more likely to produce match winning performances through improved execution of these crucial aspects of RU. Thus, coaches should consider this information when planning the technical and tactical aspects of their training sessions and developing match tactics. Coaches may also use these findings to consider performance in balanced and unbalance matches based on scoring differentials, field possession and territory, greater scoring opportunities and kicking strategies. While these findings can further support the growth of the women's game, there is still a potential limitation of this study as it only investigated a domestic competition in women's rugby that is still relatively new (5 seasons) and only assessed one domestic competition in Australia. Due to the current exponential growth of women's sport, there is the potential for more evenly matched teams competing against each other which could see the impact of KPI between balanced and unbalanced matches become less significant. Future studies should investigate KPI that differentiate between winning and losing teams across hemispheres to determine if potential differences in playing styles impact domestic competitions.

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