



Variables Involved in Ball Possession in Rugby: A Systematic Review

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Abstract

The aim of this article was to identify game variables related to ball possession in top-level rugby teams. Using a systematic review, the scientific literature on studies published between 2001 and 2021 analysing ball possession in the context of rugby in professional leagues was examined, identifying outcome variables and patterns of play. A search of specialised databases was carried out: PubMed, Scopus, SportDiscus and Web of Science, and a total of 176 articles were found. Each study was analysed by two reviewers independently; and in the event of discrepancy, a third reviewer decided on its inclusion. Ultimately, 16 studies met the inclusion criteria. The review identified three variables related to ball possession outcome: (a) field location and initial possession action, (b) ruck characteristics, and (c) line breaks. The results demonstrate interdependence in the different studies on ball possession. These variables are considered to be responsible for the continuity of offensive play and may be predictors of the final outcome of possession.

Keywords: competition, pace of play, patterns of play, performance analysis, team sports.

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Introduction

Rugby is a team sport characterised by territorial invasion, involving interaction and struggle between players for ball possession and space, within a constantly changing and dynamic context (Colomer et al., 2020). The internal logic of the game results in constant organisation and reorganisation, meaning that the game is influenced by player-team-opponent interactions (Torrents & Balagué, 2006). Given the sport's high level of complexity, using a game model allows for simplification of a team's gameplay (Ashford et al., 2020). Strategies and patterns of play have evolved with a view to gaining advantages over the opponent, in order to improve team performance (Kraak et al., 2016). Taking into account game styles and the influence of the opposition, Watson et al. (2017) and Colomer et al. (2020) agreed on the need to analyse the game as a whole, emphasising the importance of the periods when a team has ball possession.

A team's attacking phase begins with gaining possession, and is developed through a series of actions in space and time from the moment they gain control of the ball until they cease to control it. Villarejo et al. (2014) suggested the instrumentalisation and categorisation of possession to assess its effectiveness, taking into account the spatial location where ball possession is obtained and the manner in which it originates.

In relation to the categorisation of possession, Ungureanu et al. (2019) concluded that, in rugby, regardless of possession time and frequency, teams that used possession effectively were more likely to win.

Williams et al. (2017) considered that in order to study possession in rugby it would be necessary to ascertain the total time the ball is in play, i.e. the amount of time the ball is in possession of one of the players or is in a position to be contested by the two teams. Furthermore, they showed that increased ball-in-play time could contribute to greater continuity and increased match time, resulting in an increase in the number of actions, and thus a higher number of total possessions (Williams et al., 2017).

In order to analyse offensive play, McKay and O'Connor (2018) categorised possession according to the period of play and the origin of possession, establishing two main

groups; offensive organisation and offensive transition. Play based on offensive organisation would arise from pre-established scenarios in which attack and defence would act in fixed and predictable patterns, while the development of play in offensive transitions would arise from scenarios where teams initiate possession in open play situations with a high degree of unpredictability. McKay and O'Connor (2018) also observed that teams had an average of 48 total possessions per game, of which 27 came from offensive transition play situations and 21 from offensive organisation situations, reporting that 56% of possessions originate from attacking transition scenarios.

Taking possession as the central focus of all the articles included in the bibliography of the current study, the main objective of this review is to determine, through the analysis of the variables of ball possession play, which variables have the greatest influence on a team's success, understood as the winning of a match or obtaining a greater number of points, with the aim of understanding their impact on the result.

Method

In order to identify the performance-related variables during ball possession in rugby, a systematic review was carried out following the methodological guide of Perestelo-Pérez (2013).

Studies related to observational and statistical analysis of the game, rugby performance indicators and ball possession indicators were included. In addition, the studies needed to be from the period between 2001, when professional rugby XV started, and 2021; and include data from teams participating in professional competitions, as this type of competition has the largest amount of data and publications to be analysed. Studies which did not disclose the data extraction protocol and sample size, literature reviews, as well as letters to the editor and conference abstracts were excluded. An analysis of the methodological quality of the studies was carried out using the PICO system (acronym for P: Participants; I: Interventions; C: Comparisons; O: Outcomes) (Table 1).

Table 1*Analysis of the methodological quality of studies using the PICO system.*

Authors	Population	Intervention	Comparison	Outcome
Bennett et al., 2018	English Premiership - Season. 2016/17 (n = 127 matches)	Observational (Opta Analysis)	Comparison not applicable	Game outcomes are related to basic skills such as ball carrying, tackling and kicking.
Bunker et al., 2020	Japan Top League - Season. 2018 (n = 24 matches)	Observational (SPP - Safe Pattern Prunning)	Comparison not applicable	Line breaks and side kicks are the factors that bring a team closest to scoring.
Bunker & Spencer, 2020	Rugby World Cup 2019 (n = 45 matches)	Observational (Stats Perform / Opta Analysis)	Difference between winning and losing teams. - Variables analysed: • Points scored • Running metres • Line breaks • No. rucks	There are differences between winning and losing teams regarding the number of rucks and line breaks.
Coughlan et al., 2019	Super Rugby - Season. 2017 (n = 135 matches)	Observational (Stats Perform / Opta Analysis)	Comparison not applicable	Possession that begins near the opponent's scoring zone results in a greater likelihood of scoring.
Den Hollander et al., 2016	Super Rugby - Season. 2013 (n = 125 matches)	Observational (SportsCode Elite)	Comparison not applicable	Line breaks are associated with team success and provide more opportunities for scoring tries.
Kraak et al., 2016	Super Rugby - From 2008 to 2013 season (n = 646 matches)	Observational (Performance Analysis ISPAS)	Comparison of game time and actions across different seasons. - Variables analysed: • Points scored • Game time • Running with ball • Line breaks • No. rucks • Footwork	Rugby has evolved towards an increase in playing time, leading to a greater number of actions per game.
Kraak & Welman, 2014	Six Nations Tournament 2010 (n = 15 matches)	Observational (Performance Analysis ISPAS)	Comparison not applicable	The number of players involved in the ruck affects the performance of a team.

Table 1 (Continuation)*Analysis of the methodological quality of studies using the PICO system.*

Authors	Population	Intervention	Comparison	Outcome
Mosey & Mitchell, 2019	Queensland Premier Rugby - Season. 2018 (n = 76 matches)	Observational (Opta Analysis)	Comparison not applicable	A team's performance is affected by the number of times it loses possession, the number of line breaks and metres gained in possession.
Schoeman et al., 2017	Super Rugby Season. 2014 Currie Cup Season. 2014 (n = 60 matches)	Observational (Versuco TryMaker Pro)	Technical-tactical comparison between different competitions. - Variables analysed: • Possession • Set formations (Mele and touche) • No. rucks	Differences between the two competitions are found in terms of the place of origin of possession, the number of rucks and the number of tackles.
Schoeman & Schall, 2019	Aviva Premiership Season. 2016/17 Guinness Pro 12 Season. 2016/17 Top 14 - Season. 2016/17 Super Rugby Season. 2017 (n = 581 matches)	Observational (Versuco TryMaker Pro)	Comparison not applicable	Possessions that start from turnovers in static phases and line breaks are the actions that average the highest ratio of points.
Ungureanu et al., 2019	Guinness Pro 12 Season. 2016/17 (n = 127 matches)	Observational (Video)	Comparison not applicable	The speed and effectiveness of the ruck, as well as the number of line breaks, correlates with a greater ability to score points.
Van Rooyen et al., 2006	Rugby World Cup 2003 (n = 25 matches)	Observational (SportsCode)	Difference between winning and losing teams. - Variables analysed: • Points scored • Point origins • Initial possession zone	The ability to maintain possession and initiate possession near the opponent's try zone influences the team's performance.

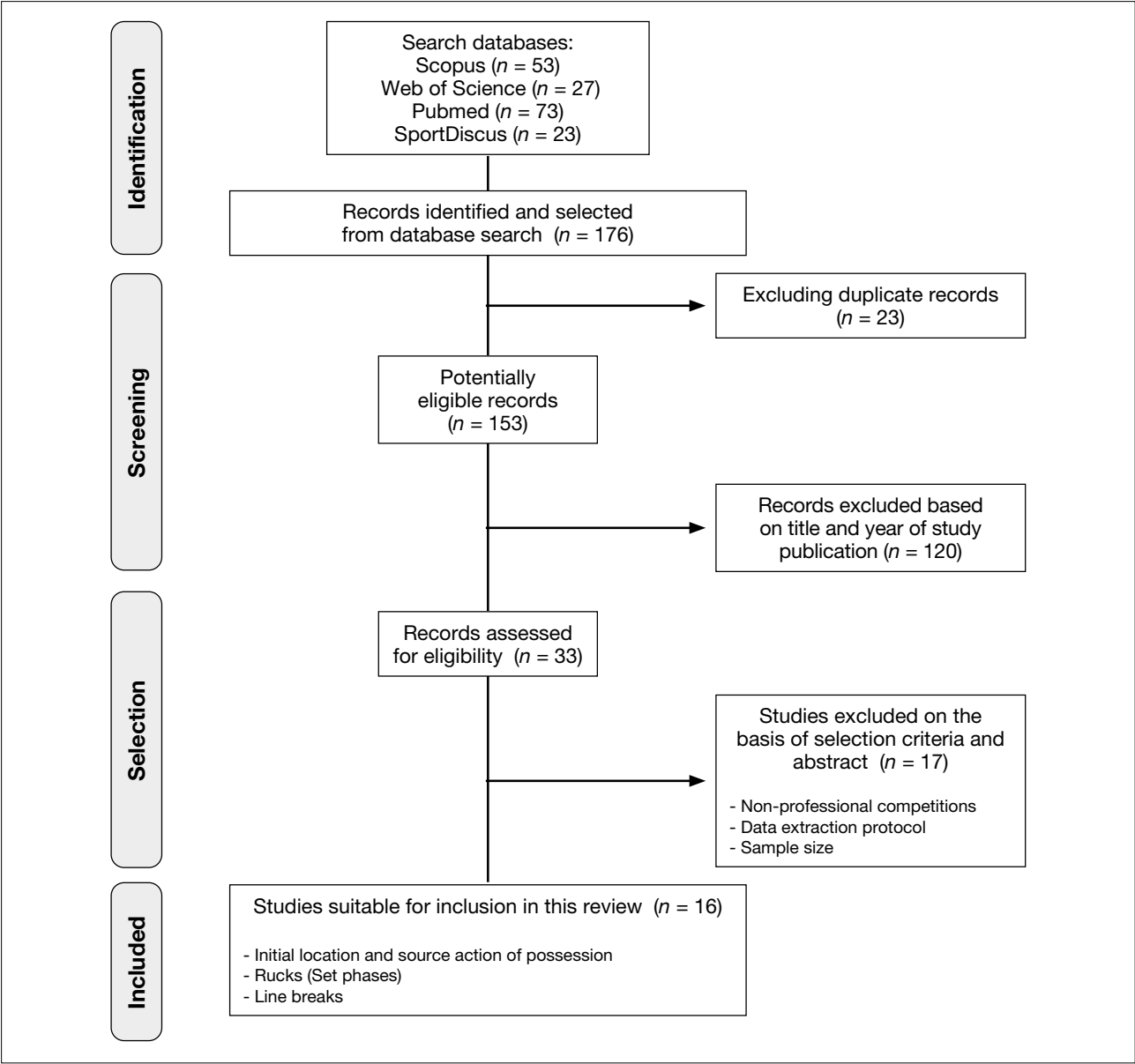
Table 1 (Continuation)*Analysis of the methodological quality of studies using the PICO system.*

Authors	Population	Intervention	Comparison	Outcome
Vaz et al., 2011	IRB - 2003 to 2006 period Super 12 - 2003 to 2006 period (n = 159 matches)	Observational (Video)	Difference between winning and losing teams. - Variables analysed: • Points scored • Footwork • No. rucks • No. tackles	Winning teams make fewer errors during possession, are involved in fewer rucks and accumulate a greater number of tackles.
Vaz et al., 2019	Rugby World Cup Finals (n = 8 matches)	Observational (SportsCode)	Difference between winning and losing teams. - Variables analysed: • Points scored • Initial possession action • No. rucks	The more possessions initiated from static phases, as well as fewer offensive rucks, the greater the likelihood of winning.
Watson et al., 2017	Heineken Cup Season. 2013/14 European Rugby Championship Season. 2014/15 Super Rugby Season. 2015 Six Nations Tournament 2013, 2014 and 2015 Rugby Championship - Season. 2014 (n = 313 matches)	Observational (Opta Analysis)	Difference between winning and losing teams. - Variables analysed: • Points scored • Line breaks • Metres gained • No. rucks	Winning teams have a higher number of line breaks and possessions that start in the opponent's half than losing teams.
Wheeler et al., 2010	Super Rugby Season. 2006 (n = 7 matches)	Observational (Video)	Comparison not applicable	Ball runs that result in line breaks or tackle breaks are associated with an increased ability to score tries.

Table 2
Search strategy and equation.

Database	Equation
SCOPUS	(TITLE-ABS-KEY (rugby*) AND TITLE-ABS-KEY (professional* OR professional AND league*) AND TITLE-ABS-KEY (ball AND possession* OR possession*) AND TITLE-ABS-KEY (key AND performance AND indicators* OR performance AND analysis* OR patterns AND of AND play*))
Web of Science (WoS)	#1 TS=(rugby*) #2 TS=(professional* OR professional league*) #3 TS=(ball possession* OR possession*) #5 TS=(key performance indicators* OR performance analysis* OR patterns of play*) #1 AND #2 AND #3 AND #5
PubMed	(((((rugby*[Title/Abstract]) AND (professional*[Title/Abstract] OR professional[Title/Abstract] OR league*[Title/Abstract])) AND (ball[Title/Abstract] OR possession*[Title/Abstract] OR possession[Title/Abstract])) AND (key performance indicators*[Title/Abstract] OR performance analysis*[Title/Abstract] OR patterns of play*[Title/Abstract]))
SPORT Discus	rugby AND (professional* OR professional OR league*) AND (ball OR possession* OR possession) AND (key performance indicators* OR performance analysis* OR patterns of play*)

Figure 1
PRISMA flowchart of the literature selection process for variables related to performance during ball possession in rugby union.



Search strategy and information sources

A literature search was conducted in the Scopus, Web of Science (WoS), PubMed and SPORTDiscus databases, using the search terms "rugby", "professional" or "professional league", "ball possession" or "possession" and "key performance indicators" or "performance analysis" or "patterns of play" (Table 2). The languages in which the search was conducted were English, as the main language in the countries where rugby has the greatest impact, and Spanish, as the researchers' mother tongue.

Study selection and data extraction

A selection was made using the PRISMA 2020 (Preferred Reporting Items for Systematic Review and Meta-Analysis) methodology (Page et al., 2021). Following the search, 176 studies were identified and extracted into a spreadsheet. The duplicates were then eliminated, leaving 153. Subsequently, the titles and years of study publication were reviewed against the selection criteria by the researchers.

During this selection process, the researchers carried out a review of all the shortlisted articles and then pooled them together. In the event of any discrepancy, a third reviewer decided on its inclusion. A total of 16 studies met all selection criteria (Figure 1).

The data related to ball possession variables and the number of matches observed in the articles were extracted

and analysed according to their results (Table 2, 3 and 4), for further comparison and discussion.

Results

The 16 studies included in the review revealed three main variables associated with ball possession and attacking play. The methodology used in all articles was observational. The results revealed the possession location and initial possession action, the number of rucks (set phases) and line breaks as the main factors influencing the outcome of possession in rugby.

Possession location and source action revealed frequency ($n = 5$) in relation to the total, studies related to rucks ($n = 7$) and publications about line breaks ($n = 10$). It was ascertained that the 16 articles included in the review analysed more than one indicator per study.

With respect to possession location and source action (Table 3) it was revealed that teams with greater ability to initiate possession in the opponent's half averaged a higher ratio of points to opponent (Van Rooyen et al., 2006; Watson et al., 2017). Furthermore, play restarts and ball recoveries from static phases in the opponent's half were the source actions with the highest scoring capacity (Vaz et al., 2019; Schoeman & Schall, 2019). Other authors have also considered the importance of addressing possession location and source action together, due to the importance of territorial occupation in rugby (Coughlan et al., 2019; Vaz et al., 2019).

Table 3

Content analysis of articles dealing with the location and source action of ball possession.

Authors	Sample	Contributions
Van Rooyen et al., 2006	($n = 25$) *matches	Teams that take possession closer to the opponent's try zone have a higher ratio of points in that sequence of play.
Vaz et al., 2019	($n = 8$) *matches	Winning teams initiate more possessions from static phases than their opponents.
Schoeman & Schall, 2019	($n = 1,162$) *matches	Possession that is initiated from turnovers in static phases averages the highest ratio of points compared to other possession initiations.
Coughlan et al., 2019	($n = 135$) *matches	Possession that is initiated from static phases within the opposing 22m zone is identified as the source with the highest percentage of success.
Watson et al., 2017	($n = 313$) *matches	Winning teams gain possession of the ball inside the opposing 22m zone twice as often as losing teams, also averaging twice as many points when playing in that zone.

Table 4*Summary of articles studying the characteristics of the ruck set phases during ball possession.*

Authors	Sample	Contributions
Kraak et al., 2016	(<i>n</i> = 646) *matches	The results indicate increased playing time results in an increase in the total number of rucks per game.
Schoeman et al., 2017	(<i>n</i> = 60) *matches	More effective offensive rucks lead to a higher standard of play, greater continuity and a greater ability to keep the ball in possession.
Vaz et al., 2019	(<i>n</i> = 8) *matches	Losing teams are involved in a higher number of rucks than winning teams.
Bunker & Spencer, 2021	(<i>n</i> = 45) *matches	Winning teams are involved in fewer than 78 rucks in their total offensive match sequences.
Ungureanu et al., 2019	(<i>n</i> = 132) *matches	Increased efficiency and speed of rucks generates greater speed in the game, which relates to a greater ability to score points.
Vaz et al., 2011	(<i>n</i> = 159) *matches	In close matches, winning teams are involved in fewer rucks than losing teams, and demonstrate a greater ability to generate quick set phases to provide more attacking options.
Kraak & Welman, 2014	(<i>n</i> = 15) *matches	Winning teams use fewer players in the rucks than losing teams, thus creating a greater availability of attacking options in open play.

In terms of rucks (set phases), two factors were identified as influencing ball possession: the total number of rucks per match and the effectiveness of these set phases (Table 4). Regarding the number of rucks, winning teams were involved in a lower number of total rucks than losing teams (Vaz et al., 2019; Bunker & Spencer, 2021; Vaz et al., 2011).

In terms of efficiency, successful teams reportedly exhibited a greater ability to maintain possession and generate continuity through faster set phases involving fewer players, resulting in a greater number of attacking options and greater ability to score points (Vaz et al., 2011; Schoeman et al., 2017; Ungureanu et al., 2019; Kraak & Welman, 2014).

Line breaks were the variable most frequently studied within the studies included in this review (Table 5). In relation to these, it was observed that winning teams had a greater ability to generate line breaks than losing teams, indicating that a greater number of breaks increases the likelihood of victory (Watson et al., 2017; Schoeman & Schall, 2019; Bunker & Spencer, 2021). Line breaks were also found to be associated with a greater number of metres gained in possession (Mosey & Mitchell, 2019; Ungureanu et al., 2019) generating continuity in attacking play and a greater ability to score tries in that same phase of play or in the actions immediately following (Bennett et al., 2018; Bunker et al., 2020; Den Hollander et al., 2016; Wheeler et al., 2010).

Table 5
Studies reviewed on line breaks during ball possession.

Authors	Sample	Contributions
Kraak et al., 2016	(n = 646) *matches	The results indicate increased playing time results in an increase in the total number of line breaks per match.
Watson et al., 2017	(n = 313) *matches	Winning teams generate a higher number of line breaks than losing teams.
Bennett et al., 2018	(n = 127) *matches	A higher number of line breaks significantly increases the probability of successful possession.
Schoeman & Schall, 2019	(n = 581) *matches	More line breaks lead to a higher score, which is the most decisive factor in terms of winning and losing.
Bunker et al., 2020	(n = 24) *matches	Line breaks are the actions that generate the most points, indicating that the higher the number of breaks a team makes, the greater the scoring capacity.
Bunker & Spencer, 2021	(n = 45) *matches	Winning teams win the advantage line more than 55 times in their total offensive sequences, generating a higher number of line breaks than losing teams.
Mosey & Mitchell, 2019	(n = 76) *matches	More line breaks are related to more metres gained, and this is related to a higher probability of winning.
Den Hollander et al., 2016	(n = 125) *matches	39% of line breaks result in a try. In 66% of the cases where the line break did not result in a try, the attacking team was able to keep possession of the ball in the next phase.
Wheeler et al., 2010	(n = 7) *matches	Line breaks are associated with scoring tries in the phases of play immediately following them.
Ungureanu et al., 2019	(n = 132) *matches	More line breaks increase the number of metres gained, resulting in greater speed and continuity of play, which is related to a greater ability to score points.

Discussion

The purpose of this review was to identify the possession-related variables involved in the outcome.

According to the results obtained, the location and source action of ball acquisition were considered as an initial scenario in which to develop the game (Coughlan et al., 2019). The findings show that possession that begins in the opponent's half, from static phases or through turnovers, both in open play phases and from fixed sets, are variables that influence the success of possession (Vaz et al., 2019; Schoeman & Schall, 2019; Watson et al., 2017), as they allow initiation of the attack closer to

the scoring zone. Possession that originates from static phases offer the opportunity to launch the attack in an organised and strategic manner, with the aim of disrupting the opposition's defensive organisation and moving towards the scoring zone. On the other hand, if this possession is initiated from a turnover, the defensive disorganisation at that moment of the game is greater and the transition to attack scenario provides the opportunity for finding more space to move quickly towards the try line.

In this sense, Villepreux (1993) has already differentiated attacking play into simple and complex possessions, distinguishing them according to whether they are made

up of a single phase or several phases, with complex possessions having a greater impact on the efficiency and quality of possession, alternating different forms of play and generating greater defensive destructuring.

Based on the results, it was considered that set phases have a significant impact on the game, both in terms of the number of set phases and their effectiveness, as it is a tactical situation that results in reorganisation at offensive and defensive level, caused by an interruption in the continuity of the movement of the ball during possession and attacking play. A lower number of rucks is related to a higher turnover of play and ball actions, resulting in a higher pace of play during possession (Solé, 2017), thus generating greater stress on the defensive system (Vaz et al., 2019; Kraak et al., 2016).

The results demonstrated that defensive line breaks were the game variable that produced the highest number of metres gained from ball possession (Mosey & Mitchell, 2019; Ungureanu et al., 2019). Actions that allow the advantage line to be won create a situation of imbalance and defensive disorganisation, allowing the attacking team to gain metres and advance towards the scoring zone (Bunker & Spencer, 2021; Schoeman & Schall, 2019; Schoeman et al., 2017), thus generating a greater likelihood of scoring tries (Vaz et al., 2011; Den Hollander et al., 2016).

It is considered that the game variables "Location and source of possession", "Set phases" and "Line breaks" observed in this review could have an interdependent relationship, as it was observed that the possession source and initial possession action can result in a greater number of line breaks, producing a greater defensive destructuring, in turn generating a lower number of rucks and thus providing a greater attacking speed, which can lead to an increased chance of success in the possession outcome.

The main limitations are that, despite analysing the most relevant variables in ball possession according to the literature, this review has studied offensive variables. The constant changes in the rules are also considered a limitation, as they produce significant changes in the development of the game that can affect the variables analysed.

It is proposed that future research should focus on the analysis of defensive game variables and their possible interrelationship with the possession-related variables studied in this review.

The contributions provided by this research can offer relevant information regarding the actions during attacking play that determine and impact outcomes. The number of

rucks and line breaks a team completes during the time it has ball possession can guide the study of pace of play and offer a new way of categorising possessions and their outcome, with the aim of designing training tasks that optimise player performance.

Conclusions

From the results obtained, three possession game variables were identified as influencing the outcome of possession. These variables are the possession location and initial possession action, rucks or set phases and line breaks. The three game variables were studied in isolation, although the results suggest possible interdependence between them, with the possession location and initial possession action, being considered as the source of the game and the set phases, together with the line breaks, as the actions that have the greatest impact on the continuity and outcome of possession.

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