Exploring elite soccer teams' performances during different match-status periods of close matches' comebacks

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Abstract

The aim of the present study was to examine winning and losing teams' performances during the four different match-status periods that occur in close matches' comebacks (drawing-winning/losing-drawing-losing/winning). The variables shots, passing effectiveness and ball possession were gathered from 17 matches of the Spanish professional soccer league. Relative-phase analysis of ball possession between teams revealed a shift from anti-phase to in-phase relations from period 1 to 4. Pass efficacy revealed a particular trend of anti-phase relations in period 2 and the analysis of shots revealed similar phase relations between periods. Statistically significant differences were observed between winning and losing teams in Period 3 for ball possession and passing effectiveness. Also, statistically significant differences among periods were observed for winning teams in ball possession with period 4 as the most differentiated from the other periods. Besides, winning teams also showed significant differences between periods in passing effectiveness (period 4 vs 3), and in shots (period 3 vs periods 1, 2 and 4). On the other hand, ball possession showed significant differences for losing teams with periods 3 and 4 different

than periods 1 and 2. The current findings can be used when controlling match-status scenarios and key performance indicators along the match.

Keywords: Football; Situational variables; Performance indicators; Team sport

1 Introduction

One of the most intriguing effects of situational variables in soccer is the interaction of match-status and match outcome during matches [1–2]. This issue is based on the main impact that scoring first has on the subsequent performances of both teams along the entire match [3–5]. In fact, soccer is a low scoring team sport where each goal scored or received affects the course of the game. Specifically, the importance of match-status variations have a direct effect on match outcome and how opposing teams act and react when facing critical scenarios [5–6].

According to this interactive effect, the available research has identified the complexity of this sport where winning teams outperformed losing teams on some key performance indicators (KPI) such as ball possession, passing accuracy (%) and shots [7–9]. However, the use of performance indicators from the match outcome in an isolated condition (i.e. cumulative performance during the full match) is inconclusive and incomplete due to the lack of the understanding of the match dynamics that sustain such results and also the different match-status scenarios along the match [7,10]. In particular, the teams need to face different game moments and manage them according to changes in some situational and contextual variables that require adaptations in game dynamics. Particularly, the match-status and the occurrence of goals create new balances and games dynamics between teams affecting the match outcome.

Along these lines, available research [7,11–14] have identified the importance of some KPI's when controlling for match-status and match outcome together. The most often used (and correlated with match outcome and scoring opportunities) by researchers were: (i) shots on and off target due to the low number of actions per match and the high impact on scoring; (ii) passing accuracy (%) allows to show attack success and then to create more scoring situations; and (iii) ball possession complements the previous KPI's showing a greater or lower use of offensive performances.

Additionally, the analysis of the context is of great relevance to measure the match-status effect in depth. The analyses should control for match type due to the fact that teams performed differently when facing close matches (score differences of one or two goals) than when facing unbalanced match-scores greater than two goals [15]. In particular, Nevo and Ritov [16] identified that after the first goal is scored by one team, the probability for scoring the second goal becomes more likely for that team as the match goes on. Therefore, the analysis of close matches is needed to control for the unpredictable trends displayed by teams, mainly due to the impact of scoring the first goal has on both teams' performances during the match [16]. From a situational variables perspective, the effect of match-status during close games is unclear and not described in the available research when one team comebacks the score (e.g., facing with drawing, losing, drawing and winning scenarios as the match progresses). The analysis of match-status is clear about the importance of technical (i.e., shooting ability), tactical (i.e., maintaining ball possession and defence), and psychological (i.e.,

concentration or pressure) factors that can affect the performance of winning and losing teams during various match statuses over the course of the match [12,17]. Based on a recent study of Redwood–Brown et al. [16] winning teams may relax their physical performances after scoring and lose any positive momentum built through a decrease of effort, subsequently allowing the opponents to get back in the match. But, on the contrary, an initial behaviour of losing teams may increase their physical responses to get back in the match. However, these teams may lose their motivation and deal with a negative momentum that persists if the aim of scoring is not reached, and then teams decrease their performance and tend to abandon their initial behaviour to overcome the score deficit. Although some studies have tried to shed a light on match-status and situational variables in soccer, the analysis of matches where one team wins the match after being in a period of losing, are still inconclusive.

Due to the unpredictability of matches where the winning team is able to score after facing losing and drawing match-status periods [3,12], it is still unclear how match status periods influences match status when teams are within a one goal difference. Therefore, the current study attempts to examine how winning and losing teams perform during the four different match-status periods (drawing-losing/winning-drawing-winning/losing) that occur in close matches (one goal difference) comebacks. The hypothesis of the study establishes that different patterns of relations between teams occur in different match-status periods. Consequently, winning and losing teams show different performances on KPI's (shots, passing accuracy (%) and ball possession) in the four match-status periods.

2 Method

2.1 Sample

The sample comprised of 17 matches that met the inclusion criteria from the total ($n = 380$) matches played in the Spanish professional soccer league (La Liga) during the 2017–2018 season. The inclusion criteria required that the matches have four specific close score-line scenarios during the match (see Fig. 1): (i) Period 1: where no one has scored 0–0; (ii) Period 2: one goal scored by either team 0–1 or 1–0; (iii) Period 3: where teams are drawing with a goal each 1–1; and (iv) Period 4: the team that was losing during period 2 has scored a goal and wins the match 2–1 or 1–2. In order to test differences among match-periods, time durations greater than 5 min~~5 minutes~~ were considered in the analyses. Match periods showed the following mean durations: (i) Period 1: 29.06 ± 14.15 min; (ii) Period 2: 21.18 ± 7.54 min; (iii) Period 3: 26.71 ± 10.75 min; and (iv) Period 4: 15.76 ± 10.51 min.

alt-text: Fig. 1

~~Figure~~ Fig. 1

Periods of the match comebacks analysed according to the match-status (goals scored) and minutes of the match.

2.2 Procedure and variables

The matches selected represented 4.5% of the total sample of the league and included matches with unpredictable match dynamics where one team was able to come back and outscore the opponents and win the match. These matches are included in the 10–15% of matches that cannot be predicted (i.e. match outcome) using linear regression or discriminant analysis models [9]. Therefore, the specific scenarios under analysis in the current study are worthy of research using temporal analysis and partial correlational models in order to gain a better understanding of the unpredictability of these soccer matches.

The operational definition of variables analysed in this study were as follows [15,18–19]: ball possession (considered as the total number of passes per team when is in possession of the ball), passing accuracy (%) (successful passes are divided by total attempted passes) and shots (an attempt to score a goal, made with any (legal) part of the body, either on or off target). The variables were gathered minute by minute in order to create a temporal series of the whole match and then, according to each period of the match. The selection of these three variables was based on the available research that had considered them to be good predictors of team's success [13,15]. Data were gathered from the public-accessed football statistic website "whoscored.com" (https://www.whoscored.com). The original data used by this website is provided by OptaSports Company, with validity of their data previously tested by Liu et al. [18] with higher values of inter-rater reliability (Cohen's kappa > 0.80; ICC > 0.90; r > 0.90; and MSE < 0.25) evident.

2.3 Statistical analyses

Firstly, the Hilbert Transform [20] was used to compute the relative phase of the time series of ball possession, passing accuracy and shots between winning and losing teams. The relative phase quantifies the dynamic relations between two sinusoidal signals (time series data) by measuring the phase differences between signals in their respective cycles. For example, in-phase (0°) represents signals at the same point in their respective cycles, and anti-phase (180°) denotes signals that are a half-phase displaced from each other. The relative phase data were inspected using frequency phase histograms and phase attractions noted from observations of peak frequency [20]. This method has been recently proposed to better inform on the emergent dynamic patterns that sustain a certain relationship between two teams.

Secondly, for comparison purposes, the normality assumptions were tested for each variable using the Shapiro Wilks test. As the data did not meet normal distributions, non-parametric tests were used to compare independent samples (winning and losing teams via Mann Whitney U; and r effect size (ES) magnitude was

used to check significant effects) and repeated measures (four match periods via Friedman). The *post hoc* test of Bonferroni was used to test the pairwise comparisons between match periods in the Friedman test.

Lastly, in order to test if positive or negative momentums occur during each match period, differences between teams (winning team − losing team) of ball possession and passing accuracy (%) were calculated, and the correlated with the shots made by winning and losing teams using the Spearman correlation test. All the analyses were conducted using the statistical software Matlab R2012b (The MathWorks Inc., Natick, MA, USA) and IBM SPSS for Windows, version 22 (Armonk, NY: IBM Corp). The significance level was set to $p < 0.05$.

3 Results

Relative phase analysis revealed different dynamic relations for each variable between different periods. Relative phase of ball possession revealed a trend of anti-phase relations in periods 1 and 2 and a clear trend of in-phase relations in period 4. In the period 3 no phase relations differences were observed between periods (Fig. 2a). Relative phase of pass efficacy only revealed a trend of anti-phase relations in period 2 with any other trend between other periods (Fig. 2b). Relative phase of shots revealed similar phase relations between periods (Fig. 2c).
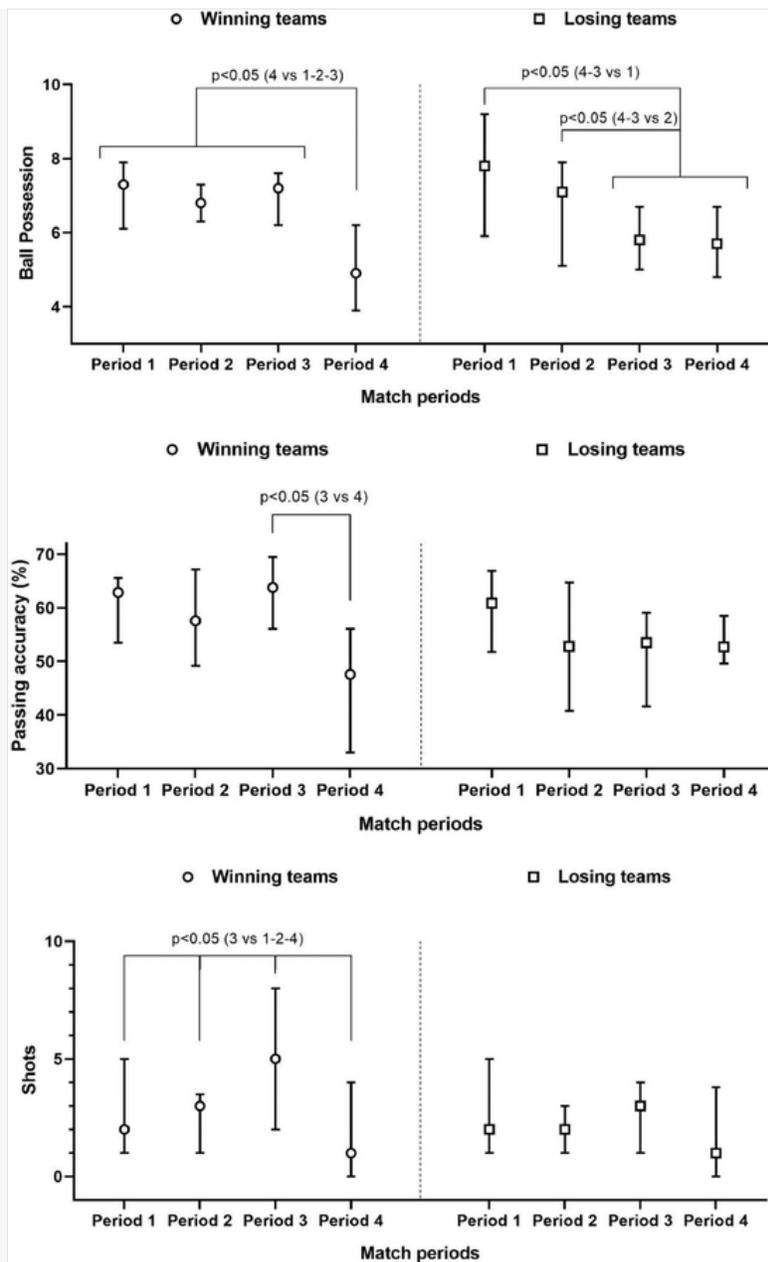
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Figure Fig. 2
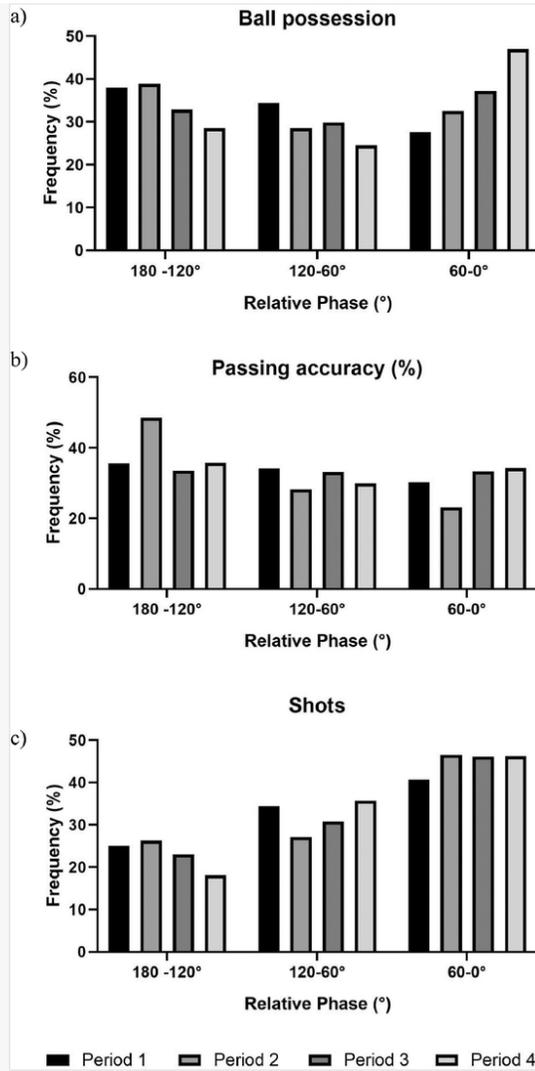
Relative phase analysis for dynamic relations of both teams (winning and losing) for each variable (ball possession: a, passing efficiency%: b and shots: c) between different periods.

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Figure Fig. 3

Median and IQR of ball possession, passing accuracy (%) and shots for each match period according to winning and losing teams.

Descriptive results for all the variables analysed are presented in Table 1 for full match and the four periods (ball possession, passing accuracy (%) and shots). The median comparisons (Mann Whitney U tests) between winning and losing teams showed statistically significant differences in Period 3 for ball possession ($Z = 2.256$; $p = 0.04$; ES = 039) and passing effectiveness ($Z = 2.962$; $p = 0.02$; ES = 0.51). There were non-significant differences between winning and losing teams in the rest of periods for all variables studied ($p > 0.05$).

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Table 1

Descriptive (median and inter-quartile range) and median differences between winning and losing teams for each variable during full match and the four periods analysed.

	Winning team			Losing team		
	BP	Passing accuracy (%)	Shots	BP	Passing accuracy (%)	Shots
Full match	6.9(6.1--7.2)	59.2(52.7--62.7)	13.0(10.5--15)	6.3(5.8--7.1)	53.5(46.8--60.3)	10.0(8.0--13.0)
Period 1	7.3(6.1--7.9)	62.9(53.5--65.6)	2.0(1.0--5.0)	7.8(5.9--9.2)	60.9(51.8--66.9)	2.0(2.0--5.0)
Period 2	6.8(6.3--7.3)	57.6(49.2--67.2)	3.0(1.0--3.5)	7.1(5.1--7.9)	52.8(40.8--64.7)	2.0(1.0--3.0)
Period 3	7.2(6.2--7.6) *	63.8(56.1--69.5)*	5.0(2.0--8.0)	5.8(5.0--6.7)	53.5(41.6--59.1)	3.0(1.0--4.0)
Period 4	4.9(3.9--6.2)	47.6(33.0--56.1)	1.0(0.0--4.0	5.7(4.8--6.7)	52.7(49.6--58.5)	1.5(1.0--3.8)

Table Footnotes

$*p <$ ~~0.05 significant differences between winning and losing teams~~0.05 significant differences between winning and losing teams.

In addition, the results differentiating the repeated measures (among periods) for each team showed statistically significant differences for winning teams in ball possession (χ_3^2 = 14.925; p = 0.002) with period 4 as the most differentiated from the other periods of the match (all pairwise comparisons $p < 0.05$). Besides, the winning teams also showed significant differences between periods in passing accuracy (%) (χ_3^2 = 10.358; p = 0.016) with significant pairwise comparison between period 4 and 3 ($p < 0.05$), and in shots (χ_3^2 = 8.799; p = 0.032) with the period 3 showing significant pairwise differences (higher values) with periods 1, 2 and 4. On the other hand, losing teams showed non-significant results among periods for passing accuracy (%) (χ_3^2 = 7.275; $p > 0.05$) and shots (χ_3^2 = 2.396; $p > 0.05$). Only ball possession showed significant differences for losing teams

(χ_3^2 = 9.750; p = 0.021) with periods 3 and 4 different (lower values) than periods 2 and 1 ($p < 0.05$).

The results of Spearman's Rank correlation for ball possession and passing accuracy (%) differences between teams and shots are presented in Table 2. The results identified only 2 significant correlations between ball possession and passing accuracy (%) differences and losing team's shots during the period 2 (r_s = −0.57; p = 0.02 and r_s = −0.64; p = 0.01, respectively).

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Table 2

Spearman's rank correlations (r_s and p-value) between teams' ball possession and passing accuracy (%) differences and shots during each period of the match.

Difference between teams	Winning team's shots		Losing team's shots	
Ball possession	r_s	p	r_s	p
Period 1	−0.19	0.47	0.02	0.94
Period 2	0.28	0.28	−0.57	0.02*
Period 3	0.30	0.25	−0.21	0.42
Period 4	0.28	0.22	−0.13	0.65
Passing accuracy (%)				
Period 1	0.07	0.78	−0.11	0.66
Period 2	0.27	0.29	−0.64	0.01*
Period 3	0.29	0.25	−0.30	0.25
Period 4	0.39	0.13	−0.14	0.62

Table Footnotes

*$p < $ ~~0.05~~0.05.

4 Discussion

The aim of the current study was to examine how winning and losing teams performed during the four different match-status periods (drawing-losing/winning-drawing-winning/losing) that occur in close matches (one goal difference) comebacks. As it was hypothesised different patterns of relations between teams occur in different match-status periods. Also, winning and losing teams show different performance trends on shots, passing accuracy (%) and ball possession during the four match-status periods.

The approach done in this study reflects the importance of controlling for interactive effects of situational variables in soccer of match outcome and match status [3]. Specifically, the identified findings allow to figure out the alternative performances (possession, passing and shooting) of confronting teams during a close match when dealing with different match-status, and how a scored/ received goal may change the evolution of the match [5,21]. In fact, the main findings of the study enhanced the importance of period 3 (when both teams are drawing with one goal each, 1‒1) to differentiate winning and losing teams for ball possession and passing accuracy (%). In opposition, period 3 was the period in which higher variability in dynamic relations in ball possession and passing accuracy (%) of teams were observed, corresponding to a period of higher exploration and variation in the dynamic relations between teams in comparison with other periods. Period 3 can be

defined by a period of meta-stability when the dynamics between teams constantly change without a transition to a dominant game dynamics pattern [22] of ball possession, passing accuracy or shots between teams.

However, it was clear that when winning and losing teams were compared, winning teams achieved better results in this period 3 leading to a final comeback (period 4) after stunning to change the unfavourable score of starting to lose the match. Specifically, this finding reflects the importance to regain the initiative performing more short passes, crosses and frequency of passes allowing to have more possession of the ball, and then creating more scoring opportunities when dealing with unfavourable scores (losing or drawing) [3].

In fact, during the first two periods, the teams seem to change the dominance between each other in terms of ball possession and pass efficacy in a minute to minute basis. That is, the anti-phase pattern of play observed for ball possession in period 1 and for pass accuracy for period 2 represent an oscillatory and opposite behaviour between teams in the performance of such variables. Based on these results it is possible to extrapolate a game with changes in ball possession in a minute by minute basis in periods 1 and 2. Additionally, in period 2 was also revealed the higher values of anti-phase for passing efficacy possible meaning that ball efficacy is balanced between teams until the goal being suffered. In opposition, in period 4 ball possession revealed an in-phase patterns of coordination revealing that the teams achieved similar values of ball possession in a minute by minute basis. That is, similar number of passes per team were achieved in each minute, increasing the balance between ball possessions between teams.

Despite of this general relations, winning teams performed differently during period 3 than periods 1, 2 and 4 in shots (higher values in period 3), during period 4 than periods 1, 2 and 3 in ball possession (lower values in period 4), and during period 3 than period 4 in passing accuracy (%) (Higher values in period 3). These specific trends may explain that the team that gets to comeback the score after losing increases the passing accuracy (%) and shooting opportunities during period 3 trying to culminate the comeback in period 4. This finding is in accordance with available research that stated the importance of psychological momentum when facing a losing match-status [5,12,23–24]. In particular, the teams that are losing try to overcome the adversity of the goal received increasing their performance to get a goal that will get back in the match. However, if the teams do not score they can lose motivation and then the negative momentum turns to a dramatically drop of performance. In the current study, the losing teams were able to score and draw the match turning their negative momentum into a positive one, and then increased their performances during period 3 reaching a final comeback in the score [5,17]. Therefore, during close matches the positive and negative momentums faced by both teams are extremely important and had a direct impact on ball possession, passing accuracy (%) and shots performed, and then on the match-status and final match outcome.

Besides, ball possession decreases in period 4 compared to period 3, this situation may show the effect of scoring the comeback last goal has on their behaviours, and then decreasing their efforts immediately after achieving the goal [12]. Available research suggested that winning teams may feel relaxed after scoring and leading the match, and then decrease their efforts trying to keep this score till the end of the match [3,5,17]. In fact, the current results from relative phases showed lower passes for winning teams when winning than when drawing or losing (see Fig. 2).

On the other hand, losing teams performed better during periods 1 and 2 than periods 3 and 4 in ball possession reflecting the initial advantage gained when winning 1–0. Results from relative phases showed anti-phase trends in both first period for ball possession and in period 2 for passing accuracy %. In addition, this finding is also reflected via the ball possession and passing accuracy (%) difference between winning and losing teams and negatively correlated to losing teams' shots (as lower the differences between teams in ball possession and passing accuracy %, as greater the number of shots performed by losing teams). However, during periods 3 and 4 the losing teams faced with a drop in performance compared to winning teams. This fact may be associated to the lapses in concentration when the opponent gets back the score and win the match. In particular, during these close matches the impact of negative momentum may start with the drawing period (1–1) reducing their performance in a critical way and then conceding the final goal for the opponent's comeback (2–1) [12]. According to Reilly [17] lapses of concentration are extremely important as the match goes on (i.e., second half and final stages of the match) and may explain the comebacks that occurred in the current research during periods 3 and 4 of close matches.

The current study has some limitations that need to be considered in further studies. Firstly, only 3 KPI were considered in the study (minute by minute data), but future researches should control for more technical-tactical indicators (e.g., tackles, balls recovered, aerial duels, fouls or crosses), tactical behaviours (e.g., positional information about passing networks or team's shapes), and physical parameters (e.g., high-intensity actions, sprints, ratio accelerations/decelerations, or distance covered with and without the possession of the ball). Secondly, due to the study only accounted for close matches (one goal of score difference) future research should analyse another comebacks that occur involving more goals scored such as six periods of alternative score-lines (e.g., drawing, winning/losing, drawing, losing/winning, drawing, and winning/losing) that are also worthy of investigation.

The current findings provide useful practical applications that can be controlled for during trainings and matches. The specific information about the impact of periods 2 (better performances of losing teams) and 3 (better performances for winning teams) can be used to account for specific training drills and competitive scenarios anticipating positive and negative effects (i.e., behavioural momentum) of the first goal scored and the goal allowing to draw the match when losing. Specifically, identified trends obtained for ball possession, passing accuracy (%) and shots can feed coaches to minimise failure adapting trainings drills (using specific constraints) according to these match period scenarios. For example, it can be defined specific training drills for the losing and the winning teams (focused on tasks at the end of the training sessions with induced fatigue, short-time situations and under specific context: i) 5 min 5 minutes remaining to play immediately after a goal received and it is only allowed to play long ball possessions with more than 10 passes; or ii) 8 min 8 minutes of play after scoring a goal increasing the defensive intensity actions with the defensive line close to the half line and increasing ball possession and number of passes when attacking) to anticipate how to take advantage of opponent's performance and to avoid a comeback during close matches.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Footnotes

Article Footnotes

Data statement: data will not be publicly available, but any person interested in i can require it writing the corresponding author via email.

Highlights

- Four match-status periods (drawing-losing/winning-drawing-winning/losing) of close matches comebacks were explored.

- Winning and losing teams show different performance trends on shots, passing accuracy and ball possession during those periods.

- Period 3 showed the highest variability in dynamic relations in ball possession and passing accuracy (%).

- Anti-phase patterns of play were observed for ball possession in period 1 and for pass accuracy for period 2.

- Teams that get to comeback the score after losing increases passing accuracy and shooting performances during period 3.

Queries and Answers

Query: Please confirm that givennames and surnames have been identified correctly.

Answer: