Effects of tactical behaviours on football defensive transitions' outcomes: is it different to defend against different-tier opponents?

Efectos de los comportamientos tácticos en las transiciones defensivas: ¿varía el defender ante rivales de distinto nivel?

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Abstract

Introduction: Despite increased attention to defence, tactical performance during open-play defensive transitions remains under-explored.
Objective: This study examined how intra-team tactical behaviours and opposition quality affect transitions outcomes in football.
Methodology: Seven matches from a Portuguese Second League team were analysed - four against same league opponents and three against First League teams. Thirty-two variables were derived from the team's positional data, with episodes outcomes notated after match video examination. Principal component analysis (PCA) condensed the data matrix, and random-effects multinomial logistic regressions were conducted to assess the impact of principal components on transition outcomes and to clarify how the opponent's quality modulated these interactions.
Results and discussion: Several principal components (PC1, PC3, PC5 and PC6) influenced the episodes' conclusions. Maintaining longitudinal compactness and adapting tactical roles to the dynamic game settings were crucial for avoiding unfavourable outcomes (DSP; $p < .05$ and OR = 1.913). The odds of regaining possession increased with cohesive movements towards outer corridors ($p < .05$ and OR = 0.560). Interactive effects revealed challenges in impeding ball advances against higher-quality adversaries, even when x-axis dynamics remained stable ($p < .05$ and OR = 0.257). Positioning more players near the team's advanced lines increased the odds of allowing ball advances against stronger opponents ($p < .05$; OR = 3.379).
Conclusion: This study used PCA to explore the relationship between defensive-related metrics and the transition outcomes achieved by a Portuguese professional team, enhancing the knowledge regarding tactical patterns on transition outcomes. Findings also reinforce the enduring value of single team's positional data for match-play analysis.

Keywords

Defensive performance; performance analysis; principal component analysis; situational factors; soccer.

Resumen

Introducción: Aunque la defensa ha recibido mayor atención, las transiciones defensivas en juego abierto siguen poco estudiadas.
Objetivo: Analizar cómo los comportamientos tácticos intraequipo y la calidad del oponente influyen en los resultados de las transiciones en fútbol.
Metodología: Se analizaron siete partidos de un equipo de la Segunda Liga portuguesa: cuatro contra rivales de la misma liga y tres frente a conjuntos de Primera Liga. A partir de los datos posicionales se generaron treinta y dos variables, y los desenlaces se clasificaron mediante revisión de vídeo. Un análisis de componentes principales (ACP) redujo la matriz de datos y se aplicaron regresiones logísticas multinomiales de efectos aleatorios para evaluar la influencia de los componentes principales y el efecto modulador de la calidad del oponente.
Resultados y discusión: Varios componentes principales (CP1, CP3, CP5 y CP6) se asociaron con los desenlaces. Mantener compacidad longitudinal y ajustar roles tácticos a las demandas del juego redujo la probabilidad de resultados desfavorables ($p < .05$; OR = 1.913). La recuperación de la posesión aumentó con movimientos hacia los corredores exteriores ($p < .05$; OR = 0.560). Frente a rivales de mayor calidad surgieron mayores dificultades para limitar la progresión del balón ($p < .05$; OR = 0.257). Posicionar más jugadores en líneas avanzadas incrementó la probabilidad de conceder progresiones a rivales de mayor calidad ($p < .05$; OR = 3.379).
Conclusión: El estudio demuestra que métricas defensivas derivadas de PCA explican variaciones en los resultados de las transiciones y subrayan la utilidad de los datos posicionales de un único equipo para comprender patrones tácticos en competición.

Palabras clave

Análisis de componentes principales; análisis del rendimiento; factores situacionales; fútbol; rendimiento defensivo.

Introduction

Football match performance is a multifactorial process that has long captivated scientific interest (Almeida et al., 2025; Casal et al., 2021). The analysis of teams and players' technical and tactical actions has traditionally relied on manual data collection methods, emphasising variables such as frequency counts, percentages, and conversion rates (Freitas et al., 2023). Recent advances in computer technology now provide scholars and teams with extensive and reliable datasets, fostering a heightened interest in the tactical performance construct (Forcher et al., 2023a). Recognising the pivotal role of tactical interactions in determining competitive outcomes, the examination of emerging match-play dynamics becomes crucial for comprehending the desirable patterns within the game. This can be achieved through team, group, and individual levels of analysis.

Despite increased scholars' attention to defence, defensive tactical performance remains under-explored (Forcher et al., 2022). Presently, technical actions (e.g., tackles or clearances) and discrete game events (e.g., shots conceded) persist as the most often assessed defensive elements (Freitas et al., 2023), lacking a thorough capture of the intricate nature of in-game dynamics (McGarry, 2009; McGarry et al., 2002). Therefore, the use of spatial-temporal data enquiries is indispensable, as it better portrays the complexity and dynamic nature of defensive play (Gudmundsson & Horton, 2017). Also, PA should assist in the provision of augmented feedback, in tactical-strategical decision-making, and in the assignment of themes to training sessions (Cossich et al., 2023; Modric et al., 2023). Various methodologies can be used to collect supporting information. While position-tracking technologies are now ubiquitous, most of the data gathered by these methods regard the own team. Currently, the analysis of opponents heavily relies on video scrutiny and notation processes. Thus, considering the applied science perspective of PA research, the use of a single team's positional data to address "real word" concerns – e.g., "how should we defend to better control the pitch?" – remains appropriate. Moreover, such an approach may reveal effective interactional patterns specific of a given team. These patterns may be subsequently examined in different contexts (e.g., other teams), competitive levels, or age groups, to assess their external validity and understand if the identified solutions represent broader principles of effective collective action.

Current spatially informed PA mainly describes team actions during defensive episodes, without clarifying desirable behaviours (Freitas et al., 2023). Moreover, the most common intra-team variables (i.e., surface area, width, length, and geometrical centre) offer limited utility for coaches' everyday practice. These metrics provide somewhat vague pieces of information, hindering the direct translation of findings into team preparation processes – e.g., they cannot be directly transferred for (1) upcoming game's preparation or (2) choice of training sessions thematic (e.g., "working together to close down passing lines"). These topics require the use of game-specific concepts (e.g., maintaining compactness in the defensive line), addressed through certain contexts of play (e.g., a given moment of play), directing players' focus to match-relevant affordances (Petiot et al., 2023). Nevertheless, these intra-team metrics can be made insightful through statistical methods as principal component analysis (PCA). This technique is known to reduce and structure high-dimensionality data matrices (e.g., composed of several interrelated variables), extracting summarised components with "real-world" conceptual validity. Even if PCA use in football PA is scarce, its utility has been demonstrated (Casal et al., 2021), notably in the identification of teams' preferred style of play (Freitas et al., 2023).

A further gap in the literature regards the analysis of open-play defensive transitions. Although transition is often used interchangeably with counterattack or, in the case of a defensive transition, with defending a counterattack (e.g., Hughes & Lovell, 2019), it should be noted that both concepts are not synonymous (Armatas et al., 2022; Eusebio et al., 2024). The former one (transition) pertains to the actions performed in the instants following a possession change (Freitas et al., 2021), whereas the latter concept (counterattack) refers to a possession type, characterised by a limited number of passes, primarily occurring on the depth axis of the pitch (Sarmento et al., 2018). The relevance and distinctiveness of these episodes - in which players adapt to their novel playing roles and tactical missions after a possession exchange - is acknowledged by top-level coaches (Wright et al., 2014). For instance, Pep Guardiola implemented a 5 second rule, according to which teams should quickly reclaim ball possession after its loss, otherwise "tactically fouling" their opponents or "falling back" (Andrienko et al., 2021). Nonetheless, despite its undeniable relevance and proven influence on competitive success (e.g., Bauer & Anzer, 2021; Casal-Sanjurjo et al., 2021; Maneiro et al., 2019; Vogelbein et al., 2014), scholars have mostly neglected separate analysis of these instants from the broader defensive phase of play (Freitas et al., 2025). Notable exceptions in this field include the works of Bauer and Anzer (2021) and Forcher et al. (2023b), which offered valuable insights into key variables influencing the effectiveness of transitions. Furthermore, performance is notably influenced by situational variables (e.g., Almeida et al., 2022; Lago-Ballesteros et al., 2012; Lago-Peñas et al., 2009; Sanfiz-Arias & López-Alonso, 2024), with the quality of opposition deemed as one of the most important ones (Aquino et al., 2017). For example, data shows that teams employ high-pressure defending less often, adopting a "cautious" approach when facing stronger opponents (Fernandez-Navarro et al., 2018; Gollan et al., 2020). Greater defensive compactness and shorter distances between formation lines are also common (Castellano et al., 2013), with the ball recovery location receding against these adversaries (Almeida et al., 2014; Fernandez-Navarro et al., 2020; Santos et al., 2017). However, the teams' quality is usually assessed through end-of-season table standings (Machado et al., 2024). As samples comprised of matches against different-tier opponents (e.g., first vs. second-league teams) are infrequent, current knowledge as to the differences in advisable defensive actions against higher- or same-division adversaries is sparse and should be subject of further research.

Therefore, this study aims to: (1) examine how intra-team defensive-related tactical behaviours, assessed through spatiotemporal informed metrics and PCA, associate to open-play defensive transitions outcomes and (2) ascertain how the quality of opposition influences the players' actions that lead to success in said episodes.

Method

Sample and data acquisition

This study analysed seven matches played by a professional football team, over a three-month period of the 2022/23 season (mid-November to mid-February). These matches were played against seven different opponents, across the following competitions: Portuguese Second League (n = 3), Portuguese League Cup (*Allianz Cup*; n = 3), and Portuguese National Cup (*Taça de Portugal*; n = 1). Four were played against teams regularly competing in the Second League (*same-quality opponents*), while the remaining three were against First League adversaries (*higher-quality opponents*). To ensure a significant distinction in the *quality* of teams', we solely included matches against the Second League sides that did not secure promotion that year and the First League squads that were not relegated. Twenty-three outfield players from the case-studied team, aged 19 to 37 years (24.5 ± 3.9) and with a body height of 182.3 ± 5.5cm, participated in said matches. Additional contextual information from the comprised games is provided in Table 1.

Table 1. Contextual information from the matches analysed

Opp #	Opposition quality	Competition	Competition round	H/A	Match result
1	=	League	13	A	Draw
2	↑	League Cup	1	H	Defeat (balanced)
3	↑	League Cup	2	A	Draw
4	=	League Cup	3	H	Draw
5	=	League	15	A	Win (balanced)
6	=	League	18	H	Draw
7	↑	National Cup	6	A	Defeat (unbalanced)

Note: abbreviations = Opp #, opponent number; H/A, match played home or away. Legends: ↑, higher-quality opponent; =, same-level opponent; H, home; A, away; balanced, 2 or less goals difference; unbalanced, over 2 goals difference.

Two types of data were used: (1) positional data and (2) video recordings. Position tracking data from the outfield players were collected by 10Hz Catapult® GPS units (Catapult Innovations, Melbourne, Australia) and was kindly supplied by an external source. Latitude and longitude coordinates were exported from the units and supplied in player-separate CSV files. For video footage, high-definition recordings of TV broadcasts were retrieved from InstatScout® platform repository (Gómez et al., 2018; Silva & Marcelino, 2023).

Data processing

Open-play defensive transitions were identified through *video footage* analysis using Longomatch software (Fluendo, Barcelona, Spain), following the criteria proposed by Freitas et al. (2021).

- Accordingly, to be considered eligible, an episode had to initiate with a possession loss inside the pitch, without any infractions to the game laws by both teams. The possession loss must have resulted from the following opponents' actions: passing interception, tackle, turnover, blocked shot, goalkeeper save or remaining goalkeeper actions with ball contact, without holding it with its hands (Freitas et al., 2021).
- Following the initiating action, the team in possession had to exhibit one of the specified behaviours, delineated by Freitas et al. (2021): (a) 1 pass followed by 3 more ball touches; (b) 2 passes followed by 2 more ball touches; (c) 3 or more passes; (d) the ball carrier made more than 4 touches with the ball; (e) the team was in possession for more than 3 seconds.
- Additionally, eligible episodes needed to meet two further criteria: (1) having twenty-two players on the pitch, excluding, for instance, episodes where players were previously sent out (red cards) or where they were temporarily receiving medical assistance, and (2) having tracking data available from all outfield players of the focus team.
- The outcome of each episode was then categorised, by the first author, into one of four classes: (1) *established defence with opponent's spatial progression* (DSP); (2) *established defence without opponent's spatial progression* (DWOP); (3) *possession recovery with opponent's progression* (RSP); (4) *possession recovery without opponent's progression* (RWOP). The definitions of these classes can be found in Freitas et al. (2021). The categorization system proposed in said paper consists of five categories, however, due to a limited number of observations in the *opponent's shot or goal* category (*n* = 8), episodes within it were excluded from this study's sample.
- For each eligible episode, the broadcast starting and ending instants, the outcomes achieved, and the *match status* at the transition's starting moment were notated in a spreadsheet. The *match status* (i.e., game result at the transition's starting moment) was classified into five categories: (1) *substantial disadvantage* (≥2 goals disadvantage), (2) *disadvantage* (1 goal disadvantage), (3) *draw*, (4) *advantage* (1 goal advantage) or (5) *substantial disadvantage* (≥ 2 goals advantage). The intra- and inter-observer reliability of the categorical outcome variable has been previously assessed, displaying a *strong* to *almost perfect agreement*, according to McHugh (2012; for additional details on the reliability testing, see Freitas et al., 2021).

Subsequently, for the computation of tactical performance variables, TV footage was synchronised with time-position data. To do so, a two-dimensional (2D) video representation of each game was generated, based on players' tracking data, using a bespoke Python script, employing *Matplotlib*, *Pandas* and *Numpy* open-source libraries. These representations were then visualised on VEGAS Pro 18 software (Magix, Berlin, Germany), alongside the corresponding TV broadcast, enabling their visual synchronisation. The GPS timestamps of each defensive transition episode were identified, and the relevant CSV data rows were imported into Python for variables' computation at each timeframe (0.1s; 10 Hz GPS units). Subsequently, data related to tactical metrics and transition outcomes were entered into SPSS Statistics 28.0 (SPSS® Inc., U.S.A.), for statistical analysis.

Variables

The study involved the computation of thirty-two intra-team variables, originating from an initial set of eight metrics: *x-axis speed*, *y-axis speed*, *stretch index*, *lateral positioning*, *vertical positioning*, *last defender positioning*, *defensive occupation percentage*, and *defensive oscillation*. Aligning with the suggestion of Sarmento et al. (2022), who advocated for examinations beyond mean values, encompassing ranges and their temporal evolution, various derivatives of the eight foundational variables were calculated for each transition. These derivations included: (1) the episode mean, (2) the difference between start and ending episode instants, (3) the average variation per 0,1 seconds, and (4) the percentage of the episode duration during which the metric value decreased. The operational definitions of the resulting thirty-two metrics are detailed in Table 2.

Table 2. Synthesis of the tactical performance variables

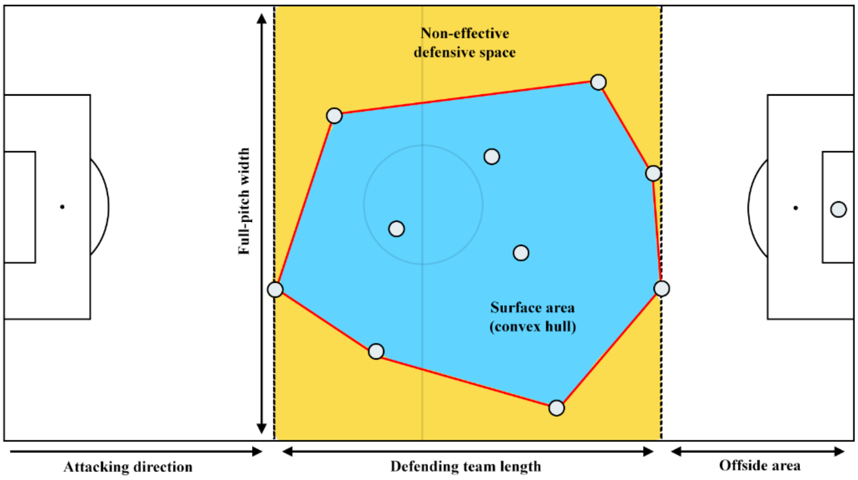
Variable name (abbreviation; unit): operational definition
X-axis mean speed (X_SpeedMean; km/h): Average speed at which the centroid displacement occurred along the longitudinal axis (i.e., goal-to-goal axis).
X-axis speed differential (X_SpeedDiff; km/h): Difference in centroid speed on the longitudinal axis between the transition's start and ending instants.
X-axis speed variation rate (X_SpeedVar; km/h): Average variation of the centroid's speed on the longitudinal axis over a 0,1 second step interval.
X-axis speed reduction time (X_SpeedReduce; %): Percentage of the duration of the episode during which the centroid speed was decreasing on the longitudinal axis.
Y-axis mean speed (Y_SpeedMean; km/h): Average speed at which the centroid displacement occurred along the transverse axis (i.e., sideline-to-sideline axis).
Y-axis speed differential (Y_SpeedDiff; km/h): Difference in centroid speed on the transverse axis between the transition's start and ending instants.
Y-axis speed variation rate (Y_SpeedVar; km/h): Average variation of the centroid's speed on the transverse axis over a 0,1 second step interval.
Y-axis speed reduction time (Y_SpeedReduce; %): Percentage of the duration of the episode during which the centroid speed was decreasing on the transverse axis.
Stretch index mean (SI_Mean; m): Average distance of players to the team's centroid.
Stretch index differential (SI_Diff; m): Difference in stretch index between the transition's start and ending instants.
Stretch index variation rate (SI_Var; m): Average variation of the stretch index over a 0,1 second step interval.
Stretch index reduction time (SI _Reduce; %): Percentage of the duration of the episode during which the stretch index was decreasing.
Lateral positioning mean (Lat_PositionMean; m): Average distance from the team's centroid to an imaginary longitudinal line dividing the pitch into two identical halves (i.e., right, and left). The distance was measured perpendicularly to the longitudinal line.
Lateral positioning differential (Lat_ PositionDiff; m): Difference in the distance of the team's centroid to the imaginary longitudinal line between the transition's start and ending instants.
Lateral positioning variation rate (Lat_ PositionVar; m): Average variation in the distance of the team's centroid to the imaginary longitudinal line over a 0,1 second step interval.
Lateral positioning reduction time (Lat_ PositionMovMid; %): Percentage of the duration of the episode during which the team's centroid was reducing its distance to the imaginary longitudinal line.
Vertical positioning mean (Vert_PositionMean; m): Average distance from the team's centroid to its own goal line. The distance was measured perpendicularly to the goal line.
Vertical positioning differential (Vert_PositionDiff; m): Difference in the distance of the centroid to its own goal line between the transition's start and ending instants.
Vertical positioning variation rate (Vert_PositionVar; m): Average variation in the distance of the team's centroid to the own goal line over a 0,1 second step interval.
Vertical positioning reduction time (Vert_PositionBacking; %): Percentage of the duration of the episode during which the team's centroid approached its own goal line.
Last defender positioning mean (LastDef_Mean; m): Average distance from the instantaneously most retreated player to its own goal line. The distance was measured perpendicularly to the goal line.
Last defender positioning differential (LastDef_Diff; m): Difference in the distance from the instantaneously most retreated player to its own goal line between the transition's start and ending instants.
Last defender positioning variation rate (LastDef_Var; m): Average variation in the distance from the instantaneously most retreated player to its own goal line over a 0,1 second step interval.
Last defender positioning reduction time (LastDef_Backing; %): Percentage of the duration of the episode during which the instantaneously most retreated player was approaching its own goal line.
Defensive occupation percentage mean (DOP_Mean; %): Average of the proportion of game space that is effectively defended (i.e., surface area), in relation the non-effectively defended game space.
Defensive occupation percentage differential (DOP_Diff; %): Difference in DOP between the transition's start and ending instants.
Defensive occupation percentage variation rate (DOP_Var; %): Average variation of DOP over a 0,1 second step interval.
Defensive occupation percentage reduction time (DOP_Reduce; %): Percentage of the duration of the episode during which DOP was decreasing.
Defensive oscillation mean (Oscillation_Mean; m): Average distance of players to an imaginary transverse line dividing the team length into two equal halves (i.e., advanced, and retreated halves). The distance was measured perpendicularly to the transverse line.
Defensive oscillation differential (Oscillation_Diff; m): Difference in defensive oscillation between the transition's start and ending instants.
Defensive oscillation variation rate (Oscillation_Var; m): Average variation of defensive oscillation over a 0,1 second step interval.
Defensive oscillation reduction time (Oscillation_Backing; %): Percentage of the duration of the episode during which defensive oscillation was approaching the team's defending/offside line.

Both *defensive occupation percentage* (DOP; Figure 1) and *defensive oscillation* represent new position-derived metrics. DOP was based on the hypothesis that a point of *diminishing returns* exists regarding the benefits of defensive compactness. That is, too small of a space occupation may reduce defending effectiveness, as it might allow, for instance, for opponents to easily "switch the play" to the opposite corridor, where fewer defenders are located. This variable was computed as the percentage of effectively (i.e., *surface area*) to non-effectively defended areas, using the following equations:

$$1. Non - effective\ defending\ space (m^2) = (Team\ length \times Full\ pitch\ width) - Surface\ Area$$

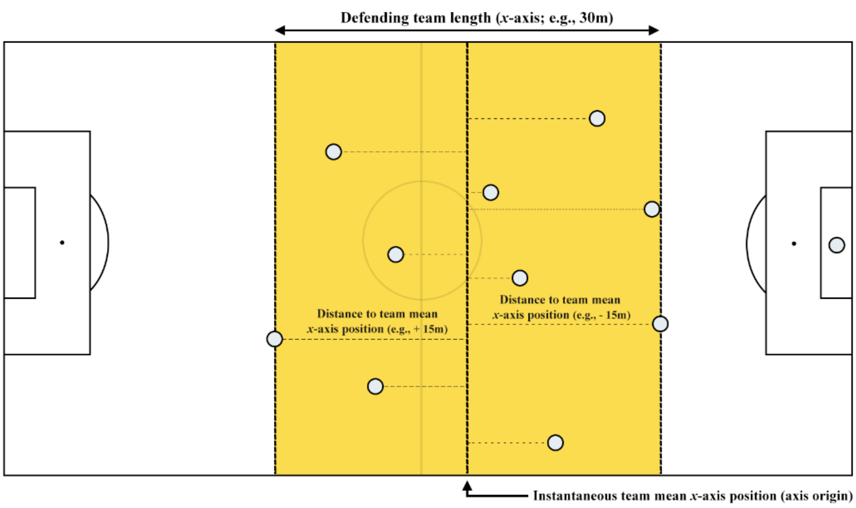
$$2. DOP\ (\%) = (Surface\ area)/(Non - efective\ defending\ space) \times 100$$

Figure 1. Elements considered for the computation of DOP.



Defensive oscillation provides an indication of the collective "swaying" within the team's length, offering insight into the players' mean *x-axis* disposition. Specifically, the concept involves capturing the team's length at each timeframe (e.g., thirty meters). A line is then drawn to divide this length into two equal halves (i.e., fifteen meters forward and fifteen backward). Subsequently, each player's distance from this line is evaluated, assigning positive values if they are positioned forward of the line in the team's attacking direction and negative values if they are situated behind it. Finally, the average distance of outfield players to the line is calculated (Figure 2).

Figure 2. Elements considered for the computation of *defensive oscillation*.



Statistical analysis

The normality of distribution of all thirty-two variables was assessed using Kolmogorov-Smirnov tests. Since not all variables followed a Gaussian distribution, the subsequent descriptive analysis incorporated mean and standard deviation, and median and interquartile range. After, to reduce the set of variables to a more manageable size and to diminish multicollinearity problems, a principal component analysis was performed with direct oblimin rotation. Prior to the computation of the principal components (PC), all variables underwent standardisation through min-max scaling. The Kaiser-Meyer-Olkin measure (KMO) exceeded the acceptable threshold (> 0.5), confirming the sample's adequacy for analysis (KMO = .70; Field, 2009). Bartlett's test of sphericity χ^2 (496) = 5798.93, p < .001, indicated substantial correlations between items, supporting the suitability of the data for PCA. In addition, the determination of the number of retained PC relied on eigenvalues exceeding 1.0, collectively explaining over 70% of the variance (Casal et al., 2021). Factor loadings with an absolute value of ± .60 were considered to have practical significance (Kong et al., 2022). These loadings signify the "weight" of each variable in each component, with positive and negative values indicating direct or indirect proportionality with the specific PC.

Afterwards, a mixed-effects multinomial logistic regression analysis was performed to estimate the odds of different episode outcomes occurring based on the values of principal components. The model included match as a random effect to account for repeated measurements (i.e., several transition episodes occurring in the same match), and the nested structure of additional elements (e.g., match location, tactical configurations, or players participating in each match). Match status was also included as random effect. The principal components were treated as the fixed effects. Following, a second mixed-effects multinomial regression was conducted, to examine the interaction between the relevant PCs and opposition quality, and their combined influence on episodes' success. Match and match status were again included as random effects, and interactions between each PC and opposition quality were specific as fixed effects. Possession recovery without opponent's progression (RWOP) was chosen as the reference category, as it denotes the highest degree of episode success. The criterion for statistical significance was set at 5% ($p < .05$). All statistical procedures were performed using IBM SPSS, version 28.0 (IBM, Chicago, U.S.A.).

Results

A total of 185 open-play defensive transitions, with a median (Mdn) duration of 3.8s, were considered eligible for analysis. The most frequent outcome was related to the team's inability to regain possession, nonetheless, effectively impeding the opponent's spatial progression (DWOP; n = 98). This was followed by episodes in which the adversary managed to progress, either with the focus team regaining (RSP; n = 34) or not regaining ball possession (DSP; n = 29). The least prevalent occurrence (12.97%) was the successful regaining of possession while impeding the opponent's advance beforehand (RWOP; n = 24).

The results of descriptive analysis have shown that the team's median speed of displacement along the goal-to-goal axis was higher than that along the sideline-to-sideline axis (Mdn = 4.80 km/h and Mdn = 3.18 km/h, respectively). Speed dynamics on both axes revealed similar durations of acceleration and deceleration (≈ 50%). As expected, there was a noticeable decrease in the collective spatial occupation, with the stretch index and DOP diminishing from the start to the end of defensive transitions. This contraction pattern persisted for most of the episode's duration. Defensive oscillation also decreased, indicating that players tended to retreat within the team's length. Concerning spatial positioning, the team's centroid was, on average, 7.93 meters away from an imaginary split dividing the pitch into right and left halves. Additionally, the geometrical centre was typically located at 52.26 meters from the own goal line, slightly behind the halfway line. The last defender, responsible for adjusting the offside line, was, on average, 33.14 meters away from his own goal. Notably, this positioning tended to advance throughout the episodes, with only 39.39% of the episodes' duration characterised by backward movements towards the team's own goal. Table 3 provides a comprehensive overview of all variables in the descriptive analysis.

Table 3. Descriptive statistics of the defensive transition episodes (*n* = 185)

	Mean ± SD	Median (IQR)
X_SpeedMean (km/h)*	5.22 ± 3.03	4.80 (3.58)
X_SpeedDiff (km/h)	-0.24 ± 6.07	-0.19 (8.13)
X_SpeedVar (km/h)*	-0.18 ± 0.19	-0.01 (0.23)
X_SpeedReduce (%)	51.18 ± 11.15	50.20 (13.79)
Y_SpeedMean (km/h)*	3.56 ± 2.09	3.18 (3.04)
Y_SpeedDiff (km/h)	0.49 ± 3.42	0.32 (4.47)
Y_SpeedVar (km/h)*	0.01 ± 0.10	0.01 (0.10)
Y_SpeedReduce (%)	49.21 ± 7.89	49.73 (9.73)
SI_Mean (m)	16.75 ± 2.45	16.56 (3.49)
SI_Diff (m)*	-1.50 ± 2.23	-1.07 (2.77)
SI_Var (m)*	-0.04 ± 0.05	-0.03 (0.08)
SI_Reduce (%)*	68.02 ± 30.48	74.60 (53.84)

Lat_PositionMean (m)	7.93 ± 4.57	7.72 (6.34)
Lat_ PositionDiff (m)*	-0.17 ± 4.84	0.12 (4.85)
Lat_ PositionVar (m)	0.01 ± 0.35	0.15 (0.52)
Lat_ PositionMovMid (%)*	47.15 ± 37.62	46.20 (75.97)
Vert_PositionMean (m)	52.26 ± 15.26	51.97 (23.83)
Vert_PositionDiff (m)*	-1.27 ± 7.30	-0.48 (8.20)
Vert_PositionVar (m)	-0.01 ± 0.15	0.02 (0.20)
Vert_PositionBacking (%)*	50.08 ± 38.19	56.14 (82.74)
LastDef_Mean (m)	33.14 ± 13.94	33.99 (21.39)
LastDef_Diff (m)*	0.96 ± 6.99	1.34 (7.64)
LastDef_Var (m)	0.04 ± 0.16	0.03 (0.21)
LastDef_Backing (%)*	40.35 ± 33.85	39.39 (62.25)
DOP_Mean (%)*	71.56 ± 24.65	66.95 (27.34)
DOP_Diff (%)*	-17.21 ± 26.63	-11.06 (27.83)
DOP_Var (%)*	-0.47 ± 0.73	-0.34 (0.79)
DOP_Reduce (%)*	68.79 ± 29.36	75.00 (48.20)
Oscillation_Mean (m)	0.22 ± 3.25	-0.01 (4.32)
Oscillation_Diff (m)*	-1.18 ± 2.49	-0.88 (2.58)
Oscillation_Var (m)	-0.03 ± 0.05	-0.03 (0.06)
Oscillation_Backing (%)*	64.08 ± 25.48	66.67 (36.74)
Episode Duration (s)*	4.98 (3.51)	3.8 (3.52)

Note: SD, standard deviation; IQR, interquartile range; *, non-normally distributed variable.

Principal component analysis revealed that six components accounted for >70% of total variance. The pattern matrix of factor loadings is presented in Table 4. Summing up this table, the analysis of the resulting six components suggests that:

- PC1 (23.1% of variance) represents the team's longitudinal movement dynamics, influenced by variables related to movement along the goal-to-goal axis (X_SpeedDiff; X_SpeedVar; X_SpeedReduce; Vert_PositionDiff; Vert_PositionVar; Vert_PositionBacking; LastDef_Diff; LastDef_Var; LastDef_Backing);
- PC2 (16.2% of variance) characterises the team's expansion/contraction dynamics, shaped by variables associated with the spatial occupation magnitude (SI_Diff; SI_Var; SI_Reduce; DOP_Diff; DOP_Var; DOP_Reduce);
- PC3 (10.3% of variance) represents the team's lateral positioning, incorporating variables linked to the team's distance to an imaginary line dividing the pitch into right and left halves (Lat_ PositionDiff; Lat_ PositionVar; Lat_ PositionMovMid);
- PC4 (8.7% of variance) captures the lateral movement speed dynamics, influenced by metrics addressing the displacement speed along the sideline-to-sideline axis (Y_SpeedDiff; Y_SpeedVar; Y_SpeedReduce);
- PC5 (6.8% of variance) embodies the longitudinal within-team allocation, including variables expressing how players position themselves within the team's length (Oscillation_Diff; Oscillation_Var; Oscillation_Backing);
- PC6 (5.1% of variance) signifies the team's longitudinal positioning, loaded by metrics related to the mean collective location along the goal-to-goal axis (Vert_PositionMean; LastDef_Mean).

It should be noted that most mean related variables (n = 6 out of 8) did not evidence practical significance (± .60 factor loading) for the retained principal components, exception made to Vert_PositionMean and LastDef_Mean metrics.

Table 4. Component statistics and factor loadings - pattern matrix

	PC1	PC2	PC3	PC4	PC5	PC6
X_SpeedMean	-0.167	0.052	0.099	0.021	-0.469	-0.182
X_SpeedDiff	-0.738	-0.136	0.027	0.084	-0.094	0.223
X_SpeedVar	-0.679	-0.165	-0.023	0.074	-0.076	0.323
X_SpeedReduce	0.607	0.060	0.058	-0.082	0.035	-0.327
Y_SpeedMean	0.025	0.046	-0.086	0.335	-0.271	0.027
Y_SpeedDiff	0.134	-0.026	-0.057	0.884	0.037	0.069
Y_SpeedVar	0.103	-0.023	0.030	0.934	0.067	0.037
Y_SpeedReduce	0.056	0.009	-0.128	-0.861	-0.157	0.025
SI_Mean	0.131	-0.263	0.490	-0.165	0.029	0.114
SI_Diff	0.064	0.823	0.171	-0.012	-0.052	0.119

SI_Var	-0.076	0.904	0.147	0.068	-0.054	-0.044
SI_Reduce	0.045	-0.845	-0.189	-0.035	0.109	0.043
Lat_PositionMean	-0.092	-0.053	0.014	0.148	0.402	-0.099
Lat_ PositionDiff	0.007	0.101	0.873	-0.008	0.028	0.058
Lat_ PositionVar	0.020	0.116	0.944	0.057	-0.069	0.016
Lat_ PositionMovMid	0.107	-0.080	-0.904	-0.088	0.004	0.030
Vert_PositionMean	-0.032	0.157	0.069	0.042	-0.003	0.891
Vert_PositionDiff	0.874	0.074	0.017	0.015	0.067	0.152
Vert_PositionVar	0.917	0.042	0.015	0.042	0.140	0.020
Vert_PositionBacking	-0.854	-0.066	-0.060	-0.102	-0.060	0.062
LastDef_Mean	-0.039	0.217	0.001	0.075	0.054	0.823
LastDef_Diff	0.882	-0.174	-0.074	0.042	-0.069	0.104
LastDef_Var	0.935	-0.188	-0.029	0.051	-0.044	0.045
LastDef_Backing	-0.901	0.104	0.000	-0.101	0.064	-0.028
DOP_Mean	0.117	-0.545	0.401	-0.118	0.016	0.073
DOP_Diff	0.106	0.746	-0.135	-0.047	0.175	0.195
DOP_Var	-0.051	0.832	-0.176	-0.009	0.158	0.000
DOP_Reduce	-0.018	-0.806	-0.011	0.082	-0.055	-0.006
Oscillation_Mean	-0.119	-0.168	0.085	-0.017	-0.025	0.587
Oscillation_Diff	0.169	0.053	0.054	-0.033	0.832	0.133
Oscillation_Var	0.088	0.146	-0.048	-0.019	0.855	0.012
Oscillation_Backing	-0.039	-0.106	0.011	0.013	-0.859	0.052
Eigenvalues						
Total	7.392	5.179	3.305	2.775	2.165	1.636
% of variance	23.1	16.2	10.3	8.7	6.8	5.1
Cumulative %	23.1	39.3	49.6	58.3	65.1	70.2

Note: bold and highlighted represent loadings greater than ± 0.60.

Among the principal components examined, PC1 (longitudinal movement dynamics), PC3 (lateral positioning), PC5 (longitudinal within-team allocation) and PC6 (longitudinal positioning) emerged as significant predictors of defensive transition outcomes (see Table 5). Specifically, in the comparison between episodes with the highest disparity in team success (established defence with opponent's spatial progression vs. possession recovery without opponent's progression; DSP vs. RWOP), an increase in within-team allocation (PC5) was associated to an augmented probability of episodes concluding in DSP ($p < .05$; OR = 1.913). As for DWOP vs. RWOP (established defence without opponent's spatial progression vs. possession recovery without opponent's progression), only the values of lateral positioning (PC3) altered the probability of the latter conclusion (DWOP) occurring. Specifically, a one-unit increase of PC3 was associated with a 44.0% decrease in the odds observing DWOP ($p < .05$; OR = 0.560). When comparing the most desirable outcomes (possession recovery with opponent's progression vs. possession recovery without opponent's progression; RSP and RWOP), increases in longitudinal movement dynamics (PC1; $p < .05$; OR = 0.248) and longitudinal positioning (PC6; $p < .05$; OR = 0.507) were both associated to smaller odds of RSP taking place. Furthermore, data indicates that PC2 (expansion/contraction dynamics) and PC4 (lateral movement speed dynamics) were not relevant in any comparison between the reference and remaining categories.

Table 5. Mixed-effects multinomial logistic regression of defensive transitions outcomes as a function of principal components

	B	OR	95% CI	p
DSP vs. RWOP				
Longitudinal movement dynamics	-0.692	0.500	[0.245, 1.023]	0.058
Expansion/contraction dynamics	-0.393	0.675	[0.378, 1.205]	0.182
Lateral positioning	0.082	1.085	[0.569, 2.071]	0.803
Lateral movement speed dynamics	0.474	1.606	[0.872, 2.956]	0.128
Longitudinal within-team allocation	0.649	1.913	[1.018, 3.598]	0.044*
Longitudinal positioning	0.141	1.151	[0.621, 2.133]	0.653
DWOP vs. RWOP				
Longitudinal movement dynamics	0.405	1.499	[0.863, 2.604]	0.149
Expansion/contraction dynamics	-0.060	0.942	[0.593, 1.496]	0.797
Lateral positioning	-0.581	0.560	[0.334, 0.938]	0.028*
Lateral movement speed dynamics	0.289	1.335	[0.820, 2.175]	0.243
Longitudinal within-team allocation	0.007	1.007	[0.592, 1.715]	0.978
Longitudinal positioning	-0.171	0.843	[0.503, 1.413]	0.515
RSP vs. RWOP				
Longitudinal movement dynamics	-1.395	0.248	[0.114, 0.541]	0.001*
Expansion/contraction dynamics	-0.052	0.949	[0.525, 1.717]	0.863
Lateral positioning	-0.159	0.853	[0.450, 1.618]	0.625
Lateral movement speed dynamics	0.348	1.417	[0.735, 2.732]	0.296
Longitudinal within-team allocation	-0.033	0.968	[0.492, 1.903]	0.923
Longitudinal positioning	-0.679	0.507	[0.280, 0.918]	0.025*

Note: OR, odds ratio; CI, confidence interval; DSP, established defence with opponent's spatial progression; DWOP, established defence without opponent's spatial progression; RSP, possession recovery with opponent's progression; RWOP, possession recovery without opponent's progression (reference category); *, p < .05. Model fitting information: Akaike Information Criterion = 2363.7; Bayesian Information Criterion = 2381.8.

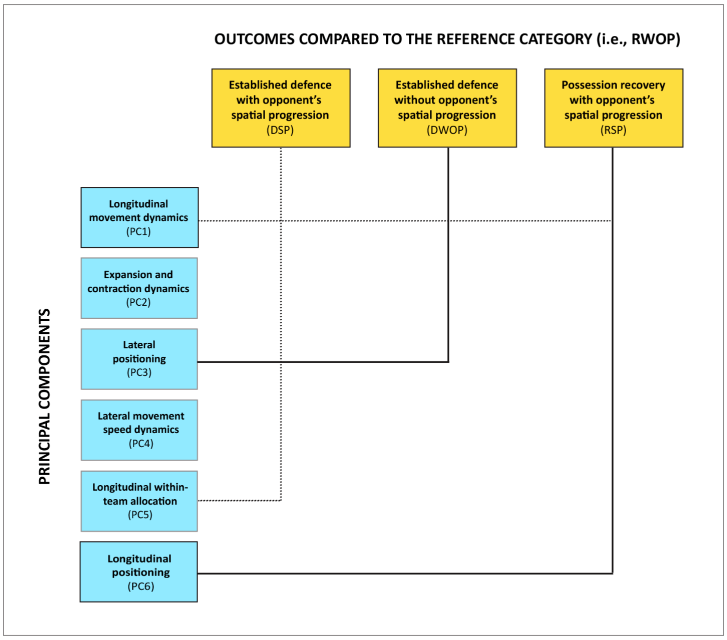
Concerning *interactive effects*, solely the relationships between *longitudinal movement dynamics* (PC1) and *longitudinal within-team allocation* (PC5) with transition outcomes were modulated by the *quality* of the opposing team (see Table 6). A one-unit increase in PC1 against *same-level* opponents was associated with an 81.9% decrease in the odds of RSP being observed ($p < .001$; OR = 0.112), compared to a 74.3% decrease in the odds with the same increase against *higher-quality* teams ($p < .05$; OR = 0.257). For principal component 5, a one-unit increase against *higher-quality* adversaries was associated with a 237.9% increase in the odds of DSP taking place ($p < .05$; OR = 3.379). A depiction of the significant associations between PC and transition outcomes is presented in Figure 3.

Table 6. Mixed-effects multinomial logistic regression of defensive transitions outcomes as a function of principal components and opposition quality

	B	OR	95% CI	p
DSP vs. RWOP				
Longitudinal movement dynamics*same-level opponents	-0.900	0.407	[0.158, 1.045]	0.061
Longitudinal movement dynamics*higher-quality opponents	-0.431	0.650	[0.190, 2.215]	0.488
Longitudinal within-team allocation*same-level opponents	0.285	1.330	[0.556, 3.181]	0.519
Longitudinal within-team allocation *higher-quality opponents	1.217	3.379	[1.081, 10.604]	0.037*
DWOP vs. RWOP				
Longitudinal movement dynamics*same-level opponents	0.282	1.326	[0.632, 2.783]	0.453
Longitudinal movement dynamics*higher-quality opponents	0.444	1.560	[0.626, 3.887]	0.338
Longitudinal within-team allocation *same-level opponents	-0.344	0.709	[0.344, 1.462]	0.349
Longitudinal within-team allocation *higher-quality opponents	0.585	1.795	[0.625, 5.159]	0.275
RSP vs. RWOP				
Longitudinal movement dynamics*same-level opponents	-1.707	0.181	[0.061, 0.544]	0.003*
Longitudinal movement dynamics*higher-quality opponents	-1.359	0.257	[0.079, 0.840]	0.025*
Longitudinal within-team allocation *same-level opponents	-0.534	0.586	[0.226, 1.519]	0.270
Longitudinal within-team allocation *higher-quality opponents	-0.652	1.920	[0.580, 6.353]	0.283

Note: only statistically significant interactions between principal components and opposition quality are shown in Table 6. OR, odds ratio; CI, confidence interval; DSP, established defence with opponent's spatial progression; DWOP, established defence without opponent's spatial progression; RSP, possession recovery with opponent's progression; RWOP, possession recovery without opponent's progression (reference category); *, p < .05. Model fitting information: Akaike Information Criterion = 2406.5; Bayesian Information Criterion = 2423.8.

Figure 3. Depiction of the significant associations between PC and transition outcomes.



Note: Solid lines denote statistically significant associations in the mixed-effects multinomial logistic regression of transitions outcomes as a function of principal components. Dashed lines denote statistically significant associations in the aforementioned, and also in the mixed-effects multinomial logistic regression of transitions outcomes as a function of principal components and opposition quality.

Discussion

This study aimed to examine the relationship between spatially informed defensive-related metrics, subject to prior PCA, and the outcomes of open-play defensive transitions. Additionally, it explored how these associations were influenced by the *quality of opposition*.

Possession recovery without opponent's progression vs. established defence with opponent's spatial progression

Comparing outcomes with contrasting success characteristics - *established defence with opponent progression* (DSP) vs. *possession recovery without opponent progression* (RWOP) - the data revealed a significant association between higher *within-team allocation* (PC5) and an increased likelihood of DSP occurrence. PC5 is influenced by derivatives of *defensive oscillation*, one of the newly introduced variables. In practical terms, as players' average position advances within the team's length, the team was less likely to regain possession or impede ball progression. Two factors may contribute to this finding:

a) Defensive oscillation is significantly influenced by the movements of the most advanced and deepest players, as they define the team's instantaneous length, necessary for the variable's computation. If the last defender retreats toward their goal without a corresponding adjustment from offensive players, team length increases, leading to a forward shift in the players' mean positioning. Thus, higher PC5 values may indicate a loss of vertical proximity, elevating the likelihood of an undesirable outcome (DSP). This aligns with previous findings that attacking players - such as wide midfielders and centre forwards - engage in fewer sprints than teammates during defensive transitions, often failing to accelerate after the opposition progresses beyond the defensive line (Bortnik et al., 2023; Caldbeck & Dos'Santos, 2022). When it comes to the influence of formation line distances on success, our proposition contrasts with Forcher et al. (2023a), likely due to differences in sample quality (i.e., Bundesliga vs Portuguese Second League teams) and methodological approaches to measuring "longitudinal compression".

b) Players' tactical roles are partly dictated by their proximity to the ball (Costa et al., 2009; Mota et al., 2023), often requiring defenders to adopt diagonal positioning relative to nearby teammates. Tactical roles shifts, such as those triggered by an opponent's lateral pass, necessitate constant micro-level adjustments. Failure to reposition into a more retreated and diagonal position may elevate PC5 values, thus reducing the ability to block progressive passes (Travassos et al., 2022). So, to optimise defensive transitions success, players must synchronise movements along the goal-to-goal axis, continually adapting their roles as match settings evolve. This will ensure defensive compactness, micro-scale balances, and a continuous provision of defensive support.

Possession recovery without opponent's progression vs. established defence without opponent's spatial progression

Findings suggest that teams may improve defensive success by quickly and consistently moving their *centroid* towards outer corridors. Increased lateral positioning (PC3) was associated with a reduced likelihood of DWOP occurrence, aligning with Bauer and Anzer (2021) who found that counterpressing was more effective near the sidelines. However, this proposition warrants caution, as pressing efficacy may depend on preceding match conditions. Specifically, both compared outcomes (DWOP and RWOP) involved the defending team successfully impeding vertical progression. Given football's ball-centric nature (Brink et al., 2023), this likely occurs if the defending team has numerical or positional superiority at the ball's location. Two possible scenarios emerge: (a) the transition began near the sideline, enabling immediate and aggressive pressing, or (b) central progression was initially deterred, by narrowing defensive width (Travassos et al., 2022), forcing play outward before executing coordinated pressing. This suggests that effective transitions may follow a procedural sequence: (1) forcing play wide or capitalising on ball location near the sideline and (2) engaging in aggressive, coordinated movements, leveraging pitch boundaries as constraints – essentially, "*using the sideline as an additional defender*". Future research should empirically validate this sequence, recognising that between-team force balances may influence its viability. If confirmed, it should be interpreted as a team-level principle of play *(i.e., a principle of play; Ribeiro et al., 2019)*, guiding players strategical *intentions*, while exploring context-available opportunities (*affordances*).

Possession recovery without opponent's progression vs. possession recovery with opponent's progression

Higher *longitudinal movement dynamics* (PC1) were linked to a reduced probability of *possession recovery with opponent's progression* (RSP). PC1 captures movement along the goal-to-goal axis, with increased values indicating stability or reduction in longitudinal speed, less time retreating towards the own goal, and fewer *falling back* actions. We argue that PC1's effect reflects game-play dynamics, rather than directly determining transition outcomes. Defending teams naturally limit opponent's progression (RSP) when they are able to spend less time retreating, while maintaining stability in *x*-axis speed. RWOP and RSP differ only in the defending team's ability to prevent ball advances before recovering possession. If it is accepted that PC1 influence on outcomes is a mere *consequence of* match dynamics, factors beyond the macro-scale of PC1 may play a decisive role in spatial progression. For instance, Goes et al. (2021) found that intra- and inter-team subgroup dynamics differed between successful and unsuccessful defensive sequences. Similarly, same-team and opposing players' distances and angular relations influence passing effectiveness (Merlin et al., 2022; Travassos et al., 2022). So, meso- and micro-scale assessments of cooperation and opposition dynamics, might be better suited to disclose how ball progression is impeded during transitions.

Higher defensive block positioning (PC6) was also associated with a lower probability of RSP. This implies that a higher block is desirable, as it becomes more likely for the reference category (*possession recovery without opponent's progression*; RWOP) to be observed. This aligns with research linking defensive pressure and ball recoveries near the opponent's goal to competitive success (Casal-Sanjurjo et al., 2021; Cooper & Pulling, 2020; Gónzalez-Rodenas et al., 2016; Hughes & Lovell, 2019). However, elite teams frequently adjust defensive block positioning in response to game contingencies (Freitas et al., 2023). So, a high block should not be seen as an objective *per se*, but as a conditional strategy, to be applied when certain preconditions are met - e.g., (1) the opponent ball holder and its nearby teammates are under pressure or (2) the area behind the defence line is effectively "controlled". These preconditions have been shown to enhance defending success (Forcher et al., 2023b; Vilar et al., 2013). Only then, the adversaries may be sufficiently time-constrained and forced to adopt unsuited *attacking methods* (Sarmento et al., 2018), or actions commonly linked to possession swaps (e.g., forward long passing; Power et al., 2017).

Regarding *expansion/contraction dynamics* (PC2), descriptive statistics indicated a general reduction in spatial occupation during transitions. However, the magnitude of this decrease did not discriminate between outcomes, as in previous research (e.g., Bartlett et al., 2012; Garcia-Calvo et al., 2023; Welch et al., 2021). PC2 was influenced by *stretch index* and DOP derivates, which do not account for: (1) the spatial occupation across both pitch axes or (2) the team's positional distribution within specific subareas. Both aspects may be critical for predicting out-of-possession success (Forcher et al., 2023a; Travassos et al., 2022). Similarly, *lateral movement speed dynamics* (PC4), which capture variations in *y-axis* speed, did not demonstrate a significant effect on episode's conclusions. This suggests that, in terms of movement along the transverse axis (sideline-to-sideline), only the speed and stability of the centroid's movement (PC3), rather than the temporal evolution or variations in lateral velocity (PC4), influence a team's ability to succeed in defensive transitions.

Interactive effects of PC and opposition quality on transition outcomes

Regarding the study's second aim - assessing the influence of *opposition quality* on the actions that lead to success -, *longitudinal movement dynamics* (PC1) effect on the RSP (ball recovery with spatial progression) *vs.* RWOP (ball recovery without spatial progression) comparison differed by opposition level. Against same-level opponents, a one-unit increase in PC1 resulted in a greater reduction in RSP likelihood than against stronger teams. This seems to be a direct consequence of the *quality* of the teams faced. Higher-quality opponents display greater individual and collective abilities (Aquino et al., 2020; Fernandez-Navarro et al., 2019), managing ball advances (RSP) more effectively, when facing similar defending challenges. Nevertheless, PC1's effect remained significant regardless of the *opposition's quality*.

For *within-team allocation* (PC5), effects were significant only against higher-quality opponents, with increased values leading to higher DSP (*established defence with opponent's spatial progression*) likelihood. This suggests that excessive forward movement within the team's length should be minimised when facing stronger teams. Higher PC5 values indicate either (1) reduced vertical compactness or (2) failure to adapt tactical roles, with players not moving to retreated and diagonal positioning. So, to ensure desirable outcomes against higher-quality opponents, teams should prioritise "longitudinal compression", positioning more players closer to their last defensive line, and ensure frequent "recovery runs" - with overtaken players repositioning themselves diagonally between the ball and their goal. This aligns with previous studies emphasising that the importance of a greater number of players behind the ball to attain defensive success (e.g., González-Rodenas et al., 2015; Taha & Ali, 2023; Tenga et al., 2017). No other *principal components* were significantly influenced by opposition quality, indicating that the effects of *lateral positioning* (PC3) and *longitudinal positioning* (PC6) on transitions' outcomes remained consistent across opposition levels.

Practical applications

Based on these findings, the following practical applications are proposed:

- To avoid highly undesirable outcomes (DSP), defending teams should maintain within- and between-line proximity, as they move along the pitch. Players near the ball must continuously reposition according to game settings, to ensure diagonal and retreated positioning relative to nearby teammates;
- Quick and consistent collective movements towards lateral corridors increased possession recovery likelihood. A procedural sequence may thus be advisable: (1) forcing play or taking advantage of a ball near the sideline and (2) pressing in a forceful and coordinated manner in an outer direction – "using the sideline as an additional defender";
- Against stronger opponents (1st league teams), teams in defensive transition should prioritise defensive "recovery runs" (e.g., by forwards or attacking midfielders), ensuring numerical superiority and tactical advantages in key pitch locations.

Limitations

Two major limitations should be noted when interpreting the findings of this study. First, metrics and principal components examined arise exclusively from position tracking data collected from a single team. As paramount elements such as ball location, pitch references, and inter-team positional relations were not available, the inferences provided used a permanently deductive reasoning process. Still, we must emphasise that this attempt to bridge the sports scientists-coaching staff gap aligns with the practical constraints faced by many professional clubs, where similar databases are used for performance analysis and decision-making. Therefore, while it represents a limitation, it also enhances the "real-world" validity of this study, as it reflects how practitioners often work within comparable informational boundaries. The other limitation lies in the typical nature of a case-study and the broader applicability of its findings. The extrapolation of our results to a more diverse set of teams should be approached cautiously, due to potential variations in team-specific or confrontational elements (inter-teams dynamics or situational factors). However, this approach enabled an in-depth exploration of within-team tactical dynamics that would be difficult to capture in multi-team datasets. Future studies encompassing a diverse set of teams can provide a more comprehensive understanding of how intra-team tactical behaviours influence defensive transition outcomes across competitive contexts.

Conclusions

This study used PCA to explore the relationship between intra-team defensive-related metrics and the transition outcomes achieved by a Portuguese Second League team. Additionally, we explored how these associations were moderated by the quality of the opposition. To the best of our knowledge, this was the first study pertaining to such topics, particularly using official match data against teams from various competitive tiers. Also, this was the first time that PCA was used in the context of defensive transitions, demonstrating its utility to condense complex datasets of interrelated variables, into higher-order constructs of applied significance. Two novel defensive-related metrics (i.e., defensive occupation percentage and defensive oscillation) were also introduced, thus expanding on the still limited set of intra-team tactical-related metrics. Overall, our study emphasised the enduring value of single team's positional data for the analysis of competitive settings, simultaneously enhancing knowledge on the influence of defensive tactical patterns on transition outcomes. Additionally, we proffered suggestions for future research, including recommendations on how to enhance the utility of intra-team positional data examination in applied scenarios.

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Competing interests

The authors report there are no competing interests to declare.

Ethics approval and informed consent

The study was approved by the Ethics Committee of the Faculdade de Motricidade Humana (#25/2021, 1st April 2021) and conformed to the recommendations of the Declaration of Helsinki, with the need for written informed consent waived.

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