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Original Article

What playing styles best represent the overall tactical identity of European soccer teams?

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Abstract:
Problem Statement: Playing style represents the tactical identity of soccer teams and has gained increasing attention in performance analysis research. While previous studies have identified multiple styles across isolated game situations, few have offered holistic, interpretable profiles describing a team's overall playing style. Approach: This study aimed to identify and describe the dominant overall playing styles of professional European soccer teams by analyzing their tactical behaviors across multiple game situations. Methods: A total of 174 teams from 11 European leagues during the 2021–2022 season were analyzed using 19 latent variables representing distinct game situations. Hierarchical cluster analysis was used to classify the teams into groups based on their standardized factor scores. Discriminant analyses and independent sample t-tests were performed to identify the tactical characteristics that distinguished each cluster. Results: The hierarchical cluster analysis initially revealed two primary playing styles (A and B). Each was subsequently divided into two subsets, resulting in four final interpretable playing styles. Style C reflects traditional British direct play with aerial duels and set-piece reliance. Style D exhibited aggressive ground-based directness, aligning with the Spanish 'furia' philosophy. Style E combined controlled possession with rapid counterattacks, whereas Style F emphasized structured positional play and high ball retention, resembling tiki-taka. Each style corresponded to consistent patterns across multiple game situations with clear tactical signatures supported by statistical significance and large effect sizes. Conclusions: This study presented a novel, soccer-specific classification of overall team-playing styles among European soccer teams. The findings provide actionable insights for coaches and applied performance analysts while also contributing to the theoretical integration of playing styles with game models and tactical periodization frameworks.
Key Words: football**, game style, performance analysis, team identity, tactics**

Introduction

Modern professional soccer increasingly depends on the ability of teams to express a clear and stable tactical identity across matches (Jung & Jung, 2025). Playing styles influence every aspect of performance, from match preparation and scouting, to in-game decision making, load management, and long-term squad construction (Forcher et al., 2023; He et al., 2023; Kong et al., 2022; Li et al., 2022; Plakias, Moustakidis, Kokkotis, Papalexi, et al., 2023; Plakias, Moustakidis, Kokkotis, Tsatalas, et al., 2023; Plakias, Tsatalas, et al., 2024; Plakias, Tsatalas, et al., 2023). As match analysis technologies continue to expand, coaches and analysts face an overload of isolated performance indicators, making it difficult to extract a unified tactical profile (Plakias, Moustakidis, Kokkotis, Tsatalas, et al., 2023). Therefore, the systematic identification of a team's overall playing style has become essential for translating large and fragmented datasets into meaningful, soccer-specific insights that reflect a team's game model and operational principles.

Playing styles have become a central topic of discussion in the international scientific soccer literature in recent years. Hewitt et al. (2016) defined playing style as "the characteristic playing pattern demonstrated by a team during games" and suggested that segmenting the game into distinct phases and analyzing the patterns that emerge within each phase can provide valuable insights into the identification, characterization, and

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quantification of playing styles in field sports. Hewitt's proposal served as a catalyst for sports science researchers to initiate a series of studies in this area. Indeed, inspired by Pollard's idea of grouping performance indicators and quantifying playing styles through factor scores (Pollard et al., 1988), and capitalizing on the increasing accessibility of performance data through semi-automated systems and analysis platforms (Memmert & Rein, 2018; Plakias, 2025), researchers employed factor analysis and conducted numerous investigations (Plakias, Moustakidis, Kokkotis, Tsatalas, et al., 2023; Rojas-Valverde et al., 2020).
Specifically, many authors studied one or more competitions, adopting factor analysis and using a variety of technical-tactical and physical performance indicators to extract between two and nineteen factors (latent variables) (Castellano & Pic, 2019; Fernandez-Navarro et al., 2016; Gómez et al., 2018; Kong et al., 2022; Lago-Peñas et al., 2017; Plakias, Kokkotis, et al., 2023; Ruan, Ge, Gómez, et al., 2022; Ruan, Ge, Shen, et al., 2022; Zhou et al., 2021). Each of these represented a game situation in which two opposing playing styles could be identified depending on the sign of the factor score (+ or -).

However, this approach resulted in multiple styles being identified for each team, as a separate style corresponded to each game situation. According to the Grounded Theory proposed by Plakias, Kasioura, et al. (2024) on teams' playing styles, some researchers have adopted a different approach, assigning an overall playing style that reflects the team's global tactical identity. For example, some teams' styles have been described as Total Football (Jensen, 2017), Sariball (Moustakidis et al., 2023), Tiki-taka (Rahimian et al., 2024), Park the Bus (Guan et al., 2023), Catenaccio (Archambault, 2022), and others.

Researchers have employed various artificial intelligence techniques to extract a single style that captures the overall image of the team. For instance, García-Aliaga et al. (2022) and Plakias, Moustakidis, Mitrotasios, et al. (2023) used t-SNE, a dimensionality reduction technique, whereby a series of variables can be represented using two coordinates (x, y). In this way, each team's style was visualized as a dot on a map. Decroos et al. (2018) and Decroos et al. (2020) applied pattern mining and clustering techniques on spatiotemporal event data (e.g., clustering, mixture models) to identify tactics and playing styles, which they visualized using arrows and phase diagrams illustrating characteristic actions (type, location, direction). In contrast, Bialkowski et al. (2016) and Brooks et al. (2016) relied on player formations and passing distributions, representing team styles through heatmaps (e.g., ball occupancy, pass origin) or static formation diagrams (formation centroids). In all these cases, although the overall style of each team was depicted using data and visualizations, the resulting profiles lacked soccer-specific interpretability, as the methodologies focused on structural/computational pattern recognition rather than on the tactical description of the defining features of each style.

Despite the progress made in previous research, a clear problem remains: the current literature does not provide a unified and soccer-specific framework for identifying the overall tactical identity of a team. To address this lack of soccer-specific, interpretable representations of overall team playing styles that integrate multiple game situations into a cohesive tactical profile, this study proposed a novel methodological framework. Unlike previous approaches that either depicted isolated aspects of play or provided abstract spatial visualizations without tactical interpretation, we aimed to cluster teams based on their holistic tactical behavior. We hypothesized that European teams could be objectively grouped into a limited number of distinct clusters, each reflecting a unique and interpretable overall playing style. Moreover, we assumed that each style would be characterized by a consistent pattern of tactical decisions across various game situations, allowing for a meaningful soccer-specific description of each cluster.

Therefore, the aim of this study was to identify and describe the dominant playing styles that define the overall tactical profiles of professional soccer teams in modern European soccer. To achieve this, we addressed the following research questions: (1) Can European teams be objectively grouped into clusters based on their tactical behavior across multiple game situations? (2) What are the specific tactical characteristics that distinguish each of the identified playing styles? By applying hierarchical clustering on standardized team-level data, we aimed to group European teams based on the global patterns of their tactical behavior rather than on isolated actions. This method allows us to generate interpretable tactical clusters that reflect stable playing styles, thereby overcoming the limitations of prior work and offering a comprehensive representation of each team's tactical identity.

Material & methods

Sample and Variables

The sample of the present study consisted of 174 European teams that participated in 11 different leagues during the 2021–2022 season. The teams and their corresponding leagues are presented in Supplementary Material 1. As variables, the 19 latent variables identified in a previous study by Plakias, Kokkotis, et al. (2023) were used. Each latent variable represented a game situation, in which teams could adopt two different tactical behaviors depending on whether their factor score on the respective latent variable was high or low. Table 1 presents the game situations along with the two corresponding tactical behaviors based on the magnitude of the factor score values.

Table 1. Game situations along with the corresponding tactical behaviors.

Game Situation (latent variables)	Tactical Behaviors High values of the factor scores	Low values of the factor scores
Build up phase	Possession-based	Direct-based with many long passes
Transition game	Many transitions	Few transitions
Attacking transition	Counterattack	Positional attack
Defensive transition	Opponent's counterattack	Opponent's positional attack
Aerial game	Game in the air	Game on the ground
Type of attack	Set pieces attack	Open play attack
Crossing	Many crosses	Few crosses
Type of opponent's attack	Open play defense	Set pieces defense
Defensive blocks	Mid block	Low block
Press	High press	Deep press
Individual defending actions	Many individual defending actions	Few individual defending actions
Width of creative phase	Center attack	Wide attack
Effective game	More interruptions and duels	More possession from one or the other team
Individual attacking actions	Many individual attacking actions	Few individual attacking actions
Tendency to create final attempts	Strong tendency	Low tedency
Passing tempo	Low passing tempo	High passing tempo
Defending aggressively	Low defensive aggressiveness	High defensive aggressiveness
Attacking aggressively	High attacking aggressiveness	Low attacking aggressiveness
Offside trap	More frequent adoption of the offside trap	Less frequent adoption of the offside trap

Statistical analysis

The initial dataset comprised 5,998 observations (one observation for each match played by each team). The mean value for each of the 19 variables was calculated for every team. This procedure resulted in the final dataset, which included 174 observations (teams) and 19 continuous variables.

A hierarchical cluster analysis was conducted to group the teams based on the 19 game situations. We used Ward’s method as the linkage criterion, which minimizes the total within-cluster variance. The measure of dissimilarity selected was the Squared Euclidean distance, appropriate for continuous variables and compatible with Ward's method. Prior to clustering, all variables were standardized using z-scores to ensure comparability across different measurement scales. The standardization was performed by variable, meaning each variable was transformed to have a mean of 0 and a standard deviation of 1. This combination of settings enhances the internal homogeneity of clusters and is particularly suited for identifying compact and well-separated clusters in multivariate data.

The dendrogram (Supplementary Material 2) revealed two distinct clusters, each of which appeared to include two sub-clusters. Based on this finding, the cluster analysis was repeated in stages. Initially, the software was instructed to extract two clusters. Subsequently, the analysis was repeated separately for each of the two primary clusters, again requesting two sub-clusters in each case. The initial clusters were labeled A and B, while the sub-clusters of cluster A were labeled C and D, and those of cluster B were labeled E and F.

Discriminant analysis was conducted three times accordingly, in order to identify which of the 19 variables significantly differed between the groups within each cluster solution. Subsequently, independent samples t-tests were performed for the variables that showed statistical significance in the discriminant analyses, aiming to evaluate not only the statistical significance but also the magnitude of the difference between each pair of clusters (A–B, C–D, E–F).

The assumption of normality was assessed using the Shapiro–Wilk test, Q–Q plots, histograms, and the values of skewness and kurtosis. To interpret the effect size, the following Cohen’s d thresholds were used: 0.2 (negligible effect), 0.5 (small effect), 0.8 (medium effect), 1.2 (large effect), and 2.0 (huge effect). All statistical analyses were performed using SPSS statistical software (Version 29.0, IBM SPSS Inc., Chicago, IL, USA). The level of statistical significance was set at $p = 0.05$ for all tests.

Results

Hierarchical Cluster Analysis

The hierarchical cluster analysis revealed that Group A consisted of 103 teams, while Group B included 71 teams. The sub-groups of Group A (C and D) consisted of 28 and 75 teams, respectively, whereas the sub-groups of Group B (E and F) comprised 37 and 34 teams, respectively.

Discriminant analyses

The results of the three discriminant analyses, which tested which variables contributed significantly to the differentiation between the groups, are presented in Table 2. It is worth noting that the overall correct classification rate was 90.8% for the discriminant analysis between Groups A and B, 100% for the analysis between Groups C and D, and 97.2% for the analysis between Groups E and F.

Table 2. Wilks' Lambda values and p-values for the three discriminant analyses.

Variable	A-B		C-D		E-F	
	Wilks' λ	p	Wilks' λ	p	Wilks' λ	p
Build up phase	0.764	<.001	0.731	<.001	0.697	<.001
Transition game	0.99	0.181	0.996	0.549	0.444	<.001
Attacking transition	0.998	0.595	0.987	0.246	0.81	<.001
Defensive transition	0.983	0.088	0.903	0.001	0.969	0.141
Aerial game	0.994	0.31	0.663	<.001	0.95	0.061
Type of attack	1	0.902	0.818	<.001	1	0.874
Crossing	0.984	0.101	0.999	0.746	0.904	0.009
Type of opponent's attack	0.988	0.143	0.953	0.028	0.726	<.001
Defensive blocks	0.981	0.068	1	0.996	0.915	0.014
Press	0.771	<.001	0.78	<.001	0.935	0.032
Individual defending actions	0.955	0.005	0.965	0.058	0.843	<.001
Width of creative phase	0.899	<.001	0.999	0.816	0.96	0.093
Effective game	0.993	0.277	1	0.969	0.851	<.001
Individual attacking actions	0.972	0.027	1	0.93	0.996	0.612
Tendency to create final attempts	0.681	<.001	1	0.851	0.97	0.148
Passing tempo	0.918	<.001	0.988	0.278	0.949	0.059
Defending aggressively	0.968	0.018	0.59	<.001	0.986	0.335
Attacking aggressively	0.884	<.001	0.976	0.119	0.972	0.161
Offside trap	1	0.985	0.959	0.042	0.997	0.64

Independent Samples t-tests

Based on the variables that were found to be statistically significant in the three discriminant analyses, pairwise comparisons between the groups were conducted to identify which tactical behaviors are characteristic of each group (playing style). The results of all t-tests performed are presented in Table 3.

Table 3. t, p, and Cohen's d values for all pairwise comparisons conducted.

Comparison	Variable	t	p	Cohen's d
A-B	Build up phase	-7.285	<.001	-1.124
	Press	-7.152	<.001	-1.103
	Individual defending actions	-2.858	0.005	-0.441
	Width of creative phase	-4.39	<.001	-0.677
	Tendency to create final attempts	-8.983	<.001	-1.386
	Passing tempo	3.909	<.001	0.603
	Defending aggressively	-2.381	0.018	-0.367
	Attacking aggressively	-4.753	<.001	-0.733
C-D	Build up phase	-6.102	<.001	-1.351
	Defensive transition	-3.295	0.001	-0.73
	Aerial game	7.168	<.001	1.588
	Type of attack	4.74	<.001	1.05
	Type of opponent's attack	-2.23	0.028	-0.494
	Press	5.338	<.001	1.182
	Defending aggressively	8.377	<.001	1.855
	Offside trap	-2.065	0.042	-0.457
E-F	Build up phase	-5.481	<.001	-1.302
	Transition game	9.295	<.001	2.208
	Attacking transition	4.02	<.001	0.955
	Crossing	2.703	0.009	0.642
	Type of opponent's attack	5.105	<.001	1.213
	Defensive blocks	2.532	0.014	0.602
	Press	2.194	0.032	0.521
	Individual defending actions	3.579	<.001	0.85
	Effective game	3.471	<.001	0.825

Results Summary

To summarize the results, a graphical representation of the playing styles was created based on the differences with at least a medium effect size (Cohen's d > 0.8). The resulting styles are illustrated in Figure 1. Additionally, Supplementary file 3 presents the cluster (style) into which each of the 174 teams has been classified.

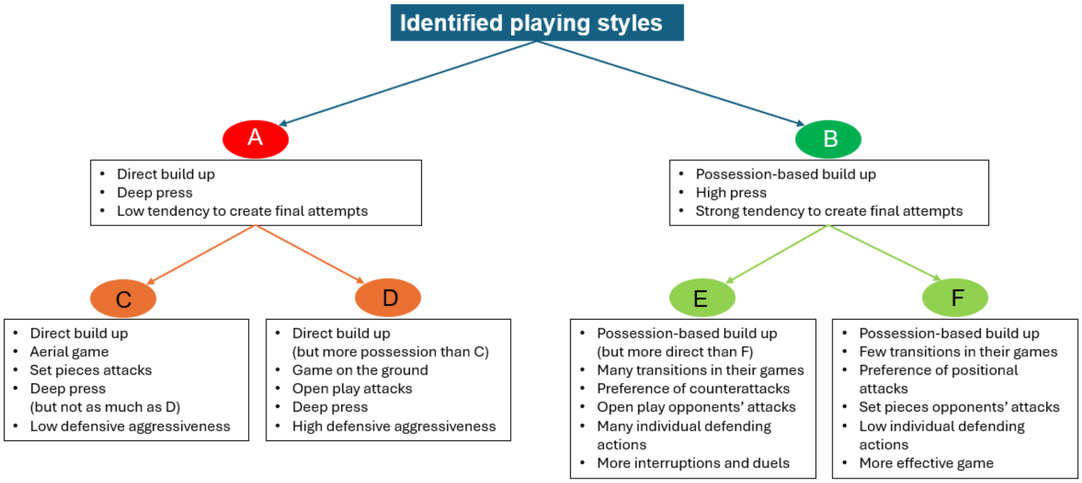

Figure 1. Graphical representation of the playing styles identified based on the study's findings.

Discussion

Overview

This study identified four distinct playing styles (C, D, E, and F). The classification was based on the tactical behavior of 174 European soccer teams from 11 leagues across 19 different game situations. Through hierarchical clustering and subsequent discriminant and t-test analyses, our findings revealed clear and meaningful patterns in how teams approach critical aspects of match play, such as build-up phase, pressing, and transition behavior.

Interpretation

The characteristics of Style C closely resemble those of the traditional British style of play, marked by a direct build-up approach, frequent aerial duels, and reliance on set pieces (Hughes & Franks, 2005; Mitrotasios et al., 2019). Indeed, as shown in Supplementary File 3, half of the English teams (10 out of 20) and half of the Scottish teams (6 out of 12) included in our study were classified under this style.

Style D is also characterized by directness, but teams tend to retain possession more than in Style C and aim to build up play through the ground rather than through aerial routes. Defensively, this style involves high levels of aggressiveness. The most prominent representatives of this style include Atlético Madrid, Athletic Bilbao, and Sevilla, along with 12 other Spanish teams. This concentration of Spanish clubs within this style appears to reflect elements of the traditional Spanish soccer identity known as the "Spanish Fury", a historically rooted ideological model that combines emotional intensity, relentless effort, and tactical aggressiveness (Vaczi, 2015). Unlike the possession-based tiki-taka approach, this expression of the furia evident in Style D relies on more direct, ground-based play without sacrificing technical quality or defensive organization, qualities that continue to shape the collective identity of many Spanish teams.

Style F represents a clear possession-based approach with a strong preference for positional attacks. These tactical traits are central to philosophies such as tiki-taka and Sarriball, both of which emphasize structured ball circulation, spatial occupation, and the control of tempo through sustained possession (Bolin & Elliot, 2025; Davies, 2013; Moustakidis et al., 2023; Plakias, Moustakidis, Mitrotasios, et al., 2023). Accordingly, this cluster includes several teams influenced by the ideas of Pep Guardiola and Maurizio Sarri, such as Barcelona, Bayern Munich, Manchester City, Napoli, Chelsea, Lazio, and Juventus. Notably, Arsenal is also part of this group, a club coached during the 2021–22 season by Mikel Arteta, who had previously served as Guardiola's assistant at Manchester City. The presence of these teams in Cluster F underscores the persistence and widespread adoption of advanced positional play models at the elite level of European soccer.

In contrast, Style E is also characterized by relatively high levels of ball possession, but it does not exhibit the same obsessive emphasis on retention as seen in tiki-taka. Instead, teams in this group place significant importance on launching counterattacks immediately after ball recovery, leveraging both space and speed during transition phases. This blend of controlled possession with aggressive transition play defines a more pragmatic and dynamic approach. Atalanta and Liverpool are exemplary representatives of this style, combining technical ability with tactical flexibility to exploit the moments following turnovers. This approach often catches opponents unbalanced and unstructured, an aspect that has been shown to be highly effective in soccer (Tenga et al., 2010a, 2010b). It is worth noting that a more granular clustering might have revealed additional distinct playing styles. Tactical identities such as catenaccio or gegenpressing may currently be embedded within broader styles like D or E, as their core features are partially captured by these groupings. For instance, catenaccio is typically associated with a deep defensive block and direct play, which are key elements of Style D (Martín-Castellanos et al., 2023). Similarly, gegenpressing is characterized by intense pressing with numerous individual defensive duels, and quick counterattacks, which are prominent features of Style E (Bauer & Anzer, 2021).

Theoretical Integration

This study approached playing styles as stable tactical profiles that characterize teams across multiple game situations. This approach aligns with the concept of the game model, as defined in recent literature, namely as a strategic framework that integrates the coach's ideas, players' characteristics, and club principles (Plakias, 2023). According to this view, the playing style does not fluctuate constantly, but rather represents a coherent performance identity that spans all phases of the game.

Furthermore, the findings support the foundations of tactical periodization, which conceptualizes the match as a unified tactical entity divided into recurring "moments" (Biermann et al., 2025; Bordonau & Villanueva, 2018). The four identified styles reflect different philosophies regarding how a team organizes and behaves within these moments. Finally, our analysis is fully consistent with the Grounded Theory of Playing Styles (Plakias, Kasioura, et al., 2024), which defines styles as integrated tactical identities expressed at multiple levels: overall team image, game phases, and subphases. Overall, the present study contributes to the theoretical integration of the concepts of playing style and game model in soccer.

Strengths and Practical Applications

One of the main strengths of this study lies in its ability to overcome the limitations of previously used techniques in constructing holistic team profiles. These approaches lacked interpretability from a tactical standpoint. In contrast, the present study advances the field by identifying playing styles that not only reflect each team's overall tactical profile but also allow for meaningful and soccer-specific interpretation of that profile.

Practically, the findings offer concrete applications for coaches, applied performance analysts, and player agents. In particular, performance analysts can use the profile of a team's cluster to benchmark their own team's tactical identity or monitor changes across seasons. Opposition analysts can identify the expected behavior of upcoming opponents based on their cluster membership. For example, if an opponent belongs to a cluster characterized by high pressing and frequent counterattacks, match preparation can focus on building play under pressure and improving readiness for defensive transitions. Furthermore, agents can recommend players whose individual strengths align with a team's dominant style (e.g., aerial ability for teams that rely heavily on crossing and set-piece attacks or technically skilled ball-playing defenders for teams that emphasize build-up play through multiple passes from the back). Finally, the clustering framework can serve as a foundation for developing automated tactical dashboards that quickly summarize team behavior, moving beyond vast and fragmented raw performance indicators.

Limitations and Future Research

Despite its strengths, this study has certain limitations that should be acknowledged. First, the classification was based on data from a single season (2021–2022), which may not capture temporal fluctuations in team behavior due to changes in coaching staff, player roster, or competition strategy. Second, although the sample was extensive, covering 11 countries of varying competitive levels, it was limited to European teams. As a result, certain playing styles that may be more prevalent in other continents might not have been identified. Third, while the 19 game situations covered a broad spectrum of tactical behaviors, some qualitative dimensions, such as team cohesion, decision-making quality, or psychological resilience, were not captured by the performance indicators used. Fourth, although some theoretical models, such as ecological dynamics and complex adaptive systems, emphasize the importance of continuous adaptation and emergent self-organization during match play (Araújo & Davids, 2016; Seifert et al., 2017; Vilar et al., 2012), the present study did not examine such dynamic adaptations. Instead, it focused on identifying a single, overall tactical style per team, based on aggregated season-long data. Thus, interpretations based on real-time team adaptability fall outside the scope of this analysis. Future research could expand this framework in several directions. First, applying the same clustering methodology to multi-season datasets would allow for the examination of tactical stability and longitudinal changes in team styles. Second, including teams from non-European leagues, such as South American, African, or Asian competitions, would help determine whether the identified clusters are globally applicable or regionally constrained. Third, integrating contextual match variables (e.g., match status, opponent quality, home vs. away games) could provide a more dynamic understanding of tactical behavior. Lastly, researchers could explore the relationship between team style and performance outcomes, such as points won, goals, or expected goals.

Conclusions

This study successfully identified and described four distinct overall playing styles that represent the tactical identity of European soccer teams during the 2021–2022 season. By analyzing 174 teams across 19 game situations using hierarchical clustering and dis-criminant analyses, we provided a holistic and interpretable classification of team behav-ior that transcends isolated performance indicators. The resulting styles reflect meaning-ful tactical patterns and align with established soccer philosophies such as traditional British play, Spanish 'furia', tiki-taka, and a modern adaptation of the latter.

The four styles identified in this study reflect fundamentally different tactical philosophies that shape team behavior across all phases of play. Style C represents a traditional direct and aerial-based game, Style D embodies an aggressive and ground-based directness, Style E merges controlled possession with high-intensity transitions, and Style F illustrates a structured, positional, possession-oriented approach. These findings demonstrate that European teams gravitate toward a limited set of stable tactical identities, each with distinct signatures in build-up patterns, pressing behavior, and transition dynamics. Importantly, these styles emerged organically from the data, confirming that holistic team behavior can be meaningfully captured and classified using latent variables rather than isolated performance indicators.

Practically, the suggested classification has a number of uses in contemporary soccer. The style profiles can be used by coaches and performance analysts to benchmark their teams, track tactical changes over the course of seasons, and create training plans that are in line with the cluster's dominant traits. Instead of depending only on fragmented event statistics, opposition analysts may be able to predict an opponent's behavior more precisely by consulting the defining tendencies of their cluster. Similarly, by matching individual strengths with the tactical requirements of each style (e.g., aerial proficiency in Style C, technical stability under possession in Style F, or transition speed in Style E), scouting departments and player agents can assess player–team fit. All things considered, the findings provide a framework that is both tactically interpretable and data-driven, improving decision-making at the team and club levels. The findings also contribute to the theoretical understanding of tactical identity in soccer. By integrating 19 game situations into a unified analytical model, this study operationalizes the concept of the "game model" as a stable and holistic expression of a team's tactical behavior. The results align with and extend recent theoretical frameworks, such as tactical periodization and the Grounded Theory of Playing Styles, by demonstrating that overall styles can be empirically identified and described using multidimensional performance data. This bridges the gap between abstract tactical theory and quantifiable, season-long team behavior.

The study highlights the value of holistic tactical profiling and opens new avenues for research. Future studies should examine whether these styles remain stable across multiple seasons, how they evolve in response to coaching changes, and whether they apply to non-European competitions. Additionally, incorporating contextual variables, such as match status or opponent quality, could enhance the dynamic interpretation of tactical behavior. By providing an interpretable, soccer-specific, and empirically validated classification of playing styles, this study offers a significant step forward for applied performance analysis and lays the foundation for more advanced tactical monitoring systems in the future.

Supplementary files: Supplementary files 1, 2 and 3 can be found at https://doi.org/10.5281/zenodo.16867187.

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Conflicts of interest The authors declare no conflict of interest.

Declaration of generative AI and AI-assisted technologies in the writing process: During the preparation of this work the authors used ChatGPT (OpenAI) in order to improve the quality, clarity, and fluency of the English language used in the manuscript. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

References:

Araújo, D., & Davids, K. (2016). Team synergies in sport: theory and measures. *Frontiers in psychology*, *7*, 1449. https://doi.org/10.3389/fpsyg.2016.01449

Archambault, F. (2022). Italy. Did the World Cup 2018 actually take place? *Soccer & Society*, *23*(7), 669-679. https://doi.org/10.1080/14660970.2022.2108235

Bauer, P., & Anzer, G. (2021). Data-driven detection of counterpressing in professional football: A supervised machine learning task based on synchronized positional and event data with expert-based feature extraction. *Data Mining and Knowledge Discovery*, *35*(5), 2009-2049. https://doi.org/10.1007/s10618-021-00763-7

Bialkowski, A., Lucey, P., Carr, P., Matthews, I., Sridharan, S., & Fookes, C. (2016). Discovering team structures in soccer from spatiotemporal data. *IEEE Transactions on Knowledge and Data Engineering*, *28*(10), 2596-2605. https://doi.org/10.1109/TKDE.2016.2581158

Biermann, H., Memmert, D., Petersen, N., & Raabe, D. (2025). Contextualization of soccer analysis with tactical periodization and machine learning. *Data Mining and Knowledge Discovery*, *39*(3), 23. https://doi.org/10.1007/s10618-025-01092-9

Bolin, N., & Elliot, V. (2025). *From Patterns to Playbooks: Identifying offensive and defensive team playing styles from possession chains with machine learning and its possible practical applications in management of football teams* Uppsala University]. Uppsala, Sweden.

Bordonau, J. L. D., & Villanueva, J. A. M. (2018). *Tactical periodization: A proven successful training model*. SoccerTutor. com.

Brooks, J., Kerr, M., & Guttag, J. (2016). Using machine learning to draw inferences from pass location data in soccer. *Statistical Analysis and Data Mining: The ASA Data Science Journal*, *9*(5), 338-349. https://doi.org/10.1002/sam.11318

Castellano, J., & Pic, M. (2019). Identification and preference of game styles in LaLiga associated with match outcomes. *International Journal of Environmental Research and Public Health*, *16*(24), 5090. https://doi.org/10.3390/ijerph16245090

Davies, J. C. (2013). *Coaching the tiki taka style of play*. SoccerTutor. com.

Decroos, T., Roy, M. V., & Davis, J. (2020). SoccerMix: Representing soccer actions with mixture models. Joint European Conference on Machine Learning and Knowledge Discovery in Databases, https://doi.org/10.1007/978-3-030-67670-4_28

Decroos, T., Van Haaren, J., & Davis, J. (2018). Automatic discovery of tactics in spatio-temporal soccer match data. Proceedings of the 24th acm sigkdd international conference on knowledge discovery & data mining, https://doi.org/10.1145/3219819.3219832

Fernandez-Navarro, J., Fradua, L., Zubillaga, A., Ford, P. R., & McRobert, A. P. (2016). Attacking and defensive styles of play in soccer: analysis of Spanish and English elite teams. *Journal of sports sciences*, *34*(24), 2195-2204. https://doi.org/10.1080/02640414.2016.1169309

Forcher, L., Forcher, L., Wäsche, H., Jekauc, D., Woll, A., Gross, T., & Altmann, S. (2023). Is ball-possession style more physically demanding than counter-attacking? The influence of playing style on match performance in professional soccer. *Frontiers in psychology*, *14*, 1197039. https://doi.org/10.3389/fpsyg.2023.1197039

García-Aliaga, A., Marquina Nieto, M., Coterón, J., Rodríguez-González, A., Gil Ares, J., & Refoyo Román, I. (2022). A Longitudinal Study on the Evolution of the Four Main Football Leagues Using Artificial Intelligence: Analysis of the Differences in English Premier League Teams. *Research Quarterly for Exercise and Sport*, 1-9. https://doi.org/10.1080/02701367.2021.2019661

Gómez, M.-Á., Mitrotasios, M., Armatas, V., & Lago-Peñas, C. (2018). Analysis of playing styles according to team quality and match location in Greek professional soccer. *International Journal of Performance Analysis in Sport*, *18*(6), 986-997. https://doi.org/10.1080/24748668.2018.1539382

Guan, T., Cao, J., & Swartz, T. B. (2023). Parking the bus. *Journal of Quantitative Analysis in Sports (in press)*. https://doi.org/10.1515/jqas-2021-0059

He, Q., Araújo, D., Davids, K., Kee, Y. H., & Komar, J. (2023). Functional adaptability in playing style: A key determinant of competitive football performance. *Adaptive Behavior*, *31*(6), 545-558. https://doi.org/10.1177/10597123231178942

Hewitt, A., Greenham, G., & Norton, K. (2016). Game style in soccer: what is it and can we quantify it? *International Journal of Performance Analysis in Sport*, *16*(1), 355-372. https://doi.org/10.1080/24748668.2016.11868892

Hughes, M., & Franks, I. (2005). Analysis of passing sequences, shots and goals in soccer. *Journal of sports sciences*, *23*(5), 509-514. https://doi.org/10.1080/02640410410001716779

Jensen, R. (2017). Looking at the extraordinary success of the 'Clockwork Orange': examining the brilliance of total football played by the Netherlands. In *Legacies of Great Men in World Soccer* (pp. 104-115). Routledge. https://doi.org/10.1080/14660970.2014.912018

Jung, D. H., & Jung, J. J. (2025). Data-driven understanding on soccer team tactics and ranking trends: Elo rating-based trends on European soccer leagues. *PloS one*, *20*(2), e0318485. https://doi.org/10.1371/journal.pone.0318485

Kong, L., Zhang, T., Zhou, C., Gomez, M.-A., Hu, Y., & Zhang, S. (2022). The evaluation of playing styles integrating with contextual variables in professional soccer. *Frontiers in psychology*, *13*. https://doi.org/10.3389/fpsyg.2022.1002566

Lago-Peñas, C., Gómez-Ruano, M., & Yang, G. (2017). Styles of play in professional soccer: an approach of the Chinese Soccer Super League. *International Journal of Performance Analysis in Sport*, *17*(6), 1073-1084. https://doi.org/10.1080/24748668.2018.1431857

Li, Y., Zong, S., Shen, Y., Pu, Z., Gómez, M.-Á., & Cui, Y. (2022). Characterizing player's playing styles based on player vectors for each playing position in the Chinese Football Super League. *Journal of sports sciences*, *40*(14), 1629-1640. https://doi.org/10.1080/02640414.2022.2096771

Martín-Castellanos, A., Flores, M. R., Solana, D. M., Del Campo, R. L., Garrosa, F. N., & Mon-López, D. (2023). How do the football teams play in LaLiga? Analysis and comparison of playing styles according to the outcome. *International Journal of Performance Analysis in Sport*, 1-13. https://doi.org/10.1080/24748668.2023.2262813

Memmert, D., & Rein, R. (2018). Match analysis, big data and tactics: current trends in elite soccer. *German Journal of Sports Medicine/Deutsche Zeitschrift fur Sportmedizin*, *69*(3), 65-72. https://doi.org/10.5960/dzsm.2018.322

Mitrotasios, M., Gonzalez-Rodenas, J., Armatas, V., & Aranda, R. (2019). The creation of goal scoring opportunities in professional soccer. tactical differences between spanish la liga, english premier league, german bundesliga and italian serie A. *International Journal of Performance Analysis in Sport*, *19*(3), 452-465. https://doi.org/10.1080/24748668.2019.1618568

Moustakidis, S., Plakias, S., Kokkotis, C., Tsatalas, T., & Tsaopoulos, D. (2023). Predicting Football Team Performance with Explainable AI: Leveraging SHAP to Identify Key Team-Level Performance Metrics. *Future Internet*, *15*(5), pp. 174. https://doi.org/10.3390/fi15050174

Plakias, S. (2023). An integrative review of the game model in soccer: definition, misconceptions, and practical significance. *Trends in Sport Sciences*, *30*(3), 85-92. https://doi.org/10.23829/TSS.2023.30.3-1

Plakias, S. (2025). Review Articles on Soccer Performance Analysis: A Bibliometric Analysis of Current Trends and Emerging Themes. *Sports*, *13*(5), 131. https://doi.org/10.3390/sports13050131

Plakias, S., Kasioura, C., Pamboris, G. M., Kokkotis, C., Tsatalas, T., Moustakidis, S., Papalexi, M., Giakas, G., & Tsaopoulos, D. (2024). A grounded theory for professional soccer teams' playing styles: Towards a consensus. *International Journal of Sports Science & Coaching*. https://doi.org/10.1177/17479541241300605

Plakias, S., Kokkotis, C., Moustakidis, S., Tsatalas, T., Papalexi, M., Kasioura, C., Giakas, G., & Tsaopoulos, D. (2023). Identifying playing styles of european soccer teams during the key moments of the game. *Journal of Physical Education and Sport*, *23*(4), pp. 878 - 890. https://doi.org/10.7752/jpes.2023.04111

Plakias, S., Moustakidis, S., Kokkotis, C., Papalexi, M., Tsatalas, T., Giakas, G., & Tsaopoulos, D. (2023). Identifying Soccer Players' Playing Styles: A Systematic Review. *Journal of Functional Morphology and Kinesiology*, *8*(3), pp. 104. https://doi.org/10.3390/jfmk8030104

Plakias, S., Moustakidis, S., Kokkotis, C., Tsatalas, T., Papalexi, M., Plakias, D., Giakas, G., & Tsaopoulos, D. (2023). Identifying soccer teams' styles of play: a scoping and critical review. *Journal of Functional Morphology and Kinesiology*, *8*(2), pp. 39. https://doi.org/10.3390/jfmk8020039

Plakias, S., Moustakidis, S., Mitrotasios, M., Kokkotis, C., Tsatalas, T., Papalexi, M., Giakas, G., & Tsaopoulos, D. (2023). Analysis of playing styles in European football: insights from a visual mapping approach. *Journal of Physical Education and Sport*, *23*(6), pp. 1385 - 1393. https://doi.org/10.7752/jpes.2023.06169

Plakias, S., Tsatalas, T., Armatas, V., Tsaopoulos, D., & Giakas, G. (2024). Tactical Situations and Playing Styles as Key Performance Indicators in Soccer. *Journal of Functional Morphology and Kinesiology*, *9*(2), pp. 88. https://doi.org/10.3390/jfmk9020088

Pollard, R., Reep, C., & Hartley, S. (1988). The quantitative comparison of playing styles in soccer. *Science and football*, 309-315.

Rahimian, P., Van Haaren, J., & Toka, L. (2024). Towards maximizing expected possession outcome in soccer. *International Journal of Sports Science & Coaching*, *19*(1), 230-244. https://doi.org/10.1177/17479541231154494

Rojas-Valverde, D., Pino-Ortega, J., Gómez-Carmona, C. D., & Rico-González, M. (2020). A systematic review of methods and criteria standard proposal for the use of principal component analysis in team's sports science. *International Journal of Environmental Research and Public Health*, *17*(23), 8712. https://doi.org/10.3390/ijerph17238712

Ruan, L., Ge, H., Gómez, M.-Á., Shen, Y., Gong, B., & Cui, Y. (2022). Analysis of defensive playing styles in the professional Chinese Football Super League. *Science and Medicine in Football*, 1-9. https://doi.org/10.1080/24733938.2022.2099964

Ruan, L., Ge, H., Shen, Y., Pu, Z., Zong, S., & Cui, Y. (2022). Quantifying the effectiveness of defensive playing styles in the Chinese Football Super League. *Frontiers in psychology*, 2461. https://doi.org/10.3389/fpsyg.2022.899199

Seifert, L., Araújo, D., Komar, J., & Davids, K. (2017). Understanding constraints on sport performance from the complexity sciences paradigm: An ecological dynamics framework. *Human movement science*, *56*, 178-180. https://doi.org/10.1016/j.humov.2017.05.001

Tenga, A., Holme, I., Ronglan, L. T., & Bahr, R. (2010a). Effect of playing tactics on achieving score-box possessions in a random series of team possessions from Norwegian professional soccer matches. *Journal of sports sciences*, *28*(3), 245-255. https://doi.org/10.1080/02640410903502774

Tenga, A., Holme, I., Ronglan, L. T., & Bahr, R. (2010b). Effect of playing tactics on goal scoring in Norwegian professional soccer. *Journal of sports sciences*, *28*(3), 237-244. https://doi.org/10.1080/02640410903502774

Vaczi, M. (2015). "The Spanish Fury": A political geography of soccer in Spain. *International Review for the Sociology of Sport*, *50*(2), 196-210. https://doi.org/10.1177/1012690213478940

Vilar, L., Araújo, D., Davids, K., & Button, C. (2012). The role of ecological dynamics in analysing performance in team sports. *Sports medicine*, *42*, 1-10. https://doi.org/10.2165/11596520-000000000-00000

Zhou, C., Lago-Peñas, C., Lorenzo, A., & Gómez, M.-Á. (2021). Long-term trend analysis of playing styles in the Chinese soccer super league. *Journal of Human kinetics*, *79*(1), 237-247. https://doi.org/10.2478/hukin-2021-0077