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Associations between confederation playing style and team strength in the FIFA World Cup 2022

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Abstract

Introduction. Previous evidence indicates that it appears to be possible to identify a pattern of success (playing styles) in football using principal components analysis or k-means clustering approaches. However, until now, little is known about the topic in teams that participated in football world cups. **Aim of Study.** This study aimed to verify if a successful playing style exists in the FIFA World Cup Qatar 2022 (2022-WC). The second aim is to intensify playing style behavior between Confederations. **Material and Methods.** Data was collected from the 32 teams that competed in the 2022-WC. The 2022-WC resulted in 64 games and produced a total of 128 data points and 68 variables. A machine learning approach (k-means cluster) was used to identify playing style behaviors in the 2022-WC competition. **Results.** The k-mean clustering identified three different playing style during ball possession and without ball possession game phases (all P < 0.001). Also, we identify significant associations (all P ≤ 0.016) between the team's playing style and their strength in the 2022-WC (i.e., FIFA ranking and 2022-WC final classification). With ball possession playing style, successful teams adopt high ball possession, building games, and high player movement (offering to receive and to receive the ball). In contrast, unsuccessful teams tend to adopt direct play, set pieces, and lower player movement. Without ball possession playing style, successful teams adopt high-block and high-press, counter-press, and recovery, while unsuccessful teams adopt low-block or mid-block and lower-press (passive approach to recover the ball). Finally, a significative association between confederations (all P < 0.01) and playing style exists during 2022-WC. In conclusion, in the 2022-WC, playing style is significantly associated with team strength and confederations. **Conclusions.** A clear successful playing style existed in the 2022-WC, and this information should provide direction for the national team's preparation for the next FIFA WC.

KEYWORDS: national teams, game performance, team behavior, game patterns, playing style.

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Introduction

Since the first FIFA World Cup (WC), only teams from the Confederación Sudamericana de Fútbol (CONMEBOL, the South American Football Confederation) or the Union of European Football Associations (UEFA) have reached the finals. On the other hand, teams from the Central American and Caribbean Association Football (CONCACAF), the Confederation of African Football (CAF), the Oceania

Football Confederation (OFC), and the Asia Football Confederation (AFC) have never reached the WC final. In this sense, identifying the teams' WC success patterns (i.e., a playing style) can be helpful to guide teams to increase success probabilities in this competition.

Difference exists between the confederations. For instance, when analyzing teams from different continents, such as European and South American teams, it is possible to identify differences in several performance indicators [9]. European teams scored more goals and key passes, used positional attacks, and spent more time in the final third of the field, while South American teams had higher numbers of shots and spent more time in the second third of the field; however, no difference was identified in set-pieces goals or length of passes [9]. Even when played in the same confederation (e.g., Europe), the player's origin reveals several differences in technical profile [10]. For example, South American and European players are more adept at passing and have higher accuracy in this technical skill (the skill used in the ball possession playing style) than their North American, African, or Asian counterparts; this might reflect in a teams' playing style profile and might reveal a different profile in a playing style among national teams from the different confederations. During the 2022-WC an impressive difference in technical and match performance indicators was identified between African teams and the top five best teams in the group stage of the 2022-WC [12]. For example, African teams have lower possession and fewer total shots, shots on target, shots from open play, key passes, and total passes and their accuracy, while having higher long passes (characteristic of a direct play playing style), committed fouls, and clearance (indicating a long time in out of ball possession). Also, beyond the technical and tactical differences, differences in running performance exist [14]. In 2018-WC, it was identified that European teams run faster than teams from other continents; thus, examining if running performance is related to a playing style will offer key information about physical preparation.

As mentioned above, performance analysis at the WC is made mainly with scouts [1, 13, 21], distances covered [1, 25], and moments of play [7, 11, 13]. So far, there are no studies on the WC that have focused on tactical movements, e.g., movements of players with or without possession of the ball, i.e., a playing style. However, recent literature has emphasized the importance of movements to receive or offer movement and to receive the ball in the movement pattern and team success [16, 18, 22, 26]. The types of playing styles, such as direct play (i.e., behavior that prioritizes counterattacks, minor ball possession, and long balls) or possession, have been distinguished between successful and unsuccessful teams [11]. Even within the same confederation, e.g., the European one, different tactical behaviors are adopted in the possession phase to create scoring opportunities[19]. Thus, analyzing whether the playing style is associated with the federations (and their respective teams) can provide insight into how to achieve a successful performance in the WC.

In national leagues, in which the champion is the most consistent team throughout the season, a playing style (with or without ball possession) is related to team success [8, 23, 24]. For instance, in national leagues, successful behavior in the playing style with ball possession, such as movements (team expansion) to dominate field areas, to receive defensive line-breaking passes, has already been identified [17, 18, 22, 26]. Furthermore, defensive patterns (when a team is out of ball possession) were previously associated with successful teams [5, 6]. Therefore, studies in the WC investigating players behaviors connected with the playing style without ball possession (when their team has ball possession) or when their team is engaged in defensive behavior (when their team is without ball possession, such as the intensity, duration, direction, location, and effectiveness of pressure and defensive actions) could provide insightful information for coaches and confederations to build competitive teams for the WC. To date, no study has investigated the playing style in the WC.

Despite the WC having a group stage and a knockout stage (different from the national leagues'), it is possible to identify a pattern of success (playing styles) in the 2022-WC using principal component analysis or k-means clustering approach [24]. Also, using contextual variables, such as consistent metric punctuations (such as the FIFA ranking) and the history of victories in the WC (confederations), it is possible to identify which behaviors (playing styles) are adopted during the WC by the teams with the greatest tradition/ strength in this competition. Thus, this exploratory study sought to identify playing style behaviors and whether these patterns are related to contextual factors such as confederations and team strength (based on the FIFA rankings and the 2022-WC success). It is hypothesized that the teams' playing style is associated with their respective confederations, the 2022-WC final classification, and the FIFA ranking. Therefore, this study aimed to identify playing style patterns adopted by teams according to their FIFA ranking, confederations, and the 2022-WC success.

Material and Methods

Experimental approach to the problem
This is an observational and exploratory study of the 19th edition of the 2022-WC. Data related to the 64 matches were collected and provided by FIFA [4]. Data were collected by FIFA using a multi-camera optical tracking system (TRACAB Gen5, ChyronHego). The validity and accuracy of data collection by TRACAB Gen5 was provided by FIFA [3] and Linke et al. [15].

Subjects
The sample consisted of the 32 national teams that competed in the 2022-WC. The 2022-WC resulted in the 64 games and produced a total of 128 distinct datasets (1 per team in each game played). Out of the 128 data points, eight data points were excluded because they were from games with extra time (thus, 120 data points

from 60 games have been used). The teams played from three to seven games, depending on team's performance in the competition. In each game, a total of 68 variables related to the game were extracted.

Procedures

Independent Variables
The 68 variables were categorized into four broad categories: (1) Key Statistics (19 variables), (2) Phase of Play (17 variables), (3) Behavior on Possession (20 variables), and (4) Behavior out of Possession (13 variables) (Table 1). Table 1 describes the concepts of the four categories and the theoretical foundation of all respective variables. All variables were standardized for z-score, thus allowing the comparison of performance between different teams for each variable.

Table 1. Variables descriptions

Variables			Description
Key statistics	Possession		Time that a team spent with the ball control. Excluding the time when the ball is in the contest (such as area duels or when ball control is not explicit for either team).
	Goals		Ball possession ends after an attempt at a goal or unintentional touch results in a goal.
	Attempts at goal	Attempts	Goal attempts on or out of target.
		On Target	Goal attempts on target.
	Total Passes	Total	Incomplete and complete passes.
		Complete	Successful passes.
	Pass completion %		Percentage of successful passes.
	Completed Line Breaks		When an attacking team moves the ball beyond the deepest player in an opposition unit (defensive line).
	Defensive Line Breaks		Overcoming the opposing team's defense line with a complete pass or carrying the ball (dribbling or leading through an empty space).
	Receptions in the Final Third		Ball successfully received in the final third.
	Crosses		Long horizontal passes (which cross zones), aiming for an assist to a goal attempt.
	Ball Progressions		Intentionally bypassing one or more opposing players while carrying the ball into space or directly beyond an opponent.
	Defensive pressures applied	Total Pressures	Defensive action, even if a player does not compete for the ball possession.
		Direct Pressures	Explicit defensive action on an opposing player to compete for the ball.
	Forced Turnovers		Recovered ball possession due to applied pressure.
	Second Balls		Winning the ball possession after an unsuccessful action from a partner or an opponent in the ball transferring by crosses, throw-ins, or goalkeeper's shot (first ball).
	Total Distance Covered		Team's total distance (sum of all players).
	High Speed Distance Covered		>20km/h (sum of all players).

Phases of Play % (describes the percentage of time spent in actions with and without possession of the ball)	In Possession (% of time spent in action with ball possession)	Build up Unopposed		An opponent team exerts minimal or no pressure on a beginner of an attack.
		Build up Opposed		An opponent team exerts pressure on a beginner of an attack to win the ball back.
		Progression		The team advances the ball into the final third, breaking lines with vertical passes or carrying the ball forward.
		Final Third		Time spent with the ball in the final third (in the opponent's defense).
		Long Ball		Long ball passes during the game.
		Attacking Transition		After regaining possession of the ball, a team creates the offensive shape.
		Counterattack		A fast and intense attack on an opposing team immediately after regaining the ball.
		Set Piece		% of time spent time in set pieces.
	Out of Possession (% of time spent in action without ball possession)	High Press		In the opponent's field, players pressure an opponent, who has the ball possession, with attempts to regain ball possession while teammates mark their passing options.
		Mid Press		The team moves as a unit preventing the opponent's progression to the last third of the field.
		Low Press		The team moves as a unit but applies passive pressure allowing an opponent to reach the last third of the field.
		High Block		Compact the team in the advanced third of the field.
		Mid-Block		Compacting the team in the middle third of the field.
		Low Block		Compacting the team in the defensive third of the field, preventing penetration in the area.
		Recovery		Running towards team's own defensive pitch after losing the ball possession.
		Defensive Transition		Recovery into team's defensive shape.
		Counter-Press		Aggressive pressure on an opponent after losing the ball possession.
Behavior on possession (a team has the ball possession, but an analyzed player is without the ball possession)	Offering to Receive (deliberate movement with the intention of receiving the ball for a teammate to continue or to finish the possession phase)	Total Offers Made		Calculated regardless of whether the ball was received or not.
		Total Offers Received		Ball received, after offering to receive.
		Made in the Final Third		Offering to receive in the final third (opponent defense).
		Made in the Middle Third		Offering to receive in the middle third (between defensive and attack lines).
		Made in the Defensive Third		Offering to receive in the defensive third (first third).
	Movement to Receive ("...movements that are designed to open up space for their team-mates to move into and receive the ball." [4])	Final Third Phase (actions in the attack field)	In Front	Movement to receive the ball in front of the first line of defense of an opposing team.
			In Between	Movement to receive the ball within the defensive lines in the opposing attack field.
			Out to In	Movement from the outside of the opposing team shape to the inside of the opposing team shape (to receive the ball between the opponent's defensive lines).
			In to Out	Movement from the inside of the opposing team shape to the outside of the opposing team shape (to receive the ball into the opponent's defensive lines).
			In Behind	Movement to receive the ball behind the last defensive line of an opponent team.

	Progression Phase (a team advances the ball into the final third)	In Front	Movement to receive the ball in front of the first line of defense of an opposing team.
		In Between	Movement to receive the ball within the defensive lines in the opposing attack field.
		Out to In	Movement from the outside of the opposing team shape to the inside of the opposing team shape (to receive the ball between the opponent's defensive lines).
		In to Out	Movement from the inside of the opposing team shape to the outside of the opposing team shape (to receive the ball into the opponent's defensive lines).
		In Behind	Movement to receive the ball behind the last defensive line of an opponent team.
	Build up Phase (attack initiation)	In Front	Movement to receive the ball in front of the first line of defense of an opposing team.
		In Between	Movement to receive the ball within the defensive lines in the opposing attack field.
		Out to In	Movement from the outside of the opposing team shape to the inside of the opposing team shape (to receive the ball between the opponent's defensive lines).
		In to Out	Movement from the inside of the opposing team shape to the outside of the opposing team shape (to receive the ball into the opponent's defensive lines).
		In Behind	Movement to receive the ball behind the last defensive line of an opponent team.
Behavior out of Ball Possession (number of actions and behaviors intended to regain the ball possession)	Defensive Actions	Forced Turnovers	Ball recovery due to applied pressure.
		Possession Regained	By different ways (interception, a poor pass from an opposing player, tackle or second ball).
		Interceptions	Intercepting the ball with the intention of winning possession during a pass, long pass, or cross from an opponent team.
		Tackles	An attempt by a player to recover the ball possession using the face-to-face (sliding, pushing, or blocking) confrontation.
	Defensive Pressure	Total Pressures	The total number of actions in which an athlete approaches an opponent to reduce their attacking options or try to win the ball possession.
		Direct Pressures	Explicit and aggressive defensive action on an opposing player to compete for the ball possession.
		Avg Pressure Duration	Average time spent pressuring an opponent's team.
		Forced Turnovers	Recovered ball possession due to applied pressure.
		Ball Recovery Time	The time required for a team to regain possession of the ball after losing possession.
		Pushing on into Pressing	Pushing an opponent who will receive the ball.
		Pushing on	A player attempts to close down the space between themselves and an opposing player when the opponent does not have the ball.
		Pressing direction Inside	A player makes a deliberate attempt to force an opposing player with the ball to go toward the center of the pitch.
		Pression Direction Outside	A player makes a deliberate attempt to force an opposing player with the ball to go away from the center of the pitch.

Contextual Variables

To identify playing style patterns between the confederations and their success in the 2022-WC, the teams were classified according to their respective 2022-WC final classification quartile (eight teams in each quartile), FIFA rank quartile (eight teams in each quartile; data rank was collected in October 2022), and the confederations: UEFA (13 teams), CONMEBOL (4 teams), CONCACAF (4 teams), CAF (5 teams), and AFC and OFC (6 teams). To identify if a playing style

is associated with the match's final score, each match was also classified as follows: defeat by three or more goals (unbalanced defeat), defeat by one goal (balanced defeat), tied game (draw), victory by one goal (balanced victory) and victory by three or more goals (unbalanced victory).

Statistical analysis

The 68 FIFA variables from game phases (described in Table 1) were standardized to z-scores, and k-means cluster analysis was employed to identify possible patterns in a playing style. K-means clustering has been explored to identify the most meaningful cluster solution (between two to five clusters). After data visualization in hierarchical cluster, three clusters were identified as the best solution. Thus, three clusters were presented in four categories: (1) Key Statistics, (2) Phase of Play, (3) Behavior on Possession, and (4) Behavior out of Possession. Chi-square analysis has been used to identify the association between the clusters with the 2022-WC final ranking, the FIFA ranking, the confederations, and the match score ratio. Differences between the clusters were verified with one-way ANOVA test followed by Duncan post-hoc test. All analyses were performed using the statistical package IBM SPSS Statistics v.26.0. Significance was set at ≤ 0.05.

Results

The clusters for (1) Key Statistics, (2) Phase of Play, (3) Behavior on Possession, and (4) Behavior out of Possession were presented in Figures 1 to 4, respectively. Clusters 1, 2, and 3 had 22, 42, and 56 team performances, respectively.

In the Key Statistics (Figure 1), the three clusters are significantly different for all the variables, except for Total Distance Covered and High-Speed Distance Covered.

In the Phases Of Play % (Figure 2), all the clusters are significantly different for all variables, except for Mid Press in the Out of Possession phase.

In the Behavior on Possession (Figure 3), all the variables are significant for the ANOVA test, except for Made in the Defensive Third, in the Offering to Receive actions.

All the variables in the three clusters from the Behavior out of Possession (Figure 4) are different from each other (all $P \leq 0.046$), except for Interceptions and Possession Regained variables in the Defensive Actions.

The clusters were significantly associated with the 2022-WC classification ($P = 0.016$; Phi = 0.361) (Figure 5A), the FIFA ranking ($P < 0.001$; Phi = 0.607) (Figure 5B) and the confederations ($P = 0.001$; Phi = 0.482) (Figure 5C). No association was identified between the clusters with the score ratio.
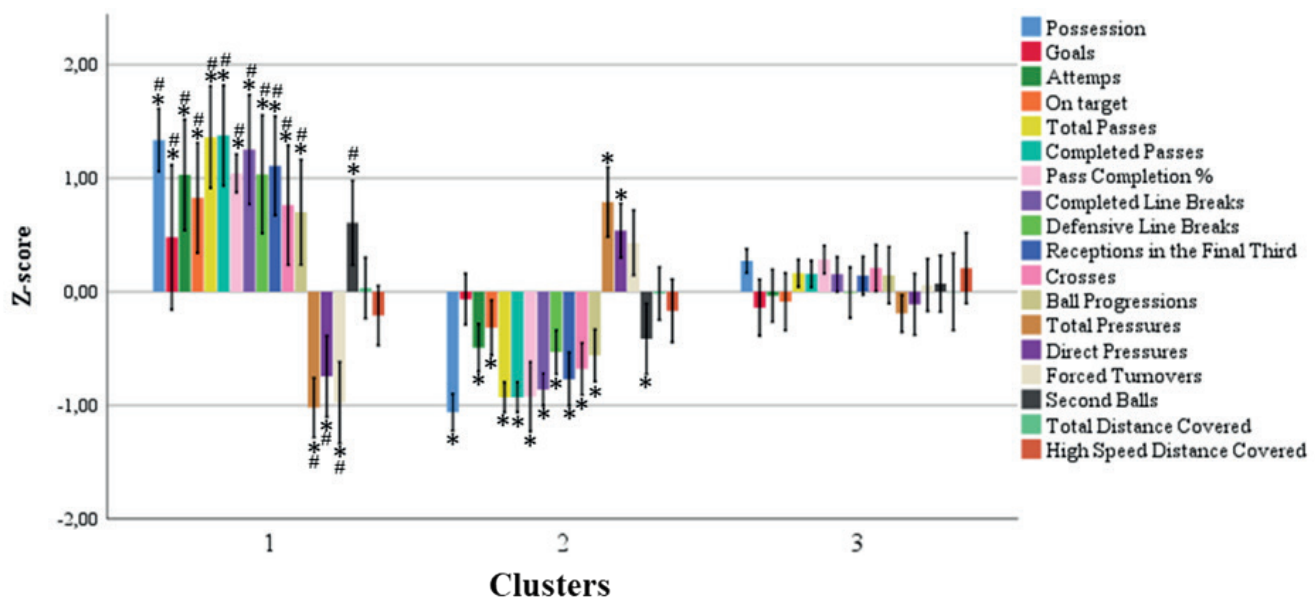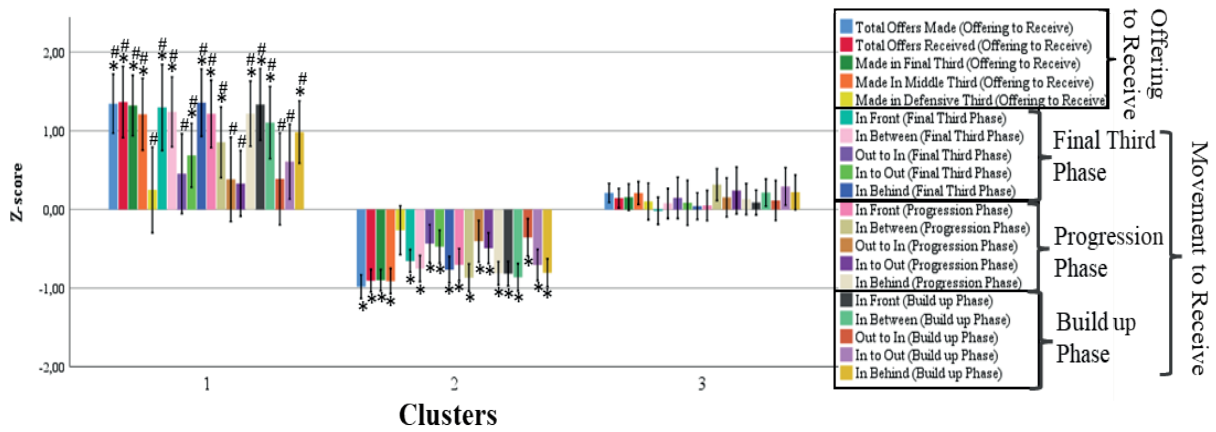

* P < 0,05 when compared to Cluster 3; # P < 0,05 when compared to Cluster 2. Data are mean and confidence intervals 95%
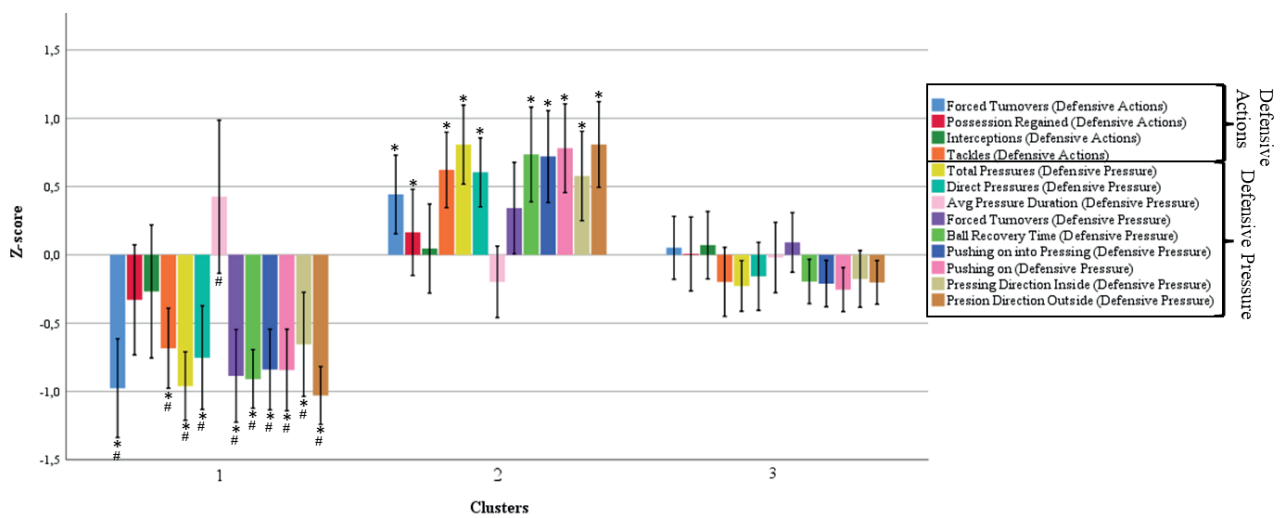
Figure 1. Clusters of Key Statistics
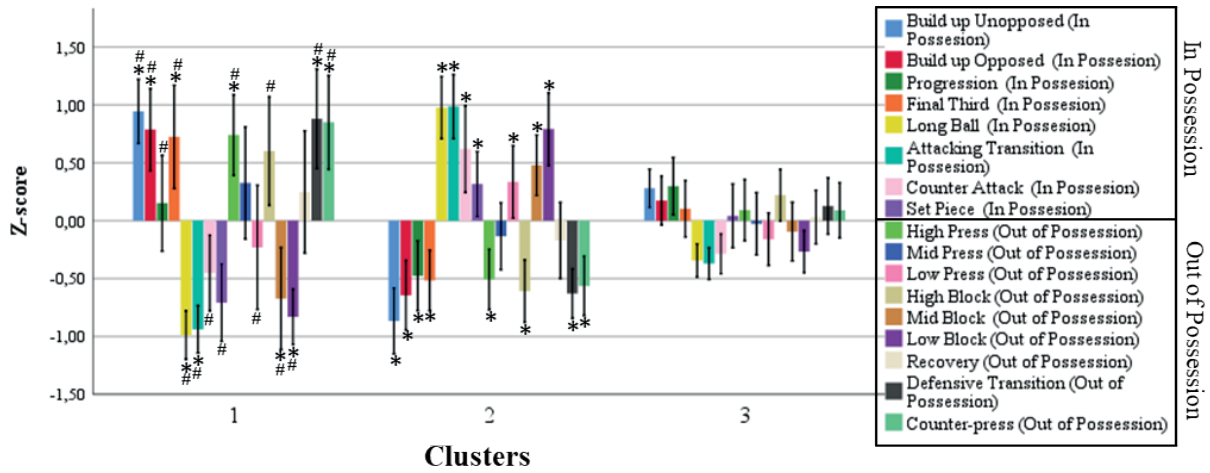
* P < 0,05 when compared to Cluster 3; # P < 0,05 when compared to Cluster 2. Data are mean and confidence intervals 95%

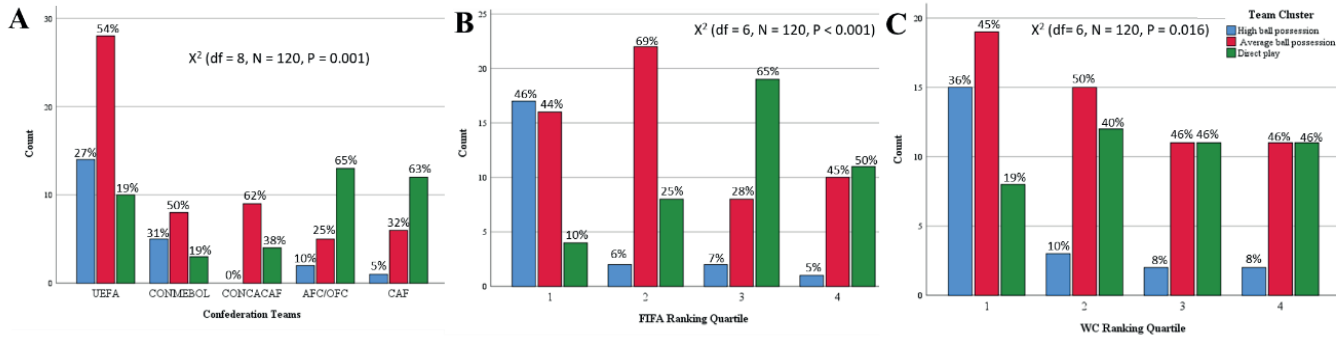**Figure 2.** Clusters of Phases of Play %

* P < 0,05 when compared to Cluster 3; # P < 0,05 when compared to Cluster 2. Data are mean and confidence intervals 95%

**Figure 3.** Clusters of Behavior on Possession

* P < 0,05 when compared to cluster 3; # P < 0,05 when compared to cluster 2. Data are mean and confidence intervals 95%

Figure 4. Clusters of Behavior out of Possession

Figure 5. Clusters association with 2022-WC final classification (A), the FIFA ranking (B) and the confederations (C)

Figure 6A presents the cluster used by the teams during the WC-2022. A significant association (P = 0.004, Phi = 0.355) between the adopted cluster and the adopted opponent's cluster exists (Figure 6B).
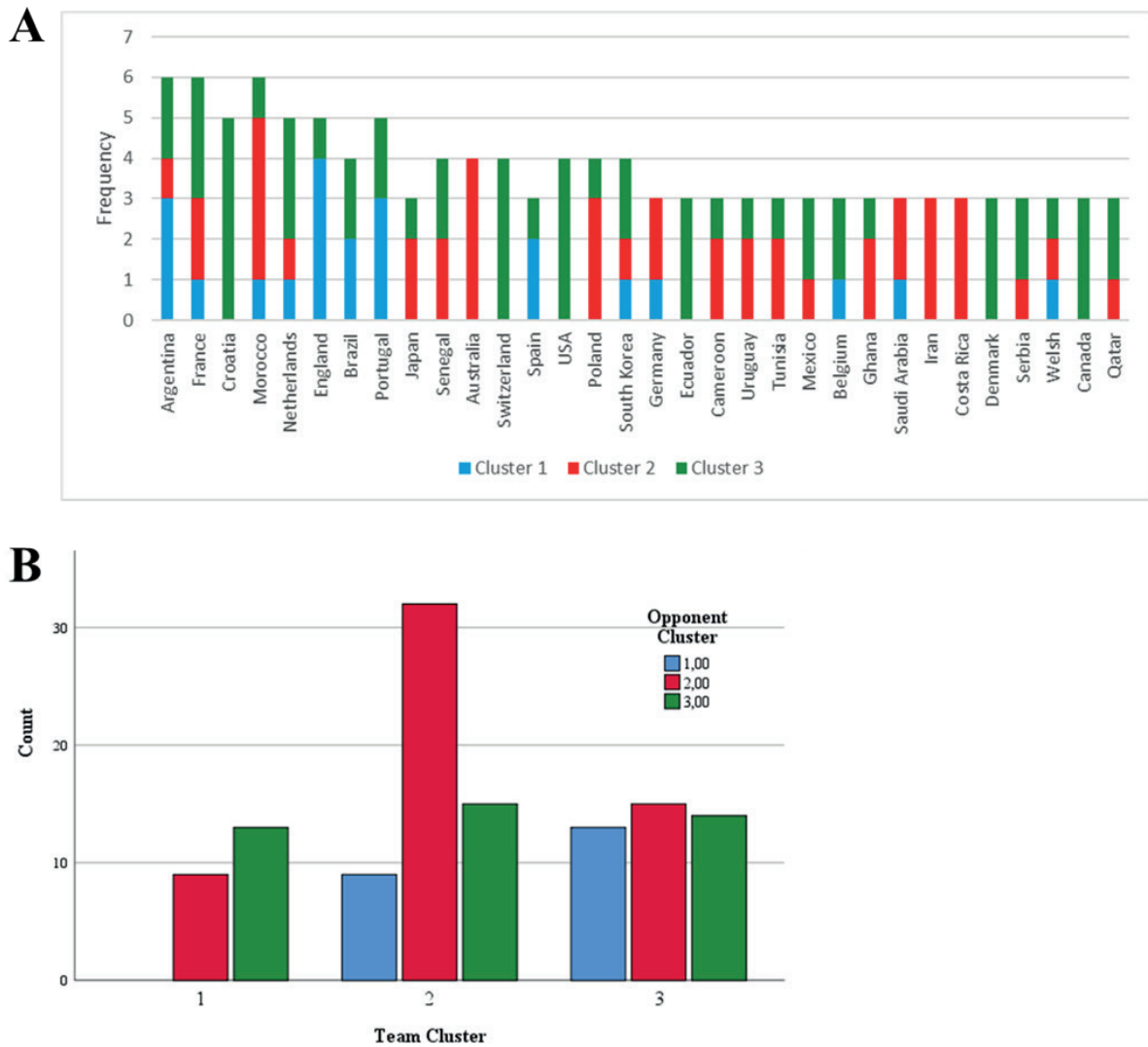
Figure 6. Use of clusters by teams in the 2022-WC (A) and the association between the type of a cluster used and the respective cluster used by the opposing team (B). On the X axis, in Fig. A, teams are ordered according to their final ranking in the 2022-WC

Discussion

Key Statistics

The cluster analysis demonstrates in the Key Statistics category that the strongest teams (according to the FIFA ranking) and the ones with the best 2022-WC classification have high ball possession, high volume of passes and completed passes, high break lines, and received the ball in the last third. They also make more crosses and have significant ball progression (behavior of Cluster 1, followed by Cluster 3, see Figure 1). Cluster 1 is mostly present in the first quartiles of the FIFA ranking and the 2022-WC classification but is lower in the last two quartiles of both the FIFA ranking and the 2022-WC classification (Figure 5). Cluster 1 has a small number of defensive actions, which is characteristic of teams that play (and maintain) ball possession, thus imposing their playing style [8].

Cluster 1 differs from Cluster 2, except for Total Distance Covered and High-Speed Distance Covered variables. Cluster 2 is highly present in the last quartiles of the 2022-WC classification (Figure 5A), and more frequent in teams in the last two quartiles of the FIFA ranking (Figure 5B), and in the AFC, OFC and CAF teams (Figure 5C). This cluster analysis corroborates the previous literature, which suggests that successful teams in the WC have greater ball Possession [2], Completed Passes, Attempts, and Attempts on Target [1, 9, 12]. In addition, a successful team with large ball possession has greater pass success in the last third of the field [9, 18], which can be identified in Cluster 1 (Figure 1). Finally, positional attacks with higher shots (shots per quantity of possession percent), creation of chances, even if they are lost (chances missed) were identified as the most important variable to predict success in football (in 5991 observations from 2996 matches in European national leagues, 2021/2022 season) [20]. Therefore, teams that aim for success in the WC must have features of Clusters 1 and 3, that is, impose the playing style with ball possession (with a high passes exchange at a high-success rate), break defensive lines, and be able to stay in the opponent's field with ball possession, creating attempts. This may result in a higher creation of chances.

Phases of Play

The Phase of Play (%) category describes how a team spend their time when they are with or without ball possession. Clusters were significantly associated with the FIFA ranking and the confederations, suggesting a relationship between a game style and team strength

and its origin. The different playing styles (e.g., the possession or direct game style) can be seen in Figure 2 (Phase of Play %). For instance, in the In Possession part (Phase of Play %), clusters analysis shows that those teams which adopt Cluster 1 (instead of Cluster 2) spend more time building a game (as observed by positive z-score for the Build Up Unopposed, Build Up Opposed, Progression, and Final Third variables). For this reason, they do not play with Long Ball, Attacking Transition, Counterattack, or Set Piece (see the negative z-score in Figure 2). In other words, Cluster 1 has the ball possession behavior playing style, while Cluster 2 has the direct game playing style. Previous studies have identified that successful teams prefer the possession playing style over the direct play one [11]. Thus, the 2022-WC cluster analysis from this study identified the different playing styles (direct game and play in possession), as already identified in national leagues [8], where the champions are the teams that achieve the highest number of points.

A previous study regarding the 2018-WC found that built attacks generate 82.5% of goals and only 17.5% of counterattacks. Also, the goals have the highest incidence with short passes than long passes [13] – a characteristic of players from Europe and South America [10]. This information is based on Clusters 1 and 3 (Figure 2) of the study. Thus, according to the significant association identified here between the clusters, the FIFA ranking, and the 2022-WC final classification, the better-ranked FIFA and first 2022-WC quartile teams prioritize the playing style in the attack construction. They also had greater permanence in the final third of the field over the detriment of direct play, which prioritizes a counterattack or long passes (feature of Cluster 2).

Interestingly, in the Out of Possession part (Figure 2), teams which prefer the possession playing style (Cluster 1) also prefer to use High Press associated with High Block with higher Recovery, Defensive Transition, and Counter-Press actions. In contrast, in the Out of Possession part, Cluster 2 spends more time in Lower Press, associated with Mid and Lower Blocks. In the Bundesliga, it has been verified that defensive success was associated with compact defense (with several players) close to the ball location, connected with pressure and reduced passing options for players in possession of the ball [5, 6]. This defensive characteristic close to the ball can also be identified in Cluster 1 (positive z-score in High Press, High Block, Counter-Press, and Defensive Transition). Also, the adoption of Defensive Transition, and Counter-Press is a strategy to Counteract the counterattack from the opponents [23].

Figure 5B shows that Cluster 1, unlike Cluster 2, is more present in the first quartile of the FIFA ranking. Cluster 2 is absent in CONCACAF and lower in AFC, OFC and CAF teams (Figure 5C) indicating a clear difference in playing styles between confederations. Therefore, teams aiming for success in the WC should be able to impose the playing style identified in Cluster 1 and 3 in the Phase of Play category.

Finally, the analysis of Phases of Play in this study is in agreement with the analysis of the playing styles of teams from several European national leagues (5998 observations from 2999 matches) [23], which led to the identification of the fact that in the construction phase (ball possession), two different styles stand out (the possession or the direct play styles). Also, without ball possession, high press and high block are characterized as an adopted defensive play style, which is different from low block and low press behavior.

Behavior on Possession

In the Behavior on Possession category cluster analysis indicates that Clusters 3, and especially Clusters 1, are markedly different from Cluster 2 (all variables). The Behavior on Possession category analyzes the movements of players without ball possession while their team has the ball. Thus, the analyzed player could make the movement (or not) to receive or offer to receive. It allowed to evaluate the tactical team movement in the occupation of space (widening and closing its shape relative to the opposing team) and in different field sectors (from the first to the last line). The cluster analysis suggests that the movement of players without the ball (offering to the receiver and receiving after offering) is a remarkable behavior from cluster 1 (and, in less intensity, Cluster 3). In contrast, Cluster 2, when compared to Cluster 1 and 3, suggests that there is little movement of players without possession (a static team), mainly moving in front, between or behind defensive lines. Mobility and width have been identified as crucial in offensive behavior [18]. This behavior of high movement can be identified in Clusters 1 and 3. Thus, when the team has the ball possession, the players without movement (offering to receive or moving to receive) could negatively impact the team on the WC. Therefore, this cluster analysis suggests that in the Behavior on Possession category, the successful teams in the 2022-WC tend to adopt the playing styles present in Clusters 1 and 3.

Behavior out of Possession

The Behavior out of Possession category analyzes the number of team actions without ball possession.

Clusters 1 and 2 (Figure 4) are markedly different, except for Possession Regained and Interceptions in the Defensive actions part. It is interesting to observe that despite the large amount of Defensive Pressure in Cluster 2, the number of the Possession Regained actions and the Interceptions is similar to Cluster 1. Furthermore, the Average Pressure Duration is lower in Cluster 2 when compared to Cluster 1. Therefore, this suggests that Cluster 2 has difficulty to put pressure on the opponent to regain the ball possession. For instance, Ball Recovery Time is significantly higher in Cluster 2 when compared with Clusters 1 and 3. Therefore, the data suggest that teams using Cluster 1 have a better defense organization than teams that adopt Cluster 2 and 3.

Logically, teams with the highest number of actions without ball possession generally have little ball possession (see Figure 1) and suffer more attacks from opposing teams, leading to a more significant number of defensive actions. In a previous study that evaluated the playing styles of the Premier League teams, it was identified that teams with a greater number of defensive actions were associated with worse classification in the league [8]. Also, as previously identified [12], the high score in defensive behavior of a CAF team has been inducing to adopt Cluster 2. Recently, it was identified that defensive pressure in a attacking player in control of the ball and close pass options is a characteristic of successful defense [5, 6]. Our data showed that Avg Pressure Duration has a positive z-score in Cluster 1, which is significantly different from Cluster 2 (negative z-score). This pressure behavior close to the ball can also be identified in Cluster 1 during the phase of play, by a positive z-score in High Press, High Block, Counter-Press, and Defensive Transition. Therefore, in the phases without the ball possession, teams that aim for success in the WC must be able to impose the playing style identified in Cluster 1.

In summary, the cluster analysis identified the different playing styles with and without ball possession. These playing styles have a significant association with the 2022-WC final classification, the FIFA ranking teams, and the confederations. It has been also identified that the Key Statistics, Phase of Play, Behavior on Possession, and Behavior out of Possession categories provide important information in exploring team's success in the WC.

Conclusions

Playing style analysis using cluster analysis approach has been an emerging topic in world football science [23, 24]. The cluster analysis of this study presents new

insight into the WC studies. This study describes the playing style profile with ball possession (two different profiles) and without ball possession (also two different profiles have been identified). In the first profile with ball possession, teams prefer ball possession associated with high movement of athletes (without ball possession) offering to receive the ball (and receiving the ball in movement). This playing style also has a high penetration performance (breaking the opponent' defensive lines). The second profile from teams with ball possession, is characterized by playing with long ball passes, attack transitions, and counterattacks (direct game). The direct game playing style has a low movement of athletes (to receive the ball in movement and to offer to receive) compared to the playing style that prioritizes ball possession. It also exhibits low penetration and a lower pass reception rate in the final third of the field. Future studies should identify factors that may lead to the use of these two playing style profiles. The analysis of the profile without ball possession identifies that teams adopting the possession profile embrace high-block and high-pressure techniques associated with high defensive transition and counter-press (certainly to prevent counterattacks from opposing teams) [23]. On the other hand, teams which prefer the direct game style choose medium and low blocks and exert low pressure. The significant association of the clusters with contextual variables suggests that the possession playing style, associated with high movement, was the most successful profile in the 2022-WC. However, as no association was identified between the score ratio or the match results with the clusters, caution is indicated when interpreting the data. For instance, as suggested in Figure 6A, France, Argentina, and Morocco used the three clusters, which might indicate that these teams explicitly intersperse the playing styles. More importantly, France, Argentina, and Morocco did not lose the games in which they adopted Cluster 2 (seven victories and one draw). Interestingly, teams using Cluster 1 are not opposed by teams with the same cluster type (Figure 6B), but when teams use Clusters 2 or 3, the face opposition from the three-cluster types. Therefore, more studies are needed to identify the contexts of adopting different playing styles.

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Conflict of Interest

The authors declare no conflict of interest.

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