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Effect of opposition quality and match location on the positional demands of the 4-2-3-1 formation in elite soccer

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A B S T R A C T

Background/Objective: The present study examined the influence of match location, quality of opposition team, and playing position on physical performance indicators of the 4-2-3-1 formation.
Methods: Twenty-six (n = 26) games (with 184 player-observations; n = 17 players, played full 90 min games) were recorded with a video system and the physical demands of the players were analyzed according to their specific playing position (classified into central and wide defenders, central and wide midfielders and forwards). Match performance variables analyzed included total distance (TD), high-intensity running (HIR), very-high-intensity running (VHIR) and sprinting (SPR).
Results: There was a main effect of position for TD ($F = 37.84$, $p < 0.001$), HIR ($F = 41.19$, $p < 0.001$), VHIR ($F = 27.89$, $p < 0.001$) and SPR ($F = 22.25$, $p < 0.001$). Wide defenders covered the most SPR and -along with the central midfielders-the most VHIR. Central midfielders covered the most TD and HIR. Match location and opposition quality had interactive effects on TD ($F = 12.96$, $p < 0.001$), HIR ($F = 8.33$ $p = 0.004$) and VHIR ($F = 8.17$ $p = 0.005$). Competing against “weak” opponents, more TD, HIR and VHIR covered during home games compared to away games ($p < 0.05$). However, more TD was covered during away games against “strong” opponents compared to away games against “weak” opponents ($p < 0.05$).
Conclusions: The current study supports more intense-based drills (i.e. repeated sprint training) for wide defenders and more volume-based drills (i.e. long interval training) for central midfielders, whilst total weekly training load can be adjusted based on match location and quality of oppositions on the anticipated game-load.

Introduction

In modern soccer, playing position is a determining factor regarding the physical demands placed on the player.[1] Although several previous studies have quantified positional demands,[2–5] the potential effect of playing formation on positional demands has received little attention. While TD covered in a match was similar among three widely used formations (4-4-2, 4-3-3 and 4-5-1), defenders in 4-4-2 formation covered more TD than defenders in 4-3-3 or 4-5-1.[6] In addition, although HIR was similar across formations, forwards in the 4-3-3 formation covered more distance with HIR compared with forwards in 4-5-1 or 4-4-2 formation and defenders in 4-4-2 covered more distance with HIR compared with defenders in 4-5-1 or 4-3-3 formation.[6]

However, one of the most popular soccer formations now, which has not been evaluated yet, is the 4-2-3-1 formation. Elite level soccer clubs (Bayern Munich, Liverpool FC, Manchester City, Inter Milan, Arsenal FC, Sevilla FC, Valencia CF) as well as the Spanish and German National teams have all adopted the 4-2-3-1 formation with great success.[7] Only one study so far, evaluated the physical demands of this particular 4-2-3-1 formation. In this study, TD was found to be significantly lower in the 4-2-3-1 formation compared to 3-5-2, but similar to 4-4-2 one; and HIR values in 4-2-3-1 were lower compared to 3-5-2 but similar to 4-4-2 and 3-4-3 formations.[8] In addition, central midfielders in 4-3-3 cover greater TD compared to 4-4-2, and forwards in 3-5-2 cover greater HIR than in 4-2-3-1.[8] However, the latter study did not specifically analyze the positional demands of the 4-2-3-1. It rather compared the physical requirements of this formation with those of other formations (4-4-

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2, 4-3-3, 3-5-2, 3-4-3) analyzing only 11 matches of U-20 and U-18 squads of a soccer club.[8] The match performance parameters therefore, for each playing position of this formation have not been well evaluated yet.

Physical performance parameters also during a match are related to the quality level and the activities completed during the game by the opponent. For example, TD of a reference team was higher when competing against the best teams of the league compared to when competing against the worst teams (11097 ± 778 m vs. 10827 ± 760 m), whilst similar results were also noted for HIR.[5] It is possible that teams adopt a different strategical approach depending on opposition quality while still using the same formation and this may have implications on the positional demands. Moreover, teams usually achieve better results when they play with home advantage.[9] Thus, players may cover different distances with various speeds when they play with home advantage or not. This is an important parameter in modern soccer training programming, but it has not been evaluated yet. Consequently, the purpose of the present study was to evaluate the positional demands of the 4-2-3-1 formation, for a whole competitive season taking also into consideration the influence of the match location and the quality of the opposition teams.

Methods

Match sample

Twenty-six matches (n = 26) played by a professional soccer team during a domestic league season, (Pro-League, UAE), were analyzed post-event. Goalkeepers were not included in the analysis. Every game provided a sample of ~10 players for analysis. The final sample consisted of 17 outfield players (age: 27 ± 4 years; height: 177 ± 5; body mass: 72 ± 4 kg). All players were full-time professionals (5 ± 8 years). The match sample was balanced with respect to match location and quality of the opposition (i.e. 13 matches were played at home and 13 matches away; a total of 12 matches were played against strong opposition and 14 matches were played against weak opposition). At the end of the season, the evaluated club finished at the top 1/3 of the table having 11 wins, 8 draws, and 7 losses, with 47 goals scored and 36 goals conceded. The study was conducted according to the declaration of Helsinki and ethical approval was obtained by the National Research Ethics Committee.

Measurements

All measures of match performance data (n = 26 games; 184 player-observations; n = 17 players who played full 90 min games; see Table 1) were obtained with the InStat software (www.instatfootball.com/). Full HD cameras capturing 2 sides of the pitch were installed in every home and away pitch. For the away games, a relevant video-capturing permissions from the opposition clubs were obtained. Video data from the cameras were processed and automatic algorithms were used to analyze the video and turn it into a 2D model of the match. The raw data of match performance analysis process were represented by x/y coordinates of every single player on the pitch. This software has been previously validated yielding a precision of 98%.[10]

Match activities were coded into: walking (0.7–7.1 $km\,h^{-1}$), jogging (7.2–14.3 $km\,h^{-1}$), running (14.4–19.7 $km\,h^{-1}$), high-speed running (19.8–25.1 $km\,h^{-1}$) and sprinting (>25.1 $km\,h^{-1}$).[11] Total distance (TD) represented the summation of distances covered in all categories. High-intensity running (HIR) consisted the running activities covered between 14.4 $km\,h^{-1}$ and 19.8 $km\,h^{-1}$ speed, whilst very high-intensity running (VHIR) consisted the running activities covered of >19.8 $km\,h^{-1}$ speed[2,3,5,6] although the threshold for VHIR (>19.8 $km\,h^{-1}$) has been termed "high-intensity running (HIR)".[12–15] Regardless of definition, TD, distance covered at >19.8 $km\,h^{-1}$ and >25.1 $km\,h^{-1}$ speeds are amongst top-10-ranked variables used to quantify soccer-training load.[11]

Statistical analysis

The dependent variables were TD, HIR, VHIR and sprinting (SPR), whilst the independent variables were: position played, venue of the match location and quality of the opponent clubs. Position had 5 levels [wide defenders (WD), central defenders (CD), central midfielders (CM), wide midfielders (WM) and forwards (FW)].[8,14] Match location was recorded as "home" or "away" depending on whether the sampled team was playing at its own ground or that of its opponent. Quality of opposition was dichotomized into "strong" and "weak" categories based on whether the opponent finished in the top or bottom half of the division (positions 1–7 or 8–14 respectively) within the season from which the data were obtained.[5] Three-way analysis of variance was used to determine the effect of the independent variables on each of the dependent variables. When F ratios were significant, post hoc comparisons of means with Tukey tests were used to locate specific differences. In addition, Cohen's d (±95%CI) was used to quantify the magnitude of the differences in means for the post hoc comparisons. Margins for small, moderate, large and very large effect sizes were 0.2, 0.6, 1.2 and 2.0 respectively.[16] Statistical significance was accepted at $p < 0.05$.

Results

Mean (±SD) values regarding the examined dependent variables are presented in Table 2. The TD covered by a single player ranged from 7824 m to 11975 m during competitive match-play, whilst HIR, VHIR and SPR for a single player ranged from 1190 m to 4058 m, 309 m–1354 m and 0 m–355 m, respectively.

There was a main effect of position for TD (F = 37.84), HIR

Table 1
Match observations/analyses per player and per played position.

Player-observations								
	Home			Away			Total	Players (n)
	Strong opponents	Weak opponents	Total	Strong opponents	Weak opponents	Total		
Team	44	48	92	43	49	92	184	17
WD	10	11	21	11	14	25	46	3
CD	9	10	19	8	9	17	36	4
CM	11	10	21	8	10	18	39	4
WM	5	6	11	8	6	14	25	2
FW	9	11	20	8	10	18	38	4

(F = 41.2), VHIR (F = 27.9) and SPR (F = 22.3) ($p < 0.001$). Center midfielders covered more TD compared to WD [d = 1.6 (1.1; 2.1)], WM [d = 1.6 (1.1; 2.2)], and FW [d = 1.2 (0.8; 1.7)], while CD covered less TD compared to WD [d = 1.6 (1.1; 2.1)], CM [d = 2.8 (2.2; 3.5)], WM [d = 0.9 (0.4; 1.4)] and FW [d = 1.4 (0.9; 1.9)] (p < 0.001). There were no statistically significant differences ($p > 0.05$) in TD covered between WD and WM [$p = 0.57$, d = -0.4 (−0.8; 0.1)], WD and FW [$p = 0.13$, d = 0.1 (−0.3; 0.6)] and WM and FW [$p = 0.06$, d = 0.4 (−0.1; 0.9)] (Table 2).

Center midfielders covered significantly more distance with HIR compared to WD [d = 1.4 (0.9; 1.8)], WM [d = 1.9 (1.3; 2.5)] and FW [d = 1.8 (1.2; 2.3)], whilst CD covered significantly less distance with HIR compared to WD [d = 1.7 (1.2; 2.2)], CM [d = 2.6 (1.9; 3.2)], WM [d = 0.6 (0.1; 1.2)] and FW [d = 1.1 (0.6; 1.5)] (p < 0.001). Wide defenders covered significantly more distance with HIR compared to WM [$p = 0.009$, d = 0.8 (0.3; 1.4)], whilst there were no statistically significant differences in HIR between FW and WM [$p = 0.66$, d = -0.3 (−0.9; 0.2)] and between FW and WD [$p = 0.21$, d = 0.5 (0.1; 1.0)] (Table 3).

Wide defenders [$p < 0.001$, d = 0.8 (0.3; 1.3)] and CM [$p = 0.02$, d = 0.6 (0.1; 1.1)] covered significantly more distance with VHIR compared to WM whilst WD also covered significantly more distance with VHIR compared to FW [$p = 0.004$, d = 0.6 (0.2; 1.1)]. Central defenders covered significantly less distance with VHIR compared to WD [d = 2.2 (1.6; 2.7)], CM [d = 2.1 (1.6; 2.7)], WM [d = 1.3 (0.7; 1.8)] and FW [d = 1.6 (1.1; 2.1)] (p < 0.001). There were no statistically significant differences in VHIR between WD and CM [$p = 0.34$, d = -0.2 (−0.6; 0.2)], CM and FW [$p = 0.12$, d = 0.4 (0.0; 0.9)] and WM and FW [$p = 0.92$, d = 0.2 (−0.3; 0.7)] (Table 4).

Wide defenders covered more distance sprinting compared to CD [$p < 0.001$, d = 1.9 (1.5; 2.4)], CM [$p < 0.001$, d = 1.7 (1.2; 2.2)], WM [$p = 0.04$, d = 0.6 (0.2; 1.1)] and FW [$p < 0.001$, d = 0.7 (0.4; 1.1)]. Wide midfielders and FW covered significantly more distance sprinting compared to CD [$p < 0.001$, d = 1.3 (0.7; 1.9)] and [p < 0.001, d = 1.0 (0.5; 1.5)] respectively and CM [$p < 0.001$, d = 1.0 (0.7; 1.4)] and [$p < 0.02$, d = 0.7 (0.4; 1.1)] respectively. There were no statistically significant differences ($p > 0.05$) in sprinting distance between CD and CM [$p = 0.83$, d = 0.3 (−0.2; 0.8)], and between WM and FW [$p = 0.92$, d = -0.2 (−0.4; 0.4)] (Table 5).

A venue*opposition interaction was observed for TD (F = 12.9, $p < 0.001$), HIR (F = 8.3, $p = 0.004$) and VHIR (F = 8.2, $p = 0.005$). More TD was covered during home games against “weak” opponents compared to home games against “strong” opponents [$p < 0.04$, d = 0.3 (0.1; 0.7)] while more TD was covered during away games against “strong” opponents compared to away games against “weak” opponents [$p = 0.04$, d = 0.3 (0.1; 0.7)]. In addition, competing against a “weak” opponent was associated with statistically significant more TD [$p = 0.004$, d = 0.4 (0.2; 0.8)], HIR [$p = 0.02$, d = 0.3 (0.1; 0.7)] and VHIR [$p < 0.05$, d = 0.4 (0.02; 0.8)] covered during home games compared to away games (Table 2). There were no other statistically significant main or interaction effects for any of the dependent variables.

Discussion

The purpose of the present study was to analyze match performance and playing position parameters of the 4-2-3-1 formation, utilized for a whole season by an elite soccer club and examine how these parameters are influenced by match location and the quality of opposition teams. The novel findings of the current study are a) the high physical demands imposed by both the WD and CM, b) competing against a “weak” opponent was associated with more TD, HIR and VHIR covered during home games compared with away games and c) more TD was covered during home games against “weak” opponents compared to home games against “strong” opponents and the opposite during away games.

The increased demands for the WD compared to the other positions were noted for high demanding activities (VHIR and SPR) and can be explained by their tactical specific role in the 4-2-3-1. When for example, the team was in possession, WM are required to move into more central positions attracting defenders inside and creating space for the WD to move up, thus introducing more players to attacking positions. Typically during the offensive phase the WM occupy the space between the opponent WD and the CD on both sides, whilst the WD are required to attack wide in order to get crosses in.[7] This transformation of moving forward the WM creates an offensive pattern of play of 4-2-3-1, thereby producing a lot of space for the WD to exploit and fill in. This is of great importance especially when competing against opponent with narrow midfield (4-3-1-2 or 4-4-2 with diamond) where both WD can push forward throughout the game.[7] During the transition to defending phase the WD are required to quickly recover from attacking positions into defensive areas, increasing the number of defensive players behind the ball and therefore reducing the space for attacking play.[7] Such a high tempo for the WD is most likely to be reflected in high VHIR and SPR values, results that have been observed in the current study. In fact, it has been suggested that the increasing popularity of the versatile 4-2-3-1 playing formation in the English Premier League is one potential reason for the increased demands in terms of HIR/VHIR and SPR imposed on the WD.[16]

The current results do not agree with several other studies indicating higher match demands for WM compared to the other position in terms of TD, HIR, VHIR and SPR.[2,4,17] In the present study, CM covered the most TD and more distance with HIR compared to all other positions and more distance with VHIR compared to CD, WM and FW. This is explained by their tactical

Table 2
Total distance covered according to playing position in home and away games against strong and weak opponents.

	Home			Away			Total
	Strong opponents	Weak opponents	Total	Strong opponents	Weak opponents	Total	
Team	9819 ± 960	10104 ± 891[||,¶]	9968 ± 931	9998 ± 752	9715 ± 943[||]	9847 ± 866	9907 ± 899
WD	9857 ± 369	10059 ± 429	9963 ± 405	10123 ± 410	9688 ± 680	9879 ± 595	9918 ± 521*
CD	8567 ± 436	9116 ± 706	8899 ± 624	9228 ± 1052	8880 ± 508	9044 ± 804	8967 ± 708
CM	10909 ± 380	10910 ± 605	10910 ± 487	10740 ± 479	10730 ± 905	10734 ± 726	10829 ± 607*,†,‡,§
WM	9056 ± 992	10142 ± 896	9648 ± 1057	9942 ± 429	9338 ± 863	9681 ± 695	9667 ± 852*
FW	10031 ± 609	10292 ± 838	10174 ± 738	9912 ± 540	9717 ± 823	9804 ± 699	9999 ± 734*

*: p < 0.05 from CD.
†: p < 0.05 from WD.
‡: p < 0.05 from WM.
§: p < 0.05 from FW.
||: p < 0.05 from strong opponents.
¶: p < 0.05 from respective away value.

Table 3
Total distance covered with high intensity running according to playing position in home and away games against strong and weak opponents.

	Home			Away			Total
	Strong opponents	Weak opponents	Total	Strong opponents	Weak opponents	Total	
Team	2450 ± 734	2590 ± 615¶	2523 ± 674	2534 ± 543	2363 ± 713	2443 ± 641	2483 ± 658
WD	2447 ± 331	2738 ± 235	2599 ± 314	2790 ± 281	2426 ± 524	2586 ± 465	2592 ± 399*‡
CD	1584 ± 338	1890 ± 347	1745 ± 368	2177 ± 800	1821 ± 525	1988 ± 672	1860 ± 540
CM	3336 ± 375	3267 ± 590	3303 ± 477	3033 ± 350	3164 ± 701	3106 ± 561	3212 ± 520*†‡§
WM	1934 ± 574	2522 ± 598	2255 ± 636	2266 ± 374	2049 ± 621	2173 ± 486	2209 ± 546*
FW	2523 ± 473	2500 ± 371	2511 ± 408	2307 ± 286	2149 ± 481	2219 ± 403	2373 ± 427*

*: $p < 0.05$ from CD.
†: $p < 0.05$ from WD.
‡: $p < 0.05$ from WM.
§: $p < 0.05$ from FW.
||: $p < 0.05$ from strong opponents.
¶: $p < 0.05$ from respective away value.

Table 4
Total distance covered with very high intensity running according to playing position in home and away games against strong and weak opponents.

	Home			Away			Total
	Strong opponents	Weak opponents	Total	Strong opponents	Weak opponents	Total	
Team	862 ± 284	927 ± 242¶	896 ± 264	901 ± 239	819 ± 265	857 ± 255	876 ± 259
WD	964 ± 216	1128 ± 105	1050 ± 183	1078 ± 177	936 ± 270	998 ± 240	1022 ± 215*‡§
CD	498 ± 145	556 ± 119	529 ± 132	673 ± 264	601 ± 216	635 ± 235	579 ± 192
CM	1042 ± 163	994 ± 143	1019 ± 152	929 ± 151	939 ± 256	934 ± 210	980 ± 184*‡§
WM	724 ± 269	1005 ± 245	877 ± 284	866 ± 222	781 ± 227	829 ± 220	850 ± 246*
FW	967 ± 244	960 ± 114	9640 ± 179	892 ± 213	754 ± 205	815 ± 214	893 ± 208*

*: $p < 0.05$ from CD.
‡: $p < 0.05$ from WM.
§: $p < 0.05$ from FW.
¶: $p < 0.05$ from respective away value.

Table 5
Total distance covered with sprinting according to playing position in home and away games against strong and weak opponents.

	Home			Away			Total
	Strong opponents	Weak opponents	Total	Strong opponents	Weak opponents	Total	
Team	110 ± 79	120 ± 72	115 ± 75	133 ± 85	106 ± 70	118 ± 78	117 ± 76
WD	172 ± 82	198 ± 54	186 ± 68	204 ± 59.0	149 ± 78	173 ± 74	179 ± 71*†‡§
CD	69 ± 48	46 ± 25	57 ± 38	71 ± 69.7	63 ± 51	67 ± 59	62 ± 49
CM	70 ± 42	87 ± 46	78 ± 44	70 ± 49.2	80 ± 57	76 ± 52	77 ± 47
WM	120 ± 63	161 ± 53	142 ± 59	139 ± 85	122 ± 52	128 ± 70	135 ± 65*†
FW	129 ± 100	116 ± 58	121 ± 78	158 ± 89	100 ± 70	126 ± 79	124 ± 77*†

*: $p < 0.05$ from CD.
†: $p < 0.05$ from CM.
‡: $p < 0.05$ from WM.
§: $p < 0.05$ from FW.

requirements in keeping the center as compact as possible and providing support in both offensive and defensive phases of the game. At the same time the two CM keep the defense compact which reduces the physical demands imposed on the CD.

Indeed, the current results indicated that CD had lower physical demands as they covered significantly less TD, HIR, VHIR and SPR compared to all other positions; results that are supported by several previous reports.[3,4,5,17] In contrast, others, indicate that CD covered similar TD with WD and FW[2,3] or FW alone[5] and HIR, VHIR and sprinting similar to WD and FW.[2] In a recent study that examined positional differences amongst various formations (4-4-2, 4-3-3, 3-5-2, 3-4-3, 4-2-3-1), it was reported that CD covered less TD compared to all other positions but similar VHIR to CM irrespective of playing formation.[8] During the offensive phase they are required to close in and take the opponent WD inside in order to create space outside for their own WD or in case where they are not followed by opponent defenders to create overload opportunities in cooperation with the FW.[7] Their tactical role is also crucial during the defensive phase of the game where they were required to form a band of defensive four along with the CM. In addition, they were also required to follow the opponent WD when they were coming upfront in order to prevent overload situations with their own WD. Thus, WM in the 4-2-3-1 have a more perhaps composite role mainly due to their movements into more central positions and probably cannot be considered as typical “wingers”.[7]

To the best of our knowledge there is only one study with limited number of games and player observations (n = 11; n = 89 respectively) that presented TD and VHIR data regarding the positional demands of the 4-2-3-1 formation.[8] Whilst in that study the mean team TD was a merely 1.4% higher than in the present study, there were more pronounced differences when players were split into their respective positions. Specifically, WD, CD and WM covered 5.5%, 7.9% and 6.2% more TD compared to their counterparts in the present study, whilst CM and FW covered 4.6% and

13.5% less TD compared to their counterparts in the present study. In addition, contrary to the present findings, Tierney et al.,[8] reported that WM cover significantly more TD compared to all other positions. Finally VHIR was quite lower in that study compared with the present one for every position. These differences probably reflect the different status of the players [elite professional in our study, U-21 and U-18 players in Tierney et al.,[8] one]. In addition, potential variations in the tactical role of the same positions may also explain the contradictory results. For example, 13% more TD for FW in our study could be explained by a more demanding role that perhaps a professional FW should accomplish in the defending phase of the game, compared with U-21/U-18 semiprofessional players.

The current observed effect sizes for the positional differences were moderate to very large indicating that besides of statistical significance, the reported differences have also practical implications.[16] This is of importance since some authors have concluded that HIR/VHIR/SPR is associated with the final outcome of a game[18,19] and has also been identified as a key feature required in elite level in football.[20] The fact that HIR/VHIR/SPR are important physical game elements is further supported since it has increased in match play by as much as 30% in recent years compared to the previous decade.[12] Consequently, HIR/VHIR/SPR monitoring can be used to increase training specificity by providing information for training prescription and periodization according to match demands.[11] Although high between-match variability in these parameters, questions whether the observed position-specific differences are meaningful enough to warrant a position-specific approach in training,[21,22] the current reported effect sizes indicate that these statistically significant differences likely justify position-specific training interventions, whilst statistically non-significant differences with consistently small effect sizes may warrant further study or at least be taken into consideration by the practitioner. In addition, it has been proposed that the majority of decisive actions during a match are performed with high intensity efforts; therefore even small differences in these efforts can be worthwhile if they may offer a competitive advantage.[23]

In the present study, the more TD was covered against “strong” compared to “weak” opponents during away games results that are supported by a previous report.[5] To the best of our knowledge only one study has examined the effect of quality of oppositions on the physical demands of the game.[5] These authors reported more TD and HIR when the reference team was competing against high quality opponents. It has been also previously reported that top teams are able to impose and maintain their pattern of play despite the alteration in variables over the match (changes in score line) and between matches (venue location).[24,25] For example, the 3 best teams from a top league were able to dominate possession against their opponents whether winning, losing, or drawing.[26]

However, it is difficult to explain why home games against “weak” opponent were associated with higher physical demands compared to away games against “weak” opponent. Considering that the current evaluated team has been categorized as a “strong” team, a potential explanation is that the “weak” teams playing away, for avoiding as much as possible to receive goals, they normally play with a more narrowing defensive tactical pattern. This particular passive zone-system, was giving the opportunity to the “strong” teams to move (attack) more with and without the ball, in order to create open spaces for overcoming the narrowing defensive zones used to be adopted from the “weak” teams and being able to develop the situations to score.[27] This narrowing defensive tactical pattern, was not perhaps evident by the “weak” teams when they were playing at their home games against the current evaluated “strong” team. Supporting the above discussion, previous research has pointed out that home than away games’ advantages including technical, tactical and moving patterns in professional soccer.[25]

It should be pointed out that although the effect sizes of the interactive effects of opposition quality and venue location on all dependent variables were relatively small, the reported differences however, may have substantial practical implication.[16] In effect, it should be taken into consideration meaningfully from football coaches and relevant fitness instructors. Future studies further analyzing data during the offensive (with ball possession) and defensive (with no ball possession) phases of the game may provide better understanding on the effect of match location and opposition quality on the positional demands.

Conclusion

The present study analyzed the positional demands of the 4-2-3-1 formation taking also in to consideration the home/away match location and the quality of the opponent. The novel finding of the current study is that WD cover more SPR and VHIR compared to all other positions; and WM do not exhibit such high physical demands as previously reported. In conclusion, the current results suggest that coaching team should develop weekly specific personalized training programs (position-specific individual drills or drills simulating intense periods of match-play), prior to each particular game preparation, in order to meet the demands of each playing position of the 4-2-3-1 formation taking also into consideration the home and/or away games and the quality of the opposition teams.

Declaration of competing interest

The authors have no conflicts of interest relevant to this study.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jesf.2019.11.001.

References

1. Martín-García A, Casamichana D, Gómez Díaz A, et al. Positional differences in the most demanding passages of play in football competition. *J Sport Sci Med*. 2018;17:563–570.
2. Bradley PS, Sheldon W, Wooster B, et al. High-intensity running in English FA Premier League soccer matches. *J Sport Sci*. 2009;27:159–168.
3. Bradley PS, Di Mascio M, Peart D, et al. High-intensity activity profiles of elite soccer players at different performance levels. *J Strength Cond Res*. 2010;24:2343–2351.
4. Di Salvo V, Pigozzi F, Gonzalez-Haro C, et al. Match performance comparison in top English soccer leagues. *Int J Sports Med*. 2013;34:526–532.
5. Rampinini E, Coutts AJ, Castagna C, et al. Variation in top level soccer match performance. *Int J Sports Med*. 2007;28:1018–1024.
6. Bradley PS, Carling C, Archer D, et al. The effect of playing formation on high-intensity running and technical profiles in English FA Premier League soccer matches. *J Sport Sci*. 2011;29:821–830.
7. Jankowski T. *Successful German Soccer Tactics: The Best Match Plans for a Winning Team*. Meyer & Meyer Sport: Verlag; 2015.
8. Tierney PJ, Young A, Clarke ND, et al. Match play demands of 11 versus 11 professional football using Global Positioning System tracking: variations across common playing formations. *Hum Mov Sci*. 2016;49:1–8.
9. Courneya K, Carron A. The home advantage in sport competitions: a literature review. *J Sport Exerc Psychol*. 1992;14:13–27.
10. Alexeev D, Nosov M, Vaguine I, et al. *Validation and Precision Analysis of InStat Fitness System*. Moscow Sports Committee; 2012.
11. Akenhead R, Nassis GP. Training load and player monitoring in high-level football: current practice and perceptions. *Int J Sports Physiol Perform*.

2016;11:587–593.
12. Barnes C, Archer DT, Hogg B, et al. The evolution of physical and technical performance parameters in the English Premier League. *Int J Sports Med*. 2014;35:1095–1100.
13. Bradley PS, Lago-Penas C, Rey E, et al. The effect of high and low percentage ball possession on physical and technical profiles in English FA Premier League soccer matches. *J Sport Sci*. 2013;31:1261–1270.
14. Bush MD, Archer DT, Hogg R, et al. Factors influencing physical and technical variability in the English Premier League. *Int J Sports Physiol Perform*. 2015;10(7):865–872.
15. Bush MD, Barnes C, Archer DT, et al. Evolution of match performance parameters for various playing positions in the English Premier League. *Hum Mov Sci*. 2015b;39:1–11.
16. Hopkins WG, Marshall SW, Batterham AM, et al. Progressive statistics for studies in sports medicine and exercise science. *Med Sci Sport Exerc*. 2009;41: 3–12.
17. Di Salvo V, Gregson W, Atkinson G, et al. Analysis of high intensity activity in Premier League soccer. *Int J Sports Med*. 2009;30:205–212.
18. Di Salvo V, Baron R, Tschan H, et al. Performance characteristics according to playing position in elite soccer. *Int J Sports Med*. 2007;28:222–227.
19. Bloomfield J, Polman RCJ, O'Donoghue PG. Physical demands of different positions in FA Premier League soccer. *J Sport Sci Med*. 2007;6:63–70.
20. Drust B, Atkinson G, Reilly T. Future perspectives in the evaluation of the physiological demands of soccer. *Sport Med*. 2007;37:783–805.
21. Carling C. Interpreting physical performance in professional soccer match-play: should we be more pragmatic in our approach? *Sport Med*. 2013;43:655–663.
22. Carling C, Bradley P, McCall A. Match-to-match variability in high-speed running activity in a professional soccer team. *J Sport Sci*. 2016: 342215–342222.
23. Stolen T, Chamari K, Castagna C. Physiology of soccer: an update. *Sport Med*. 2005;12:501–536.
24. Hughes MD, Franks I. Analysis of passing sequences, shots and goals in soccer. *J Sport Sci*. 2005;23:509–514.
25. Lago-Pennas C, Dellal A. Ball possession strategies in elite soccer according to the evolution of the match-score: the influence of situational variables. *J Hum Kinet*. 2010;25:93–100.
26. Bloomfield J, Polman R, O'Donoghue P. Effects of score-line on team strategies in FA Premier League soccer. *J Sport Sci*. 2005;23:192–193.
27. Almeida CH, Ferreira AP, Volossovitch A. Effects of match location, match status and quality of opposition on regaining possession in UEFA champions' league. *J Hum Kinet*. 2014;41:203–214.