Heliyon 10 (2024) e29240

Contents lists available at ScienceDirect

Heliyon

journal homepage: www.cell.com/heliyon

Research article

Effect of the role, playing position and the body characteristics on physical performance in female soccer players

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ARTICLE INFO

Keywords:
Football
Female
GPS
Playing position
Weight

ABSTRACT

The aims of this study were to know the physical demands according to the playing position and team role, and to assess the effect of the body characteristics on the physical performance of semi-professional female soccer players. Forty-five female semi-professional soccer players during 9 home-matches of the 2021–2022 season were analyzed and GPS devices (GPEXE ®) were used. ANCOVA tests were performed with playing time as covariate. The results showed greater physical demands in forwards and wide-midfielders and offensive role players. Total distance, metabolic power, accelerations, deaccelerations, and distance covered to medium and high speed obtained a strong effect size in these analyses according to the playing position. Furthermore, relationships between body weight and physical performance were found ($p < 0.05$). In conclusion, the main finding of this study showed that semi-professional female soccer players compete differently, caused by differentiated functions, evidenced in the playing positions and role in the team. Offensive role, forwards and wide-midfielder female players performed the highest physical demands in the competition. This study has shown relevant information for coaches, S&C coaches, and training staff of the semi-professional female soccer teams in order to propose new keys and ways of planning training sessions.

1. Introduction

Soccer is the most relevant collective sport, practiced by 300 million people and with almost two million teams around the world [1]. Interest in women's soccer has experienced exponential growth, especially in the last decade. During this period, participation has increased by a third and FIFA estimates that the number of female practitioners will reach 60 million in 2026 [2]. However, there is a great disparity in the volume of publications involving men and women in this sport [3], being less than 15% of all the studies carried out on professional soccer, with female participants [4]. Thus, the literature about some performance determinants of women soccer is insufficient, particularly referred to match physical demands, so it would be necessary more gender-specific evidence.

Recent research confirmed the importance of conditional preparation in optimizing performance in women's soccer. Training

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https://doi.org/10.1016/j.heliyon.2024.e29240
Received 8 August 2023; Received in revised form 2 April 2024; Accepted 3 April 2024
Available online 4 April 2024

should consist of a combination of physical, technical, and tactical factors to allow the player to meet the demands of the match and develop his tactical role efficiently [5], taking into account possible influences due to contextual factors (location of the match, level of the rival, result, among others) that can alter and condition performance [6]. For these reasons, it is necessary to know what the physical demands are in competition in order to plan and manage the training process. In general, the female players cover a total distance of about 9–11 km per match, of which most is done walking or jogging, with the aerobic system providing the [7,8]. In addition, the distance covered at high-speed running or in sprint are considered fundamental components of the activity during the halves gone because they are represented in the decisive actions of football, mainly in those that end in a goal [9], although they barely account for 30% of the total. In a competition, professional players make more than 1300 changes in activity patterns, a fact that shows the intermittence of this sport [2], with a total of 423 accelerations and 430 decelerations, which can reach achieve [10].

It becomes clear that monitoring the load is an essential process to improve performance and reduce the risk of injury [11]. Nowadays, is known that science and new technologies helps maximize women performance in training and competition. Thus, wearable micro-technologies or video tracking systems are important for monitoring physical and physiological performance factors [12]. Global Navigation Satellite Systems (GNSS) are accepted by FIFA for use in competition, and it use making possible to know both the volume of work and the intensity of the actions carried out during the match [13]. Currently, a complete analysis of the external load and the demands of the players in competition supposes to know aspects of the metabolic demands that a certain activity supposes to the soccer player. In this case, the Metabolic Power (MP) and Equivalent Distance Index (EDI), which arise from the combination of speed and acceleration data and are calculated by algorithms, allow a detailed analysis of the energy and locomotive cost during the matches [8,14].

The variability of the data between soccer players in the same competition or individual variability in different competitions can be explained by various factors. One of the most influential is, according to the literature, the game position or the role played by the players [15]. In general, central midfielders and wide midfielders record lower load values (both in total distance and in distance covered at high speed), while midfielders and forwards show the highest values [11], together with a greater number of accelerations. Other results indicated that the greatest distance at high speed and in sprint were on the wings and forwards with respect to central defenders and midfielders [16], further confirming a decrease in all physical metrics during the second half, showing the effect of fatigue on the physical performance of soccer players. Finally, other studies concluded that the central defenders and forwards are the ones that carry out more high-speed running, while the wide midfielders, the ones that execute more sprints [17]. This differentiation of demands is produced by the playing styles, which allow each playing position to develop a specific role with more or less autonomy in attacks and defenses, among other tactical aspects [18].

In summary, the literature shows notable differences in the physical metrics of the players based on their playing position and tactical role in the team, for which the aim is to optimize performance and minimize the incidence of injuries [17], however, there is a scarce scientific literature on the matter that can clarify the controversies between authors. Therefore, the objectives of this study are to know the physical demands of semi-professional soccer players based on the role and position of the game; and to assess the effect of basic body characteristics on physical performance. Our hypothesis is that match physical demands may differ according to the role and playing position.

2. Material and method

2.1. Participants

Forty-five Spanish semi-professional female soccer players between 18 and 32 years old (M 24.5 ± 5.6 years old, 58.8 ± 14.8 kg [48.4–68.8 kg] and 165 ± 5.7 cm [155–173 cm]) were the participants. They competed in the *Reto Iberdrola* League (second division in Spain). This category could be equivalent to the so-called elite, which is below super-elite, according to the classification by level of expertise [19]. These players were classified according to their playing position [20,21]: central defender, wide defender, central midfielder, wide midfielder, and forward. In addition, they were classified according to the role in the team [22]: the attacking players are made up of forwards, wingers and some midfielders with an offensive profile, on the other hand, the defensive players are made up of defenders and midfielders with defensive profile.

On the other hand, the selection criteria for the participating players were: 1) having played at least 80 min in each of the games analyzed; 2) do not change position throughout the match; 3) not having been injured in the 15 days prior to the analyzed matches or presenting any discomfort in said matches that prevents the normal performance of the footballer. Moreover, menstrual cycle of the players was included as exclusion criteria. The data collection was established outside this period in which it has been proven that it negatively influences the physical performance of women of childbearing age. It is characterized by variations in the hormonal levels of estrogen and progesterone, having a direct relationship on multiple systems such as the cardiovascular, metabolic and respiratory systems, in such a way that they clearly influence physical performance [23]. In addition, the levels of estrogen and progesterone vary according to the phase of the menstrual cycle in which the soccer players are, and the luteal phase is included as the one in which the resistance capacity or muscular strength can be reduced [24]. The indications recommended in the 2013 Declaration of Helsinki were followed and this study was approved by the Ethics Committee of the University of Granada (471/CEIH/2018).

2.2. Procedure

This study lasted 9-weeks and was a cross-sectional on different female soccer players. After obtaining consent form for their participation, the study began. Each week all starter female players wore GPS devices and cardio belts during the competition. In this

Table 1
ANCOVA test of physical demands on female soccer players according to the playing position.

Relativedata		Widedefender(n = 16)	CV(%)	Centraldefender(n = 17)	CV(%)	Widemidfielder(n = 16)	CV(%)	Centralmidfielder(n = 17)	CV(%)	Forward(n = 16)	CV(%)	*F*	*P*	η_p^2
TD	(m/min)	92.3 ± 6.3	(7%)	86.8 ± 9.4 $^{Wm, F}$	(11%)	99.0 ± 12.8 ^{Cd}	(13%)	96.2 ± 9.0	(9%)	101.3 ± 6.2 ^{Cd}	(6%)	3.965	0.008	0.265
TD-Half 1	(m/min)	50.4 ± 9.0	(18%)	43.5 ± 5.2 ^{F}	(12%)	49.3 ± 7.2	(15%)	49.1 ± 4.6	(9%)	57.2 ± 8.5 ^{Cd}	(15%)	4.735	0.003	0.301
TD-Half 2	(m/min)	40.7 ± 8.2 ^{Wm}	(20%)	42.8 ± 4.4	(10%)	49.4 ± 5.8 ^{Wd}	(12%)	46.9 ± 5.0	(11%)	43.9 ± 8.6	(20%)	2.585	0.050	0.190
Accelerations	(events/min)	0.5 ± 0.1 $^{Wm, F}$	(20%)	0.3 ± 0.1 $^{Wm, Cm, F}$	(33%)	0.7 ± 0.1 ^{Wd,Cd,Cm}	(14%)	0.5 ± 0.1 $^{Cd, Wm, F}$	(20%)	0.7 ± 0.1 $^{Wd, Cd, Cm}$	(14%)	23.505	0.000	0.681
Decelerations	(events/min)	0.7 ± .2 $^{Cd, Cm, F}$	(29%)	0.4 ± 0.1 $^{Wd, Wm, F}$	(25%)	0.8 ± 0.1 $^{Cd, Cm}$	(13%)	0.5 ± 0.1 $^{Wd, Wm, F}$	(20%)	0.9 ± 0.1 $^{Wd, Cd, Cm}$	(11%)	30.223	0.000	0.733
MP	(W/Kg)	6.41 ± 0.53	(8%)	5.83 ± 0.73 $^{Wm, F}$	(13%)	7.20 ± 1.08 ^{Cd}	(15%)	6.51 ± 0.90	(14%)	7.37 ± 0.52 ^{Cd}	(7%)	6.655	0.000	0.367
EDI	(%)	11.0 ± 1.26 ^{All}	(11%)	9.00 ± 1.30 $^{Wd, Wm, F}$	(14%)	12.5 ± 0.90 $^{Wd, Cd, Cm}$	(7%)	9.70 ± 0.61 $^{Wd, Wm, F}$	(6%)	12.3 ± 0.67 $^{Wd, Cd, Cm}$	(5%)	24.455	0.000	0.680
Walking-jogging	(m/min)	39.9 ± 1.9	(5%)	40.6 ± 1.8	(4%)	39.4 ± 3.6	(9%)	39.6 ± 4.0	(10%)	39.5 ± 2.9	(7%)	0.269	0.897	0.024
LSR	(m/min)	34.5 ± 2.7	(8%)	33.8 ± 7.4	(22%)	37.0 ± 10.8	(29%)	38.0 ± 5.7	(15%)	37.0 ± 5.1	(14%)	0.652	0.628	0.056
HIR	(m/min)	16.6 ± 7.8	(47%)	10.2 ± 2.6 $^{Wm, F}$	(25%)	16.9 ± 4.1 ^{Cd}	(24%)	14.7 ± 6.5	(44%)	19.8 ± 2.7 ^{Cd}	(14%)	4.774	0.003	0.303
HSR	(m/min)	2.7 ± 1.1 $^{Wm, F}$	(41%)	1.7 ± 0.7 $^{Wm, F}$	(41%)	4.4 ± 1.3	(30%)	2.0 ± 0.8	(40%)	4.3 ± 0.9	(21%)	16.784	0.000	0.604
Sprint	(m/min)	0.6 ± 0.6	(100%)	0.5 ± 0.3	(60%)	1.4 ± 0.7	(50%)	0.2 ± 0.2	100%)	0.7 ± 0.6	(86%)	7.420	0.000	0.403
maxV	(km/h)	25.4 ± 1.77	(7%)	24.8 ± 2.46	(10%)	27.9 ± 2.40	(9%)	24.2 ± 3.25	(13%)	23.5 ± 8.66	(37%)	1.169	0.337	0.092

TD: Total distance; MP: Metabolic power; EDI: Equivalent distance index; Walking-jogging (0.0–6.98 km h^{-1}); LSR: *low speed running* (6.99–13.0 km h^{-1}): HIR: *high intensity running* (13.01–18.97 km h^{-1}*);* HSR: *high speed running* (18.98–22.97 km h^{-1}); Sprint (>22.98 km h^{-1}); maxV: maximum velocity.

way, we were able to analyze the competition load according to the playing position and the team role. Only, it was measured the starter players than play at least 80 min in the matches. Finally, 9 matches of the 2021–2022 season from September to March were analyzed with a total of 82 individual data sets satisfied all the requirements and were logged for evaluation and analysis. We should note that all matches were played at home in the same pitch with the aim of avoiding the influence of some contextual factors.

2.3. Instruments

Eighteen GPS devices (GPEXE, Udine, Italy) were used for external load quantification. These devices operate with a frequency of 18.8 Hz, representing the amount of data they are capable of recording per second. In turn, the reliability and validity of these instruments has been widely confirmed by the literature [25]. It is concluded that the 18.8 Hz GPEXE devices are the most valid and reliable in monitoring the distance traveled and the sprint, above other devices with a lower sampling frequency. For prior statistical analysis, the recorded data is displayed on the web of these GPEXE devices, which provides a detailed report of all the variables recorded and calculated during the competition or training. The following external load variables were analyzed.

a. Total distance covered (TD). It is an indicator of volume and expresses the number of meters that the player travels per game. It will also differentiate between the distance traveled in the first half and in the second, to analyze the possible effect of fatigue.
b. Distance traveled in speed zones: The greater the distance traveled at high speeds, the greater the intensity of the activity. Following the guidelines established by FIFA after the World Cup in France in 2019 and included in the article by Ref. [26], 5 speed zones are established in women's football: zones 1 (0.0–6.98 km h^{-1}) and 2 (6.99–13.0 km h^{-1}; low speed running, LSR), zone 3 (13.01–18.97 km h^{-1}; high intensity running, HIR), zone 4 (18.98–22.97 km h^{-1}; high speed running, HSR) and, finally, zone 5 (above 22.98 km h^{-1}; sprint).
c. Number of accelerations and decelerations (ACC and DEC): Accelerations are defined as any change in speed above 2 m s^{-2}, while decelerations refer to the ability to stop a high speed, below the 2 m s^{-2}.
d. Number of sprints and peak speed: Sprints are one of the most decisive actions in football, so recording them is essential. The number of times the players sprint during the match and the peak speed they reach will be monitored.
e. Average Metabolic Power: It is a metabolic variable that considers that the energy produced by the soccer player arises from the combination of her accelerations and the speed at which they are produced. The average is calculated with the energy given off by the player per second and per kilogram of weight. In short, it allows obtaining information about the metabolic demand required by the match [27].
f. Equivalent Distance Index (EDI): Expressed as a percentage, this variable indicates the ratio between the distance covered if the energy is produced at a constant speed and the total distance covered [28]. In other words, it shows the influence of accelerations on total energy expenditure, so the higher the percentage, the greater number of high-intensity actions will have occurred (normally accelerations).

3. Statistical analysis

The statistical package SPSS for Windows version 25 (IBM SPSS Statistic, Chicago, USA) and Microsoft Office Excel (Microsoft Corp., Redmond, Washington, DC, IL, USA) were used. The Kolmogorov-Smirnov test was used to verify the normality of the variables. The sample size in each group was adequate (n $\geq$ 20) to apply the central limit theorem, which gave normally distributed sample means [29]. ANCOVA test was performed to find differences of the physical demands of competition with the playing position and role with playing time as covariate. The effect size in the ANCOVA was presented by η_p^2 and was interpreted using the following criteria: minimal effect ($\eta_p^2 \leq 0.02$), moderate effect ($0.02 < \eta_p^2 \leq 0.09$) and strong effect ($\eta_p^2 > 0.09$) [30]. Simple linear regression tests (stepwise)

Table 2
ANCOVA test of physical demands on female soccer players according to the role.

Relative data	Defensive role (n = 41)			CV (%)	Ofensive role (n = 41)			CV (%)	$F_{(1,69)}$	p	η_p^2
TD (m/min)	89.4	±	8.4	(9%)	98.9	±	9.6	(10%)	12.431	0.001	0.209
TD-Half 1 (m/min)	46.8	±	7.8	(17%)	51.9	±	7.8	(15%)	4.889	0.032	0.094
TD-Half 2 (m/min)	41.8	±	6.4	(15%)	46.7	±	6.8	(15%)	6.306	0.016	0.118
Accelerations (events/min)	0.4	±	0.1	(25%)	0.6	±	0.1	(17%)	34.009	0.000	0.420
Decelerations (events/min)	0.5	±	0.2	(40%)	0.7	±	0.2	(29%)	11.094	0.002	0.191
MP (W/Kg)	6.1	±	0.7	(11%)	7.0	±	0.9	(13%)	14.067	0.000	0.223
EDI (%)	10.0	±	1.6	(16%)	11.4	±	1.5	(13%)	11.213	0.002	0.186
Walking-jogging (m/min)	40.3	±	1.8	(4%)	39.5	±	3.4	(9%)	0.882	0.352	0.018
LSR (m/min)	34.1	±	5.5	(16%)	37.3	±	7.4	(20%)	2.601	0.113	0.052
HIR (m/min)	13.2	±	6.4	(48%)	17.1	±	5.0	(29%)	5.594	0.022	0.106
HSR (m/min)	2.2	±	1.0	(45%)	3.6	±	1.5	(42%)	13.074	0.001	0.218
Sprint (m/min)	0.5	±	0.5	100%)	0.8	±	0.7	(88%)	2.453	0.124	0.050
maxV (km/h)	25.1	±	2.1	(8%)	25.1	±	5.6	(22%)	0.122	0.728	0.002

TD: Total distance; MP: Metabolic power; EDI: Equivalent distance index; Walking-jogging (0.0–6.98 km h^{-1}); LSR: *low speed running* (6.99–13.0 km h^{-1}): HIR: *high intensity running* (13.01–18.97 km h^{-1}*);* HSR: *high speed running* (18.98–22.97 km h^{-1}); Sprint (>22.98 km h^{-1}); maxV: maximum velocity.

Table 3
Single linear regression test between physical performance variables and role, playing position and body weight as independent variables.

Events of female soccer players (n = 82)	Role				Playing position				Body weight				Body height			
Variables	**Beta**	**(95% CI)**	***β***	***p***	**Beta**	**(95% CI)**	***β***	***p***	**Beta**	**(95% CI)**	***β***	***p***	**Beta**	**(95% CI)**	***β***	***p***
TD (m/min)	−9.463	(-14.863; −4.064)	−0.457	0.001	2.807	(0.859; 4.754)	0.389	0.006				Ns.				Ns.
MP (W/Kg)	−0.951	(-1.419; −0.483)	−0.512	0.000	0.273	(0.101; 0.445)	0.422	0.003	−0.050	(-0.092; −0.008)	−0.330	0.021				Ns.
EDI (%)	−1.696	(-2.530; −0.861)	−0.512	0.000	0.405	(0.089; 0.722)	0.352	0.013	−0.127	(-0.197; −0.056)	−0.467	0.001				Ns.
Accelerations (events/min)	−0.201	(-0.271; −0.132)	−0.648	0.000	0.056	(0.029; 0.083)	0.516	0.000	−0.010	(-0.017; −0.003)	−0.378	0.007				Ns.
Decelerations (events/min)	−0.183	(-0.294; −0.073)	−0.437	0.002	0.047	(0.006; 0.088)	0.322	0.024	−0.021	(-0.029; −0.013)	−0.610	0.000	-1–396	(-2.37; −0.42)	−0.388	0.006
Walking-jogging (m/min)				Ns.				Ns.	0.188	(0.058; 0.319)	0.390	0.006				Ns.
HIR (m/min)	−3.874	(-7.169; −0.579)	−0.326	0.022	1.146	(-0.020; 2.313)	0.277	0.053	−0.350	(-0.617; −0.083)	−0.359	0.011				Ns.
HSR (m/min)	−1.405	(-2.187; −0.623)	−0.467	0.001	0.364	(0.075; 0.653)	0.143	0.015	−0.107	(-0.173; −0.042)	−0.433	0.002				Ns.

Note: Beta: Non standardized coefficient; β: standardized regression coefficient; TD: Total distance; MP: Metabolic power; EDI: Equivalent distance index; Walking-jogging (0.0–6.98 km h^{-1}); HIR: *high intensity running* (13.01–18.97 km h^{-1}); HSR: *high speed running* (18.98–22.97 km h^{-1}). Ns: non significative model.

of the physical performance metrics with body weight, playing position, and role were performed. Considering a statistical power of 80%, a type 1 error or alpha of 0.05 and effect size of 0.82 (this is the value equivalent to a $R^2 = 0.45$, which was the maximum prediction coefficient found in the literature for similar studies), we would need a minimum sample size of 33 subjects. The level of significance established was $p < 0.05$.

4. Results

Table 1 shows the physical performance metrics of semi-professional female soccer players according to the playing position and playing time as covariate in absolute data. Wide midfielders and forwards are the ones that perform the greatest number of accelerations and decelerations compared to the rest of the game positions with very large effect sizes ($p = 0.0001$; $\eta_p^2 > 0.61$). Furthermore, these players performed higher TD, TD-Half 1, MP, EDI, HIR, HSR, and Sprints ($p < 0.05$,>; $0.21 < \eta_p^2 < 0.68$). In addition, body weight was different according to the playing position ($F_{(4,69)} = 11.189$; $p = 0.000$; $\eta_p^2 = 0.504$). It was the lowest in forwards (54.2 ±0 .8 kg) and the highest in central defenders (65.6 ± 4.7 kg).

On the other hand, another ANCOVA test has been carried out to compare the roles in the team with the playing time as covariate (Table 2). It is verified that the players with an offensive role performed more TD and in both halves of the competition ($p < 0.05$; $0.09 < \eta_p^2 < 0.21$). Also, the number of accelerations, decelerations, MP, EDI, LSR, HIR, HSR, and number of sprints were higher in offensive players both in absolute and in relative metrics.

Finally, simple linear regression tests were carried out between body weight, role and playing position (as independent variables) with the physical performance metrics (as dependent variables; Table 3). Body weight was negatively associated with metabolic power ($\beta = -0.330$; $p < 0.05$), EDI ($\beta = -0.467$; $p < 0.01$), accelerations ($\beta = -0.378$; $p < 0.01$), deaccelerations ($\beta = -0.610$; $p < 0.001$), HIR ($\beta = -0.359$; $p < 0.05$), and HSR ($\beta = -0.433$; $p < 0.01$). Furthermore, body weight was positively associated with walking-jogging ($\beta = 0.390$; $p < 0.01$).

5. Discussion

The main objective of this study was to explain the effect of playing position, role, and body characteristics on the physical demands of semi-professional soccer players. There is currently limited research about female soccer players on both elite and the lower expertise level [31]. In the present study, it offers relevant information on players who have the possibility of ascending to the elite category. The results confirmed our hypothesis which, physical demands were different among playing position. In this sense, accelerations, decelerations, metabolic power, EDI, and distances covered higher than 13 km h^{-1} were greater in forwards and wide midfielders. In addition, offensive role players had higher physical demands too.

The TD covered was 7000–11000 m per match, obtaining that the midfielders covered the most distance (9461 ± 1191 m of mean). These data are slightly below studies with elite female players (10321 ± 6859 m) and European elite female players (10754 m) [31,32]. Furthermore, these results are in line with those obtained by Romero-Moraleda [11] in whose study he also showed that the midfielders and offensive players are the ones that present a greater load during match days. However, the authors consider that the relative data should be shown based on playing time. This information does not appear in most of the studies that include the analysis of physical demands in competition, although it was reported that caution should be applied when comparing data for multiple reasons of difference in technology, sample sizes, among others [33]. In our participants, the forwards covered 101 m min^{-1} and the wide midfielders 99 m min^{-1}, being the positions that covered the greatest distance per minute. Despite this, in other studies such as that carried out by Díaz-Serradilla et al. [17], the results indicated that the wide-defenders covered the greatest distance, both in relative and absolute terms.

Taking into account that the distances covered at high intensity are the most related to sports success [34,35] and represent the most important component at the physical level in the competition [31], forwards, wide midfielders, and those with an offensive role in the team, have higher values in these metrics. In general, 21.7% of the distance covered was at high intensity (>13 km h^{-1}). These values are below elite players, whose average is 24%. Considering the comparison between playing positions, our results follow the line of other studies such as that of Ramos [16] where the authors demonstrated a greater distance at high speed in wide midfielders and forwards with respect to center backs and midfielders. It is likely that the role of the more offensive players, forced to press and run longer distances, is the most plausible explanation for these data. However, Strauss et al. [36] did not find significant differences in high-intensity actions between the playing positions analyzed. Some studies suggest that these metrics represent an objective value that differentiates the expertise level of players [37,38], although there is currently no consensus on specific speed thresholds for players both elite and sub-elite [39]. In the same way, the distances covered as sprints range between 220 and 380 m in elite female players [37,38], being higher than those shown at these participants with lower level of expertise, which the wide midfielders players reached 138 m. Attacking players tend to develop more sprint actions due to the need to overcome rivals and create scoring possibilities [35]. All the metrics that have been presented were inferior in the second half. This fact is frequent in the current bibliography [40], with fatigue as the main cause [41], although the result of the match at different times could also be considered [42,43] and playing styles [18].

On the other hand, the physical performance metrics of the competition were inversely related to the body weight of the female soccer players and were higher in forwards, as occurs in other studies [44,45]. However, no differences were found in the height of the participants, coinciding with other investigations [45], although in contrast to other authors who determined that the defenders were taller than other playing positions [46]. This study does not have information on the fat mass of the participants, which was presented in the limitations paragraph. Athletes in general, and female soccer players, in particular, tend to mesomorphy [21], which makes evident the need to find anthropometric profiles in semi-professional female players to determine applied and precise information, since there are not current references with anthropometric profiles [45].

This study has several limitations. In the first place, based on the results, it could be inferred that the fat mass of semi-professional soccer players is inversely related to their physical performance. Moderate to strong relationships have been found between weight and some competition performance metrics, but there is an absence with player height. Therefore, it is essential to analyze the fat mass variable both to carry out analyzes as an independent variable, and as a covariate in other analyses. On the other hand, researchers are urged to carry out psychological-cognitive and physical-physiological profiles that can explain the different behaviors that players have by game role and game position. In addition, it is a case study, although various competitions have been evaluated to verify that the data could be reliable and valid. As a strength, this study has dealt with a semi-professional team that competes in the second division. Following the skill level rankings, these players are very close to elite level, and some may have already competed at that level. It is suggested that this experience be controlled at elite levels to avoid possible contamination in the sample. Information has been provided so that coaches can see how close or far their team is compared to professional teams.

6. Conclusions

The main findings of this study showed that the physical demands differ according to the playing positions. In addition, as an added value, an analysis has been carried-out on the offensive or defensive role, obtaining that the attacking players have higher demands than those who play with defensive role in the team. Finally, these metrics were positively related to body weight, confirming that the players obtained a lower physical performance.

These results could be used by for coaches, S&C coaches, and training staff of semi-professional soccer teams, specifically in the second division, to be able to manage training loads, plan breaks and avoid possible injuries, specifically in offensive soccer players and extreme forward positions. and attacking midfielders because they produce general behaviors in very differentiated matches.

Data availability statement

The study was not administered on any platform. All data, protocols, and methods developed by other researchers are appropriately referenced. The datasets generated and analyzed during the current research are available from the corresponding author on reasonable request.

Funding

This research was funded with charge to the aid P20-00194 granted by the Consejería de Universidad, Investigación e Innovación of the Junta de Andalucía (Spain) and by FEDER, "Una manera de Hacer Europa", and by Ministerio de Universidades (Spain) under Grant called Beca Salvador de Madariaga PRX21/00080.

CRediT authorship contribution statement

Omar Sánchez-Abselam: Writing – original draft, Resources, Investigation, Formal analysis, Data curation, Conceptualization. **Francisco Tomás González-Fernández:** Writing – review & editing, Writing – original draft, Supervision, Software, Investigation, Funding acquisition, Formal analysis, Data curation. **Antonio Figueiredo:** Writing – review & editing, Supervision, Project administration, Methodology, Data curation, Conceptualization. **Alfonso Castillo-Rodríguez:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Funding acquisition, Formal analysis, Conceptualization. **Wanesa Onetti-Onetti:** Writing – review & editing, Writing – original draft, Software, Resources, Methodology, Investigation, Data curation, Conceptualization.

Declaration of competing interest

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

Acknowledgments

Thank the University of Coimbra for its reception and the teaching produced during the stay in Portugal.

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