Anthropometric and physical indicators among Jordanian female soccer according to playing position

Indicadores físicos y antropométricos en futbolistas jordanas según posición de juego

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Abstract

Introduction: Soccer requires specific indicators to help achieve athletic accomplishments, including anthropometric measurements linked to physiological capacities and significantly influencing fitness levels.
Objective: This study aimed to explore the anthropometric and physical measurement values among Jordanian female soccer players and to identify differences in these values according to playing position.
Methodology: Thirty-two players on the Jordanian women's national soccer team participated in this study. The age, height, and body mass of the participants (mean ± SD) were 21.5 ± 4.1 years, 163.8 ± 6.8 cm, and 56.02 ± 6.7 kg, respectively, were assessed during the competitive (2022-2023) seasons. The study's goals were accomplished by applying means, standard deviations, and One-Way ANOVA analysis to examine the impact of playing position on the dependent variables.
Results: The study findings revealed that the average skinfold thickness was (70.28± 3.89) mm, while the midfield players were the tallest compared to other playing positions (1.66± 0.06) m. They also achieved the best time in the Zig Zag test (21± 1.63) s. On the other hand, the forwards achieved the highest level of kicking accuracy and the 30-meter sprint tests (4.68± 0.41) and (31.21±1.67) s, respectively. The results showed a positive correlation between the body mass index and the results in the Illinois test (0.37).
Discussion: These findings are primarily aligned with the results of previous studies.
Conclusions: Based on the study results, future studies that increase the sample size and include other anthropometric tests and measurements can be conducted.

Keywords

Anthropometric; female; physical; playing position; soccer.

Resumen

Introducción: El fútbol requiere de indicadores específicos para ayudar a alcanzar logros atléticos, incluidas las mediciones antropométricas vinculadas a las capacidades fisiológicas y que influyen significativamente en los niveles de condición física.
Objetivo: Este estudio tuvo como objetivo explorar los valores de las mediciones antropométricas y físicas entre las jugadoras de fútbol jordanas e identificar diferencias en estos valores según la posición de juego.
Metodología: Treinta y dos jugadoras de la selección nacional de fútbol femenino de Jordania participaron en este estudio. La edad, la altura y la masa corporal de las participantes (media ± DE) fueron 21,5 ± 4,1 años, 163,8 ± 6,8 cm y 56,02 ± 6,7 kg, respectivamente, y se evaluaron durante las temporadas competitivas (2022-2023). Los objetivos del estudio se lograron aplicando medias, desviaciones estándar y análisis ANOVA unidireccional para examinar el impacto de la posición de juego en las variables dependientes. Resultados: Los hallazgos del estudio revelaron que el grosor medio del pliegue cutáneo fue de (70,28± 3,89) mm, siendo los centrocampistas los más altos en comparación con las otras posiciones de juego (1,66± 0,06) m. También lograron el mejor tiempo en el test de Zig Zag (21± 1,63) s. Por otro lado, los delanteros lograron el mayor nivel de precisión en el golpeo y en los tests de sprint de 30 metros (4,68± 0,41) y (31,21±1,67) s, respectivamente. Los resultados mostraron una correlación positiva entre el índice de masa corporal y los resultados en el test de Illinois (0,37).
Discusión: Estos hallazgos se alinean principalmente con los resultados de estudios previos.
Conclusiones: Con base en los resultados del estudio, se pueden realizar estudios futuros que aumenten el tamaño de la muestra e incluyan otras pruebas y mediciones antropométricas.

Palabras clave

Antropométrico; femenino; físico; posición de juego; fútbol.

Introduction

Over the past years, the landscape of women's football has experienced a remarkable shift, with a 37% increase in participation compared to 2000. This surge in interest is further underscored by the International Football Federation's ambitious goal to boost the number of female players worldwide from 13.3 million in 2019 to a staggering 60 million by 2026(International Federation of Association Football [FIFA], 2019).

As a team sport, soccer is a complex interplay of various demands. Players must master many skills, including passing, dribbling, kicking, and maintaining adequate physical, physiological, and psychological attributes (Abdel Fattah et al., 2023; Goncalves et al., 2021). Therefore, the primary focus of training is to enhance the physical capabilities of football players (Chtara et al., 2017). Enabling them to cope with the rigorous training loads (Silva et al., 2015). The nature of football includes moderate-intensity (running), low-intensity (walking), and high-intensity actions such as sprinting and jumping (Beato et al., 2018). Consequently, developments in women's football have imposed greater physical demands on the game than ever before; as playing styles have diversified and evolved, this requires the development of training programs in line with changes in player performance (Pardos Mainer et al., 2021).

Football requires specific indicators to help achieve athletic accomplishments, including anthropometric measurements such as height and weight, which are linked to physiological capacities and significantly influence fitness levels. Therefore, these variables are highly valuable for team success by placing players in positions that match their anthropometric measurements and physical abilities, such as strength, speed, and aerobic and anaerobic requirements (Doyle et al., 2020; Hencken & White, 2006). Interest in anthropometric measurements stems from the physical demands and rigorous training regimes that can affect other variables such as fat and muscle mass, as well as the ability to endure performance and general fitness during the sports season (Owen et al., 2018). Attackers and wingers are often subject to intense bouts of speed and agility, requiring explosive power and speed to help penetrate opponents' defenses. Midfielders often cover long distances during competition, requiring exceptional stamina to contribute to defensive and offensive tasks. Defenders focus on agility and spatial awareness to thwart opposing attackers and initiate build-up play, while goalkeepers focus on agility, reaction, and explosive movements to thwart opponents' attempts. Specific to each playing position, these roles require specific physical attributes and body composition (Carling & Orhant, 2010).

In anthropometric measurements, body surface measurements are a valuable tool for understanding the morphological aspects of body composition and have practical applications in sports science. In fact, body circumferences provide geometric insights and are influenced by muscle mass and adipose tissue, which particularly affects performance endurance and movement quality (Fitton et al., 2022). Skinfold measurement also provides very useful indicators of subcutaneous adipose tissue, a negative factor in performance endurance and efficiency (Carling & Orhant, 2010). In this regard, Ramirez-Munera et al. (2024) indicated that the average total skin folds of female soccer players were (74.57± 18.48) mm, while the average height was (164.15± 5.84) cm, with a clear superiority of goalkeepers in height and calf circumference (36.50± 2.95, 176.60± 7.06) cm respectively, while attackers were superior in thigh circumference (51.60± 2.41) cm. Studies indicated a decrease in fat mass and the superiority of attackers in jumping tests (Hammami et al., 2023). Sporis et al. (2009) indicated that midfielders are shorter and lighter than defenders, while full-backs are taller. Studies indicate that the arm length of football players is (70.72± 1.87) cm, and (85.77± 1.43) cm for leg length (Pradhan, 2017).

On the other hand, studies related to anthropometric measurements and physical capabilities and their association with playing positions have conflicting results. Some studies indicate differences in anthropometric measurements and physical capabilities according to playing position (Haugen et al., 2014). While others suggest no statistically significant differences in these measurements and capabilities based on playing position (Hasegawa & Kuzuhara, 2015). Therefore, the results of studies concerned with anthropometric measurements and physical tests can be used to design training and nutritional programs for each athlete according to the unique requirements of his gender and specific role in competition (Santos et al., 2010). These assessments, along with physical tests, also help to explore the effectiveness of preparation for competition and the effect of training and nutritional changes on body composition (Sutton et al., 2009).

Given the limited scientific research on women's soccer and the crucial role of personal profiles in developing player levels and determining potential success in football, the researchers have identified a significant study problem. Studies on female football players related to anthropometric measurements and physical tests according to playing position are scarce in Jordan. However, they are related between athletic performances, nutrition and contribute to improving players' with readiness for the long sports season. Given the urgent need for updated data on all aspects related to women's football, this study focused primarily on exploring the values of anthropometric and physical measurements among Jordanian female football players and comparing these values with elite players in the world. Moreover, it seeks to explore the differences in the values of anthropometric and physical measurements according to the variable of playing position, thus contributing to understanding the strategies for developing and training female players in women's football. This is important to keep pace with the global context in women's football, which is heading towards significant growth. Thus, it opens future horizons by conducting studies to monitor longitudinal changes during the sports season and other tests and measurements.

Method

Participants

This study followed a cross-sectional, descriptive, and correlational design. Thirty-two players in good health and not injured on the Jordanian women's national football team participated in this study. The age, height, and weight of the participants (mean ± SD) were 21.5 ± 4.1 years, 163.8 ± 6.8 cm, and 56.02 ± 6.7 kg, respectively, were assessed during the competitive seasons of 2022-2023. Also, they all had at least eight years of experience in local competitions. The participants were grouped according to their specific playing position: 14 defenders (Ds), 7 midfielders (Ms), and 11 forwards (Fs). Overall, the sample size (n=32) is considered appropriate, but with the aim of exploring differences in anthropometric measurements and physical abilities according to playing position, this is considered a potential limitation on the generalization of the study results, and therefore, it can be recommended to increase the sample in future studies.

Procedure

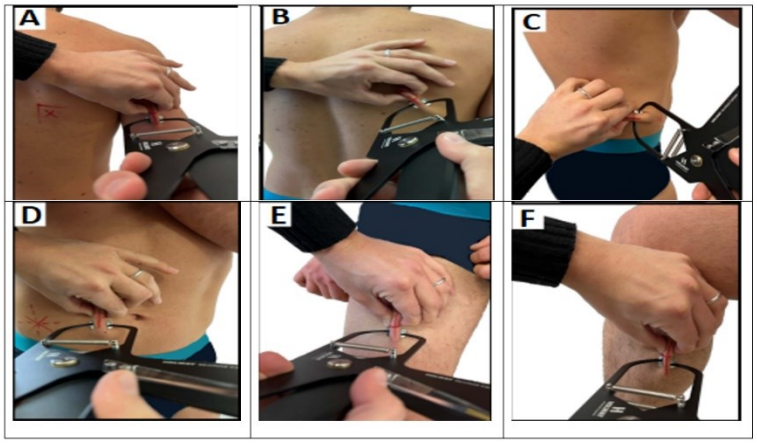
Anthropometry

Data for all anthropometric measurements related to the current study were obtained according to the standards set by the International Society for the Advancement of Kinesiology (ISAK) by a Ph.D. anthropometrics. we conducted all the tests in the laboratory, between June -November /2022, on their training days, between *7*:00 A.m. to *9*:00 A.m. Considering that the players did not participate in the evening training on the previous day and fasting. Also, the researchers made sure that all participants in the current study had (10-15) days until their menstruation occurred. Body weight (HD-351, Tanita, Arlington Heights, IL, USA) and height (SECA, Leicester, UK) were assessed to the nearest 0.1 kg and 0.1 cm, respectively, according to the guidelines of the manufacturer. Three measurements of each variable were completed, with the mean value being recorded. Height measurements were taken as meters, with the subjects standing erect barefoot. Body mass was measured with a sensitive electronic scale with the subjects in bare feet and wearing only bathing suits bare feet.

The body mass index (BMI), an anthropometric indicator commonly used in studies with athlete populations, was calculated using the following formula: BMI = BW/h^2. Where: BMI (kg/m^2) = Body Mass (BW) (kg)/ Height (h^2).

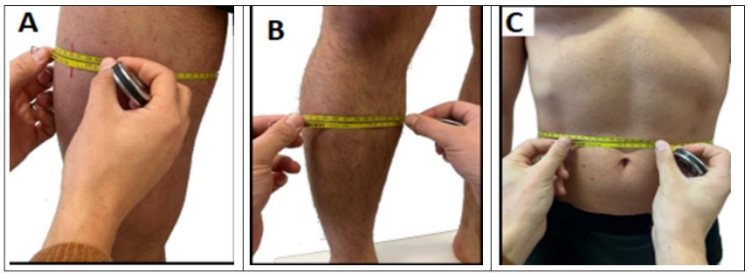
The sum of six skinfolds (Σ6skinfolds: Triceps, Subscapular, Suprailiac, Abdominal, Thigh, and Calf) with a skinfold caliper (Harpenden, West Sussex, UK) (Figure 1). Three measurements of each fold were performed in a rotation, using the mean value in mm for the sum of the 6 skinfolds. A qualified and experienced tester realized all measurements (International Society for Advancement of Kinanthropometry [ISAK], 2001). The measurement method has been widely used on female football players (Petri et al., 2024).

Figure 1. Illustration of the Triceps (A), Subscapular(B), Suprailiac(C), Abdominal(D), Thigh(E), and Calf(F) skinfolds (Petri et al., 2024)



Waist circumference measured the narrowest circumference between the lowest rib and the process of the anterior superior iliac spine above the navel parallel to the floor using a transfer tape measure. Waist circumferences were taken with the subjects standing with arms by their sides, feet close to each other, and with equal weight on each foot. In the thigh circumference: The participants were requested to stand with their feet apart at shoulder width. One measurement was taken at the widest point near the groin (at maximum quadriceps extension). The second measurement was taken with the thigh muscles contracted (at maximum quadriceps contraction) at the exact location. Either in calf circumference: The measurement was taken using a non-stretching tape measure parallel to the floor at the widest point of the calf (Figure 2).

Figure 2. Illustration of the Thigh (A), Calf (B) and waist (C) circumferences (Petri et al., 2024).



Total leg length was measured as the height of the trochanter landmark on the hip minus ankle height, calculated as the distance from the floor to the lateral malleolus landmark on the ankle. Anatomical leg length is defined as the Length of the tibia plus the femur (Bogin & Varela Silva, 2010). Also, the total arm length was calculated as the distance from the acromial process on the shoulder to the radial styloid process on the wrist (Cameron, 2013).

Physical fitness tests

Illinois Agility Test (IAT)

This test is frequently used to evaluate football players' agility and direction changes. Before the test, each participant performed a specific warm-up of four submaximal-intensity attempts. Then, the participants carried out three agility attempts on the natural grass pitch, with three minutes of rest between attempts. The shortest time of the three repetitions was selected.

Thirty-meter test

The thirty-meter linear Speed Test (T30) is usually used to assess the acceleration capacity and maximum speed of female football players (Hammami et al., 2020). The specific warm-up consisted of five progressive sprints of 30 m. During the test, each player performed three maximal effort sprints separated by three minutes of a rest period. During the morning training unit, this test was performed over natural grass and with football shoes.

Zigzag 20m test

The players were instructed to start with one foot positioned on a mark 30 cm from the starting point. Then, after the sound signal using a whistle, the player should run at maximum intensity to cover the distance of 20 m; they should perform this test in the shortest possible time.

Kicking accuracy test

The goal is divided into 15 areas. The center of the goal is divided into three areas numbered from 1 to 3, 6 areas on either side of the center numbered from 4 to 6, and 6 areas next to the right and left goal-posts numbered from 7 to 9. The areas from 1 to 6 have dimensions of 2x0.80 meters, and the areas from 7 to 9 have dimensions of 0.66-0.81 meters. The player must kicking 5 balls at the goal, with the player's score being the number in the corresponding area. A player's maximum score is 45 points (Figure *3*).

Figure *3*. Shows the accuracy kicking test used (Bar-Eli et al., 2007)

9	6	3	6	9
8	5	2	5	8
7	4	1	4	7

Temporalization

The selected participants performed the physical condition tests in 4 days during a weekly training cycle. All players were required to avoid exhausting exercise 24 hours before the tests to prevent fatigue during the assessments. The fitness coach directed all the warm-up exercises. The participants performed a general standardized warm-up, which included slow running, multidirectional movements, and dynamic stretching, followed by a specific warm-up for each test, which lasted 15–20 min. The different tests were scheduled as follows: Day 1: Anthropometric evaluation and Illinois Agility Test (IAT). Day 2: Anthropometric evaluation and Thirty-meter test. Day 3: Anthropometric evaluation and Zigzag 20-m test. Day 4: Anthropometric evaluation and kicking accuracy. Therefore, all participants were familiar with the tests and performed them regularly. Each player was encouraged to apply their maximum effort on each test. Taking into account achieving a balance in the diet and hydration according to the individual differences of the players during the days of the tests.

Ethical Considerations

This type of intervention does not alter normal football training or imply motor actions different from those of the usual practice of training sessions and matches. Moreover, all participants were subjected to a medical examination prior to the beginning of the season and carried out the tests with no injuries or physical discomfort. All players were informed of the research procedures and signed a consent form.

Data analysis

Statistical analysis SPSS 29.0.1.1 for Windows (SPSS Inc., Chicago, USA) was used to analyze the results. Means and standard deviations were calculated for all the parameters. The One-Way ANOVA analysis was utilized to examine the impact of playing position on the dependent variables. The assumptions of multicollinearity, equality of covariance, and normality were met for all the variables. The statistical significance of the results was accepted at $p < 0.05$.

Results

The primary focus of this study was to explore the anthropometric and physical measurement values among Jordanian female soccer players and compare these values with elite players worldwide. Furthermore, it seeks to explore differences in the anthropometric and physical measurement values according to the playing position variable. Table 1 presents means and standard deviations for all the study variables.

Table 1. Means and standard deviations for all the study parameters (n=32)

Variables	Position				Skewness
	Defenders (n=14)	Midfielders (n=7)	Forwards (n=11)	Total (n=32)	
Subscapularis skinfolds (mm)	11.02 ± 3.43	11.14± 3.02	10.25± 2.40	10.78± 2.95	0.718-
Calf skinfolds (mm)	10.57± 5.42	15.57± 2.90	14.48± 3.60	13± 4.80	0.617-
Thigh skinfolds (mm)	13.40± 5.04	12± 4.87	11.30± 4.34	12.37± 4.71	0.004-
Suprailiac skinfolds(mm)	11.19± 4.60	10.71± 2.82	13.54± 4.45	11.90 ± 4.28	0.156
Abdominal skinfolds(mm)	8.76± 3.54	7.93± 2.40	9.58± 3.81	8.86± 3.38	0.543-
Triceps skinfolds (mm)	12.32±4.78	14.21±3.82	14.18±2.83	13.37±3.24	0.191
Σ6Skinfold	67.26± 4.46	71.56± 3.31	73.33± 3.57	70.28± 3.89	0.432
Thigh circumference (cm)	49.68±3.17	49.64±4.80	50.09±3.15	49.81±3.45	0.844
Calf circumference(cm)	36.03±2.20	35.71±2.75	35.45±2.52	35.76±2.37	0.146
Waist (cm)	71.14±3.34	70.57±5.93	71±5.958	70.96±4.65	0.469
Arm's Length (cm)	50.43± 2.31	49.57±2.82	50.36±3.66	50.22±2.87	0.788
Leg's Length (cm)	88±7	87±5.71	88.63±7.37	88±6.69	0.072
Height (m)	1.64±0.04	1.66±0.06	1.62±0.09	1.64±0.06	0.141
Body mass (kg)	56.10±5.09	56.43±8.20	55.6±8.07	56.01±6.71	0.457
BMI (kg/m^2)	20.68±1.49	20.56±2.61	21.26±1.37	20.86±1.72	0.978-
Kicking (accuracy)	25± 2.58	28.67± 1.84	31.21± 1.67	27.94± 2.15	0.262
Zig Zag (s)	22.03±2	21±1.63	21.43±1.70	21.60±1.81	1.33
Illinois (s)	17.66±1.02	17.79±0.99	18.31±1.67	17.92±1.27	0.626-
30 M (s)	4.74±0.31	4.70± 0.37	4.68±0.41	4.71± 35	0.484

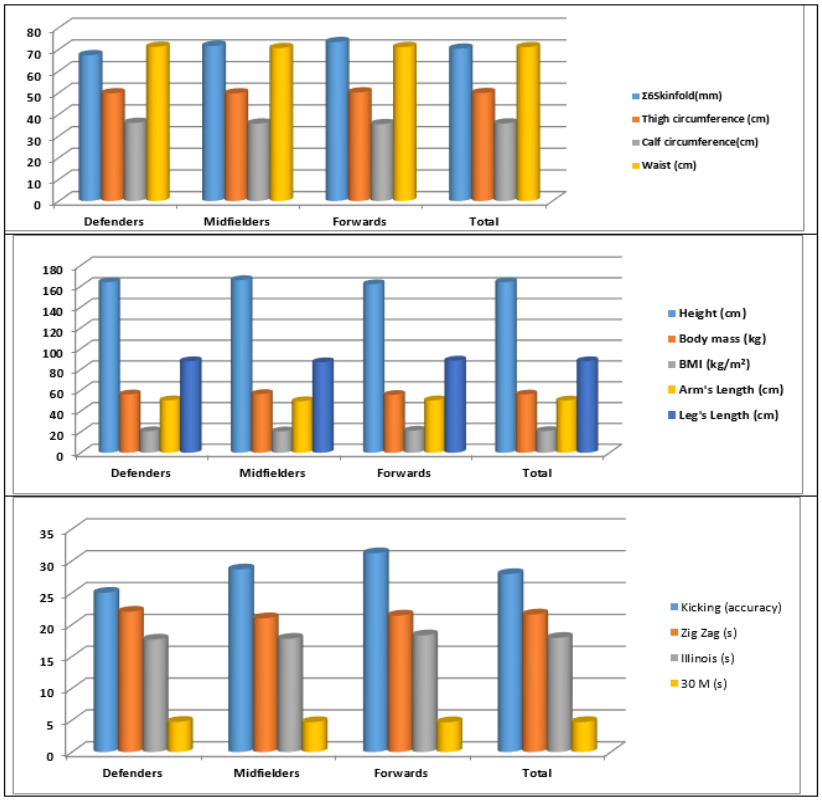
Before analyzing the data, the researchers ensured that they were normally distributed. as shown in Table (2).

Table 2. Results of the standard distribution test for the study sample data (n=32)

Variables	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Subscapularis skinfolds (mm)	0.158	32	0.141	0.928	32	0.134
Calf skinfolds (mm)	0.113	32	0.200	0.938	32	0.064
Thigh skinfolds (mm)	0.135	32	0.146	0.947	32	0.118
Suprailiac skinfolds(mm)	0.078	32	0.200	0.971	32	0.520
Abdominal skinfolds(mm)	0.104	32	0.200	0.984	32	0.910
Triceps skinfolds (mm)	0.088	32	0.200	0.950	32	0.140
Thigh circumference (cm)	0.105	32	0.200	0.969	32	0.468
Calf circumference(cm)	0.127	32	0.200	0.961	32	0.292
Waist (cm)	0.122	32	0.200	0.956	32	0.215
Arm's Length (cm)	0.143	32	0.096	0.963	32	0.334
Leg's Length (cm)	0.140	32	0.116	0.944	32	0.099
Height (m)	0.112	32	0.200	0.969	32	0.480
Body mass (kg)	0.074	32	0.200	0.978	32	0.744
BMI (kg/m^2)	0.220	32	0.117	0.812	32	0.231
Kicking (accuracy)	0.127	32	0.200	0.939	32	0.070
Zig Zag (s)	0.164	32	0.129	0.946	32	0.109
Illinois (s)	0.156	32	0.146	0.888	32	0.113
30 M (s)	0.483	32	0.121	0.219	32	0.085

For further clarification, Figure 4 presents the differences in the values of the study variables according to the playing position.

Figure 4. Illustration of the values of the study variables according to the playing position.



One-Way ANOVA analysis was used to explore differences in the anthropometric and physical measurement values according to the player position variable. Table (3) illustrates this.

Table 3. Results of the One-Way ANOVA for difference testing

Variables		Sum of Squares	df	Mean Square	F	Sig.	Effect size
Subscapularis skinfolds (mm)	Between Groups	4.881	2	2.440	0.267	0.767	
	Within Groups	264.968	29	9.137			0.499
	Total	269.849	31				
Calf skinfolds (mm)	Between Groups	153.008	2	76.504	3.947	0.060	
	Within Groups	562.159	29	19.385			0.5
	Total	715.167	31				
Thigh skinfolds (mm)	Between Groups	28.405	2	14.202	0.623	0.544	
	Within Groups	661.620	29	22.814			0.499
	Total	690.025	31				
Suprailiac skinfolds(mm)	Between Groups	46.625	2	23.312	1.298	0.288	
	Within Groups	520.685	29	17.955			0.499
	Total	567.310	31				
Abdominal skinfolds(mm)	Between Groups	12.004	2	6.002	0.507	0.607	
	Within Groups	343.217	29	11.835			0.5
	Total	355.221	31				
Triceps skinfolds (mm)	Between Groups	27.631	2	13.816	0.859	0.434	
	Within Groups	466.369	29	16.082			0.5
	Total	494.000	31				
Thigh circumference (cm)	Between Groups	1.305	2	0.653	0.051	0.950	
	Within Groups	368.570	29	12.709			0.383
	Total	369.875	31				
Calf circumference(cm)	Between Groups	2.104	2	1.052	0.177	0.839	
	Within Groups	172.388	29	5.944			0.5
	Total	174.492	31				
Waist (cm)	Between Groups	1.540	2	0.770	0.033	0.967	
	Within Groups	668.929	29	23.067			0.5
	Total	670.469	31				
Arm's Length (cm)	Between Groups	3.780	2	1.890	0.218	0.806	
	Within Groups	251.688	29	8.679			0.5
	Total	255.469	31				
Leg's Length (cm)	Between Groups	11.455	2	5.727	0.120	0.887	0.499
	Within Groups	1378.545	29	47.536			

	Total	1390	31				
Height	Between Groups	0. 09	2	0.005	0.975	0.389	0.55
	Within Groups	0.137	29	0.005			
	Total	0.147	31				
BMI	Between Groups	2.825	2	1.412	0.460	0.636	0.5
	Within Groups	89.013	29	3.069			
	Total	91.838	31				
weight	Between Groups	2.893	2	1.447	0.030	0.970	0.5
	Within Groups	1394.349	29	48.081			
	Total	1397.242	31				
Kicking	Between Groups	242.659	2	121.330	1.309	0.286	0.5
	Within Groups	2688.838	29	92.719			
	Total	2931.497	31				
Zig	Between Groups	5.407	2	2.703	0.808	0.456	0.5
	Within Groups	97.069	29	3.347			
	Total	102.476	31				
Illinois	Between Groups	2.780	2	1.390	0.849	0.438	0.5
	Within Groups	47.461	29	1.637			
	Total	50.241	31				
30m	Between Groups	163.690	2	81.845	2.271	0.121	0.5
	Within Groups	1045.095	29	36.038			
	Total	1208.785	31				

The researchers used the Pearson correlation coefficient to reveal the statistically significant correlations between the study variables. Table (4) illustrates this.

Table 4. Results of Pearson correlation coefficient test for statistically significant variables

Variables		Pearson Correlation	Sig. (2-tailed
Subscapularis skinfolds (mm)	Thigh skinfolds (mm)	-0.462**	0.008
	Triceps skinfolds (mm)	0.553**	0.000
	Thigh circumference (cm)	0.476**	0.006
	Calf circumference(cm)	0.492**	0.004
	Waistline(cm)	0.392*	0.003
	BMI (kg/h^2)	0.613**	0.001
	Body mass (kg)	0.470**	0.001
Thigh skinfolds (mm)	Thigh circumference (cm)	-0.473**	0.006
	Waistline(cm)	-0.370*	0.004
	BMI (kg/h^2)	-0.482**	0.001
	Illinois (s)	-0.442*	0.001
Suprailiac skinfolds (mm)	Waistline(cm)	0.391*	0.003
	Illinois (s)	0.416*	0.002
Thigh circumference (cm)	Waistline(cm)	0.542**	0.000
	Calf circumference(cm)	0.674	0.00
	BMI (kg/h^2)	0.850**	0.001
	Body mass (kg)	0.662**	0.001
Leg's Length (cm)	Height(m)	0.602**	0.001
	Body mass (kg)	0.415*	0.02
BMI (kg/m^2)	Waistline(cm)	0.544**	0.00
	Body mass (kg)	0.685**	0.001
	Illinois (s)	0.369*	0.04
Kicking (accuracy)	Zig Zag(s)	-0.371*	0.036

** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

Discussion

The study's objectives aimed to explore the anthropometric and physical measurement values among Jordanian female soccer players and compare these values with elite worldwide players. Furthermore, it seeks to explore differences in the anthropometric and physical measurement values according to the playing position variable .By reviewing the values presented in Tables (1 and 3), the researchers found that the Σ6Skinfold for defenders, midfielders, forwards, and total female soccer players are (67.26± 4.46, 71.56± 3.31, 73.33± 3.57, 70.28± 3.89) respectively. This finding aligns with research by Ramirez Munera et al. (2024), who found that Σ6Skinfolds for the defenders, midfielders, and forwards were (67.012± 12.28, 70.74± 13.06, 65.81± 14.45) respectively. In the same context, this finding Supported by results of previous study (Kosta et al., 2021). On the other hand, these values were lower than those reported in previous study (Villaseca Vinicus et al., 2021). Additionally, there were notice-

able differences in these means based on the playing position variable, although they were not statistically significant. The results of the Scheffe test for post-hoc comparisons did not show any statistically significant differences between these variables. The researchers found that the Σ6Skinfolds level of midfielders was striking. It was expected that female midfielders would have the lowest levels because they often cover great distances during competition compared to defenders, which requires exceptional stamina to contribute to defensive and offensive tasks. Σ6Skinfold measurements also provide very useful indicators of subcutaneous adipose tissue, a negative factor in performance endurance and efficiency (Carling & Orhant, 2010).

As for the circumferences under study, the researchers found that Thigh, Calf and Waist circumferences for defenders, midfielders and forwards are (50.09±3.15, 35.45±2.52, *71*±5.9*58* cm) respectively. This finding aligns with research by Ramirez Munera et al. (2024), who found that Thigh, Calf and Waist circumferences for defenders, midfielders and forwards were (50.68± 3.06, 35.33± 1.81, 70.40± 7.45) respectively. In the same context, this finding agreed with the results in previous study (Villaseca Vinicus et al., 2021). There were also noticeable differences in these means based on the playing position variable. However, they were not statistically significant, which aligns with the findings of Hasegawa and Kuzuhara (2015), who indicated no statistically significant differences in anthropometric measurements and physical abilities according to the playing position. The researchers believe that the lack of differences in thigh, calf, and waist circumferences according to playing position is due to the high physical, physiological, and anthropometric demands imposed by modern playing styles. These styles require special physical attributes and body composition to perform intense bouts of speed, agility, explosive power, speed, performance endurance, and covering vast distances during competition.

The mean arm and leg lengths of the study sample were within the previous study results (Rickta et al., 2024) study. Studies also indicate that the arm length of football players is (70.72± 1.87) cm, and (85.77± 1.43) cm for leg length (Pradhan, 2017). With noticeable differences in these means based on the playing position variable, although they were not statistically significant. The researchers believe that the lack of statistically significant differences in these variables is normal because they are considered very important mechanical indicators for players in all playing positions. Regarding, the means of height, mass, and body mass index variables were consistent with the results of previous studies (Hammami et al., 2020; Ozbar, 2015). Although they were higher than the values reported in the previous study (Rickta et al., 2024). It is also noted that there were noticeable differences in these mean values based on the playing position variable, but they were not statistically significant. Here, it must be noted that soccer is considered a multi-requirement team sport, and in general, it requires players to master several skills, such as passing, dribbling, and kicking, in addition to possessing an adequate level of physical, physiological, and psychological attributes (Abdel Fattah et al., 2023; Goncalves et al., 2021). The researchers believe the lack of statistically significant differences in these variables is expected because they all fall within the normal standards for football players. For example, normal body mass is considered to be able to perform the requirements of football, such as covering large distances during competition while rationing the energy used, which requires light body masses.

The results also showed that the study sample's results in the 30m speed and the Illinois tests were within the previous study results (Villaseca Vinicus et al., 2021). With noticeable differences in the means of these results based on the playing position variable, although they were not statistically significant. As for the study sample's results in the Zig Zag test, they were consistent with Rajkumav (2015) who indicated that international female soccer achieved (28.82 ± 2.38)s, while university-level female soccer achieved (30.06 ± 2.51)s. The researchers believe the lack of statistically significant differences in these variables is normal because modern playing styles require unique physical characteristics and body composition to perform all tasks efficiently and effectively so that female soccer players can continue effectively during the long sports season.

Although there were noticeable differences in the variable's means under study based on the playing position variable, these differences were not statistically significant. It was observed that attackers outperformed in the 30m speed test, and one striking result was that the attackers were the shortest in stature. This does not align with the anthropometric requirements for attackers, who are typically expected to be taller, as they need to score goals with headers, which requires active engagement with defenders, who are usually taller. The researchers believe these differences in the study variables are

due to the physiological demands imposed by the playing position. Mallo et al. (2015) indicated that midfielders cover an average distance of (11.210) km in a match, attackers (10.979) km, and defenders (10.369) km. Thus, the physical and anthropometric requirements differ based on the exertion and movement patterns associated with the playing position. For instance, defenders tend to have a height advantage, using the heading skill more frequently than other positions. Meanwhile, midfielders are typically shorter to better handle the ball and move with it efficiently over longer distances on the field, as their lower center of gravity provides them with better balance.

On the other hand, the study sample's results in the kicking accuracy test were weak, with noticeable differences in means values based on the playing position variable, although they were not statistically significant. It was observed that attackers outperformed in this test, with an average of (31.21 ± 1.67). The researchers attribute this to the fact that kicking accuracy is one of the essential physical requirements for attackers to score goals. Accordingly, soccer requires specific indicators that help achieve sporting success, including anthropometric measurements such as height and mass. These are linked to physiological capabilities and are crucial to physical fitness levels. Thus, these variables are highly valuable for the team's success by positioning the players in roles that suit their anthropometric measurements and physical abilities, such as strength, speed, and aerobic and anaerobic requirements (Doyle et al., 2020; Hencken & White, 2006).

The study results also showed correlations between the anthropometric and physical variables, as illustrated in Table (4). This indicates that soccer requires anthropometric indicators such as height and mass, which are linked to physiological capabilities and influential factors in physical fitness levels. Therefore, these variables are highly valuable for the team's success by positioning players in roles that match their anthropometric measurements and physical abilities, such as strength, speed, and aerobic and anaerobic requirements (Doyle et al., 2020; Hencken & White, 2006). The researchers believe that the findings of this study align with previous research, as studies on the relationship between anthropometric measurements, physical abilities, and playing positions have shown mixed results. Some studies indicate differences in anthropometric measurements and physical abilities based on playing position (Haugen et al., 2014). While others suggest no statistically significant differences in anthropometric measurements and physical abilities based on playing position (Hasegawa & Kuzuhara, 2015). The nature of football includes moderate-intensity (running), low-intensity (walking), and high-intensity actions such as sprinting and jumping (Beato et al., 2018). Consequently, developments in women's football have imposed greater physical demands on the game than ever before; as playing styles have diversified and evolved, this requires the development of training programs in line with changes in player performance (Pardos Mainer et al., 2021). The researchers believe the current study may suffer from a small sample size depending on the playing position. Also, the study was conducted at the beginning of the sports competitions (domestic league 2024/2025). Therefore, differences in the data may arise during other competitive periods.

Conclusions

By reviewing the study results, the researchers conclude that the study variables values largely align with the results of previous studies. There were noticeable differences in the values means, although they were not statistically significant. This is consistent with the anthropometric and physical requirements for each playing position in football. The researchers believe that the results of the current study can assist coaches in selecting female soccer players so that the anthropometric indicators are within the optimal values according to the playing positions. It can also contribute to developing training programs by maintaining the quality of strong indicators and addressing weak indicators, such as focusing on kicking accuracy training for players in all positions. Finally, this study provides updated data on anthropometric measurements and physical tests for female soccer players according to their playing position. Thus, it opens future horizons for conducting studies to monitor longitudinal changes in anthropometric and physical indicators during the training season throughout the year, increase the sample size, and focus on other age groups. Other anthropometric measurements and physical tests can be added.

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References

Abdel Fattah, O., Atiyat, K., Mazahreh, J., & Jarrad, M. (2023). The supporting foot as a kinematic indicator of penalty kick direction in soccer. *Journal of Physical Education and Sport*, 23(11), 3142-3146. https://doi.org/10.7752/jpes.2023.11358

Bar Eli, M., Azar, H., Ritov, I., Keidar-Levin, Y., & Schein, G. (2007). Action bias among elite soccer goalkeepers: The case of penalty kicks. *Journal of Economic Psychology*, *28*(5), 606–621. https://doi.org/10.1016/j.joep.2006.12.001

Beato, M., Bianchi, M., Coratella, G., Merlini, M., & Drust, B. (2018). Effects of Plyometric and Directional Training on Speed and Jump Performance in Elite Youth Soccer Players. *Journal of Strength and Conditioning Research*, 32(2), 289-296. https://doi.org/10.1519/JSC.0000000000002371

Bogin, B., & Varela-Silva, M. I. (2010). Leg length, body proportion, and health: A review with a note on beauty. *International Journal of Environ mental Research and Public Health*, *7*(3), 1047–1075. https://doi.org/10.3390/ijerph7031047

Cameron, N. (2013). Essential anthropometry: Baseline anthropometric methods for human biologists in laboratory and field situations. *American Journal of Human Biology*, *25*(3), 291–299. https://doi.org/10.1002/ajhb.22388

Carling, C., & Orhant, E. (2010). Variation in body composition in professional soccer players: Interseasonal and intraseasonal changes and the effects of exposure time and player position. *Journal of Strength and Conditioning Research*, *24*(5), 1332–1339. https://doi.org/10.1519/jsc.0b013e3181cc6154

Chtara, M., Rouissi, M., Haddad, M., Chtara, H., Chaalali, A., Owen, A., & Chamari, K. (2017). Specific physical trainability in elite young soccer players: Efficiency over 6 weeks' in-season training. *Biology of Sport*, *2*, 137–148. https://doi.org/10.5114/biolsport.2017.64587

Doyle, B., Browne, D., & Horan, D. (2020). Differences in anthropometric and physical performance characteristics between U17, U19, and Senior Irish female international football players. *International Journal of Sports Science & amp; Coaching*, *16*(2), 352–359. https://doi.org/10.1177/1747954120968191

FIFA. (2019). Women's Football Member Associations Survey Report. Federation Internationale de Football Association*, 1–113.* (2024, July 15). https://img.fifa.com/ image/upload / nq3enso h y xpuxovcovj0.

Fitton Davies, K., Sacko, R. S., Lyons, M. A., & Duncan, M. J. (2022). Association between functional movement screen scores and athletic performance in adolescents: A systematic review. *Sports*, *10*(3), 28. https://doi.org/10.3390/sports10030028

Gonçalves, L., Clemente, F. M., Barrera, J. I., Sarmento, H., González-Fernández, F. T., Palucci Vieira, L. H., Figueiredo, A. J., Clark, C. C. T., & Carral, J. M. C. (2021). Relationships between fitness status and match running performance in adult women soccer players: A cohort study. *Medicina*, *57*(6), 617. https://doi.org/10.3390/medicina57060617

Hammami, M. A., Ben Klifa, W., Ben Ayed, K., Mekni, R., Saeidi, A., Jan, J., & Zouhal, H. (2020). Physical performances and anthropometric characteristics of young elite North-African female soccer players compared with international standards. *Science & Sports*, *35*(2), 67–74. https://doi.org/10.1016/j.scispo.2019.06.005

Hammami, M. A., Ben Ayed, K., Mekni, R., Ghouili, H., Bouzouraa, M. M., Trabelsi, K., & Ben Izzeddine, L. (2023). Physical and anthropometric profile of Tunisian elite football players according to their playing position: A longitudinal study. *Tunisian Journal of Sports Science and Medicine*, 1(1), 48–56. https://doi.org/10.61838/kman.tjssm.1.1.6

Hasegawa, N., & Kuzuhara, K. (2015). Physical characteristics of collegiate women's football players. Football Science, 12, 51–57. html.home/net.jssf.www://h

Haugen, T. A., Tønnessen, E., Hem, E., Leirstein, S., & Seiler, S. (2014). VO2max characteristics of elite female soccer players, 1989–2007. *International Journal of Sports Physiology and Performance*, *9*(3), 515–521. https://doi.org/10.1123/ijspp.2012-0150

Hencken, C., & White, C. (2006). Anthropometric assessment of Premiership soccer players in relation to playing position. *European Journal of Sport Science*, *6*(4), 205–211. https://doi.org/10.1080/17461390601012553

International Society for Advancement of Kinanthropometry. (2001). International Standards for Anthropometric Assessment; International Society for the Advancement of Kinanthropometry: *Potchefstroom, South Africa*, ISBN 9780868037127.

Kosta, G., Ana L., Sinisa, K., Nebahat E., Milan, A., & Marko, J. (2021). Morphological characteristics, body composition and explosive power in female football professional players. *Journal of Physical Education and Sport*, 21 (1), Art 11, 81 – 87. https://doi.org/10.7752/jpes.2021.01011.

Mallo, J., Mena, E., Nevado, F., & Paredes, V. (2015). Physical demands of top-class soccer friendly matches in relation to a playing position using global positioning system technology. *Journal of Human Kinetics*, *47*(1), 179–188. https://doi.org/10.1515/hukin-2015-0073

Owen, A. L., Lago-Peñas, C., Dunlop, G., Mehdi, R., Chtara, M., & Dellal, A. (2018). Seasonal body composition variation amongst elite European professional soccer players: An approach of talent identification. *Journal of Human Ki*netics, *62*(1), 177–184. https://doi.org/10.1515/hukin-2017-0132

Ozbar, N. (2015). Effects of plyometric training on explosive strength, speed and kicking speed in female soccer players. *The Anthropologist*, *19*(2), 333–339. https://doi.org/10.1080/09720073.2015.11891666

Pardos-Mainer, E., Lozano, D., Torrontegui-Duarte, M., Cartón-Llorente, A., & Roso-Moliner, A. (2021). Effects of strength vs. plyometric training programs on vertical jumping, linear sprint and change of direction speed performance in female soccer players: A systematic review and meta-analysis. *International Journal of Environmental Research and Public Hea*lth, *18*(2), 401. https://doi.org/10.3390/ijerph18020401

Petri, C., Campa, F., Holway, F., Pengue, L., & Arrones, L. S. (2024). ISAK-Based anthropometric standards for elite male and female soccer players. *Sports, 12*(3), 69. https://doi.org/10.3390/sports12030069

Pradhan K. Comparison of Anthropometric Characteristics and Body Composition of Inter University Level Volleyball and Football Players. WBCIPE JOURNAL 2017;III(1):41-47.

Rajkumar, S. (2015). Assessment of Motor Fitness, Physical Fitness and Body Composition of Women Football Players at Different Levels of their Participation. *American Journal of Sports Science and Medicine*, 3(2), 47-54. https://doi.org/10.12691/ajssm-3-2-4

Ramírez-Munera, M., Arcusa, R., López-Román, F. J., Victoria-Montesinos, D., García-Muñoz, A. M., Ávila-Gandía, V., Pérez-Piñero, S., & Marhuenda, J. (2024). Anthropometric and body composition changes during pre-season of Spanish professional female soccer players according to playing position. Nutrients, *16*(16), 2799. https://doi.org/10.3390/nu16162799

Rickta, J. F., Arafat, Md. Y., Johora Mukta, F. T., & Islam, Md. R. (2024). Anthropometry and physical features of Bangladeshi women national level kho-kho and football players: A Frank comparison. *International Journal of Kinanthropometry*, *4*(1), 44–49. https://doi.org/10.34256/ijk2416

Santos, D. A., Dawson, J. A., Matias, C. N., Rocha, P. M., Minderico, C. S., Allison, D. B., Sardinha, L. B., & Silva, A. M. (2014). Reference values for body composition and anthropometric measurements in athletes. *PLoS ONE*, *9*(5), e97846. https://doi.org/10.1371/journal.pone.0097846

Silva, J. R., Nassis, G. P., & Rebelo, A. (2015). Strength training in soccer with a specific focus on highly trained players. *Sports Medicine - Open*, *1*(1). https://doi.org/10.1186/s40798-015-0006-z

Sporis, G., Jukic, I., Ostojic, S. M., & Milanovic, D. (2009). Fitness profiling in soccer: Physical and physiologic characteristics of elite players. *Journal of Strength and Conditioning Research*, *23*(7), 1947–1953. https://doi.org/10.1519/jsc.0b013e3181b3e141

Sutton, L., Scott, M., Wallace, J., & Reilly, T. (2009). Body composition of English Premier League soccer players: Influence of playing position, international status, and ethnicity. *Journal of Sports Sciences*, *27*(10), 1019–1026. https://doi.org/10.1080/02640410903030305

Villaseca-Vicuña, R., Molina-Sotomayor, E., Zabaloy, S., & Gonzalez-Jurado, J. A. (2021). Anthropometric profile and physical fitness performance comparison by game position in the Chile women's

senior national football team. *Applied Sciences*, *11*(5), 2004. https://doi.org/10.3390/app11052004

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