ORIGINAL ARTICLE

Somatotype and body composition based on playing position in Peruvian U-20 football players

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ABSTRACT

Background. Football, like other sports, necessitates the development of specific skills to achieve optimal performance. Furthermore, the roles of each player must be individually tailored, taking into account their physical composition and body structure. This underscores the importance of understanding the anthropometric and morpho structural characteristics of athletes. In this context, the aim of the present study was to describe these characteristics in a sample of U-20 youth soccer players, based on their playing positions on the field. Methods. This study employed a cross-sectional design. A non-probabilistic sample of 120 athletes, aged 17 to 20, was drawn from a professional soccer club in Lima, Peru. Twenty-three anthropometric variables were measured following the protocols of the International Society for the Advancement of Kineanthropometry (ISAK), using Kerr's 5-component method for body composition and the Carter and Heath somatotype classification. Results. The Kerr anthropometric method demonstrated high accuracy in estimating body weight (R^2 = .956, p < .05), with good agreement as confirmed by the Bland-Altman analysis. Significant differences were observed in favour of goalkeepers in variables such as height, weight, skinfold thickness, thigh and calf circumferences, biacromial diameter, humerus and femur breadths, as well as arm and forearm circumferences, compared to defenders, midfielders, and forwards. However, defenders demonstrated significantly greater thorax and calf perimeters (p < .05). Significant differences were also observed in body composition indicators, as per Kerr's method, including adipose tissue, muscle mass, bone mass, and skinfold thickness, with goalkeepers showing higher values (p < .05). All groups were classified as balanced mesomorphs. Conclusion. The results emphasize the importance of tailoring training and nutritional interventions to the specific morpho structural characteristics of soccer players, based on their playing position.

Keywords: Sport medicine, Cineanthropometry, Soccer, Youth, Body composition, Somatotypes.

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INTRODUCTION

Football is one of the most popular sports worldwide and the most widely practiced in our country, whether at the professional, recreational, or amateur level. At the professional level, the practice of football requires the development of specific capacities such as reaction speed, movement speed, leg power, cardiorespiratory endurance, muscular endurance, muscular power, lower body strength, upper body muscular strength, agility, coordination, and appropriate body composition (Ramírez Marrero & Rivera, 1992). Football, like many other sports, requires the development of specific characteristics to achieve optimal performance on the field (Rampinini et al., 2009). Similarly, the roles of each athlete must be individualized according to their body shape and structure (Rienzi et al., 2000).

In modern sports, optimizing performance requires selecting athletes based on their morpho structure, such as height, which allows for greater reach; muscle mass, which is associated with strength and power; and reduced fat mass, which facilitates lower body weight, thereby increasing running speed and reducing energy expenditure (Jorquera et al., 2013). Moreover, a distinctive feature of team sports is the variation in physical demands across playing positions, which may result in physiological differences among athletes based on their position on the field (Bangsbo, 2016).

The player's morphological characteristics can be a determining factor in the team's tactical approach. When selecting an athlete, it is essential to consider the extent to which specific morphological traits are required for a particular playing position (Casajús, 2001; Gil et al., 2007; Hazir, 2010). In this regard, there appears to be a consensus that the body shape of professional football players typically corresponds to a balanced mesomorph somatotype. However, the differences according to playing position remain less well-defined (Henríquez-Olguín et al., 2013).

In a study conducted on Portuguese youth football players, the authors concluded that physical training has a direct impact on the development of the athletes' aerobic capacity. However, other untrained physical characteristics, such as height and body weight, were factors that positively influenced performance in the vertical jump and the 30-meter sprint test (Malina et al., 2004). On the other hand, youth athletes selected for competition based solely on their technical skills, without considering their physical structure, are more likely to face professional failure due to inadequate height, suboptimal muscle mass, or an increased risk of chronic injury from insufficient physical strength (Arnason et al., 2004).

These morphological and structural parameters are essential for both the evaluation and selection of athletes (Jorquera et al., 2013). There are currently no national reference standards for these parameters, which would be highly valuable for the physical optimization of youth football players, serve as a reference for athlete selection during the developmental stage, and contribute to future research in sports science. Currently, there is a lack of comprehensive information regarding the morphological and structural characteristics of Peruvian youth football players. Therefore, the objective of the present study is to describe and compare the morphological and anthropometric characteristics of Peruvian U-20 youth football players and examine their relationship with playing position on the field.

METHODS

Design, type of research, and participants

The present study utilized a cross-sectional design. The subjects were selected through a non-probabilistic convenience sampling method, consisting of 120 athletes aged 17 to 20, all belonging to a professional football club. The inclusion criteria considered an age range of 17 to 20 years, football players who had signed the informed consent form, and those not undergoing recovery from any injury. Participants who did not sign the informed consent form, did not fall within the established age range, or were undergoing recovery from a sports injury were excluded from the study. All participants were informed of the study's objective and agreed to participate. The study was conducted in accordance with the ethical principles outlined in the Helsinki Declaration. Additionally, it received approval from the nutrition department of the professional football club.

Anthropometric measurements

Following schedule coordination and authorization from the club's nutrition department, data collection was conducted with the participation of two trained nutritionists and the author of this study, all certified as ISAK Level 2 anthropometric technicians. Informed consent was obtained from all athletes prior to data collection.

The anthropometric measurements taken from the athletes included weight, height, sitting height, skinfold thickness, bone diameters, and circumferences. All measurements were conducted according to the protocol established by the International Society for the Advancement of Kinanthropometry (ISAK) (Marfell-Jones et al., 2012). With respect to the technical error of measurement, at the suggestion of the ISAK, a margin of 5% for skinfolds and 1% for the other measurements will be considered acceptable.

Body weight was measured using a digital scale with an accuracy of 100 g and a capacity of 200 kg. Height was assessed with a wooden stadiometer featuring a measuring range from 0 to 200 cm and an accuracy of 0.1 cm, validated by the National Center for Food and Nutrition (CENAN). A wooden anthropometric bench, 60 cm in height, was used to measure seated height. Skinfolds were assessed using SLIM GUIDE callipers, validated by ISAK, with a measurement range of 0 to 48 mm and an accuracy of 0.5 mm. For the circumference measurements, a LUFKIN flexible metal anthropometric tape was used, with a length of up to 2 meters and an accuracy of 1 mm. Short bone diameters were measured using a pachymeter or small-diameter calliper, with a measurement range of 0 to 250 mm and an accuracy of 1 mm. For long bone diameters, an anthropometer or large-diameter calliper, both from ROSSCRAFT, with an accuracy of 1 mm, was used.

Somatotype

The somatotype system is designed to identify and classify individuals based on their external body shape. It was originally proposed by Sheldon in 1940 and later updated by Heath and Carter in 1967 (Carter, 2002). This method provides a quantitative analysis of the body, expressed on a three-number scale. These numbers represent, in order, adiposity (endomorphy), musculoskeletal robustness (mesomorphy), and thinness or relative linearity (ectomorphy). Using various equations and considering variables such as weight, height, triceps skinfold, subscapular skinfold, supraspinal skinfold, calf skinfold, humerus diameter, femur diameter, flexed arm circumference, and calf circumference, the three somatotype components are obtained as absolute values. These components can then be classified as endomorph, mesomorph, ectomorph, or their variants (Norton & Olds, 1995).

Statistical analysis

Microsoft Excel (version 2019) was used to record and organize the data, while IBM SPSS statistical software (version 29) was employed for data processing and analysis. Additionally, Bland-Altman plots were used to assess concordance, and a somatotype plot was employed to visualize the distribution of players based on their endomorphy, mesomorphy, and ectomorphy components, allowing for the identification of specific trends in somatotypes according to playing position. A significance level of $p < .05$ was set.

Ethical aspects

Compliance with the principles of the Declaration of Helsinki was ensured, with all participants being informed about the objectives and procedures of the research. The confidentiality of the information provided by participants was strictly safeguarded, and all collected data were anonymized to protect the privacy of the study subjects. Written informed consent was obtained from all participants prior to their inclusion in the study.

RESULTS

Figure 1 illustrates the relationship between body weight estimated using the Kerr anthropometric method and actual body weight. The linear regression model is represented by the equation y = 4.5 + 0.94x, with a coefficient of determination $R^2 = 0.956$ ($p < .05$), indicating a very strong fit to the data and suggesting a high correlation between the estimated body weight and actual body weight.

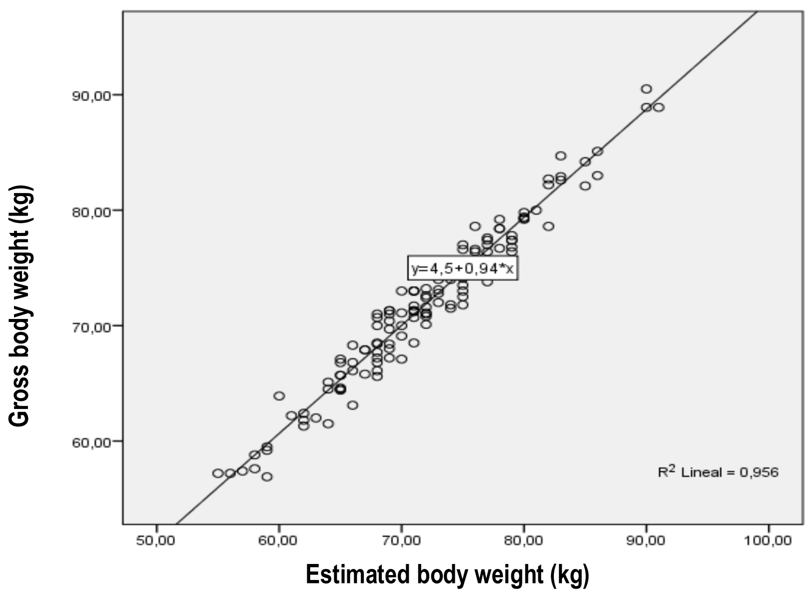


Figure 1. Ratio between body weight estimated by the Kerr anthropometric method and gross body weight in kilograms.

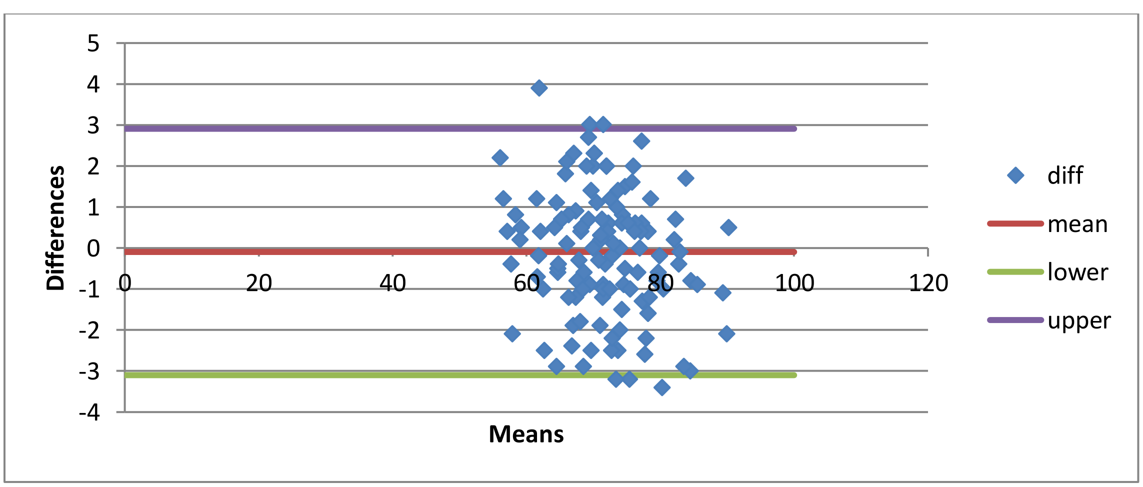


Figure 2. Bland-Altman plot for concordance between estimated and measured weight.

In summary, this result demonstrates that the Kerr anthropometric method can estimate the actual body weight of the subject with a high degree of accuracy, explaining approximately 95.6% of the variability in gross body weight based on the estimated weight.

On the other hand, Figure 2 shows that the Bland-Altman analysis revealed good agreement between estimated and measured weight, with approximately 95% of the differences falling within the limits of agreement (mean ± 1.96 times the standard deviation). This analysis demonstrated a constant bias of -0.095 kg and a standard deviation of the differences of 1.532 kg.

Table 1. Averages and standard deviations of the general, basic physical and specific characteristics of soccer players according to positions.

Variables	Goalkeeper (n = 17)		Defender (n = 41)		Midfielder (n = 42)		Forward (n = 28)		Total (n = 128)	
	M	DE	M	DE	M	DE	M	DE	M	DE
Basic and general physical characteristics										
Age (years)	18.75	0.71	18.83	0.60	19.01	0.68	18.93	0.55	18.90	0.63
Height (cm)	181.32	2.07	178.27	5.03	173.74	6.29	176.08	6.38*	176.71	6.04
Height seated	94.10	1.60	93.46	3.12	92.07	3.27	92.05	2.98	92.78	3.07
Weight (Kg)	77.28	5.08	73.51	5.22	68.24	7.63	71.40	6.52*	71.82	6.99
BMI (kg/m2)	23.52	1.74	23.14	1.44	22.56	1.60	23.01	1.42	22.97	1.55
6 skinfolds	54.62	9.73	49.50	11.59	45.01	10.34	47.98	12.00*	48.37	11.34
Skinfolds (mm)										
Triceps	8.24	1.83	7.82	2.29	6.96	2.01	8.04	2.57	7.64	2.24
Subscapular	9.41	1.46	8.21	1.64	8.56	1.87	8.57	1.72	8.56	1.74
Supraspinal	8.41	2.69	7.38	2.43	6.48	1.81	7.20	2.21	7.18	2.29
Abdominal	12.03	3.37	11.41	4.97	10.35	3.69	10.18	3.58	10.88	4.10
Thigh	10.15	2.07	9.15	2.45	7.75	2.15	8.68	2.62*	8.72	2.45
Calf	6.38	1.32	5.54	1.13	4.92	1.35	5.32	1.23*	5.40	1.32
Diameters (cm)										
Biacromial	41.88	2.71	41.55	1.61	40.60	1.76	41.30	1.58*	41.23	1.87
Thorax Transverse (T.)	30.81	3.10	30.20	1.73	29.90	2.17	30.51	2.61	30.25	2.28
Thorax Anteroposterior (A.)	21.84	5.93	20.31	1.46	19.86	1.27	19.83	1.48	20.26	2.55
Biiliocrestal	28.60	1.39	28.18	1.23	27.95	1.27	28.25	2.22	28.18	1.53
Humerus	7.23	0.31	7.06	0.32	6.94	0.39	6.99	0.34*	7.03	0.35
Femur	10.39	0.39	10.11	0.40	10.02	0.43	10.08	0.38*	10.11	0.42
Perimeters (cm)										
Head	56.50	1.69	56.11	1.54	55.95	1.33	55.50	2.51	55.98	1.76
Arm	30.47	1.86	29.61	1.59	28.63	1.67	28.95	1.58*	29.26	1.75
Arm flexed	32.55	1.94	31.86	1.61	30.99	1.86	31.18	2.22	31.52	1.94
Forearm	27.22	1.56	26.25	1.04	25.71	1.36	26.00	1.05*	26.15	1.31
Chest	94.54	3.25	94.96	3.29	92.17	3.89	93.71	4.31*	93.71	3.87
Waist	77.43	3.69	76.82	3.00	75.61	3.45	76.76	3.77	76.49	3.44
Calf	36.98	1.35	37.51	3.56	35.71	1.89	36.43	1.67*	36.61	2.55
Thigh	59.30	3.25	57.47	3.46	55.42	3.34	56.29	2.70*	56.78	3.45

*Note. *p < .05; The test used for comparison was the Kruskal Wallis H test; M=Mean; SD=Standard Deviation.*

Table 1 presents the analysis of differences in general characteristics, skinfolds, diameters, and circumferences of the football players, categorized by playing position (goalkeeper, defender, midfielder, and striker). Significant differences were observed in basic physical characteristics, including height (goalkeepers: M = 181.32 cm, SD = 2.07; outfield players: M = 173.74 cm, SD = 6.29), weight (goalkeepers: M = 77.28 kg, SD = 5.08; outfield players: M = 68.24 kg, SD = 7.63), and the sum of 6 skinfolds (goalkeepers: M = 54.6 mm, SD = 9.73; outfield players: M = 45.01 mm, SD = 10.34) ($p < .05$). Significant differences were found in skinfold thickness (mm), particularly in the thigh (goalkeepers: M = 10.15 mm, SD = 2.07; outfield players: M = 7.75 mm, SD = 2.15) and calf (goalkeepers: M = 6.38 mm, SD = 1.32; outfield players: M = 4.92 mm, SD = 1.35) skinfolds ($p < .05$). Significant differences were observed in diameters (cm), specifically in the biacromial diameter (goalkeepers: M = 41.88 cm, SD = 2.71; outfield players: M = 40.60 cm, SD = 1.76), as well as in the humerus (goalkeepers: M = 7.23 cm, SD = 0.31; outfield players: M = 6.94 cm, SD = 0.39) and femur diameters (goalkeepers: M = 10.39 cm, SD = 0.39; outfield players: M = 10.02 cm, SD = 0.43) ($p < .05$). Significant differences were also identified in perimeters (cm), specifically in the arm (goalkeepers: M = 30.47 cm, SD = 1.86; outfield players: M = 28.63 cm, SD = 1.67), forearm (goalkeepers: M = 27.22 cm, SD = 1.56; outfield players: M = 25.71 cm, SD = 1.36), chest (goalkeepers: M = 94.54 cm, SD = 3.25; outfield players: M = 92.17 cm, SD = 3.89), and calf (goalkeepers: M = 36.98 cm, SD = 1.35; outfield players: M = 35.71 cm, SD = 1.89) ($p < .05$).

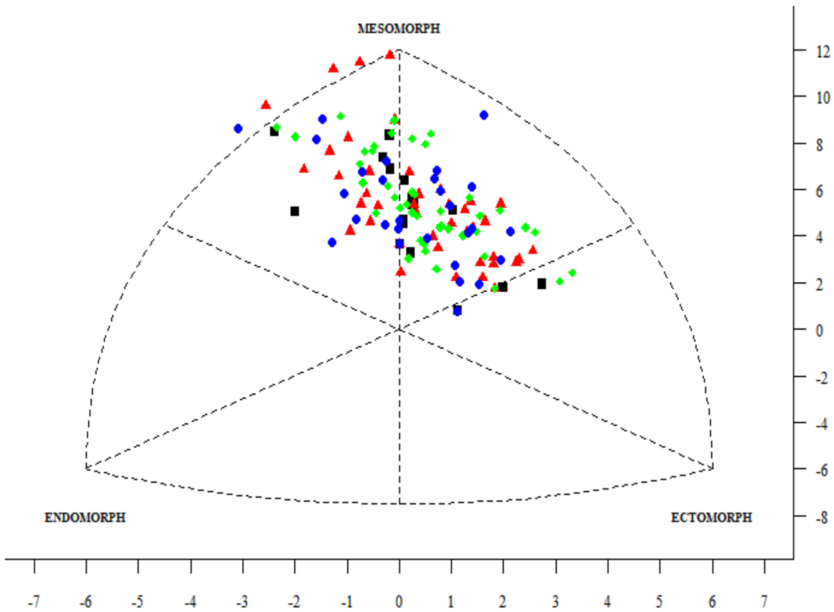
Table 2. Averages and standard deviations of body composition according to Kerr and Carter and Heath somatotype of soccer players according to playing position.

Variables	Goalkeeper (n = 17)		Defender (n = 41)		Midfielder (n = 42)		Forward (n = 28)		Total (n = 128)	
	M	DE	M	DE	M	DE	M	DE	M	DE
Kerr Body Composition										
Adipose tissue										
(%)	22.94	2.29	21.72	2.28	21.00	2.08	21.56	2.66	21.61	2.36
(Kg)	17.68	1.72	15.98	2.11	14.37	2.53	15.41	2.41*	15.55	2.49
Muscle tissue										
(%)	47.91	2.01	49.12	2.38	48.58	1.90	48.43	1.83	48.63	2.08
(Kg)	37.08	3.60	36.13	3.41	33.17	4.05	34.58	3.50*	34.95	3.92
Residual tissue										
(%)	11.90	1.63	11.84	0.86	12.35	0.89	12.29	1.08	12.11	1.06
(Kg)	9.20	1.44	8.69	0.73	8.40	0.88	8.77	1.09	8.68	1.00
Bone tissue										
(%)	12.24	0.97	12.24	0.78	12.84	0.85	12.55	0.83*	12.50	0.87
(kg)	9.44	0.86	8.98	0.74	8.73	0.91	8.96	0.98*	8.96	0.89
Skin tissue										
(%)	5.02	0.36	5.08	0.32	5.24	0.32	5.18	0.32	5.15	0.33
(kg)	3.87	0.24	3.73	0.20	3.56	0.30	3.68	0.28*	3.68	0.28
Somatotype (Carter and Heath)										
Endomorphy	2.43	0.55	2.19	0.63	2.09	0.56	2.26	0.69	2.20	0.61
Mesomorphy	5.01	0.85	5.07	1.06	5.08	0.80	4.98	0.84	5.05	0.90
Ectomorphy	2.62	0.83	2.60	0.77	2.60	0.78	2.53	0.74	2.59	0.77
Classification	Mesomorph - Balanced		Mesomorph - Balanced		Mesomorph - Balanced		Mesomorph - Balanced			

*Note. *p < .05; The test used for comparison was the Kruskal Wallis H test; M = Mean; SD = Standard Deviation.*

Table 2 presents the analysis of differences in body composition according to Kerr's method and the Carter and Heath somatotype classification among football players in different positions (goalkeepers, defenders, midfielders, and forwards). Regarding body composition according to Kerr, significant differences were observed in adipose tissue (goalkeepers: M = 17.68 kg, SD = 1.72; outfield players: M = 14.37 kg, SD = 2.53), muscle tissue (goalkeepers: M = 37.08 kg, SD = 3.60; outfield players: M = 33.17 kg, SD = 4.05), bone tissue in kilograms (goalkeepers: M = 9.44 kg, SD = 0.86; outfield players: M = 8.73 kg, SD = 0.91), and as a percentage (goalkeepers: M = 12.24%, SD = 0.97; defenders: M = 12.24%, SD = 0.78), and skin tissue (goalkeepers: M = 3.87 kg, SD = 0.24; outfield players: M = 3.56 kg, SD = 0.30) ($p < .05$). With respect to the Carter and Heath somatotype, no significant differences were observed between playing positions, as all groups were classified as "*balanced mesomorphs*."

Figure 3 illustrates the somatotype distribution of the study sample by playing position, with goalkeepers represented by black squares, defenders by red triangles, midfielders by green diamonds, and forwards by blue circles. Overall, the majority of football players are situated in the mesomorphism region, which corroborates the classification in Table 2 as balanced mesomorphs, characterized by a proportional balance of muscle mass, fat, and bone structure. Goalkeepers tend to be more positioned towards the mesomorphic and endomorphic zone, reflecting their higher percentages of body fat and muscle mass compared to other positions. Defenders and midfielders are also concentrated in the mesomorphic zone, with a slight tendency toward ectomorphism, indicating a more balanced physique with lower body fat. Forwards, represented by blue circles, are more distributed towards the mesomorphic and ectomorphic area, aligning with their need for less mass and greater agility. In summary, Figure 3 reinforces the findings in Table 2, emphasizing how physical and somatotypic characteristics vary by playing position, with each group of football players exhibiting specific adaptations to optimize their performance on the field.



Note. Black square = Goalkeepers; Red triangle = Defenders; Green diamond = Midfielders; Blue circle = Forwards.

Figure 3. Somatotype of the study sample by playing position.

DISCUSSION

From a physiological perspective, many authors regard anthropometric variables as essential components of sports performance, as they directly influence physical capacity and game efficiency (Herrero de Lucas et al., 2004; Mujika et al., 2009; Reilly et al., 2000). These variables, which include measures such as somatotype and body composition, not only serve as indicators of the current physical condition of athletes but also provide valuable references for the selection and development of youth football players (Gil et al., 2007). In this context, understanding the anthropometric and morpho structural characteristics of players in different positions can provide valuable insights to optimize performance and guide training strategies. The aim of the present study was to describe the anthropometric and morpho structural characteristics by playing position in U-20 youth football players.

As shown by our results, the highest average height values were observed in goalkeepers (181.32 cm) and defenders (178.27 cm), characteristics typical of positions where an aerial advantage is sought. However, when comparing these data with those of Chilean youth football players, a significant difference is observed in the height of goalkeepers (183.3 cm), whereas the difference in defenders is minimal (177.8 cm) (Hernández-Jaña et al., 2021). These findings suggest that, while there are similarities in the height of defenders, Peruvian U-20 goalkeepers are, on average, shorter than their Chilean counterparts, which could impact performance in game situations requiring aerial skills.

Additionally, midfielders were found to have the lowest average weight and height, a result consistent with previous studies on elite football players. For example, Sporis et al. found similar characteristics in their analysis of the physical and physiological profiles of elite players, highlighting that midfielders tend to have shorter stature and lower weight compared to other positions due to the specific demands of their role, which requires agility and endurance (Sporis et al., 2009). Similarly, Hernández-Mosqueira et al., in their study on body composition and somatotype of U-18 football players, reported that midfielders tend to be lighter and shorter, characteristics that enhance their performance in terms of mobility and aerobic capacity (Cossio-Bolanos et al., 2012). These observations underscore the importance of position-specific anthropometric characteristics in football, suggesting that player development and selection should take these differences into account to optimize team performance.

Regarding body composition, the youth athletes in the present study exhibited 48.63% muscle mass (MM), 21.61% adipose mass (AM), and 12.50% bone mass (BM), values comparable to those reported in Chilean youth football players, who presented 48.07% MM, 22.10% AM, and 11.40% BM (Hernández-Mosqueira et al., 2013). However, when comparing these results with those of adult professional football players, significant differences are evident. For instance, Spanish professional football players exhibit 50.04% MM, 10.42% AM, and 15.44% BM, while Chilean professional football players present 57.3% MM and 9.2% AM (Hernández-Jaña et al., 2021). These notable differences can be attributed to the lack of physical maturation and the lower level of preparation in youth categories compared to professional adult football players. The lower muscle mass and higher adipose mass observed in youth players may reflect the early stages of physical development and the differences in training and nutrition regimens between junior and professional categories (Said et al., 2022). Physical maturation and adaptation to more intensive and specialized training in professional adults contribute to increased muscle mass and reduced adipose mass, thereby optimizing athletic performance (Dreher et al., 2023). These findings underscore the importance of designing specific development and training programs tailored to the unique needs of young football players, aimed at improving their body composition and better preparing them for the demands of professional football.

In terms of somatotype, the present study shows that goalkeepers, defenders, midfielders, and forwards are classified as balanced mesomorphs, with an average somatotype of (2.2 - 5.0 - 2.6). This classification is similar to that observed in Chilean youth football players of the same age group, who exhibit an average somatotype of (2.2 - 4.1 - 1.9) (Hernández-Mosqueira et al., 2013). However, a difference is observed when comparing with Brazilian youth football players, who are classified as meso-endomorphic, with an average somatotype of (3.52 - 4.45 - 2.87) (Vinicius et al., 2015). It is important to note that the balanced mesomorph classification is common among high-performance adult professional football players. For example, Chilean professional football players present an average somatotype of (2.3 - 5.4 - 2.05), and Mexican football players of (2.5 - 5.1 - 2.1) (Jorquera et al., 2013) [4], which differs from the meso-endomorphic classification observed in Peruvian adult football players, who show an average somatotype of (3.0 - 4.8 - 2.1), according to the study by Yata et al. (Yata et al., 2012). These results suggest that the tendency toward a balanced mesomorph somatotype, characterized by a higher proportion of muscle mass and a well-balanced physical structure, is a desirable trait in both youth and professional football players, as it is associated with enhanced physical performance on the field. The difference observed between the somatotypes of youth and adult football players could be attributed to the natural progression of physical development and adaptations resulting from more rigorous and specialized training as players advance in their careers.

On the other hand, when evaluating the somatotype by playing position within our study sample, no significant differences were found, highlighting the homogeneity of somatotype profiles across positions. This data contrasts with the study by Hernández-Mosqueira et al. (Hernández-Mosqueira et al., 2013) on youth football players, where defenders were classified as meso-endomorphic, although they aligned with the mesomorphic-balanced classification for goalkeepers, midfielders, and forwards. Similarly, Vera et al. concluded in their analysis that goalkeepers, forwards, and midfielders exhibited an endo-mesomorphic somatotype, while defenders were classified as meso-endomorphs. On the other hand, in the study by Lago-Peñas et al. (Lago-Peñas et al., 2011), which also evaluated youth football players, similarities were found in the classification by playing position, with the balanced mesomorph somatotype being the common denominator. This classification is typical for professional athletes and indicates that the mesomorphic component in juvenile age groups, such as those in the present study, is below 5.0. This reflects a lack of muscular development, likely due to age or insufficient preparation related to training and nutrition (Lago-Peñas et al., 2011). These results suggest that, although there is homogeneity in the somatotypes of youth players across different playing positions, attention should be given to training and nutrition programs from an early age to promote adequate physical development and achieve an optimal somatotype for sports performance in adulthood. Early identification and correction of potential deficiencies in somatotypic development can be crucial for the development of competitive professional football players.

Implications of the study

The implications of the findings from the present study are varied and highly relevant for coaches, physical trainers, nutritionists, and sports managers involved in the training of youth football players. First, the homogeneity observed in the somatotype of youth players across different playing positions underscores the importance of implementing specific and differentiated training and nutrition programs from an early age. These programs should focus on developing the optimal physical characteristics required for each playing position, ensuring an appropriate balance between muscle mass, fat mass, and bone mass. Second, the identification of a balanced mesomorph somatotype in most players suggests that, despite differences in maturation and physical preparation, it is possible to achieve somatotype profiles similar to those of professional players through appropriate training and dietary interventions. This implies that academies and clubs must invest in specialized personnel and resources to ensure the comprehensive training of players.

Additionally, the differences observed between Peruvian youth players and their counterparts from other countries underscore the need to tailor training programs to the specific characteristics and needs of Peruvian football players. This personalized approach may help close the gap in physical development and enhance sports performance at the international level. Finally, these findings also have implications for sports policy and long-term planning. It is essential for sports and educational institutions to collaborate in promoting healthy lifestyle habits and regular physical activity among young people, thereby fostering holistic development that supports both athletic performance and overall well-being.

Limitations and future considerations

Despite the significant findings of this study, several limitations must be acknowledged. First, the cross-sectional design limits the ability to infer causality. Second, the sample consisted solely of youth football players from a specific region of Peru, which may restrict the generalizability of the results to other populations or contexts. Additionally, factors such as genetics, training history, and diet, which can significantly influence body composition and somatotype, were not considered. Finally, the absence of longitudinal follow-up prevents the observation of changes over time in response to specific interventions.

For future research, longitudinal studies are recommended to assess how training and nutritional interventions impact anthropometric characteristics and sports performance over time. In addition, it would be valuable to include a larger and more diverse sample of football players from different regions and levels of competition to enhance the generalizability of the findings. Incorporating objective and more detailed measurements of body composition and somatotype, along with considering additional factors such as genetics and training history, can provide a more comprehensive understanding of the needs and characteristics of youth football players.

CONCLUSIONS

In conclusion, this cross-sectional study demonstrated that the anthropometric and morpho structural characteristics of Peruvian U-20 youth football players vary by playing position, with goalkeepers and defenders showing higher height and weight values, while midfielders exhibit the lowest values. Similarly, a predominant classification of balanced mesomorph somatotype was observed across all playing positions, consistent with findings in youth football players from other countries, though notable differences were identified when compared to adult professional players. These findings underscore the importance of implementing specific training and nutrition programs from an early age to optimize the physical development of players. Furthermore, the homogeneity in somatotype suggests the need for personalized interventions tailored to each playing position, which could help improve athletic performance and the overall well-being of youth football players.

AUTHOR CONTRIBUTIONS

C.M.J. (Caso Mauricio Jean) and M.F.M.A. (Miranda Flores María Alina) assisted with the conceptualization and study design. J.-A.D. (Javier-Aliaga David) contributed to the formal analysis and methodology. C.M.J. (Caso Mauricio Jean), M.F.M.A. (Miranda Flores María Alina), C.-M.Y.E. (Calizaya-Milla Yaquelin E.), and S.J. (Saintila Jacksaint) contributed to the writing of the original draft and the review and editing process. All relevant materials are included in the present manuscript.

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DATA AVAILABILITY STATEMENT

All data are available upon request from the corresponding authors.

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