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Variations in Body Measurements According to the Role Played on the Field by Football Players in the Brazilian Army

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Abstract: *Objective: To determine and compare the morphological characteristics of Brazilian army soccer players according to their game positions.*

Methods: Field study with a descriptive, explanatory and quasi-experimental approach, 28 male athletes (26.1±4.2 years) with more than one year of practice, divided into: goalkeepers, defenders, central/offensive midfielders, midfielders, laterals and forwards. The anthropometric evaluation used the protocols of the somatotype Heath & Carter (1964), body fractionation in five components of Ross and Kerr (1993), Phantom in body proportionality of Ross and Wilson (1984) and Withers (1987) for the percentage of body fat. The analysis was performed based on the use of the z-score equality of means.

Results: The athletes had a proportionally higher body mass value observing the z-score Phantom, with a lower concentration of fat in the region and a greater muscle volume. The biiliocristal breadth z-score Phantom was smaller than the Phantom model. Percentage adiposity measured by body fractionation into five components approximately 10% greater than by the two-component method. The muscle/bone index showed a normal behavior. The somatotype varied according to the playing position.

Conclusions: There are differences identified by each game position, making it possible to define an anthropometric profile of specialization and different training for each game position.

Keywords: *Body measurements, anthropometry, kinanthropometry, football.*

1. INTRODUCTION

Football is a sport that has conquered the world and aroused much interest from science, its popularity comes from the fact that it does not require from practitioners fully developed skills or physical qualities as performance depends on a variety of factors such as anaerobic development, aerobic power, agility, speed and coordination, in addition to other technical and tactical skills of the sport. Anthropometry plays an important role among the factors that influence performance in soccer, as it not only helps to identify the appropriate physical characteristics for the sport, but also to define the most appropriate playing position for the athlete based on the specific demands of each playing position. In recent years, there has been an increase in scientific studies that seek to improve performance in football and address different aspects, especially the analysis of sports performance. These contributions of science are currently more accepted by coaches and players, who understand the need for this information to improve both preparation for competitions and performance itself [1, 2].

The kinanthropometric profiles of athletes addressed in the international scientific literature include: the chemical and/or structural composition of the body; the somatotype describing endomorphy (fat ratio), mesomorphy (muscle-bone ratio) and ectomorphy (thinness or slenderness ratio); and proportionality, defined as the relationship between anthropometric measurements and the individual's height [3].

Proportionality has been analyzed in the sports scientific literature using the mathematical model called the phantom stratagem, which was initially approached by Ross and Wilson (1974) [4] to compare differences in the proportion of body shape and size. Individuals are compared with a theoretical reference model which is conceptually sexless, symmetrical (bilaterally), without considering ethnic or age differences. The differences obtained are called z-phantom scores.

In sports such as soccer, it is important to evaluate kinanthropometry, because the study of absolute size is a relevant factor in the analysis of athletic success. Several authors have shown that soccer players have developed the characteristics of muscle power, ability to master the ball, strength and height in jumps, strength and speed for sprints, endurance, speed and agility among other kinanthropometrics [5].

To properly evaluate and select the soccer players it is necessary to know the specific morphological parameters of the players of this modality. In this way, it would be possible to benefit both the sports team and the player, intervening to seek individualized morphological improvements according to the requirements of the modality and the playing position. However, Brazil, as well as others in Latin America, do not have anthropometric reference values, which makes this strategy difficult to achieve in its entirety.

Based on what has been exposed, the objective of this study is to determine and compare the morphological characteristics, both in individual variables and in body composition, of soccer players from the Brazilian army according to their game positions.

2. Material & Methods

The characterization of the study according to Thomas, Nelson and Silverman (2015) is descriptive and explanatory as to its objective, as it aims to describe the somatotype, body composition and proportionality of field soccer players and their positions in the game. As for the procedure, the same authors classify it as quasi-experimental because it performs an observational analysis of the performance resulting from different anthropometric proportions of soccer players and their respective positions on the field [6].

The sample was composed of the Brazilian army field soccer team, which participates in national and international competitions in the military circle, composed of 28 male athletes, with more than one year of practice and aged between 26.1 ± 4.2 years. These individuals were divided according to their positions in play: goalkeepers, defenders, central/offensive midfielders, midfielders, laterals and forwards.

The study follows the determinations of resolution No. 466 of December 12, 2012, which determines the norm for conducting research involving human beings. All study participants were instructed about the procedures to be performed in obtaining data collection and after reading the free and informed consent form agreed to sign it, consenting to their participation.

All athletes were submitted to an anthropometric evaluation performed by an anthropometrist with international certification level 3 by the International Society for the Advancement of Kinanthropometry (ISAK), with a technical measurement error of 1.6%. All evaluations followed the standards established by ISAK [7]. For the anthropometric evaluation it was used the protocols of the somatotype Heath & Carter (1967) [8], the body fractionation in five components of Ross and Kerr (1993) [9], the Phantom in body proportionality of Ross and Wilson (1984) [4] and to determine the percentage and body fat (%F) the protocol of Withers (1987) [10]. For a standardization of proportionality values among athletes, the values of anthropometric measurements are converted by adopting the Phantom strategy of Ross and Wilson (1984) [4] and later transformed into z-score Phantom.

It was requested that for the collection of the measurements all the athletes were wearing beach sunga, with the objective of the clothing interfering as little as possible in the collection of anthropometric measurements. For the measurement of body mass and height, the athlete was asked to climb on his back on the scale, previously verified in its accuracy and adjusted when necessary.

The Arm Span or extension of the arms (perpendicular distance between dactylions measured with the shoulders at 90º with the trunk) is composed of seven anthropometric structures: two arm segments (acomiale-radiale), two forearm segments (radiale-stylion), two hand segments (midstylion-dactylon) and by the biacromial diameter. A segmometer (CESCORF, Brazil) was used for its measurement, with an accuracy of 1mm.

To verify the sitting height, a portable stadiometer (CESCORF, Brazil) with a precision of 1 mm and an anthropometric box with measurements of 50 cm (wide), 40 cm (tall) and 30 cm (deep) were used.

To measure the skinfolds (subscapular, triceps, supraspinale, abdominal, front thigh and medial calf) the same scientific model compass (CESCORF, Brazil) with precision of 0.1mm, was used in all measurements with the objective of minimizing the effect of the instrument on the technical error of the measurement (TEM).

The girths (head, chest, waist, relaxed arm, flexed and tensed arm, forearm, upper thigh and calf) were measured with an anthropometric metal tape (CESCORF, Brazil) with a precision of 1mm; and for the breadths (biacromial, anteroposterior chest depth, transverse chest, biiliocristal, biepicondylar humerus and femur) two calipers (CESCORF, Brazil), a small one of 24 cm for smaller diameters and a large 60 cm for larger diameters, both with an accuracy of 1 mm.

Three lenghts were made (acromiale-radiale, radiale-stylion, and midstylion-dactylion) and a segmometer (CESCORF, Brazil) was used with 1mm precision.

Data were compiled in an MS Excel spreadsheet and calculations were performed to determine body composition, somatotype, proportionality and indexes. Means and standard deviations were calculated (anthropometric variables; adipose, muscle, skeletal, residual tissue and skin masses); percentages and z-scores Phantom (z-Phantom) for fat, muscle, bone, skin and residual mass; endomorphy, mesomorphy, ectomorphy, Σ6 skinfolds and body mass index; and estimation of error for body weight and muscle-bone ratio.

The discriminant analysis was performed to establish the discriminatory power of the functions of the physical structure of the players and to distinguish to what extent the absolute dimensions employed discriminate between the playing positions (goalkeepers, defenders, midfielders, laterals and forwards).

The analysis was performed based on the method described in the study by Ross and Wilson (1974) [4], using the z-score Phantom to evaluate differences in means between the playing positions for: body mass, height, arm span, fat mass, muscle mass, bone mass, BMI and muscle-bone ratio (kg).

The program Somatotype v.1.2 was used to design the somatochart that shows the descriptive statistics with the somatotypical profile of each position.

3. RESULTS

Tables 1 and 2 present the results of the anthropometric variables considered in the study, and the z-score values of the Phantom anthropometric model, where it is highlighted that these values have a value between -1 and +1.

Similarities and differences between variables can be appreciated for each playing position, especially in height and arm span (higher in goalkeepers). It is possible to observe that the biacromial diameter exerts influence on the arm span, since this measure refers to approximately 22-25% of its total value. This information implies the need for greater attention when analyzing the scope, in fragmenting it in the segments that compose it and proceeding in the analysis separates it from the mind so that it is possible to identify whether the predominant contribution in the dimension is of the segments of upper limbs or biacromial diameter.

Another important basic measure to be analyzed is body mass, in absolute values the goalkeepers present higher values of body mass, however, when adjusted to the height of each athlete it is possible to observe that the forwards present values in the z-score Phantom of body mass > 1, indicating higher values of body mass, proportionally heavier individuals generate a greater energy expenditure in their displacement during the game.

Comparing the z-score Phantom values of the thigh and calf perimeters of the forwards and laterals, considering the z-score Phantom values of the front thigh and medial calf skinfolds, it is possible to verify that the laterals and the forwards are the ones with proportionally greater muscle volume in these regions.

The same athletes presented proportionally higher value of body mass observing the z-score Phantom of 0.87 and 0.87 respectively, but when performing the analysis considering the z-score Phantom of the waist girth of 1.95 and 1.91 and of the supraspinale skinfold -1.69 and -2.12 and of the abdominal skinfold -1.68 and -1.71 respectively, a lower concentration of fat in the region and a higher muscle volume are identified. These results were like those found by Jorqueira et al (2013) in Chilean players [5].

In general, players have a biiliocristal breadht z-score lower than the Phantom model, and the closer to zero the larger this diameter will be proportionally (Rodríguez-Rodríguez et al; 2019).

This effect corroborates to an increase in body mass. For White (1956) [11] a variation of 3cm to 5cm of the biiliocristal breadht, can cause differences of 10kg in the body mass of the athlete as figure 1.

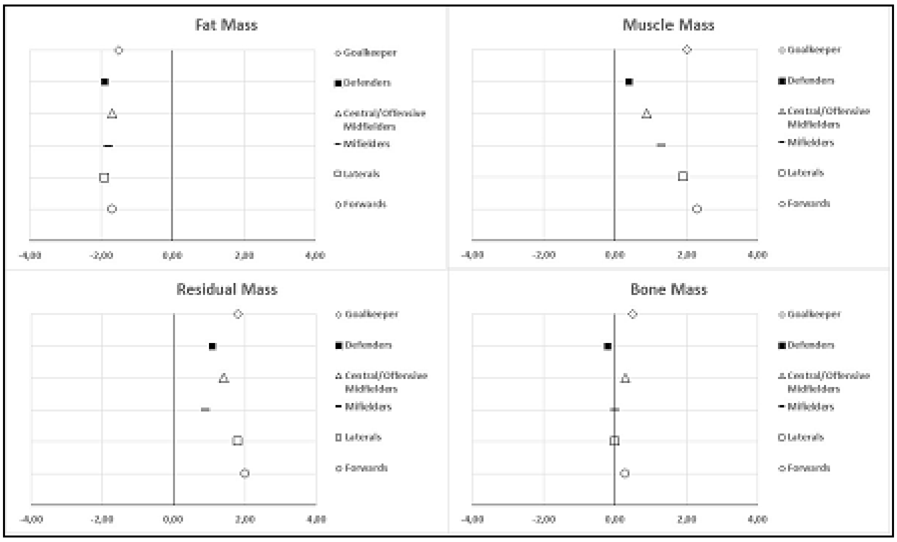

Figure1. *Mass distribution by playing position*

Table 1. *Mean and standard deviation (±) of anthropometric variables by playing position – part one*

		Goalkeepers (n=3)		Defenders (n=5)		Central/offensive midfielders (n=5)		Midfielders (n=6)		Laterals (n=3)		Forwards (n=6)		Overall (n=28)	
		Average	*Z-Phantom*	Average	*Z-Phantom*	Average	*Z-Phantom*	Average	*Z-Phantom*	Average	*Z-Phantom*	Average	*Z-Phantom*	Average	*Z-Phantom*
Basic Measures	Age (years)	25.8 ± 0.7	-	24.5 ± 1.7	-	30.0 ± 5.9	-	25.6 ± 4.3	-	27.3 ± 5.9	-	24.3 ± 2.9	-	26.1 ± 4.2	-
	Body Mass (kg)	88.1 ± 2.0	0,32	79.4 ± 4.2	-0,36	76.1 ± 4.4	0,11	70.0 ± 8.9	-0,11	72.5 ± 1.7	0,39	80.9 ± 11.6	0,87	77.3 ± 8.8	0,20
	Height (cm)	186.2 ± 4.0	-	185.3 ± 3.8	-	179.0 ± 6.3	-	175.5 ± 5.2	-	174.3 ± 8.7	-	176.8 ± 7.9	-	179.2 ± 7.1	-
	Sitting Height (cm)	95.5 ± 3.2	-0,58	96.6 ± 2.8	-0,27	94.3 ± 3.6	-0,06	91.3 ± 3.1	-0,31	93.1 ± 4.3	0,22	92.5 ± 2.5	-0,17	93.7 ± 3.4	-0,20
	Arm span (cm)	189.7 ± 9.2	0,14	186.1 ± 4.7	-0,18	180.0 ± 6.0	-0,15	178.0 ± 8.7	0,04	175.1 ± 7.4	-0,19	178.2 ± 9.4	-0,11	180.8 ± 8.4	-0,08
Lengths (cm)	Acromiale-radiale	35.6 ± 1.8	-0,02	35.2 ± 0.9	-0,10	32.8 ± 1.2	-0,76	33.8 ± 2.9	0,11	32.0 ± 2.0	-0,75	32.9 ± 2.2	-0,48	33.7 ± 2.2	-0,32
	Radiale-stylion	28.7 ± 1.6	1,23	25.9 ± 3.3	-0,56	27.1 ± 0.4	0,87	25.4 ± 0.6	0,08	25.8 ± 2.3	0,45	26.5 ± 1.7	0,69	26.4 ± 1.9	0,40
	Midstylion-dactyllion	20.0 ± 0.5	-0,70	20.1 ± 0.2	-0,47	19.9 ± 0.7	0,08	19.5 ± 0.7	0,01	19.2 ± 1.2	-0,10	19.6 ± 1.2	0,00	19.7 ± 0.8	-0,15
Breadths (cm)	Biacromial	44.0 ± 0.4	1,13	42.1 ± 1.3	0,35	41.6 ± 1.0	0,82	40.9 ± 2.7	0,82	40.3 ± 0.8	0,68	40.6 ± 1.9	0,54	41.4 ± 1.9	0,69
	Transverse chest	29.8 ± 1.7	-0,37	28.8 ± 0.9	-0,85	29.1 ± 2.1	-0,13	26.5 ± 2.6	-1,29	28.2 ± 1.0	-0,20	28.9 ± 2.4	-0,05	28.4 ± 2.2	-0,52
	Anteroposterior chest depth	20.5 ± 0.7	0,87	20.1 ± 1.3	0,69	20.0 ± 4.0	1,10	19.1 ± 1.5	0,77	19.5 ± 1.0	1,15	19.8 ± 1.3	1,12	19.8 ± 1.9	0,94

	Biiliocristal	29.2 ± 2.8	-1,22	28.1 ± 1.0	-1,74	27.2 ± 1.1	-1,70	26.6 ± 1.4	-1,75	27.2 ± 1.6	-1,30	27.5 ± 1.2	-1,31	27.5 ± 1.5	-1.56
	Biepicondylar Humerus	7.8 ± 0.2	1,96	7.6 ± 0.2	1,44	7.8 ± 0.4	2,64	7.1 ± 0.2	1,12	7.2 ± 0.1	1,70	7.7 ± 0.4	2,73	7.5 ± 0.4	1,95
	Biepicondylar Femur	11.0 ± 1.0	1,18	10.7 ± 0.8	0,55	10.7 ± 0.5	1,33	10.1 ± 0.4	0,61	10.8 ± 0.9	2,08	10.4 ± 0.7	1,03	10.5 ± 0.7	1,04

Table 2. *Mean and standard deviation (±) of anthropometric variables by playing position – part two*

Girths (cm)	Head	57.9 ± 1.5	-2,09	55.7 ± 1.0	-3,33	56.9 ± 1.2	-1,29	55.8 ± 1.7	-1,29	56.6 ± 1.1	-0,48	56.1 ± 1.6	-1,31	56.4 ± 1.5	-1,66
	Chest	104.8 ± 1.7	1,54	87.5 ± 24.1	-1,47	97.0 ± 2.5	-1,00	93.9 ± 5.3	0,61	95.9 ± 1.9	1,14	99.4 ± 6.0	1,52	94.1 ± 14.1	0,30
	Waist	86.2 ± 4.2	1,53	81.3 ± 2.6	0,62	80.7 ± 2.5	1,10	76.5 ± 5.0	0,50	82.2 ± 2.5	1,91	82.2 ± 3.7	1,65	80.1 ± 4.3	1,14
	Relaxed arm	32.8 ± 1.1	1,32	31.5 ± 2.7	0,87	30.6 ± 1.1	0,97	29.6 ± 2.5	0,77	29.4 ± 1.5	0,81	32.1 ± 2.4	1,72	31.0 ± 2.3	1,09
	Flexed and tensed arm	34.9 ± 0.9	1,06	33.5 ± 2.4	0,59	32.8 ± 1.3	0,75	31.8 ± 2.6	0,58	31.3 ± 2.0	0,51	34.2 ± 2.7	1,45	33.1 ± 2.3	0,84
	Forearm	28.6 ± 0.7	0,71	27.2 ± 0.8	-0,10	27.4 ± 1.1	0,65	26.0 ± 1.4	0,03	26.1 ± 0.7	0,28	28.3 ± 1.5	1,50	27.2 ± 1.5	0,53
	Upper thigh	57.9 ± 3.6	0,35	55.1 ± 1.0	-0,34	55.7 ± 1.0	0,36	52.2 ± 2.8	-0,22	54.5 ± 1.6	0,56	57.8 ± 3.9	0,86	55.4 ± 3.2	0,24
	Calf	39.7 ± 1.6	0,47	37.1 ± 1.1	-0,50	37.6 ± 1.9	0,24	36.3 ± 1.8	-0,04	38.0 ± 0.5	0,84	38.9 ± 2.5	0,96	37.8 ± 2.0	0,29
Skinfolds (mm)	Triceps	10.3 ± 1.8	-1,33	7.5 ± 1.2	-1,91	9.5 ± 2.4	-1,42	8.7 ± 2.0	-1,56	9.3 ± 0.2	-1,40	9.7 ± 2.7	-1,34	9.1 ± 2.1	-1,51
	Subscapular	10.5 ± 3.3	-1,33	8.9 ± 0.8	-1,78	9.6 ± 2.0	-1,60	9.5 ± 2.6	-1,58	8.2 ± 2.4	-1,80	11.5 ± 1.6	-1,20	9.8 ± 2.2	-1,55
	Supraspinale	9.4 ± 1.9	-1,52	5.93 ± 0.4	-2,23	8.2 ± 3.4	-1,71	6.8 ± 3.3	-1,97	6.1 ± 0.4	-2,12	8.2 ± 1.4	-1,69	7.4 ± 2.4	-1,88
	Abdominal	23.1 ± 6.9	-0,56	13.05 ± 6.3	-1,72	16.2 ± 5.9	-1,28	13.8 ± 7.8	-1,54	12.4 ± 2.7	-1,71	12.8 ± 2.0	-1,68	14.7 ± 6.1	-1,47
	Front thigh	10.5 ± 0.9	-2,09	12.95 ± 3.9	-1,82	11.0 ± 2.2	-1,99	9.5 ± 2.6	-2,14	11.7 ± 2.5	-1,87	11.0 ± 2.6	-1,97	11.1 ± 2.7	-1,98
	Medial calf	7.4 ± 0.6	-1,99	5.5 ± 0.6	-2,34	6.6 ± 1.1	-2,09	6.7 ± 1.5	-2,04	5.6 ± 0.7	-2,26	7.2 ± 2.6	-1,94	6.5 ± 1.5	-2,10

Composition by fractionation of masses, sum of skinfolds and somatotype.

When comparing the percentage adiposity of athletes measured by the body fractionation in five components, it is observed that they are approximately 10% higher than the values of percentage fat measured by the two-component method. This is a cause of confusion, but the basic difference between the two methods is that they assess distinct entities: anatomical adiposity and fat chemically defined. Fat mass is made up of lipids (fat), water, electrolytes and some proteins. The proportion of the lipid bubble within the adipocyte varies according to the degree of obesity of the person. Again, the fractionation of the body into five components presents higher values because it measures the anatomically defined fat mass, with its adipocytes with lipids, water, electrolytes and proteins, while the two-component method measures only the chemically defined lipid part [12].

To provide information and create references for soccer, the present study also used a bi-compartmental model frequently used on the field. Following the guidelines of the study by Reilly et al. (2009) [13], the model adopted was Whiter (1987) [10], which presented greater agreement for male soccer athletes. The same author also recommends in his study that along with the percentage of fat, the sum of six skinfolds (triceps, subscapular, supraspinale, abdominal, front thigh and medial calf) be calculated and also used as a quantification of body fat. When compared to the values found in Whiter's (1987) [10], the defenders, midfielders and laterals presented lower fat percentage values.

The muscle/bone index is calculated by dividing muscle mass by bone or skeletal mass (both in kilograms). Ele describes the degree of development of muscle mass in relation to one of its limitations: bone or skeletal mass.

Table 3. *Mean and standard deviation (±) of anthropometric indices, body composition, somatotype by playing position*

		Goalkeeper (n=3)	Defenders (n=5)	Central/offensive midfielders (n=5)	Midfield (n=6)	Laterals (n=3)	Forwards (n=6)	Overall (n=28)
		Average	Average	Average	Average	Average	Average	Average
Fat Mass	Kg	22.3 ± 3.2	18.5 ± 1.4	18.5 ± 3.1	16.4 ± 2.7	15.9 ± 2.1	17.8 ± 2.6	18.0 ± 2.9
	%	21.7 ± 2.4	24.8 ± 1.9	24.6 ± 3.9	23.4 ± 3.2	21.5 ± 2.0	21.7 ± 1.8	23.4 ± 3.1
	z-score Phantom	-1,5	-1,9	-1,7	-1,8	-1,9	-1,7	-1,7
Muscle Mass	Kg	46.0 ± 2.4	34.6 ± 12.8	34.4 ± 8.3	34.5 ± 6.3	36.8 ± 0.8	41.6 ± 7.1	37.5 ± 8.3
	%	42.5 ± 9.3	42.8 ± 11.0	45.1 ± 7.9	48.5 ± 4.0	49.7 ± 1.6	50.6 ± 2.0	47.0 ± 6.8
	z-score Phantom	2,0	0,4	0,9	1,3	1,9	2,3	1,4
Bone Mass	Kg	11.0 ± 1.3	9.5 ± 0.4	9.6 ± 1.0	8.6 ± 1.3	8.4 ± 1.4	9.2 ± 1.3	9.3 ± 1.3
	%	11.8 ± 1.8	13.0 ± 3.5	12.9 ± 2.7	12.0 ± 0.4	11.2 ± 1.4	11.2 ± 0.9	12.1 ± 2.0
	z-score Phantom	0,5	-0,2	0,3	0,0	0,0	0,3	0,1
Residual Mass	Kg	10.5 ± 1.3	9.3 ± 1.0	9.0 ± 0.8	7.6 ± 1.1	9.1 ± 0.4	9.3 ± 1.4	8.9 ± 1.2
	%	1.8 ± 1.4	12.6 ± 2.7	12.0 ± 1.5	11.0 ± 1.3	12.3 ± 1.0	11.4 ± 1.0	11.6 ± 1.6
	z-score Phantom	1,8	1,1	1,4	0,9	1,8	2,0	1,5
Skin Mass	Kg	4.4 ± 0.1	4.2 ± 0.1	4.0 ± 0.4	3.8 ± 0.3	3.9 ± 0.4	4.1 ± 0.4	4.0 ± 0.3
	%	4.7 ± 0.1	5.7 ± 1.2	5.4 ± 0.6	5.4 ± 04	5.2 ± 0.2	5.0 ± 0.3	5.3 ± 0.6
Somatotype	Endomorphy	2.8 ± 0.5	2.0 ± 0.3	2.6 ± 0.6	2.4 ± 0.8	2.3 ± 0.5	2.9 ± 0.6	2.5 ± 0.6
	Mesomorphy	6.1 ± 1.0	5.2 ± 0.5	6.1 ± 1.0	5.2 ± 0.6	6.1 ± 1.2	6.6 ± 1.2	5.8 ± 1.0
	Ectomorphy	2.1 ± 0.6	3.0 ± 0.6	2.4 ± 1.0	2.7 ± 0.8	2.1 ± 1.3	1.5 ± 0.9	2.3 ± 0.9
Indexes	∑ 6 skinfolds (mm)	71.2 ± 12.6	53.8 ± 8.7	61.1 ± 12.1	66.6 ± 18.4	53.6 ± 0.6	60.4 ± 9.2	58.5 ± 11.6
	Body Mass Index (kg/m²)	25.4 ± 1.0	23.1 ± 1.0	23.8 ± 1.0	22.7 ± 2.1	23.9 ± 1.8	25.8 ± 2.4	24.0 ± 2.0
	Muscle/Bone Index	4.2 ± 0.7	3.7 ± 1.4	3.7 ± 1.1	4.0 ± 0.4	4.5 ± 0.7	4.6 ± 0.5	4.1 ± 0.9
%G	(Withers, 1987)	12.5 ± 2.2	9.5 ± 1.5	10.8 ± 2.1	9.7 ± 2.7	9.4 ± 01	10.6 ± 1.6	10.3 ± 2.0

The normal muscle/bone index range is approximately 3.8 to 4.9 (4.2 ± 0.5) in men and 3.0 to 4.2 (3.5 ± 0.5) in women, which corresponds to the 15th and 85th percentiles and generally covers the range considered normal in statistical terms. The index of all athletes showed a normal behavior, being within the range known in the literature. Defenders and central/offensive midfielders when compared to Chilean athletes evaluated in the study by Rodriguez-Rodriguez et al. (2019) and the Argentine athletes from the study by Bernal-Orozco et al (2020) presented lower values of this index and the other athletes similar values [3,14].

With the combined use of the muscle-bone index and the sum of skinfolds, it is possible to identify the appropriate values of muscle mass and body fat for the athletes.

When compared to the study by Rodriguez-Rodriguez et al. (2019), goalkeepers, midfielders, central/offensive midfielders and forwards presented higher values in the sum of skinfolds [3, 15].

In the somatotype the characteristic of the athletes identified was goalkeepers and forwards endomorphic mesomorphs; central/offensive midfilders, midfielders and laterals balanced mesomorphy; and defenders ectomorphic mesomorphs as shown in Figure 2. The mesomorphism component was predominant in all groups, being differentiated in the defenders, where ectomorphism was the second predominant component, confirming the muscular volume of the laterals and attackers the results behaved similar to the results of the study by Hazir (2010). When compared to the study by Jorqueira et al (2013), the forwards presented a greater amount of the endomorphy component, as well as the defenders who presented a greater amount of the ectomorphy component [5, 16].

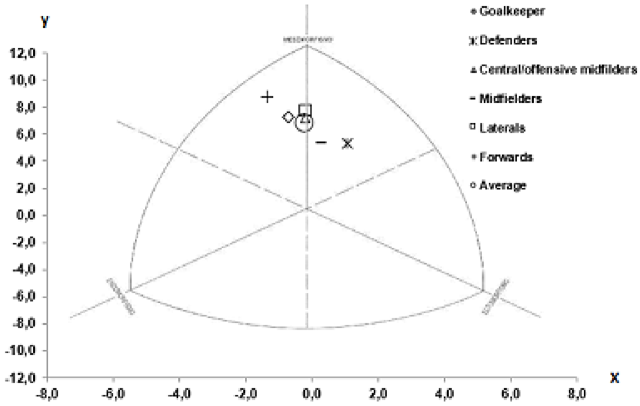

Figure 2. *Somatochart by playing position*

4. CONCLUSION

It is possible to verify that anthropometry can be considered an economic system and of easy execution and analysis, which allows the monitoring and evaluation of the soccer players with a view to the planning and individual training of the players providing a variety of information.

There are differences identified both in anthropometric measurements and in body composition components for each game position, making it possible to define an anthropometric profile of specialization and differentiated training for each game position.

The present study aimed to investigate only the anthropometric characteristics of the athletes and their differences by position, it is suggested from the data found the realization of a second study associating such information to neuromuscular tests with the objective of identifying muscle potential and risk of injuries.

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