Anthropometric and Somatotype Characteristics of Young Soccer Players: Differences Among Categories, Subcategories, and Playing Position

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Abstract

Perroni, F, Vetrano, M, Camolese, G, Guidetti, L, and Baldari, C. Anthropometric and somatotype characteristics of young soccer players: Differences among categories, subcategories, and playing position. *J Strength Cond Res* 29(8): 2097–2104, 2015—Considering that anthropometric parameters are important factors in the performance of the soccer players, the aim of this study was to explore the differences in anthropometric and somatotype characteristics of Italian young soccer players. Weight, height, body mass index, and somatotype of 112 young soccer players, grouped in Giovanissimi "A" (14 years), "B" (13 years), and "C" (12 years) as well as Allievi "B" (15 years) and "A" (16 years) and "Juniores" (older than 17 years), were evaluated. Statistical analysis tests were computed at $p \leq 0.05$, and an analysis of variance for each somatotype was calculated to analyze the main effects and interactions of the factors: categories, subcategories, and playing position. Bonferroni's post hoc analysis was used to identify differences among mean values. Considering all subjects, we have found significant differences in categories, subcategories, and playing position between anthropometric values and a somatotype value of 2.8-3.8-2.9. Significant differences have found among goalkeepers and the others playing position in endomorphy ($p \leq 0.001$) and with defenders and midfielders in ectomorphy ($p < 0.01$) components, whereas no differences in mesomorphy. Analyzing the interaction between subcategories and playing position factors, a significant effect was found only in the endomorphy component ($p = 0.05$). The analysis of anthropometric characteristic of Italian young soccer players indicates that players have high muscularity value and low adiposity. This study showed the presence of somatotype differences for playing position within categories also in the youngest categories and subcategories, in particular, in the endomorphy component. Young soccer players should be trained with more appropriate and specific training load to avoid the increased injury risk during adolescence.

Key Words skinfold, sitting height, endomorphy

Introduction

Soccer is the most common and popular sport in the world, especially among children. It is a multifactorial team sport that depends on a combination of high levels of physical, technical, and tactical skills (4,6,16,33,37,38,41). In addition, various studies (1,16,27,32) have demonstrated that the work rates (i.e., distances covered and the intensity of running) were significantly influenced by age and playing position. In fact, it has been reported that during an adult soccer match, defenders and forwards cover lower mean distance than the midfield players, whereas forwards performs more sprints than defenders or midfielders (16,37,42,45).

Arnason et al. (3) have shown that the anthropometrical profile of the players has been associated with measures of match-related performance and reported that teams with higher fitness levels and lower percent body fat had a higher league ranking, whereas other studies (5,45,48,49) reported that the anthropometry in adult soccer players differs regarding the playing position.

In this way, Sporiš et al. (45) supposed that to perform defense tactical tasks, defenders have to be the highest and the heaviest of the players. Various studies (23,29) have found higher values of height and weight for the goalkeepers and lower value of fat for the defenders.

Somatotype is defined as the quantification of the present shape and composition of the human body, and it is accepted as one of the indicator of physical body

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TABLE 1. Mean ± *SD*s of anthropometric data across categories and subcategories.

	n	Age group (y)	Height (m)	Sitting height (m)	Weight (kg)	Body mass index (kg·m^{-2})
Giovanissimi	63	12.51 ± 0.62	1.60 ± 0.11*†	0.84 ± 0.53*†	52.06 ± 9.60*†	20.22 ± 2.62†
Giovanissimi C	20	11.95 ± 0.21	1.52 ± 0.10‡§	0.79 ± 0.38‡§	47.67 ± 9.00‡§	20.50 ± 3.30
Giovanissimi B	21	12.95 ± 0.22	1.68 ± 0.06	0.85 ± 0.28	56.58 ± 8.54	19.95 ± 1.87
Giovanissimi A	22	14.00 ± 0.00	1.69 ± 0.07	0.84 ± 0.53	60.68 ± 8.38	21.17 ± 1.64
Allievi	33	15.42 ± 0.50	1.74 ± 0.06	0.92 ± 0.36	65.41 ± 9.03†	22.43 ± 2.27†
Allievi B	16	15.00 ± 0.00	1.74 ± 0.05	0.90 ± 0.32§	62.60 ± 8.03	20.69 ± 1.96
Allievi A	17	15.82 ± 0.39	1.75 ± 0.07	0.93 ± 0.34	68.06 ± 9.36	22.12 ± 2.37
Juniores	16	17.44 ± 0.63	1.75 ± 0.05	0.92 ± 0.45	71.30 ± 8.99	23.17 ± 2.40
Total	112	14.31 ± 1.84	1.68 ± 0.11	0.82 ± 0.46	60.27 ± 11.60	21.25 ± 2.52

*$p \leq 0.05$ vs. Allievi.
†$p \leq 0.05$ vs. Juniores.
‡$p \leq 0.05$ vs. B.
§$p \leq 0.05$ vs. A.

structure (10,50). On the basis of physical characteristics and body type, subject is classified in endomorphy (relative fatness with predominance of abdomen over chest, high-square shoulders, and short fleshy neck), mesomorphy (musculoskeletal robustness with big bones, large chest, and waist relative slender), and ectomorphy (linearity or slenderness with small bones, thin muscle, relatively long limb, short trunk, and flat abdominal region). From the original 3 basic components, Carter (9) derived 13 different somatotypes categories. Each category is named to reflect the relationship and dominance among the endomorphy, mesomorphy, and ectomorphy components, for example, 343 is in the "central" category in which no component differs by more than 1 unit from the other 2.

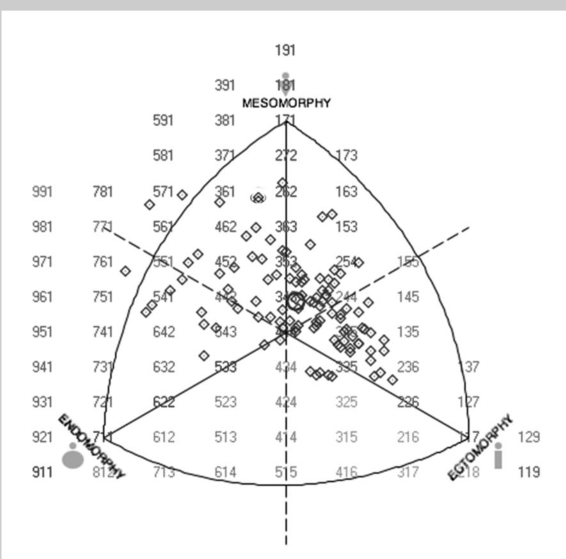

Figure 1. Individual somatoplots of Italian young soccer players (◊) and the mean somatoplot for all players (O).

The ideal somatotype for an athlete differs according to the requirements of the sport (22,28) and the different playing positions (26). Various studies (11,41,42) have shown that the most predominant somatotype component of soccer players is balanced mesomorph (2.5-5-2.5) with high muscularity (63%) and a low fat percentage (7–19%), whereas Casajús (11) showed no significant seasonal variation in the somatotype of adult soccer players from the Spanish First Division (2.6-4.9-2.3 vs. 2.4-4.8-2.39). In addition, Salokun (44) has shown that body types that tended toward the ectomorph seemed to be more susceptible to all types of common injuries than their more sturdy peers.

In the literature, there are fewer data (23,45) available on the somatotype of young soccer players according to playing level and position. To add data, the hypothesis of the study was that characteristic anthropometric differences exist between different playing positions, particularly in the younger categories.

METHODS

Experimental Approach to the Problem

The aim of this study was to explore the differences in anthropometric and somatotype characteristics among categories, subcategories, and playing positions of Italian young soccer players.

To calculate the anthropometric characteristics and somatotype of the soccer players, we used weight, height, skinfolds, and bone breadths. To reduce measurement

TABLE 2. Mean ± *SD*s of somatotype data across categories and subcategories.

Age group (y)	Endomorph	Mesomorph	Ectomorph
Giovanissimi	3.13 ± 1.34*	4.01 ± 1.11*	3.01 ± 1.16
Giovanissimi C	3.90 ± 1.67†‡	4.61 ± 1.50†‡	2.53 ± 1.54†
Giovanissimi B	2.52 ± 0.76	3.58 ± 0.76	3.56 ± 0.82
Giovanissimi A	2.95 ± 1.03	3.79 ± 0.52	2.97 ± 0.70
Allievi	2.42 ± 0.91	3.31 ± 1.03	3.22 ± 1.09
Allievi B	2.31 ± 1.03	3.36 ± 0.65	3.52 ± 0.93
Allievi A	2.53 ± 0.80	3.27 ± 1.31	2.94 ± 1.17
Juniores	2.59 ± 1.23	4.56 ± 1.08*	2.39 ± 0.96*
Total	2.85 ± 1.25	3.88 ± 1.15	2.98 ± 1.13

*$p \leq 0.05$ vs. Allievi.
†$p \leq 0.05$ vs. B.
‡$p \leq 0.05$ vs. A.

variation, all anthropometric measures were taken on the same day (first training day after a soccer match), at the same time of day (between 16:00 PM and 16:30 PM), by the same experienced investigator.

Subjects

One hundred twelve Italian young male soccer players, members of an Italian Young Soccer Club, were engaged at the beginning of the 2013–2014 Italian competitive soccer season (i.e., September to October) to take part in this study. The procedures of the study were approved by the local Scientific and Ethics Committee, and they were carefully explained to each adolescent and their parents who provided their written informed consent. According to young soccer competitions rules, they are organized into annual age groups: Giovanissimi "A" (14 years), "B" (13 years) and "C" (12 years; range: 11-12 years), Allievi "A" (16 years; range: 15-16 years) and "B" (15 years) and Juniores (older than 17 years; range: 17-19 years) soccer players. However, it is allowed to a talented young soccer player to play with the higher categories but not in the lower categories.

All players had an average participation of 8–10 hours of training and competitive play per week (6-hour soccer training sessions and 1–2 games per week).

Anthropometric Measures

To calculate the anthropometric characteristics and somatotype (Heath-Carter Method) of the soccer players, we need 10 anthropometric dimensions: height (in centimeters), body mass (in kilograms), 4 skinfolds (triceps, subscapular, supraspinale, and medial calf, in millimeters), 2 limb girths (arm flexed and calf, in centimeters), and 2 bone breadths (biepicondylar humerus and femur, in centimeters). Weight and height were measured only in light clothes and barefoot using an electronic scale (±0.1 kg) and a fixed stadiometer (±0.1 cm). Sitting height was measured with the same stadiometer used with a 50-cm high wooden box. Body mass index (BMI) was used to assess weight relative to height, and it was calculated by dividing body mass by the squared height (in kilograms per squared meter). A Harpenden's caliper (±0.1 mm) was used to estimate the measurement of skinfold thicknesses, whereas metallic nonextendible tape (Lufkin W606PM; Rosscraft, Surrey, British Columbia, Canada) and branch caliper (Rosscraft, Surrey, British Columbia, Canada) were used to estimate girths and breadths, respectively.

Skinfold and somatotype measurements were taken in triplicate on the right side, and the average value was used for calculation. Somatotype version 1.2.5 software packages were used to analyze the data by Carter and Heath protocol (10):

$$\text{Endomorphy} = -0.7182 + 0.1451\times(X) - 0.00068 \times(X^2) + 0.0000014\times(X^3),$$

where $X =$ (sum of triceps, subscapular, and supraspinale skinfolds) × (170.18/height).

$$\begin{aligned}\text{Mesomorphy} = {} & 0.858\times\text{Humerus breadth} + 0.601 \\ & \times\text{Femur breadth} + 0.188 \\ & \times\text{Corrected arm girth} + 0.161 \\ & \times\text{Corrected calf girth} \\ & -(\text{height}\times 0.131) + 4.5,\end{aligned}$$

$$\begin{aligned}&\text{Ectomorphy according to the height-weight ratio} \\ &(\text{HWR}) = 0.732\times\text{HWR} - 28.58 \ (\text{if HWR} \geq 40.75) \\ &\text{or } 0.463\times\text{HWR} - 17.63 \ (\text{if HWR} < 40.75 \\ &\text{but} > 38.25) \text{ or } \leq 0.1\times\text{HWR} \ (\text{if HWR} \leq 38.25).\end{aligned}$$

Statistical Analyses

All results were expressed as mean values and *SD*s (mean ± *SD*), and the statistical analysis tests were computed at 0.05 level of significance ($p \leq 0.05$). Statistical package for social sciences STAT View software was used to analyze the data. Shapiro-Wilk test was applied to ascertain the normal distribution of data. For each anthropometric (height, sitting height, weight, and BMI) and somatotype (endomorphy, mesomorphy, and ectomorphy components) variables, a 3 (categories: "Giovanissimi," "Allievi," and "Juniores") × 4 (playing positions: goalkeepers, defenders, midfielders, and forwards) univariate analysis of variance (ANOVA) was applied. In addition, for each dependent variable, a 5 (subcategories: Giovanissimi A, B, and C; Allievi A and B) × 4

Table 3. Mean ± *SD*s of somatotype data across categories and subcategories according playing positions.

Category	Variables	Goalkeepers	Defenders	Midfielders	Forwards
Giovanissimi	Endomorph	3.8 ± 1.1	3.2 ± 1.4	2.8 ± 0.9	3.1 ± 1.7
	Mesomorph	4.2 ± 0.3	3.9 ± 1.1	3.6 ± 0.9	4.5 ± 1.4
	Ectomorph	2.1 ± 0.5	3.1 ± 1.1	3.4 ± 0.9	2.6 ± 1.4
Giovanissimi C	Endomorph		4.7 ± 1.6	3.0 ± 0.9	4.3 ± 2.2
	Mesomorph		4.8 ± 1.7	3.9 ± 0.9	5.4 ± 1.8
	Ectomorph		2.0 ± 1.8	3.3 ± 1.2	1.9 ± 1.9
Giovanissimi B	Endomorph	3.9 ± 0.9*†‡	2.2 ± 0.3	2.3 ± 0.6	2.5 ± 0.2
	Mesomorph	4.3 ± 0.2†	3.7 ± 0.6	3.0 ± 0.8	3.9 ± 0.4
	Ectomorph	2.1 ± 0.5*†	3.9 ± 0.4	4.0 ± 0.5	3.1 ± 0.6
Giovanissimi A	Endomorph	3.8 ± 1.5	3.1 ± 0.6	3.2 ± 1.2	2.0 ± 0.1
	Mesomorph	4.1 ± 0.5	3.4 ± 0.3	4.0 ± 0.4	3.9 ± 0.7
	Ectomorph	2.1 ± 0.7	3.2 ± 0.6	2.9 ± 0.7	3.2 ± 0.6
Allievi	Endomorph	4.4 ± 1.6*†‡	2.4 ± 0.6	2.1 ± 0.6	2.2 ± 0.5
	Mesomorph	3.7 ± 0.6	3.1 ± 1.2	3.2 ± 0.8	3.4 ± 1.2
	Ectomorph	2.3 ± 1.1	3.3 ± 1.2	3.3 ± 0.9	3.3 ± 1.1
Allievi B	Endomorph	4.1 ± 2.1‡	2.5 ± 0.6	2.1 ± 0.6	1.7 ± 0.2
	Mesomorph	4.1 ± 0.2	3.4 ± 0.4	3.3 ± 0.9	3.1 ± 0.7
	Ectomorph	2.3 ± 1.6	3.5 ± 0.4	3.4 ± 0.8	4.1 ± 0.8
Allievi A	Endomorph	5.0 ± 0.0*†‡	2.4 ± 0.6	2.1 ± 0.6	2.6 ± 0.3
	Mesomorph	3.0 ± 0.0	2.9 ± 1.6	3.2 ± 0.8	3.6 ± 1.6
	Ectomorph	2.3 ± 0.0	3.1 ± 1.7	3.1 ± 1.0	2.7 ± 1.0
Juniores	Endomorph	6.1 ± 0.0*†‡	2.2 ± 0.9	2.5 ± 1.0	2.4 ± 0.5
	Mesomorph	5.2 ± 0.0	3.7 ± 0.7‡	5.4 ± 0.8	4.9 ± 0.9
	Ectomorph	0.8 ± 0.0	3.1 ± 0.7	2.0 ± 0.8	2.0 ± 1.0
Total	Endomorph	4.3 ± 1.3*†‡	2.9 ± 1.3	2.6 ± 0.9	2.7 ± 1.3
	Mesomorph	4.2 ± 0.6	3.7 ± 1.1	3.8 ± 1.1	4.1 ± 1.4
	Ectomorph	2.0 ± 0.8*†	3.1 ± 1.1	3.2 ± 1.0	2.9 ± 1.3

*$p \leq 0.05$ vs. defenders.
†$p \leq 0.05$ vs. midfielders.
‡$p \leq 0.05$ vs. forwards.

(playing positions: goalkeepers, defenders, midfielders, and forwards) univariate ANOVA was performed.

When a significant effect was found, Bonferroni's post hoc analysis was used to identify differences among mean values.

Results

Mean values, *SD*s, and statistical differences of anthropometric data across categories and subcategories are presented in Table 1.

Considering categories, Giovanissimi have shown statistical differences with the other categories in height ($p < 0.001$), sitting height ($p < 0.001$), and weight ($p < 0.0001$), but only with the Juniores for the BMI (7.8, $p < 0.001$) values. Therefore, Allievi have shown statistical differences with Juniores for the weight ($p \leq 0.05$) and BMI ($p \leq 0.05$) values. Among subcategories, we have found statistical differences in Giovanissimi for height, sitting height, and weight and in Allievi for sitting height.

Individual somatoplots of Italian young soccer players and the mean somatoplot for all players are presented in Figure 1.

Mean values, *SD*s, and statistical differences of somatotype components across categories and subcategories are analyzed in Table 2.

Considering all categories, we found a significant differences between Giovanissimi and Allievi ($p < 0.01$) in endomorphy and mesomorphy and among Allievi and Juniores ($p < 0.005$) in mesomorphy. Among subcategories, we have found statistical differences only in Giovanissimi.

Considering the playing position of all subjects, in this study, we have found that goalkeepers had higher values for height, sitting height, weight, and BMI compared with the others playing position. In particular, the ANOVA test showed statistical differences between goalkeepers and midfielders and forwards ($p \leq 0.05$) in height, between goalkeepers and midfielders ($p < 0.02$) in sitting height, and among goalkeepers and the other playing position in weight ($p \leq 0.001$) and BMI ($p \leq 0.001$), respectively.

Mean values, *SD*s, and statistical differences of somatotype data across categories and subcategories according to playing position are shown in Table 3.

Considering playing position and all subjects, we found a significant difference among goalkeepers and the other players' position in endomorphy ($p \leq 0.001$) and with defenders and midfielders in ectomorphy ($p < 0.01$) components, whereas no differences in mesomorphy.

In Allievi category, significant differences were represented only in the endomorphy component among goalkeepers and the other playing position ($p \leq 0.01$). In Juniores category, we have found a significant differences among goalkeepers and the other playing positions ($p < 0.01$) in endomorphy and between defenders and midfielders in mesomorphy ($p < 0.01$).

Within subcategories, Giovanissimi B have shown significant differences among goalkeepers and the other playing positions ($p \leq 0.05$) in endomorphy, with midfielders ($p \leq 0.05$) in mesomorphy, and with defenders and midfielders in the ectomorphy component. Allievi A has shown statistical significant difference among goalkeepers and the other playing positions in endomorphy ($p \leq 0.05$).

Analyzing the interaction between subcategories and playing position factors, a significant effect was found only in the endomorphy component ($p = 0.05$).

Discussion

The purpose of this study was to explore the differences in anthropometric and somatotype characteristics among categories, subcategories, and playing positions of Italian young soccer players. The main finding of this study was the presence of somatotype differences for playing position within categories also in the youngest age group and subcategories, in particular, in the endomorphy component.

Anthropometric studies in soccer players (39,40,42) have shown that height and body weight are important factors in the performance. Despite at least 4 Juniores have to play in the Italian adult amateur soccer championship (Italian rules), in this study, our Juniores values were lower and lighter than elite adult soccer players (180 cm and 76.9 kg, respectively) (47).

According to the international cutoff point of childhood reported by Cole et al. (12), in this study, mean values of each subcategories and categories were in the "normal weight" range (BMI cutoffs >18.5 and <25, respectively). However, in our study, BMI value was lower than in the study by Perroni et al. (35) for Giovanissimi and Allievi but higher for Juniores, whereas height and weight values were higher than the study by Vivani et al. (46) for 13-year-old soccer players. The study by Gil et al. (23) have investigated relationship between anthropometric and physiological characteristics of young soccer players (14–17 years) and their being successful or not as soccer players. Compared with their study, we have found higher values of weight and BMI in 14 years but lower in 15 and 16 years for both selected and nonselected soccer players. In our study, we have found higher values of height and weight than that reported by Mendez-Villanueva et al. (32) in highly trained young soccer players (younger than 13 to 18 years) and by Gravina et al. (25) in Spanish soccer players aged 10–14 years at the beginning and at the end of the season but lower than reported by Sporiš et al. (45) in Croatian young soccer players (aged 14 or 15 years). Analyzing age from 10 to 13 years, height, weight, and BMI values of our results were higher than the ones reported by Canhadas et al. (8) on Brazilian young male athletes. In addition, Gravina et al. (25) have shown BMI values lower than our study. Compared with results of Di Luigi et al. (15) on Italian soccer players ranging from 10 to 16 years of age, we have found higher values of height and weight in all categories but lower BMI in categories over 14 years. In addition, considering playing position, data of our study are in line with the study by Deprez et al. (14) that have shown higher value of height in goalkeepers (age categories U11 and U15) and significant differences for weight between goalkeeper and all other positions.

When sitting height parameter of the subjects is evaluated, we have found same values of Allievi and Juniores categories (91.85 and 91.80 cm, respectively) than those reported by Brocheire et al. (7) on adult international male soccer players (92.0 cm) belonging to the national "A" squad of the Qatar Football Association. Therefore, despite Allievi A and Juniores had the same height, Juniores had lower values than Allievi A (93 cm) in sitting height. The results of our study were higher than the study by Polat et al. (36) and Figueiredo et al. (21) on Portuguese young soccer players (11–12 years and 13–14 years). Polat et al. (36), examining male children at the age of 16 years, have found sitting height value of soccer to be significantly higher than the sedentary.

Body mass index and standing height are the most used inexpensive tools to evaluate the body composition. Body mass index is used to determine body mass and to correlate it with body fat of athletes, whereas standing height is a global marker that consists of 2 components (sitting height and subischial height) that often grow at different rates and at different times. Considering that leg length and sitting height change differentially during childhood and adolescence (13) and that standing height does not always exactly correlate with the loss of trunk height in children, various studies (18,19) showed that it is more important to monitor changes in sitting height rather than in standing height.

Given that several studies (17,19) have shown that puberty begins at approximately 78 cm of sitting height in boys and a gain in sitting height of 12–13 cm corresponds to puberty, we can hypothesize that the category Giovanissimi C (78.7 cm) has begun the development process. These results were in contrast with the study by Malina (30) that declared that the growth spurt in boys occurs at the age of around 14 years, when the composition of the bodies of young people undergoes rapid changes.

Considering all subjects, we have found a somatotype value of 2.8-3.8-2.9. Results of our study are in line with previous studies (42,46) that have demonstrated the mesomorph prevalence in somatotype of adult and young soccer players. Considering that the game of soccer is characterized by run with different intensities (i.e., high and low) and jump, turns, kicking, and dribbling, we agree with Rienzi et al. (42) who declared that high degrees of muscle mass with low adiposity can prevent excess weight having to be repeatedly lifted during movement. The possession of these advantages by a dominant mesomorphic component allows the player to avoid traumatic injuries derived by contacts and explosive power movements, which characterize soccer more than other sports. In addition, knowledge of the somatotype characteristics of the soccer player could allow a better and faster talent identification and to design an effective physical fitness program. High percentage of muscle mass, with a low fat, could allow the mesomorph to increase the volume and the intensity of the workloads during training. Although not statistically significant, the results of the study by Lago-Penãs et al. (29) have shown that players from successful teams are leaner and more muscular than their unsuccessful counterparts.

The study by Nikolaidis and Karydis (34) showed that somatotype components changed across adolescence too. In their study, endomorphy and ectomorphy decreased, whereas mesomorphy increased to attain the adult soccer somatotype (3-4.9-2.3). In addition, no significant difference was observed between adolescent age groups with respect to endomorphy. A recent study by Gil et al. (24) in soccer players, aged between 14 and 19 years, showed similar values in endomorphy and mesomorphy and a decrease with age only in ectomorphy somatotype (U15: 2.5-4.2-3.4, U16: 2.3-4.3-3.1, U17: 2.6-4.4-2.6, U18: 2.5-4.4-2.6, U19: 2.4-4.3-2.4). Compared with Gil et al. (24), we have found lower values for the players younger than 17 years and higher values for the players older than 17 years. In our study, we have found higher values of endomorphy and ectomorphy (2.5 vs. 1.9 and 3.6 vs. 3.2, respectively) and lower value of mesomorph components (3.6 vs. 4.4) than the study by Vivani et al. (46). Compared with Gil et al. (23), we have found lower values in the endomorphy component of selected young soccer players and in the mesomorphy component of nonselected and selected young soccer players (14, 15, and 16 years of age, respectively). Ectomorphy showed lower values than 14 years and higher than the other categories (15 and 16 years) in nonselected and selected young soccer players. According to the 13 different somatotypes of Carter (9), in our study, we have found endomorphic mesomorphy somatotype in Giovanissimi C and Juniores whereas mesomorphic ectomorph in Allievi B. The other subcategories have shown a central somatotype component. In particular, the central component has demonstrated high frequency in Giovanissimi category ($n = 16$ subjects) and a low frequency in Juniores ($n = 1$). Ectomorphic mesomorph was a predominant component in Allievi and Juniores ($n = 7$ and 6 subjects, respectively). In this study, we have found a different somatotype in soccer players of 12 and 13 years of age (central component) compared with the study by Canhadas et al. (8) where the somatotype were endomorphic mesomorph and mesomorph-ectomorph, respectively. Reilly et al. (40,41) showed that there was a significant difference between elite and subelite English young male soccer players (mean age = 16.4 years) in somatotype components. Our results (2.5-3.3-2.9) were slightly lower of subelite counterparts (2.9-3.8-3.1), whereas Elite players possessed lower endomorphy ratings (2.1-4.0-2.9) than our soccer players.

The results of our study show that there are significant differences in Giovanissimi subcategories and not in Allievi subcategories. Despite the major maturity-related differences in anthropometric (i.e., height and weight) and performance (i.e., strength, speed, and endurance) characteristics of children of the same chronological age, the young soccer competitions are organized into annual age groups according to chronological age. Individual differences in maturational status are associated with changes in physical fitness. Therefore, special attention has to be put on the administration of training loads in the Giovanissimi subcategories where the range of variability between soccer players of the same chronological age in growth changes is large. Indeed, to achieve early success, young coaches ignore that the anthropometric development variability, early specialization, and inadequate workload are some of the major contributors to the increased injury risk during adolescence (2,20,32).

According to previous studies, (31,41,47), we have divided the soccer players into 4 groups: forwards, midfielders, defenders, and goalkeepers. Despite elite soccer players showed a balanced mesomorph somatotype, significant variations are determined for the different playing position (42). Lago-Penãs et al. (29) have found that anthropometric characteristics of young soccer players (range, 12–19 years) differed according to the playing position. In particular, the endomorphy values were higher in central defenders and goalkeepers compared with external midfielders and forwards; highest ectomorphy (2.4-4.0-2.9) and mesomorphy (2.9-4.1-2.6) values in forwards and goalkeepers, respectively. Although we agree with the results of Lago-Penãs et al. (29), we have found a high range of variability in the Giovanissimi subcategories but not in the Allievi subcategories. Rogan et al. (43) showed that the somatotype mean values of the adult amateur soccer players were mesomorph-endomorph. In their study, despite goalkeeper had higher values of the mesomorphy component than defender, midfielder, and striker, they had similar and lower values of endomorphy and ectomorphy, respectively. In addition, their studies have demonstrated that there were no anthropometric and somatotype differences between the soccer teams of different club ranking. The study by Gil et al. (23) has concluded that anthropometric and physiological differences exist among Spanish young nonelite soccer players who play in different positions. In their study, they found forwards with the lowest endomorphy and the highest mesomorphy values compared with the rest of the players positions groups. Results of our study have shown a central component (3-4-3) in defenders, midfielders, and forwards and mesomorph-endomorph component in goalkeepers (4-4-2). In this study, we have found that goalkeepers had higher values for endomorphy (4.3) and mesomorphy (4.2) but lower values for ectomorphy (2.0) compared with the other players' positions. Compared with the other components, high frequency of central, balanced ectomorph, and ectomorphic-mesomorph components was found in "defenders" ($n = 10$ subjects), midfielders ($n = 9$ subjects), and "forwards" ($n = 7$ subjects), respectively. Soccer playing positions demand specific requirements and tasks. In this study, we have found different somatotype characteristic between goalkeepers and the other players' positions from the beginning subcategories. Goalkeepers perform more defending activities (e.g., vertical jumping, tackles, long kicks, and passes) than other playing position that require specific skills (e.g., repetitive vertical and side jumps and dives). For this reason, they should be trained with more appropriate and specific training load than other soccer players should.

Salokun (44) investigated the influence of somatotypes on the injury rate among Nigerian soccer players and showed that the incidence of injury varied considerably from 1 body type to another. They found that 45% of the meso-ectomorphs and 44% of the mesomorphs sustained injuries, whereas 85% of the ectomorphs and 50% ecto-mesomorphs were injured.

Considering results of Salokun (44) and that during adolescence soccer players present significant differences in terms of body composition and physique, further researches would be recommended to ascertain the relationship between somatotype and injuries in young soccer players. The consequences of injuries among adolescent athletes could include long-term deleterious outcomes, such as interference to normal growth and development, physical disability or dysfunction, and negative psychological appearances.

Practical Applications

The analysis of anthropometric characteristic of Italian young soccer players indicates that players have high-muscular value and low adiposity. Considering the evidence of positive relationship between somatotype, the index of fitness (i.e., strength, endurance, balance, speed, agility, and explosive power), and injuries, more attention should be placed on the selection and training of the young soccer player based on the characteristics of the somatotype. As the ectomorph seemed to be more susceptible to the injuries, different and individualized training duration and load should be administered with more care than for the other somatotypes.

On this basis, medical doctors and coaches should work together to identify the physical characteristics of the young player and his needs for the improvement of sport. In fact, with a first and simple evaluation of body size, medical doctors can give important information to the coach that can be used to develop individual soccer-specific fitness programs on the basis of the physical characteristics of a young soccer player. In adolescent athletes, undesirable training responses may impact on normal growth and maturation. Particular attention has to be put on the administration of training loads in the Giovanissimi soccer players because they are susceptible to variable growth changes within the same subcategory. A previous and continuous analysis of somatotype could be an useful tool to avoid a too long time to know the physical characteristics of a young soccer player during puberty.

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