

Anthropology

Somatotype Characteristic of Children and Adolescents from Plovdiv

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The purpose of the present study is to follow the growth dynamics of the three somatotypic components in children and adolescents from Plovdiv at the age from 7 to 18 years, as well as to find the inter-sexual and inter-age differences in their somato-typological characteristic. The investigated sample of this cross-sectional study includes 888 boys and 717 girls. The Heath-Carter method of somatotyping is used. We found specific age changes in the development of the three somatotypic components. The changes in the average somatotype, with age, in both genders, are mainly expressed in coming under contiguous somatotypic categories.

Key words: children, adolescents, somatotype, sex, age.

Introduction

The somatotype is an integral characteristic of the morphological status of an individual. It gives a complex assessment of body shape and structure. The changes that appear in body composition during the growth period draw the attention of modern scientists. Many of them think that there is a distinctive dependency between the characteristics which determine the somatotype, the gender and the age of an individual [2, 4, 5, 6, 7]. The purpose of the present study is to follow the growth dynamics of the three somatotypic components in children and adolescents from Plovdiv at the age from 7 to 18 years, as well as to find the inter-sexual and inter-age differences in their somato-typological characteristic.

Material and Methods

1605 children and adolescents were measured anthropometrically (2006-2007) by the classical methods of Martin-Saller (1957), 888 boys and 717 girls at the age 7-18 from Plovdiv. Somato-typological characteristic was done through the method of Heath-Carter (1957,1990). The data was analyzed with a SPSS statistical set. The reliability of inter-sexual and inter-age differences was checked through ANOVA test.

Results and Discussion

The differences between both genders in the growth rates of the three somatotypic components with the age growing are shown in Fig. 1. The first somatotypic component, Endomorphic, gives a notion about the development of subcutaneous fat tissue and the relative fatness in the physique of an individual. It is the lowest in the beginning of the observed period (2.80 in boys and 3.34 in girls). Up to the age of 12, values gradually increase but the differences between both genders are insignificant. In boys, it reaches its peak of growth at the age of 12 (3.76), it retains at near levels between 12-14 years ($p > 0.05$), and it decreases significantly after the age of 14 ($p < 0.05$) and it changes considerably up to the end ($p > 0.05$). In girls, it reaches its peak of growing two years later – at the age of 14 (4.53) and it retains with scientifically-significant higher values up to the end ($p < 0.05$). The results clearly show that at the age of 13-18 the subcutaneous fat tissue in girls is a relatively bigger part of body composition than in boys.

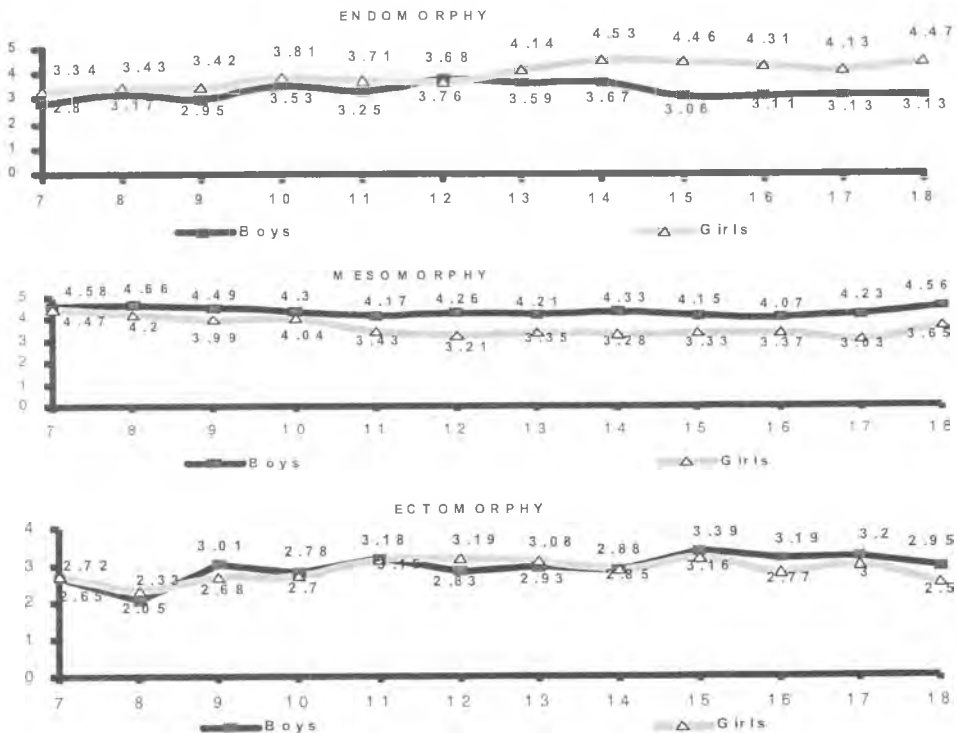


Fig. 1. Growth rates of the three somatotypic components with the age growing

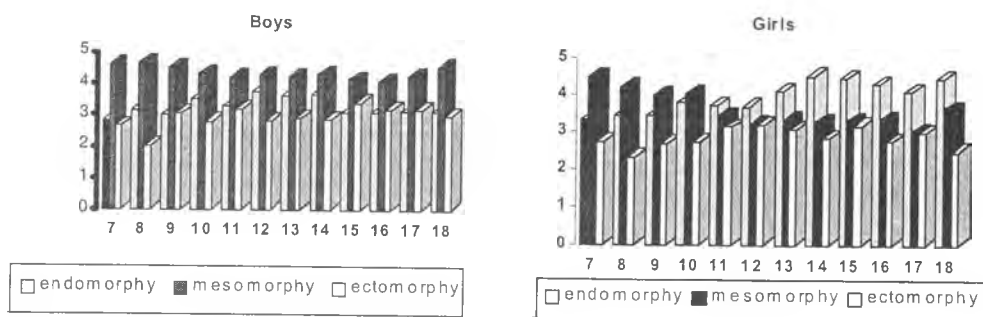


Fig. 2. Average somatotype at the different ages

The second somatotypic component, Mesomorphic, characterizes the muscle-skeletal development towards the height. In 7-year-old children, the mesomorphy has high values in both genders (4.47 in boys and 4.58 in girls). Up to 10 years in boys, the values become higher, scientifically-significant ($p < 0.05$), but at the age of 10 the differences between both genders are insignificant ($p > 0.05$). After this age to the end of the observed period, mesomorphy in girls falls, and in boys it retains relatively stable and scientifically-significantly higher ($p < 0.05$). Hence, at the age 11-18, muscles and the bone tissue in boys develop to a considerably greater extent.

The third somatotypic component – Ectomorphic – gives a real idea about the relative lengthening of body segments and body proportion. This component shows a different variability which responds to the fluctuating changes of the height and weight during the periods of observation. The lowest ectomorphy occurs in 8-year-old children (2.65 in boys, 2.72 in girls). At the next three years (9-11 years), however insignificantly, it is higher in boys and also at the age after 14 years, in girls it is insignificantly higher during the period 11-14, i.e. the changes in the development of this component reflect the specificity of growth processes in both genders.

The summary somatotype gives total information about the body shape and composition, Fig. 2. It is noticeable that in boys mesomorphy has the highest values during the whole period of observation. The changes in its development show differences within the limits of 0.1 to 0.5 units and that reveals the stability of this component and its leading role in the common somatotype for each age. The other two components – endo- and ectomorphic – are lower than mesomorphic and they have near values at the age 9-11. This determines an average somatotype from the category – balanced mesomorphy. Between 12-14 years the significance of endomorphy in body composition in boys increases and that changes the character of somatotype – endo-mesomorphic. After the age of 14 up to the end of observation, the summary somatotype is balanced mesomorphy again. Its characteristics are well-developed bones and joints and strong muscles of limbs as well. Together with this, the moderately-developed fat tissue combines harmoniously with a moderate lengthening of body segments.

In girls the average somatotype at each age also shows specific features. Until the beginning of puberty (at the age of 10) the mesomorphic component is leading, then the endomorphic follows and that determines the endo-mesomorphic somatotype. At the age 11-12 the three components have near values and the summary somatotype becomes central. After the age of 12 the endomorphic component definitely starts dominating and determining a girls' somatotypic characteristic. In the end of the growth period, the summary somatotype in girls is meso-endomorphic. Its specific feature is its more distinguishing subcutaneous fat tissue and relatively moderate muscle-skeletal growth – a characteristic feature of women's body composition.

Table 1. Percentage distribution of the different somatotype categories in both genders

Age	Boys				Girls			
	Endo-	Meso-	Ecto-	Other	Endo-	Meso-	Ecto-	Other
7 years	0	70	10	20	9.52	47.56	9.52	33.33
8 years	0.5	60	0.5	30	8	48	10	37
9 years	3.51	59.65	17.54	19.3	11.48	37.70	16.39	34.43
10 years	14.70	39.71	22.06	23.53	24.10	22.89	25.30	27.71
11 years	10.61	37.88	30.30	21.21	23.26	8.14	38.37	30.23
12 years	22.67	25.33	25.33	26.67	28.92	9.64	36.14	25.30
13 years	18.29	32.93	28.05	20.73	37.04	7.41	34.57	20.98
14 years	21.52	26.58	26.58	25.32	58.21	5.97	23.88	11.94
15 years	9	38	33	20	45.15	10.26	28.21	15.38
16 years	14.10	35.36	28.18	24.16	36.37	11.36	22.72	29.55
17 years	8.79	39.56	32.97	18.68	50	4.55	21.21	24.24
18 years	7.32	51.22	14.63	26.83	47.22	8.33	27.78	16.67

It was a matter of big interest for us to find the percentage distribution of the different somatotype categories in both genders – Table 1. In order to generalize the information and to have a more objective notion of body shape and structure, we combined the 13 somatotypic categories by Heath-Carter in 4 big groups: body types with leading endo-, meso- and ectomorphic component. All the other types we put in the 4th category where two or three components have equal share. In the early age periods 7-9 years, the majority of boys belong to somatypes with a dominating mesomorphic component – between 50% and 70 % of the cases, the ectomorphic types are considerably less -10-17%, and the relative share of the endomorphic types is insignificant – 0-3.5%. At the age between 10 and 14 years, when growth processes are more distinguished, the percentage of mesomorphic boys reduces by half at the expense of the ecto- and endomorphic types. The changes are mainly due to the different ways of development of the morphological sections that form the somatotype, and it does not correspond to the increase of height. This determines the bigger variability of individual typological peculiarities during the puberty. After the age of 14, the fat component of body composition decreases, and that leads to reducing the percentage of boys with endomorphic body type and also to logical increase of the other types, especially the mesomorphic type.

In girls in the initial periods 7-9 years, like in boys, the mesomorphic types of structures are more – 38-48%. At the age of 10 girls are evenly grouped in the four big categories. After this age, the relative share of mesomorphic types sharply falls, while endomorphic progressively rise and dominate up to the end of the study.

On the basis of the results we received, we can draw the following **conclusions**:

1. We found specific age changes in the development of the three somatotypic components. Growth rates display a distinctive sexual dimorphism. The inter-sexual differences in growth dynamics of the endomorphic and mesomorphic components are significant.

2. The skeleton-muscle development in boys is determinant during the whole growth period, while in girls – only to the beginning of the sexual maturity. During the puberty, as well as in the late growth periods, the development of the subcutaneous fat tissue in girls is determinant for the body shape and structure.

3. With age, in both genders, the changes in the average somatotype are mainly expressed in coming under contiguous somatotypic categories: in boys – from a balanced mesomorphy, through a mixed endo-mesomorphy and again to a balanced mesomorphy; in girls – from endo-mesomorphy, through a central type to a meso-endomorphy.

4. In assessment of the relative share of the different body type categories, in both genders, we found a similarity in the prevalent type in the pre-puberty period – meso-

morphic. With the beginning of the intense growth period, some changes start and they are different in both genders: in girls, they lead to a rise in percentage of ectomorphic, and especially the endomorphic body types, while in boys – they lead to retaining the percentage of the mesomorphic types.

Acknowledgements. This study was supported by the National Fund of Scientific Research, Bulgarian Ministry of Education and Science, grant B 1404.

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