EXPERIENCE EXCHANGE

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Comparative Analysis of the Forms and Types of the Lower Extremities Using Anthropometric Indexes

ABSTRACT

In order to conduct a comparative analysis of linear longitudinal, transverse and girth dimensions of the lower extremities and determining patterns proportionality of their structure in various forms of the girls at the age from 17 to 20 of the Saratov region morphometric research was carried out. The basic variants of the anatomical configuration of the free lower limbs; indexes limb proportions depending on their shape; indexes lower limb proportions to the total length of the body depending on their shape; the incidence of various forms of lower limb at brachi -, meso - and dolihomorphic types.

Keywords: lower extremities, morphometric research, the shape of the lower extremities, anthropometric indexes.

INTRODUCTION

Today man has become the object of study of many natural and social sciences. The necessity to study the wave-individual variability of the huge mass of the body shapes of the population determined by the processes of acceleration and retardation, particularly regarding the young age when most of the anthropometric indicators stabilized, knowledge of which is essential for evaluating the prognostic significance of the demographic situation in Russia, clinical medicine and sociology, and finally formed human somatic [1,2,4,5,9].

For a reasoned judgment about the individual characteristics of the lower extremities, including age information about the proportionality of their structure is extremely important. To determine the proportions of the individual segments of the lower limb proportions usually expressed their size as a percentage of the total length of the limb.

The purpose of the research was to investigate the variability of linear longitudinal, transverse and girth dimensions of the available lower limbs and defining patterns of the proportionality of their structure of girls at the age from 17 to 20 years of the Saratov region.

MATERIALS AND METHODS OF RESEARCH

Body morphometry with in-depth study of the metric parameters of free lower limb was conducted among 148 girls at the age from 17 to 20, components the Slavic ethnic group.

For a comparative analysis of the basic sizes and shapes of the lower limbs was determined their full length and the length of the individual segments [6]. To determine the ratio of the individual parts of the body size (aspect ratio) used the most common and available to the general practice - technique index. We studied the following indices:

1) (The length of the lower limb x 100) / length of the body;

2) (The length of the hip x 100) /The length of the body;

3) (The length of the shin x 100) / Thelength of the body;

4) (The length of the foot x 100) / The length of the body;

5) (The length of the hip x 100) / The length of the lower limb;

6) (The length of the shin x 100) / The length of the lower limb;

7) (The length of the foot x 100) / The length of the lower limb.

Depending on the ratio of the legs' length/ body length of the entire contingent surveyed divided into 3 groups: women with dolihomorphic (M+σ), mesomorphic (M±σ) and brachymorphic (M-σ) types of lower limbs.

THE RESULTS OF RESEARCH

The research showed that the ratio (the length of the hip x 100 / the length of the body) consist of51,4% (Table 1). The difference of this indicator among girls with different forms of lower limb is small - only 1,2% (50,7% - 51,9%). The minimum value (the length of the shin x 100) / the length of the lower limb) occurs among girls with a valgus knee clearance form of lower extremities (39,7%), and the maximum - among girls with valgus interfemoral clearance form of lower extremities. The ratio of the foot length to the total length of the lower extremities varies from 25,8% among women with valgus interfemoral clearance form of lower extremities to 27,1% in the group of girls with a valgus knee clearance of lower extremities . The ratio of the length to the upper extremity of the lower limb length in the range of 79,9% to 82,6%, with a mean of 81,4% of this value.

Table 1

Indexes of the lower limbs in proportions depending on their shape

The shape of the lower extremities	Indicators														
	the length of the hip / the length of the lower limb, %			the length of the shin / the length of the lower limb, %			the length of the foot / the length of the lower limb, %			the length of the upper limb /the length of the lower limb, %			the length of thebody/the length of the lower limb, %		
	X ± m	σ	Cv %	X ± m	σ	Cv %	X ± m	σ	Cv %	X ± m	σ	Cv %	X ± m	σ	Cv %
Straight	51,3 ± 0,3	2,0	3,8	40,9 ± 0,4	2,1	5,1	26,5 ± 0,1	0,8	3,0	81,5 ± 0,5	3,0	3,6	57,4 ± 0,5	2,8	4,8
Straight with an interfemoral clearance	51,2 ± 0,4	1,9	3,7	41,1 ± 0,3	1,5	3,6	26,0 ± 0,2	1,1	4,2	80,6 ± 0,6	2,8	3,4	56,8 ± 0,6	2,5	4,4
Valgus	51,9 ± 0,2	1,4	2,6	40,0 ± 0,2	1,6	4,0	26,6 ± 0,1	0,9	3,3	81,2 ±0,5	3,6	4,4	57,2 ± 0,6	4,2	7,3
Valgus with an interfemoral clearance	50,7 ± 0,4	1,5	2,9	41,5 ±0,4	1,4	3,3	25,8 ± 0,3	1,0	3,9	79,9 ± 0,8	2,5	3,1	55,4 ± 1,8	5,9	10,6
Valgus with an knee clearance	51,9 ± 0,4	1,2	2,3	39,7 ± 0,3	0,9	2,2	27,1 ± 0,2	0,7	2,5	82,6 ± 1,3	4,0	4,8	56,6 ± 2,9	8,7	15,3
Varusrhomboid	50,8 ± 0,3	1,7	3,3	40,9 ± 0,3	1,8	4,4	26,9 ± 0,2	1,1	4,0	82,0 ± 0,4	2,6	3,1	58,7 ± 0,7	4,4	7,4
Varustrapezoidal	51,1 ±0,7	1,7	3,3	41,2 ± 0,9	2,0	4,8	27,0 ± 0,4	1,0	3,7	81,6 ± 0,9	2,2	2,6	57,3 ± 0,6	1,4	2,4
Total	51,4 ± 0,1	1,7	3,3	40,6 ± 0,1	1,7	4,4	26,6 ± 0,08	1,05	3,6	81,4 ± 0,2	3,1	3,8	57,3 ± 0,3	4,3	7,6

For general comparative characteristics of lower limb proportions of the individual dimensions of their segments are expressed by us on the conventional method as a percentage of the total body length (Table2).

Table 2

Indexes proportions of the lower limbs to the total length of the body depending on their shape

The shape of the lower extremities	**Indicators**											
	The length of the lower limb/ length of the body, **%**			The length of the hip / length of the body, **%**			The length of the shin / length of the body, **%**			The length of the foot / length of the body, **%**		
	X ± m	σ	Cv%	X ± m	σ	Cv %	X ± m	σ	Cv %	X ± m	σ	Cv %
Straight	53,6± 0,1	1,0	1,9	27,5± 0,2	1,2	4,3	21,9± 0,2	1,2	5,4	14,2± 0,07	0,3	2,1
Straight with an interfemoral clearance	53,8± 0,2	1,1	2,0	27,5± 0,3	1,4	5,0	22,1± 0,1	0,7	3,1	14,0± 0,1	0,4	2,8
Valgus	53,7± 0,2	1,5	2,7	27,9± 0,1	1,1	3,9	21,5± 0,1	1,2	5,5	14,3± 0,06	0,4	2,7
Valgus with an interfemoral clearance	54,7± 0,6	1,9	3,4	27,8± 0,4	1,4	5,0	22,6± 0,3	1,2	5,3	14,1± 0,1	0,4	2,8
Valgus with an knee clearance	52,6± 0,4	1,2	2,2	27,3± 0,2	0,7	2,5	20,9± 0,2	0,8	3,8	14,2± 0,04	0,1	0,7
Varusrhomboid	53,3± 0,2	1,5	2,8	27,1± 0,2	1,3	4,7	21,8± 0,1	1,1	5,0	14,3± 0,08	0,4	2,8
Varustrapezoidal	53,4± 0,3	0,6	1,1	27,3± 0,4	1,1	4,0	22,0± 0,4	1,0	4,5	14,1 ± 0,1	0,3	2,1
Total	53,6± 0,1	1,4	2,6	27,5± 0,1	1,2	4,5	21,8± 0,09	1,1	5,4	14,2± 0,03	0,4	3,0

The ratio of the lower limbs to the total length of the body practically does not differ from women with different forms of feet (52,6 – 54,7%), as well as the ratio of the length of the hip to the total length of the body (27,1% - 27,9%). The maximum value of the index ratio of the length of the shin to the total length of the body occurs among women with valgus interfemoral clearance form of lower limbs (22,6%), and the lowest in the group - with valgus knee clearance form of

legs (20,9%). The ratio of the length of the foot to the total body length among girls with different forms of the lower extremities equally (14,0% - 14,3%).

The incidence dolihomorphic types of lower extremities was 14,8%, mesomorphic types – 84,4% and brachymorphic types – 0,6% (drawing 1).

Dolihomorphic type of lower extremities equally frequent to found at straight form of lower limbs, valgus, valgus with interfemoral clearance and varusrhomboid shaped legs (18.2%) (Table 3). Mesomorphic type - often under the form of valgus (32.0%), and the type of brachymorphic lower extremities is observed only in the varus rhomboid shape.

Table 3

The incidence of various forms of lower limb at brachi -, meso - and dolihomorphic types

The shape of the lower extremities	The length of the lower limb/ length of the body					
	Dolihomorphic types (>55)		mesomorphic types (50-55)		Brachimorphic types (<50)	
	абс.	%	абс.	%	абс.	%
Straight	4	18,2	23	18,4	0	-
Straight with an interfemoral clearance	3	13,6	14	11,2	0	-
Valgus	4	18,2	40	32,0	0	-
Valgus with an interfemoral clearance	4	18,2	6	4,8	0	-
Valgus with an knee clearance	0	-	10	8,0	0	-
Varusrhomboid	4	18,2	28	22,4	1	100
Varustrapezoidal	0	-	4	3,2	0	-

CONCLUSION

Thus, for women with different types of leg shapes characterized by certain patterns of lower limb structure proportionality. Average value (the length of the hip x 100) / the length of the lower limb) - 51,4%; (the length of the shin x 100) / (the length of the lower limb)- 40,6%; (the length of the foot x 100) / the length of the lower limb) – 26,6%; the length of the upper limb x 100) / (the length of the lower limb) – 81,4%; (the length of the body x 100)/(the length of the lower limb) - 57,3%.The most common type of mesomorphic lower extremities - 84.4%, type of dolihomorphic lower extremities - 14.8%, and type of brachymorphic lower extremities - 0.6%.

The practical significance of the analysis of variability of linear longitudinal, transverse and girth dimensions of the free lower limbs and the definition of proportionality laws of their structure among girls at the age from 17 to 20 years of the Saratov region will allow to diagnose some diseases; determine the degree of fitness for a particular profession; it will be useful for arts and crafts designers and artists in the study plastic anatomy; for practical anthropology. Information obtained by you may be used in physical education when choosing a sport; on fitness classes for targeted figure correction. Add information about interstate standardization of the population, the results of which are required for the designing clothes in the textile industry [3,7,8].

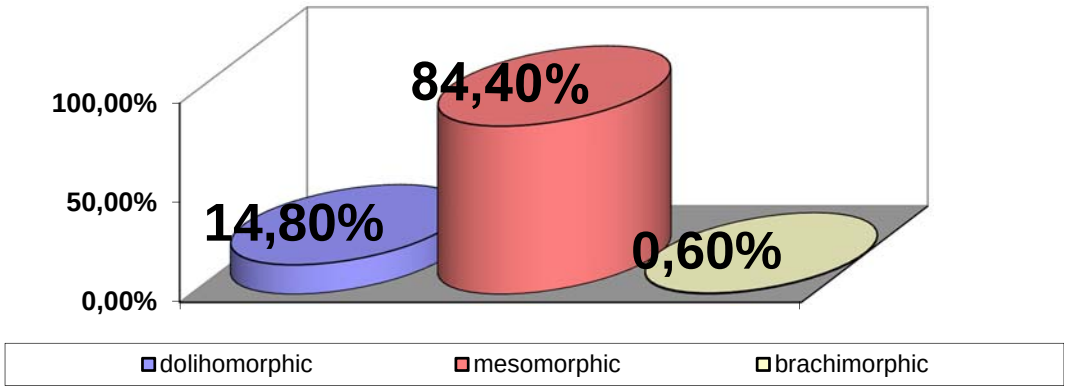

Fig. 1. The incidence of various forms of lower limb at brachi -, meso - and dolihomorphic types (%)

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