ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 6, Issue 9 , September 2019

Features of Growth and Development of Figures of Children of School Age

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ABSTRACT. The problem of designing high-quality and proportionate clothing for schoolchildren that is as appropriate as possible for the size and shape of the child's figure actualizes anthropological studies of children and adolescents. The problem of designing high-quality and proportionate clothing for schoolchildren that is as appropriate as possible for the size and shape of the child's figure actualizes anthropological studies of children and adolescents.

Mass production of clothes and shoes for children (household, school, sports, special, knitwear) involves the manufacture of products not for an individual consumer, but for standard (typical) figures of a limited number of sizes.Therefore, an important task for developers of children's school uniforms is to ensure the anthropometric and psychophysiological correspondence of children's products to the size and shape of the body, taking into account the dynamics of movement, and the growth characteristics of the child's physique during various periods of growth and development.In this work, an anthropomorphological study of children's figures was carried out in order to identify the features of their development in different periods of life.The objects of the study were the figures of girls and boys aged 7 to 16 years.

Peculiarities of the growth and development of children's figures, annual growths of dimensional signs determining dimensions, which are the basis for the development of a new dimensional typology of children and the design of a school uniform adapted to the age-related dynamics of dimensional characteristics of the children's body, are revealed. The introduction of the results of this work at enterprises producing children's clothes contributes to the successful sale of garments and increase consumer satisfaction with commensurate clothing.

KEYWORDS: design, children's clothing, school uniform, anthropological research, dimensional signs, physique, growth dynamics, body length.

I. INTRODUCTION

The problem of designing high-quality and proportionate clothing for schoolchildren that is as appropriate as possible for the size and shape of the child's figure actualizes the conduct of anthropological studies of children and adolescents.

The intensive pace of development and growth of the child's body determines the short life of children's clothing due to the mismatch of its size with the changing anthropometric characteristics of the child's body. As shown by sociological studies, the main reason for buying new children's clothing is usually the replacement of things from which the child grew up. In this regard, it is necessary to improve the methods of parameterization of the design, taking into account the age-related dynamics of the dimensional characteristics of the body of children.

II. EXPERIMENTAL RESEARCH.

In this work, an anthropomorphological study of children's figures was carried out in order to identify the features of their development in different periods of life. The object of the study was selected figures of girls and boys aged 7 to 16 years. Studies were carried out in various regions of Uzbekistan: in Bukhara, Urgench, Namangan, Tashkent and Angren. The calculation of the sample was made taking into account the requirements of

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
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representativeness: the sample included children who differ in territorial, age, professional and social characteristics, place of residence (city, village).

III. ANALYSIS OF THE RESULTS.

One of the main characteristics of the growth process of the human body is a change in body length. From the data given in table 1, it follows that the total increase in body length in boys from 7 to 11 years is 20.5 cm. The maximum increase in body length during the study time falls on the age of 13-14 years and is 8.19 cm, and in girls - on the age of 11-12 and is 7.65 cm (Fig. 1). In general, the graph shows the dynamics of changes in body length of boys and girls by age.

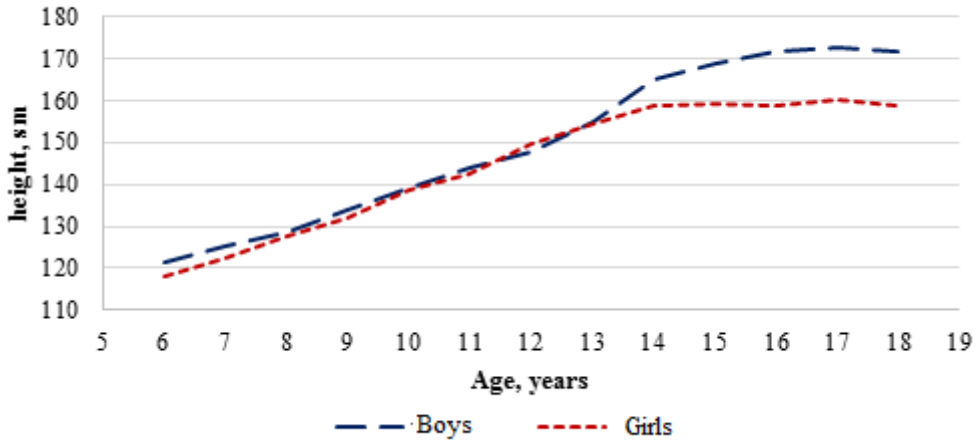
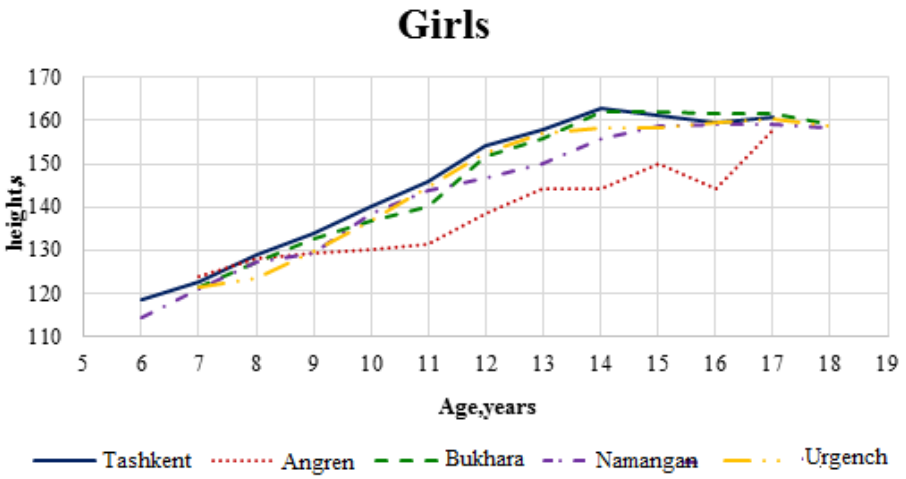


Fig. 1. Graph of growth variability of students of different ages

Body length exhibits age, gender, group, intragroup and epochal variability. The dynamics of changes in the length of the body of boys and girls in different regions (Fig. 2), differs little and generally reflects the dynamics presented in the previous graph.



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International Journal of Advanced Research in Science, Engineering and Technology
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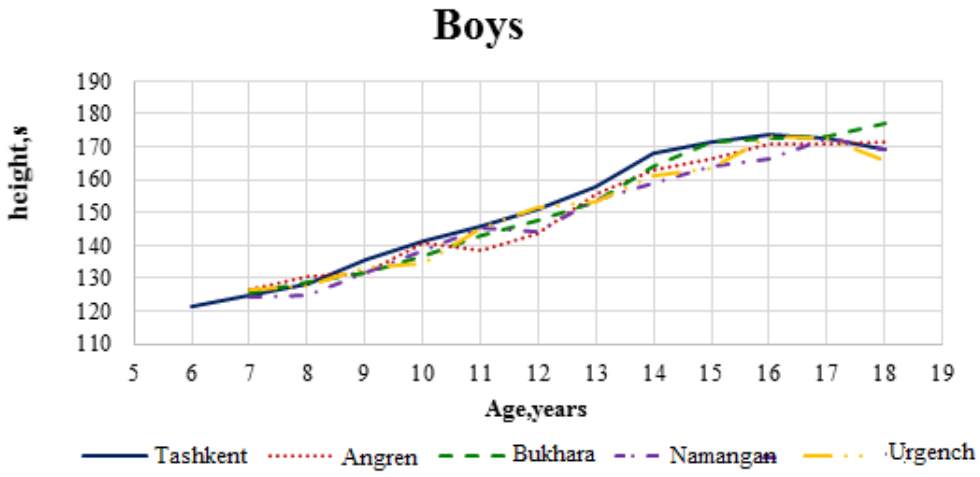

Fig. 2. Graph of age-related dynamics of the body length of girls (1) and boys (2) living in various regions of Uzbekistan

From 10 to 12 years old girls grow somewhat faster than boys. Therefore, the average length of the body of the rods in this period becomes longer than the little ones. By the age of 13, the average body length of little girls and little girls is leveled out, and then the little ones grow faster than fishing rods (Table 1). The large height of the girls over a period of 10–12 years is explained by the fact that puberty and related growth acceleration begin at the girls much earlier (by about 2–3 years) and ends earlier than the little ones. [1] As a result, during a certain period of time, girls are larger than boys of the same age. Anthropologists believe that the body of girls reaches the final length by an average of 16–17 years, and among young men by an age of 18–19 [8].

In anthropology, the so-called anthropometric chest girth, which determines the perimeter of the skeletal base of the chest, is most studied. With age, the girth of the chest is constantly increasing, which is associated with the growth of the bone skeleton, muscles and the subcutaneous fat layer; The age-related dynamics of the chest circumference is shown in Table 1. Thus, the total increase in chest circumference in boys aged 7 to 16 years is 25.33 cm, in girls 26.41 cm. The greatest average increase in chest circumference in boys is ¬ lasts for the age of 13-14 years, and in girls - for 11-13 years and the growth is 5.73 cm (Table 2).

Thus, the age period of 11–13 years in children is characterized by a rapid increase in leading dimensional signs, and from 15 to 17 years, the rate of increase in total size slightly decreases

Table 1.Dynamics of changes in girth of chest size by region, cm

Age,years лет	Regions									
	Tashkent citi		Namangan citi		Bukhoro citi		Urgench citi		Regional average	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
7	61,9	59,62	64,55	60,5	60,68	60,02	63,3	56,85	62,61	59,25
8	65,38	62,16	62,5	63,39	62,62	60,77	61,91	60,04	63,10	61,59
9	65,34	63,94	65,15	62,48	62,84	61,97	66,02	63,25	64,84	62,91
10	67,44	66,18	66,52	67,32	66,59	66,22	66,86	66,77	66,85	66,62
11	72,58	72,57	67,5	70,52	69	66,95	67,83	70,2	69,23	70,06
12	73,98	77,47	69,89	70,76	69,35	72,68	72,39	73,9	71,40	73,70
13	76,99	82,27	73,2	73,4	73,36	77,98	72,92	77,6	74,12	77,81

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

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14	82,02	83,4	79,87	78,05	80,72	79,25	78,03	81,03	80,16	80,43
15	83,88	83,49	83,02	80,39	83,48	84,68	80,7	81,5	82,77	82,52
16	87,89	84,86	86,25	83,9	88,46	85,64	85,82	85,56	87,11	84,99
17	87,3	84,7	90,24	86,16	85,6	87,97	88,61	83,8	87,94	85,66

To study the age-related dynamics of growth of dimensional characteristics of schoolchildren, it is of interest to change the growths of the leading signs: body length and chest circumference.

An analysis of the growth dynamics of the body length of different sex and age groups of schoolchildren (Figs. 1 and 2) by region and a comparison of the results with the data of GOST 17917-86 and GOST17916-86 showed that there is a difference in the development of children. According to our data, in the younger age group of girls from 7 to 11 years of 6 months, body length is from 121 cm to 145 cm, while in GOST 17916-86 from 122 cm to 152 cm. In boys in the same age group according to research results from 125 cm to 145 cm, and in GOST 17917-86 from 122 to 146 cm. In the older age group of boys from 11 years 6 months to 14 years, according to our studies, body length varies from 144 cm up to 168cm; and according to GOST from 152 to 176 cm. For girls in this age group: from 144 cm to 164 cm, and in GOST from 152 cm to 164 cm.

Annual growths of the leading dimensional signs of the body of schoolchildren

Age interval,years	Years growth in body lenth, T1, sm		Breast augmentation, T16, sm	
	Boys	Girls	Boys	Girls
7-8 лет	2,64	4,98	0,49	2,34
8-9 лет	4,98	4,97	1,74	1,32
9-10 лет	4,82	6,66	2,01	3,71
10-11	6,99	5,38	2,38	3,44
11-12 лет	5,16	7,65	2,17	3,64
12-13 лет	4,92	4,01	2,72	4,11
13-14 лет	8,19	4,26	5,29	4,37
14-15 лет	5,78	4,18	2,61	2,09
15-16 лет	2,79	-3,87	4,34	2,47
16-17 лет	1,14	0,50	0,83	0,67

According to the research results, in the teenage age group, the body length of boys aged 14-17 varies from 168 cm to 172 cm, while in GOST from 164 cm to 194 cm. For girls in this age group, from 160 cm to 165 cm, and according to GOST 17916-86. [2] Consequently, for the region under consideration, the assumption of the acceleration process of school-age children and the need to make changes in the size typology and size scales for each region is confirmed [7-10].

The same comparative analysis was carried out on the basis of dimensional characteristic T16- “Breast circumference third."

Studying the growth dynamics of the chest girth of schoolchildren of different age groups (Table 2) by region and comparing the results with the data of GOST 17917-86 and GOST17916-86 showed that there are differences. According to our data, in the younger age group of girls from 7 to 11 years of 6 months, the chest circumference is from 59 cm to 72 cm, while in GOST 17916-86 from 60 cm to 76 cm.

In boys in the same age group according to research results from 60 cm to 72 cm, while in GOST 17917-86 [3] from 60 to 76 cm.

In the older age group of girls from 11 years old 6 months to 14 years according to our research from 72 cm to 83 cm; and according to GOST [2] from 76 to 88 cm. Boys in this age group from 70 cm to 82 cm, and according to GOST [3] from 68 cm to 84 cm.

According to the research results, in the adolescent age group, girls' body lengths from 14 to 17 years old vary from 81 cm to 88 cm, while in GOST from 84 cm to 100 cm. For boys in this age group, from 81 cm to 90 cm, while GOST

ISSN: 2350-0328

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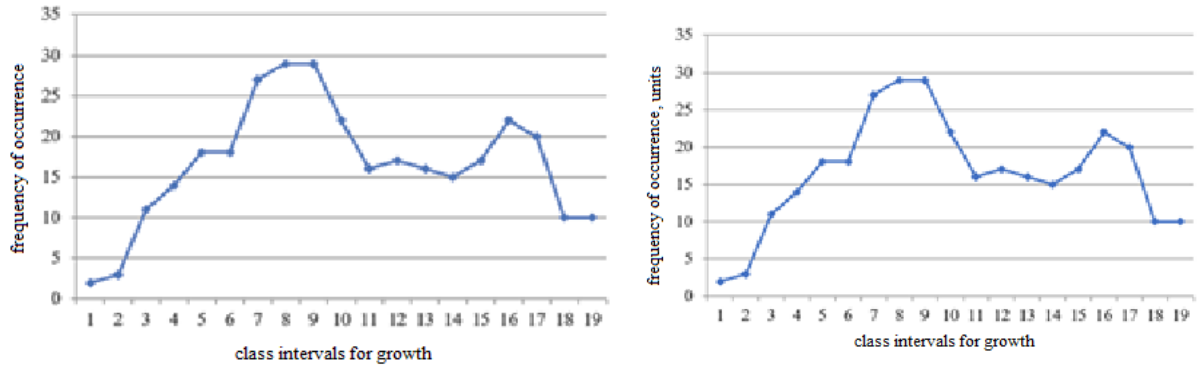
17916-86. The results obtained differ from those of GOSTs [2-5], which confirms the need for changes in the dimensional typology and size-growth scales for the regions under consideration.

An analysis of the variation curves of the distribution of children's figures along the length of the body revealed the most common types of figures that are appropriate for mass production of children's clothing, including school uniforms. Figures 3 and 4 show the distribution curves (variation curves) along the length of the students' body. different age and gender groups by region [8].



Designated by class intervals, cm: 1-114, 2-118, 3-122, 4-126, 5-130, 6-134, 7-138, 8-142, 9-146, 10-150, 11-154, 12 - 158, 13- 162, 14--166, 15--170, 16-174, 17--178, 18--182, 19—186

Fig. 3. Variational curves along the body length (school-age boys, 2019, a) Bukhara, N = 400 units, b) Tashkent, N = 503 units.

designation of class intervals, cm: 1-114, 2-118, 3-122, 4-126, 5- 130, 6- 134, 7-138, 8-142, 9- 146, 10-150, 11- 154, 12- 158, 13- 162, 14- 166, 15- 170, 16-174, 17- 178, 18- 182, 19- 186.

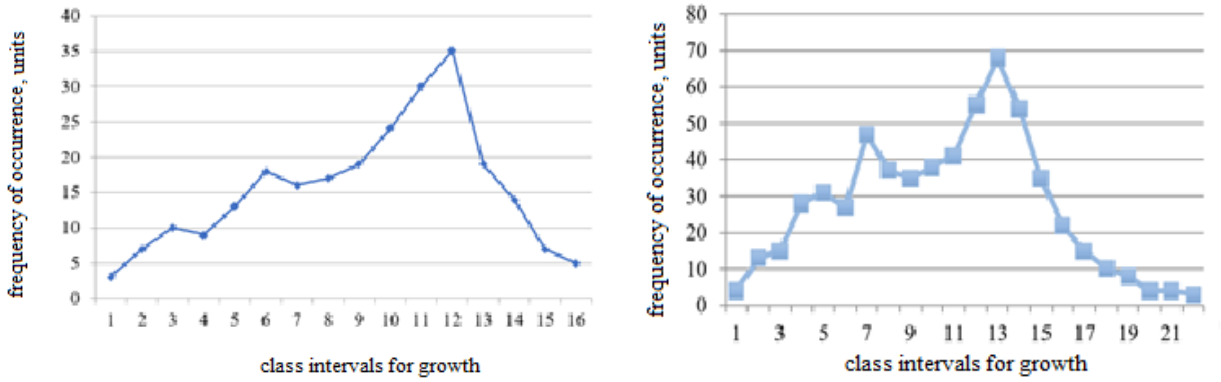


Fig. 4.Variational curves along the body length (girls of school age, 2019, a) Namangan, N = 250 units, b) Tashkent, N = 594 units.

Similar results were also obtained in other regions. An anthropometric study revealed that in children of primary and high school age, in both girls and boys, there is a tendency to change the leading dimensional signs of increasing sideways (Table 1.2) [11-13].

Comparison of the obtained results of anthropometric studies of schoolchildren's figures with the size and height scales used at enterprises shows that enterprises use an outdated scale and unreasonable data to calculate the necessary list of sizes and growths for which enterprises produce clothes. The performed research shows that manufacturers often neglect the manufacture of clothes for some sizes, different full-size groups [6], which reduces the population's satisfaction with the assortment of sizes and growths of manufactured clothes.

IV. FINDINGS

The revealed features of the growth and development of children's figures, the annual growth of dimensional signs that determine the dimensions are the basis for developing a new dimensional typology of children and designing school

ISSN: 2350-0328

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uniforms adapted to the age-related dynamics of dimensional characteristics of the children's bodies. The introduction of the results of this work at enterprises producing children's clothes contributes to the successful implementation of sewing products and increase customer satisfaction with proportionate clothing.

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