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Comparative Characteristics of the Levels of Physical Development of Young Gujarati Males and Females

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ABSTRACT

Purpose of the study: To examine at the sex-based differences in anthropometric and somatotypological parameters of Gujarati young males and young females at the age of 17-21 years.

Materials and methods: The object of the study was a group of 147 young males and 105 young females of the Gujarati ethnicity, at the age of 17-21. Anthropometry was performed with a standard set of instruments followed by entering the data into a specially designed form. The measured parameters included the following: body length, weight, transverse chest diameter, sagittal chest diameter, chest circumference during a pause of breathing, maximum chest circumference now of inhalation, minimum chest circumference now of exhalation, shoulder width, pelvic width; besides that, the difference between the values of the chest circumference during inhalation and exhalation was calculated. The Pignet, Tanner, Erisman, Rhys-Eysenck, and Quetelet II indices were calculated. The results of the anthropometric survey were processed by variational and statistical methods.

Results and discussion: All absolute anthropometric parameters were significantly higher in young men, except for the width of the pelvis and the difference in chest circumference at maximum inhalation and exhalation. The body length of young males averaged 171.75 ± 0.50 cm, for young females this value was 156.83 ± 0.59 cm; the body weight of young males averaged 63.57 ± 1.17 kg, the weight of young females was 53.37 ± 1.09 kg; the value of the biacromial diameter in young males was 39.80 ± 0.17 cm, and in young females, 34.30 ± 0.19 cm; the frontal diameter of the chest in young males was 26.86 ± 0.18 cm, and in young females, 23.03 ± 0.18 cm; the circumference of the chest in young males at the time of the pause of breathing was 87.8 ± 0.68 cm, and in young females 79.96 ± 0.54 cm.

Conclusion: The absolute anthropometric parameters, except for the pelvic width, were higher in young men. Male of athletic body type were characterized by a narrow chest, andromorphy, and normal body weight. The pyknic young males in most cases had a wide chest, a mesomorphic body type according to Tanner's classification and overweight. Young females of the asthenic body type were characterized by a narrow chest, mesomorphism, and underweight. Among young females of an athletic body type, mesomorphism, a narrow chest, and normal body weight were more often observed. Most young females with a pyknic body type had a wide chest, a gynomorphic body type, and overweight.

Key words: Anthropometry, Adolescence, Indians, Body type, Gujarati people

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INTRODUCTION

Humans as a biological species have a high level of morphological and functional variability [1].

The study of the status of physical development of various population groups helps to establish the variants of the norm and limits of the variability of anthropometric parameters, considering the conditions of the ecological situation, dietary habits, the level of physical activity, as well as their relationship with internal factors. At the same time, it can be assumed that climatic, economic, geographic, social, and economic factors play a modifying role in the variability of the organism since the genetic component is largely constant. Some researchers suggest that there is a constant need to analyse the relationship between anthropometric parameters and various socio-economic and demographic indicators in different populations since these factors determine the level of well-being of the population [2,3].

The individual characteristics of the organism and its morphological and functional parameters are associated with the level of physical activity and help to determine the direction of physical training methods to achieve the optimal level of average statistical standards and develop strategies to improve the results in sports competitions [4,5].

The concept of physical development is closely related to the body constitution. Kornetov et al. [6,7] proposes a universal definition of the general body constitution: "The

general body constitution is an integral qualitatively interconnected set of somatic, biopsychological characteristics and behavioural patterns that have developed during anthropogenesis, are relatively stable during a person's life, and, at the level of a holistic individuality, provide a genetically determined way of responding to external and internal changes and influences".

The main manifestation of the body constitution is the somatic type (somatotype) or morpho-phenotype [7]. The somatotype can be determined using the analysis of anthropometric measurements to assess the characteristics of the population as a whole and the individual body separately.

Currently, there is a difference between approaches to assessing physical development in different countries. The lack of a unified standardized typology method makes it difficult to carry out a comparative analysis of research results and explains the interest in this issue [8,9].The study aimed to examine the sex-based differences in anthropometric parameters and somatotypological characteristics of young males and young females of the Gujarati people aged 17-21 years.

MATERIALS AND METHODS

The object of the study was a group of 252 students of the Gujarati ethnic group (India), including 105 young females aged 17-20 years (41.6% of the participants), and 147 young males aged 17-21 (58.3% of the participants). The inclusion parameters were: signed informed consent, age 17-21 for young males and 16-20 for young females (youth age group), Gujarati ethnicity, physical and mental ability to participate in the study. Exclusion parameters: inconsistency with the above points.

The anthropometric study was carried out using standard instruments. Determined anthropometric data (body length, body weight, inter-crestal diameter (pelvic width), frontal (transverse) chest diameter, sagittal chest diameter, biacromial diameter (shoulder width), chest circumference (at maximum inhalation, maximum exhalation, now of breathing pause), chest excursion during breathing) were entered into specially developed forms. According to the parameters obtained, we calculated the following indices: body mass index (Quetelet II), Pignet's index, Erisman's index, Rhys-Eysenck's index, sexual dimorphism index (Tanner's index). The data obtained were processed by the methods of variation statistics using the Statistica software for Windows v.10.0. The distribution normality was checked using the Kolmogorov-Smirnov test at a significance level of $p<0.05$. The distribution of the described anthropometric features was determined as close to normal.

The significance of differences between the groups was assessed using the Kolmogorov-Smirnov test at a significance level of $p<0.05$.

RESULTS

All absolute anthropometric parameters were significantly higher in young men, except for the width of the pelvis and the difference in chest circumference at maximum inhalation and exhalation. The body length of young males averaged 171.75 ± 0.50 cm, which is 9.5% higher than this parameter for young females (156.83 ± 0.59 cm). The body weight of young males on average was determined to be 63.57 ± 1.17 kg, and for young females, it was 53.37 ± 1.09, 19% less. The difference in the biacromial diameter in young males (39.80 ± 0.17 cm) and young females (34.30 ± 0.19 cm) was 16.0%. The frontal diameter of the chest in young females was 23.03 ± 0.18 cm, which is 16.6% less than this indicator in young males (26.86 ± 0.18 cm). The sagittal diameter of the chest in young males was 18.48 ± 0.69, which is 13.2% more than in young females (16.32 ± 0.17 cm). The chest circumference in young males at the time of the breathing pause was 87.8 ± 0.68 cm, and in young females, it was 79.96 ± 0.54 cm (9.8% less). The maximum chest circumference in young males and young females differed by 7% (90.90 ± 0.69 cm and 84.83 ± 0.63 cm, respectively), while the minimum one differed by 8.9% (82.89 ± 0.69 and 76.17 ± 0.63 cm, respectively) (Table 1).

Table 1: Comparative characteristics of anthropometric parameters.

	Young males (M ± m)	Young females (M ± m)	Validity of differences
Body length, cm	171.75 ± 0.50	156.83 ± 0.59	p<0.05
Body weight, kg	63.57 ± 1.17	53.37 ± 1.09	p<0.05
Biacromial diameter, cm	39.8 ± 0.17	34.30 ± 0.19	p<0.05
Intercostal diameter, cm	26.7 ± 0.23	26.40 ± 0.22	p>0.05
Frontal chest diameter, cm	26.86 ± 0.18	23.03 ± 0.18	p<0.05
Sagittal chest diameter, cm	18.48 ± 0.69	16.32 ± 0.17	p<0.05
Chest circumference (during breathing pause), cm	87.8 ± 0.68	79.96 ± 0.54	p<0.05
Chest circumference at maximum inhalation, cm	90.90 ± 0.69	84.83 ± 0.63	p<0.05

Chest circumference at maximum exhalation, cm	82.89 ± 0.69	76.17 ± 0.63	p<0.05
Chest excursion, cm	7.96 ± 0.17	8.77 ± 0.23	p<0.05

When interpreting the Pignet index, it was found that among the young representatives of the Gujarati ethnic group, 40.2% had an asthenic body type, 37.3% had an athletic type, and 22.5% had a pyknic type. When comparing the results of the two groups, it was found that the asthenic body type was observed in 42.9% of cases among young females and in 37.4% of cases among young males. Among the young females, the athletic body type was found 1.2 times more often, and the pyknic type occurred 1.06 times less often.

The Rhys-Eysenck index showed that the asthenic body type prevailed among young Gujarati people, amounting to 61.4% of the total (75.2% of young females and 47.6% of young males), the normosthenic type was less common, occurring in 33.2% of cases (22.9% young females and 43.6% of young males), and the pyknic type was found in 5.4% of cases (1.9% of young females and 8.8% of young males).At the same time, the number of asthenic young females was 1.6 times greater than that of young males, and the normosthenic and pyknic body types were found less often than in young males, by 1.9 and 4.6 times, respectively.

The Erisman index was used to assess the proportionality of the chest. The majority (45.3%) had a narrow chest, fewer participants (35.5%) had a proportional one, and wide-chested participants were observed in 19.2%. Among the female participants, a wide chest was least often observed (18%), the narrow chest was more common (45.7%), and a proportional one was found in 36.3% of cases. A similar distribution was observed among young males: a wide chest was observed in 20.4% of cases, a proportional chest in 34.7%, and a narrow chest in 44.9%. When comparing the two groups, it was found that young males had a wide chest more often by 13.3%, and proportional (by 4.6%) and narrow chests (by 1.8%) were more often observed in young females.

When analyzing the distribution by the index of sexual dimorphism, the following results were obtained. The majority of young females and young males had a mesomorphic body type (58.2% and 49%, respectively). The second most frequent body type in young females was defined as gynecomorphic (29.5%) and exceeded this indicator in young males by 9.8 times. At the same time, in males, the andromorphic body type was found 3.9 times more often than in young females and amounted to 48%. At the same time, among the participants in general, the mesomorphic body type was more common (53.6%), the andromorphic type was in second place in frequency (30.1%), and the gynecomorphic type was observed in 16.25% of cases.

The body mass index showed that most participants in both groups had a normal body weight (54.6%), 25.9% were underweight, 14.6% were overweight, and 4.9% were obese. At the same time, normal weight was observed in 51% of young males, which is 1.1 times less frequent than in young females (58.1%). Insufficient body weight in young men was 1.4 times more frequent (29.9%) compared with the representatives of the second group (21.9%). Excess weight among young females was observed in 14.3% of cases, and among young males by 4% more (14.9%). In young females (5.7%) obesity was determined 1.4 times more often than in young males (4.2%).

In the groups divided by the Pignet index into asthenics, athletes and pyknics, we studied the distribution according to the Quetelet II, Erisman, and tanner indices. It was found that all young asthenic men had a narrow chest, and in the group of young females, a narrow chest was determined in 39% of cases, and a proportional one in 1%.

According to the Quetelet II index, insufficient body weight was observed in young males 1.4 times more often than in females, while normal weight was found 2.4 times more often among young females. According to the index of sexual dimorphism, the gynecomorphic body type was observed by 9.8 times more in young females, the andromorphic body type was more often observed in young males (by 3.3 times), and the mesomorphic type was found in 20.4% of young males and 21.9% of young females.

In the group with an athletic body type, a narrow chest was found with almost the same frequency (in 25.9% of young males and 25.7% of young females). The proportional and wide chest was observed more often in young females (1.7 and 2.8, respectively).

The gynecomorphic body type, as in the previous group, was observed more often in young females, (21 times more often). The andromorphic type prevailed in young men by 5.2 times. The mesomorphic body type according to the index of sexual dimorphism was found 1.7 times more often in young females. Normal body weight was determined in all male athletes (34.7%), and 37.2% of the young females. Excess weight was observed in athletic young females in 5.7% of cases.

Obesity was observed only in people with the pyknic body type, 1.4 times more often in young females. Normal weight and overweight were observed more often among young men by 3.1 and 1.7 times, respectively. Studies of the index of sexual dimorphism showed a picture like the previous groups. Andromorph prevailed in young males by 4.5 times, and gynecomorphy prevailed in young females by 2.1 times. Mesomorphism in young males was observed in 13.6% of cases, and in young females in 11.3% of cases (Table 2).

Table 2: The ratio of the frequency of occurrence by somatotypological indices.

	Young males			Young females		
	Asthenic body type (37.4%)	**Athletes (34.7%)**	**Pyknic body type (27.9%)**	**Asthenic body type (40%)**	**Athletes (42.9%)**	**Pyknics body type (17.1%)**
Distribution of participants according to the Erisman index, %						
Narrow chest	37.4	25.9	2	39	25.7	0
Proportional chest	0	6.8	2.7	1	11.5	1.9
Wide chest	0	2	23.2	0	5.7	15.2
Distribution of subjects by the Tanner index, %						
Andromorphic body type	15.6	19.7	12.9	4.8	3.8	2.9
Mesomorphic body type	20.4	14.3	13.6	21.9	24.8	11.3
Gynecomorphic body type	1.4	0.7	1.4	13.3	14.3	2.9
Distribution of participants by body mass index, %						
Obesity	0	0	4.1	0	0	5.7
Overweight	0	0	15	0	5.7	8.6
Normal body weight	7.5	34.7	8.8	18.1	37.2	2.8
Underweight	29.9	0	0	21.9	0	0

DISCUSSION

Currently, there is no enough data on the anthropometric characteristics of Indian young males and young females aged 18-21 years in Russian and foreign literature. The data obtained on the variant anatomy of the greater palatine canal differ from the data obtained in other studies. Perhaps this is since our studies were conducted only in men of the first mature age; in the studies of other clinicians, gender differences and age categories were not considered. In research. Thus, according to studies of the parameters of Indian male athletes conducted in 2010 [10], their average height was determined in the range of 166.84-172.13 cm, and their body weight varied from 62.13 kg to 72.65 kg, depending on the field of sports. The study of anthropometric characteristics of young male basketball players in 2013 [11] was aimed at identifying the relationship between the measurement data and the position of the players. This study showed that the average height of defenders was 177.94 ± 6.57 cm, their weight was 57.82 ± 4.89 kg, the height of the attackers was 181.70 ± 5.70 cm, and their weight was 63.27 ± 5. 39 kg, the height of the centre players was determined to be 192.82 ± 5.58 cm, and their weight was 70.03 ± 11.57 kg. In 2011, a comparative study of the parameters of physical development of professional cricketers and young men of the control group who were not professional athletes was carried out [12]. The average height of athletes in that study was determined to be 169.3 ± 6.69 cm, their body weight was 60.21 ± 9.92, while the body length of representatives of the control group averaged 173.2 ± 4.15 cm, and their body weight was 71, 12 ± 9.92 kg. When comparing the results of this study and the data of the control group, it was found that the height difference was 0.8%, and in body weight, it was 11.9%. A 2013 study showed the results of comparing the parameters of the physical development of female basketball players and the control group [13]. According to these data, the average height of athletes was 160.32 ± 7.41 cm, and their body weight was 53.88 ± 7.56 kg. In the control group, the body length was 159.17 ± 6.05, and the body weight was 51.83 ± 8.97 kg. Comparing the results of the control group (young females who did not play sports at a professional level) with the data of our study, we found that the difference in data for body length was 1.5%, and the difference in body weight was 3%.

CONCLUSION

The absolute anthropometric parameters, except for the pelvic width, were 7-19% higher in young men. Young men of asthenic body type had a narrow chest, most of them had an underweight and mesomorphic body type according to the index of sexual dimorphism. Male of athletic body type were characterized by a narrow chest, andromorphy, and normal body weight. The pyknic young males in most cases had a wide chest, a mesomorphic body type according to Tanner's classification, and overweight. Young females of the asthenic body type were characterized by a narrow chest, mesomorphism, and underweight. Among young females of an athletic body type, mesomorphism, a narrow chest, and normal body weight were more often observed. Most young females with a pyknic body type had a wide chest, a gynecomorphic body type, and overweight.

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