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Regional Patterns of Gender Differences in Body Build in Modern Human Populations

Marina Negasheva[1], Elena Godina[2]

[1]Lomonosov Moscow State University, Moscow, Russia
[2]Institute and Museum of Anthropology, Lomonosov Moscow State University, Moscow, Russia

ABSTRACT

One of the most important aspects in modern anthropological research is the study of the level of sexual dimorphism in morphological characteristics, because its variability in different populations may serve as an indicator of the influence of environmental factors, including those of ecological and social stress. The aim of this paper is to study the regional differences in variations of sexual dimorphism indicators in morphological characteristics of various population groups in Russia and the neighbouring countries. Complex anthropological investigations of students were carried out in several cities of Russia (Moscow, Samara, Arkhangelsk, Saransk) and neighbouring countries (the city of Tiraspol, Transdniestrian Moldavian Republic), as well as in the villages of Zubovo-Polyansky district of Mordovia. Data on 756 young women and 651 young men, mostly of Russian ethnicity, between 17 to 23 years of age (total number 1407 individuals) are presented in this paper. The programme included the following measurements: height and body weight, shoulder and pelvic breadth, circumferences of trunk and extremities, skinfolds thickness. To evaluate the level of sexual dimorphism the following indices were used in this study: coefficient of sexual dimorphism according to Deryabin, index of sexual dimorphism according to Tanner, and Mahalanobis distances between male and female groups obtained by multivariate discriminant analysis. Despite of some mosaic patterns in separate somatic traits, young men and women from Moscow were the tallest among their counterparts from other regions, with the lowest values of subcutaneous fat layer. The analysis of all sets of measurements (skeletal traits, circumferences, skinfolds) revealed minimal level of sex differences in Moscow students when compared to young men and women investigated in other areas (Arkhangelsk, Samara, Saransk, Tiraspol and the villages of Mordovia). In Moscow as compared to other regions, the highest frequency of girls with andromorphic body type occurred (32%) and the lowest frequency of those with the gynecomorphic type (6%), which was the reflection of the trend towards relative somatic masculinity of modern young women living in Moscow megapolis.

Key words: *anthropology, sexual dimorphism, somatic traits, regional differences, Russian students*

Introduction

One of the most important aspects in modern anthropological research is the study of the level of sexual dimorphism in morphological characteristics, because its variability in different populations may serve as an indicator of the influence of environmental factors, including those of ecological and social stress. According to the "evolutionary theory of sex" formulated by V.A. Geodakyan, sexual dimorphism in each character is connected with its evolutionary history and direct influence of changing environment[1,2]. Certain relationship between the degree of sexual dimorphism and environmental conditions including the influence of environmental stress in different populations of the world, was shown by H.M. Danzeiser[3]. Some authors stated that the mechanism of defense reaction can be based on the impact of different levels of sex hormones on the formation of morphological status[4,5]. However the question of how exactly morphological characteristics are changing in men and women under the influence of environment, remains unclear. Thus, some authors think that male sex is more sensitive and reacts stronger and faster to the changes of environmental factors[6-15]. Other researchers suggest that unfavourable living conditions affect the whole population and increase traits variations to compensate the imbalance with the environment[16-18].

Hence, the study of regional difference in variations of sexual dimorphism indicators in morphological characteristics of various groups of modern population seems currently important and represents the aim of this study.

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In accordance with this aim, one of the most important task of the study was to compare the level of sexual dimorphism in different systems of somatic characteristics in young generation investigated in several cities of Russia and neighbouring countries.

Materials

Complex anthropological investigations of modern students were carried out in several cities of Russia (Moscow, Samara, Arkhangelsk, Saransk) and neighbouring countries (the city of Tiraspol, Transdniestrian Moldavian Republic), as well as in the villages of Zubovo-Polyansky district of Mordovia. Data on 756 young women and 651 young men, mostly of Russian ethnicity, from 17 to 23 years of age (total number 1407 individuals) are presented in this paper. Ethnicity was evaluated by the questionnaire and was important for comparison of different samples.

The programme of morphological investigation included the following measurements: height and body weight, shoulder and pelvic breadth, circumferences of trunk and extremities, skinfold thickness.

The choice of the settlements was determined by the fact that in each of those regions (cities etc.) one of the ecological or socioeconomic factors was dominating, which could influence morphofunctional adaptation potentials in modern students. For example, Moscow students were mostly affected by huge population density of this megapolis (number of people 12,330 mlns., density 4,832 ind./square km), high level of psychoemotional stress, higher levels of life quality and health care; Samara is a big economical, transport, scientific, educational and cultural center of Volga-river area with the population more than 1 mln. people (1,170 mln., density 2,162 ind./square km), with high degree of atmospheric pollution and absence of ecological reserve. Saransk – the capital of Mordovia Republic, and Arkhangelsk – the administrative center of Arkhangelskaya region and Primorsky municipal district, are also big cities with the population from 250,000 to 500,000 people. Besides, Arkhangelsk is located in the area with difficult climatic conditions in comparison to other studied locations. In Mordovia villages (Zubovo-Polyansky district) the population number was around 55,000 people.

Tiraspol is the capital of Transdniestrian Moldavian Republic; its political, scientific, economical and cultural center. Climate is more favourable comparative to other studied localities: winter there is short and mean annual temperature is +9.6 °C.

Sample organization was based on voluntary participation in the survey, in accordance with bioethical principals (expert agreement of Bioethical Committee of Lomonosov Moscow State University, application N 22-ch, protocol N 55 of 26.03.2015). Informed consent protocols were signed by each participant, all obtained data were depersonalized.

Methods

To evaluate the level of sexual dimorphism two indices were used in this study: coefficient of sexual dimorphism (CSD)[19] and index of sexual dimorphism (ISD)[20].

$$CSD = \frac{M_m - M_w}{S^2}, \text{ where } S^2 = \sqrt{\frac{(N_m - 1)\cdot S_m^2 + (N_w - 1)\cdot S_w^2}{N_m + N_w - 2}},$$

where N – sample size, M – mean value for men and women, S – standard deviation in male and female samples, N – number of investigated men and women.

ISD = 3 x SB – PB,

where SB – shoulder breadth (biacromial diameter), PB – pelvic breadth (bi-iliac diameter).

Tanner's index[20], calculated on the anthropometric data of Oxford students (237 men and 173 women), is widely used in many studies, both in Russia[21-24], and abroad[25].

For young men the index values more than 93.1 characterize andromorphic traits of body build, values from 83.7 to 93.1 – mesomorphic ones, less than 83.7 – gynecomorphic ones. For the girls values of the index less than 73.1 characterize gynecomorphic traits of body build, values from 73.1 to 82.1 – mesomorphic ones, and more than 82.1 – andromorphic ones[21-24].

For the study of regional and gender differences in morphofunctional characteristics of modern populations, canonical discriminant analysis was used as a main multivariate statistical method[26-27]. Its results not only reveal the main trends in intergroup variability of traits but also allow to obtain a quantitative estimate of the level of sex differences un the populations under study.

In addition, Mahalanobis distance was calculated between male and female subsamples, which could be considered as a complex universal characteristic of sexual dimorphism value in the group. Similar method based on calculating of multivariate distances and introduced by Bennet was used by many authors[28-30].

The analysis was performed both for the separate sets of morphological traits and for the whole complex of anthropometric measurements. In this way, the calculated value of Mahalanobis distance evaluates the level of sexual dimorphism for each sets of measurements characterizing the development of certain morphological systems (body mass components: bone-muscular, fat), and for the whole data set.

Statistical analysis was performed with the package «*Statistica-10.0*».

Results

Mean values of anthropometric measurements – characteristics of body build for young men and women investigated in different locations are presented in Table 1.

Comparative analysis of regional differences in somatic traits of male samples revealed that the tallest among

TABLE 1
MEAN VALUES OF THE ANTHROPOMETRIC TRAITS FOR THE YOUNG MEN (M) AND WOMEN (W) STUDIED IN DIFFERENT REGIONS

Trait	Locality											
	Moscow		Samara		Arkhangelsk		Tiraspol		Villages of Mordovia		Saransk	
	M	W	M	W	M	W	M	W	M	W	M	W
Height, cm	178.4	166.2	176.2	163.9	176.0	163.8	176.6	164.2	175.2	162.2	178.7	163.5
Weight, kg	69.0	57.9	68.1	56.5	71.0	56.8	69.2	57.9	66.6	54.9	73.9	55.0
Body Mass Index, kg/m2	21.7	20.9	21.9	21.0	22.9	21.1	22.2	21.5	21.6	20.9	23.1	20.6
Biacromial diameter, cm	39.7	35.8	39.7	35.5	39.8	34.9	40.0	35.3	...	...	...	...
Bi-iliac diameter, см	28.0	27.5	28.4	27.6	28.6	27.7	27.7	27.3	...	...	...	...
Bi-iliac diameter / Biacromial diameter, %	70.5	76.8	71.5	77.7	71.9	79.4	69.3	77.3	…	…	…	…
Waist circumference, cm	74.9	67.8	76.5	69.0	77.3	68.2	76.1	68.7	75.5	69.5	79.3	68.2
Hip circumference, cm	94.1	94.5	93.6	94.4	94.6	93.5	92.3	93.4	94.6	94.0	95.5	92.2
Upper arm circumference, cm	28.2	25.7	28.4	25.8	28.3	25.5	27.4	24.7	...	...	...	...
Forearm circumference, cm	25.8	22.8	26.0	22.6	26.4	22.6	25.4	22.1	...	...	...	...
Calf circumference, cm	36.8	35.6	36.2	35.2	37.2	34.6	36.3	35.1	...	...	...	...
Subscapular skinfold, mm	11.1	12.2	11.5	13.9	14.2	16.2	10.8	13.8	9.6	13.3	13.4	12.8
Triceps skinfold, mm	10.5	15.2	9.7	16.1	12.3	21.6	10.6	18.0	9.5	16.6	12.2	17.0
Forearm skinfold, mm	6.5	8.3	5.5	6.6	7.2	9.5	5.8	7.8	4.4	6.3	7.8	8.4
Abdominal skinfold, mm	13.9	18.0	17.7	23.2	20.7	25.2	14.2	21.6	10.8	18.9	24.5	25.8
Calf skinfold, mm	12.3	16.3	13.1	21.2	12.8	19.2	11.1	17.6	12.0	17.6	14.3	20.7
Mean skinfold, mm	10.4	13.0	11.5	16.2	13.4	18.3	10.5	15.8	9.1	13.6	14.3	16.6
Tanner's index, cm	91.0	79.8	90.8	78.9	90.9	76.9	92.2	84.0	...	...	...	...

the studied samples were young men from Moscow and Saransk ($p<0.001$; $p<0.01$; $p<0.05$), while youngsters from the Mordovia villages were relatively short. In body weight, the young men from Saransk had the biggest values (significant differences when compared to all other regions, except Arkhangelsk). The lowest values of body weight were again found in the Mordovian rural sample.

Regional differences in the values of shoulder and pelvic diameters (relative to height) were non-significant. In some body circumferences (hips, forearm, calf) Arkhangelsk youths overpassed their counterparts from other regions. Values of all skinfolds (except that one on the calf) were the biggest in Arkhangelsk and Saransk, and for subscapular, triceps and forearm skinfolds the differences were significant for both cities when compared to Samara, Moscow and Tiraspol ($p<0.001$; $p<0.01$; $p<0.05$).

Moscow girls proved to be significantly taller than the girls from other investigated groups ($p<0.001$; $p<0.01$). Regional differences in weight and BMI in girls were non-significant. Moscow girls had the biggest values of biacromial diameter but the differences were significant only when compared to Arkhangelsk females ($p<0.001$). It is worth noting that the girls from the Russian capital had minimal values of the index "pelvic breadth to shoulder breadth", which may be connected with regional pattern in the expression of somatic sexual dimorphism. In the values of trunk and extremities circumferences, mosaic pattern of the regional differences was demonstrated. For example, waist circumference in Moscow girls had minimal values, but the differences were significant only when compared with rural Mordovian sample ($p<0.05$). The biggest skinfold values (except the one on the calf) were typical for the girls from Arkhangelsk. Moscow girls had the minimal values of all skinfolds (except for the one on forearm) comparatively to the girls from all other groups studied.

In Table 2 the values of the coefficients of sexual dimorphism (CSD) calculated for somatic traits according to V. Deryabin's method are presented. Positive sign (+) in front of the obtained values means that the value of a corresponding trait is bigger in men. Negative sign (-) means that the value of the trait is bigger in women.

As could be anticipated, all skeletal traits had positive values of CSD, which could be explained by more robust skeletons in men. CSD of all skinfolds had a negative sign, which reflected better development of fat component in women.

Canonical discriminant analysis was used to study the intergroup (regional) variations of gender differences and

TABLE 2
COEFFICIENTS OF SEXUAL DIMORPHISM ESTIMATED BY DERYABIN'S METHOD FOR THE SOMATIC TRAITS OF YOUNG GENERATION FROM DIFFERENT REGIONS

Trait	Location					
	Moscow	Samara	Arkhangelsk	Tiraspol	Mordovian villages	Saransk
Height	2.1	2.0	2.0	1.9	2.1	2.8
Weight	1.2	1.4	1.6	1.3	1.4	2.1
Body mass index	0.3	0.3	0.6	0.2	0.3	0.9
Biacromial diameter	2.2	2.3	2.7	2.4	...	...
Bi-iliac diameter	0.3	0.5	0.6	0.2	...	...
Waist circumference	1.2	1.3	1.5	1.1	1.0	1.8
Hip circumference	-0.1	-0.1	0.2	-0.2	0.1	0.6
Upper arm circumference	0.9	0.9	1.0	0.9	...	...
Forearm circumference	1.8	1.9	2.4	1.6	...	...
Thigh circumference	-0.2	...	...	-0.2	...	...
Calf circumference	0.5	0.4	1.0	0.4	...	...
Subscapular skinfold	-0.3	-0.4	-0.3	-0.6	-0.8	-0.1
Triceps skinfold	-1.0	-1.2	-1.5	-1.4	-1.2	-0.9
Forearm skinfold	-0.6	-0.4	-0.8	-0.8	-0.9	-0.2
Abdominal skinfold	-0.6	-0.6	-0.5	-0.9	-0.8	-0.1
Calf skinfold	-0.7	-1.2	-1.1	-1.1	-1.0	-1.0
Tanner's index	2.1	2.7	2.7	2.4	...	...

comparative evaluation of the degree of sexual dimorphism for the sets of somatic traits in the studied samples. The results are given in Table 3 and in Figs. 1-2.

After canonical discriminant analysis, Mahalanobis distances between male and female subsamples were calculated for different sets of somatic traits (Table 4). The set of skeletal traits included height, shoulder and pelvic diameters. Circumferences included those of waist, hip, upper arm and calf. The skinfolds set consisted of subscapular, triceps, abdominal and calf skinfolds.

TABLE 3
THE RESULTS OF THE CANONICAL ANALYSIS FOR DIFFERENT SOMATIC TRAITS SYSTEMS

Sets of traits	Trait	Standardized coefficients	
		1st canonical variable	2nd canonical variable
Skeletal traits	Height	0.59	0.89
	Biacromial diameter	0.75	-0.69
	Bi-iliac diameter	-0.42	-0.62
Circumferences	Waist circumference	1.30	1.07
	Hip circumference	-1.49	-0.08
	Upper arm circumference	0.33	-1.54
	Calf circumference	0.27	0.12
Skinfolds	Subscapular	-0.40	0.15
	Triceps	-0.83	1.24
	Abdominal	1.51	0.12
	Calf	0.24	-0.89

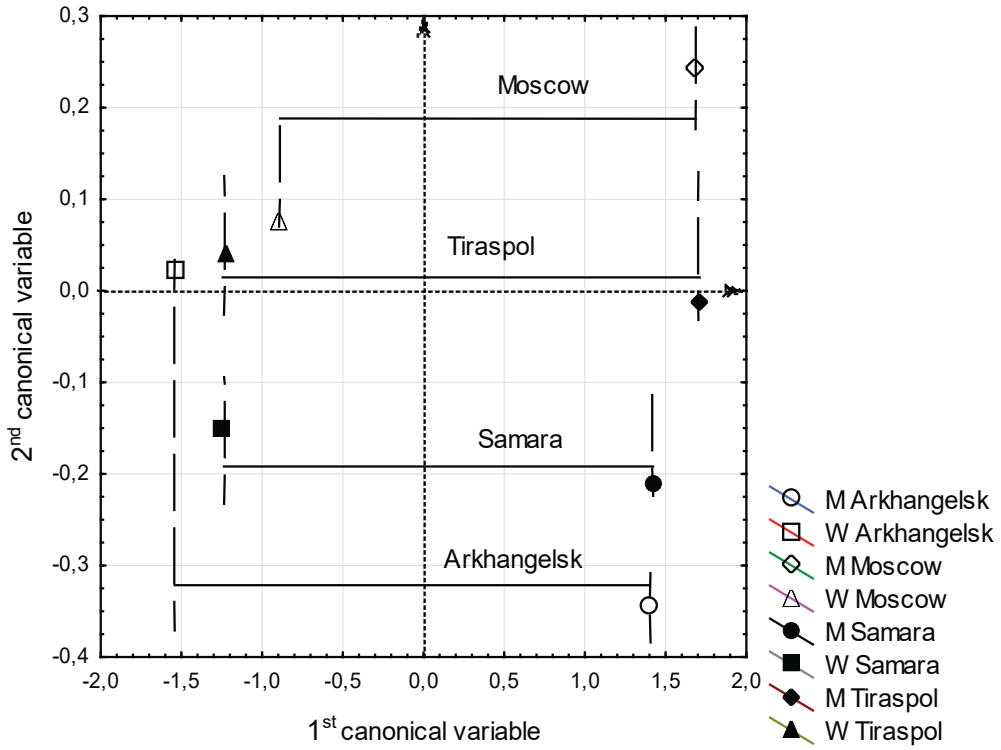

Fig. 1. Results of canonical analysis for skeletal set of measurements in the students from different regions (M – men, W – women).

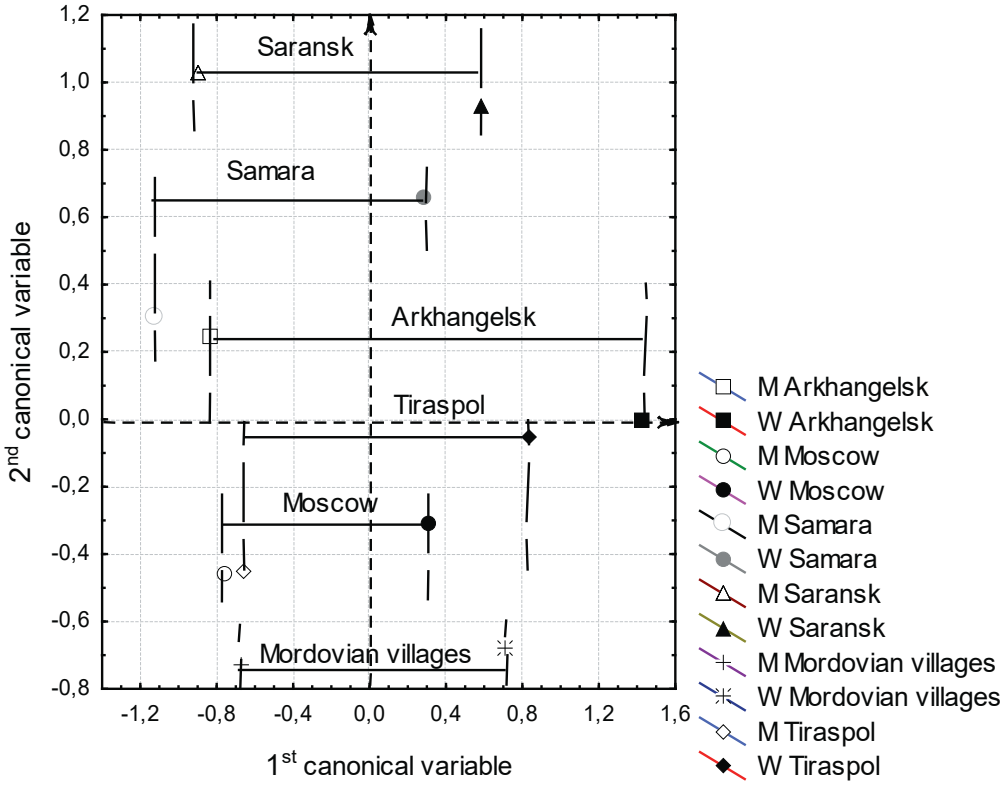

Fig. 2. Results of canonical analysis for the set of skinfolds in the students from different regions (M – men, W – women).

TABLE 4
MAHALANOBIS DISTANCES BETWEEN MALE AND FEMALE SAMPLES ACCORDING TO THE RESULTS OF CANONICAL ANALYSIS

Set of traits	Location					
	Moscow	Samara	Arkhangelsk	Tiraspol	Saransk	Villages of Mordovia
Skeletal	6.68	7.26	8.66	8.57	…	…
Circumferences	4.08	4.79	5.32	5.40	…	…
Skinfolds	1.08	2.50	4.48	2.21	2.90	1.49

TABLE 5
DISTRIBUTION OF BODY TYPES (BY TANNER'S INDEX OF SEXUAL DIMORPHISM) IN THE INVESTIGATED MEN (M) AND WOMEN (W) FROM DIFFERENT CITIES

City	Andromorphic, %		Mesomorphic, %		Gynecomorphic, %	
	M	W	M	W	M	W
Arkhangelsk	32	12	62	69	6	19
Moscow	34	32	58	62	8	6
Samara	41	20	48	68	11	12
Tiraspol	40	24	55	65	5	11

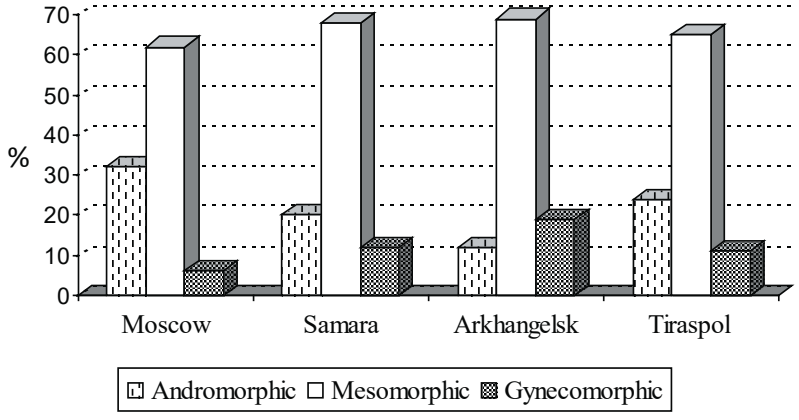

Fig. 3. Distribution of body types (by Tanner's index of sexual dimorphism) in the investigated women from different cities.

In Table 5 the distribution of different types of body build calculated according to the Tanner's index of sexual dimorphism (ISD) in the groups studied is given.

On Figure 3 the distribution of different types of body build calculated according to the Tanner's index of sexual dimorphism (ISD) is given for the girls from different localities.

Discussion

Comparative analysis of morphological traits in the students from different regions of Russia (Moscow, Samara, Saransk, villages of Mordovia, Arkhangelsk) and neighbouring countries (Tiraspol) has shown general similarity of the studied samples in their somatic status (see Table 1). However, the tallest among all those studied, were the young generation of the Moscovites (both men and women) who also had the lowest values of skinfolds thickness.

On the other hand, the thickest skinfolds were found for the population of the two cities – Saransk and Arkhangelsk. The latter is the Northern-most one among the investigated localities, and this difference could be attributed to the trend of increasing weight and accumulation of fat mass in cold climate[31]. The increase of subcutaneous fat demonstrated in Saransk could be also explained by lower mean annual temperature compared to Samara and Moscow.

In modern studies, both in this country and abroad, a special attention is given to a trend of increasing fat parameters[32-36], mostly in central (abdominal) area in modern children and adults[37-40].

According to our results, lower values of fat parameters were found in young people of Moscow as compared to their counterparts from other localities (mean values of an average skinfold in men and the whole set of the studied fat parameters in women, with the only exception of forearm skinfold). This could be probably explained by the fact that in spite of still spreading "obesity epidemics", in the big cities there was also more effective control over children's and adults' nutrition as well as better state of the health care. Furthermore, better-expressed decrease of the fat component in Moscow girls was probably connected with the changes of "beauty ideals" at the end of the 20th century. The fashion industry changed the beauty etalon types: from the plump "matreshka" to leptosomic "Barbie", and the ordinary girls started to follow this trend to look like "photo models" with the "ideal" 90-60-90 formula. In other words, with their body shape more like that of a young men.

Most likely, that fashion and stereotypes of mass culture can act as a strong social factor, which affects the body build and shape of modern young generation[41,42]. This tendency to compile with the fashion trends is more typical for young inhabitance of the big cities, Moscow in particular.

The comparison of mean values of somatic traits in male and female subsamples (see Table 1) showed that for majority of traits, the differences were statistically significant. Predictably, in skeletal characteristics young men were significantly bigger than young women, while in skinfold thickness it was the opposite.

The next stage of the analysis consisted of the comparison in the level of sexual dimorphism in the groups studied (according to the values of Deryabin's coefficient of sexual dimorphism, see Table 2). The biggest differences in total body dimensions - height, weight and BMI, were obtained in Saransk youngsters. In such traits as biacromial and bi-iliac diameters, arm, forearm and calf circumferences, triceps skinfold, the differences were more expressed in young people of Arkhangelsk. Minimal differences in the values of CSD for weight, biacromial diameter, skinfold thickness on extremities (triceps and calf), and Tanner's ISD values were received for Moscow students.

In general, despite of a certain mosaic pattern of the results, the comparison of CSD in somatic traits in different regional groups revealed a tendency to decrease of gender differences in the capital city of Russia. These results are in accordance with those of other authors who explained the reduction of differences in muscular and bone components by the unfavourable living conditions in urban setting[43].

The results of multiple discriminant analysis for the sets of somatic traits (skeletal dimensions, circumferences, skinfolds) helped to compare and evaluate the level of sexual dimorphism in several territorial groups. As could be predicted, the first canonical variable distinctively separated the studied subjects by their sex assignment: at one end there were all male subgroups, at the other – the female ones (see Figs. 1-2).

For the system of skeletal traits (Fig. 1 and Table 3) at the "positive" pole of variations, there were tall young men with big values of shoulder breadth and relatively narrow (when compared to the female subgroups) pelvises. At the negative pole all investigated female subsamples were located, with such traits as shorter (relative to males) height, smaller values of shoulder breadth and wider pelvises.

The abovementioned morphological differences clearly characterize sexual dimorphism in body proportions. However, the present study not only confirmed the presence of sexual differences in skeletal body proportions but also gave a quantitative estimate in the level (value) of those differences in various regional groups. This is the most important and new result of the research.

As could be seen from Fig. 1, the biggest differences between young men and women were obtained for Tiraspol and Arkhangelsk, while the smallest – for Moscow students. In other words, young people from the Russian capital are characterized by less expressed differences in skeletal proportions when compared to other locations. Perhaps, in Moscow girls such differences as narrow shoulders and broad pelvis were less expressed than in girls from other cities.

The results obtained for the 2nd canonical variable showed that at the positive pole there were Moscow young men with the highest values of height and the lowest values (comparatively to other groups) of biacromial and bi-iliac diameters. It means that Moscow males were characterized with leptomorphic body shape.

Similar results in the 2nd canonical variables were obtained for Moscow girls. However, the differences between girls investigated in different localities were smaller than those for the young men.

Minimal level of gender differences for Moscow students was also obtained when other systems of traits were analyzed: e.g., circumferences and skinfolds. For the set of skinfold measurements, the 1st canonical variable separated the groups of young men and women according to subcutaneous fat distribution. Thus, at the positive pole there were the individuals with the lower ("gynoid") type of fat accumulation: big values of abdominal and calf skinfods, typical for girls, while on the negative pole – those with the upper (android) type of fat accumulation: big values of subscapular and triceps skinfold thickness, which was typical for the studied young men (Table 3, Fig. 2).

These results are of interest not only from the point of view of objective demonstration of sexual dimorphism in the distribution of subcutaneous fat but also for quantitative estimates of the level of regional gender differences. On Fig. 2 it can be clearly seen that the minimal level of sexual dimorphism was typical for the young generation of Moscow (1.1 intergroup standard deviation), while the

maximal level was obtained for Arkjhangelsk students (2.2 standard deviation).

Thus, gender differences in female pattern of subcutaneous fat topography in Moscow students were twice as less as in Arkhangelsk. The reduction of sexual dimorphism in quantitative assessment could be compared with the decrease of body height by 6 cm (standard deviation for height is 6 cm). Most likely, that Moscow female students were characterized with the trend towards decrease of gynoid patterns and increase of andromorphic manifestation in the distribution of subcutaneous fat. In Moscow young men there was a similar inversion: the decrease in the frequency of android type of fat accumulation as compared to their counterparts from other cities.

The results of several canonical discriminant analyses for different systems of somatic characteristics showed the existence of general, stable trend for the reduced level of sexual dimorphism in Moscow sample.

Similar results were obtained when Mahalanobis distances between male and female subgroups were compared (see Table 4). As can be seen from the Table, minimal distances for all sets of traits were received in Moscow sample, which confirmed the above discussed results of reduced gender differences in Moscow megapolis. It is important to know in this case, representatives of which sex (men or women) were more susceptible to morphological transformation of the somatic traits that led to the decrease of sexual dimorphism in this location.

To answer this question, Tanner's indexes of sexual dimorphism have been analyzed (see Table 5). According to the type of somatic sexual dimorphism, young men and women were divided into three groups: andromorphic, mesomorphic and gynecomorphic ones. In Moscow, there were the biggest number of andromorphic girls compared to other regions – 32%, while in the other cities the corresponding numbers varied from 12 to 24%. Moreover, the lowest number of girls with gynecomorphic type was recorded in Moscow – 6%, while in the other groups there were from 11 to 19%. For the young men distinctive regional differences in the frequencies of sexual dimorphism types evaluated by the Tanner's method were not found.

These results might be interpreted within the concept of secular trend when skeletal growth in length surpass growth in width (in particular, it concerns bi-iliac diameter)[44]. There is even such a term in obstetrics as "jeans pelvis" (type of narrow pelvis in transversal plane), "which could be developed as a consequences of wearing narrow pants made of tight fabric during puberty"[45].

The reduction in sexual dimorphism and masculinization of women could be connected with the sports activity, which is becoming very popular in a certain part of young generation, particularly in the big cities[22]. Besides, many women going in for sports also have more masculine personality traits: they are more self-assured, extravert, more confident and aggressive[46].

The revealed patterns of somatic traits in young men and women can be interpreted as a tendency to somatic sex inversion when women's body type obtains men's features and vice versa[47], which might be typical for the body build of young generation at the end of the 20th – beginning of the 21st centuries[48-53]. This trend needs further studies with more numbers of investigated subjects and groups, with application of other research methods, including those of physiology and psychology.

Conclusions

The analysis of all sets of measurements (skeletal traits, circumferences, skinfolds) revealed minimal level of sex differences in the students of Moscow megapolis when compared to young men and women investigated in other areas (Arkhangelsk, Samara, Saransk, Tiraspol and the villages of Mordovia).

In Moscow comparatively to other regions, the highest frequency of girls with andromorphic body type occurred (32%) and the lowest frequency of those with the gynecomorphic type (6%), which was a reflection of the trend towards relative somatic masculinity of modern young women living in Moscow megapolis.

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M. Negasheva

Lomonosov Moscow State University, Biology Faculty, Department of Anthropology
Leninkie gory 1 bl.12, 119234, Moscow, Russia
e-mail: negasheva@mail.ru

REGIONALNE SPOLNE RAZLIKE U GRAĐI TIJELA SUVREMENIH LJUDSKIH POPULACIJA

S A Ž E T A K

Analiza spolnog dimorfizma u morfološkim obilježjima važan je aspekt suvremenih antropoloških istraživanja jer njegova varijabilnost u različitim populacijama upućuje na utjecaj okolišnih čimbenika, uključujući ekološki i društveni stress. Cilj ovog rada je proučavanje regionalnih spolnih razlika u morfološkim obilježjima suvremenih populacija u Rusiji i susjednim zemljama. Složena antropološka istraživanja među studentskom populacijom su provedena u nekoliko ruskih gradova (Moscow, Samara, Arkhangelsk, Saransk) i susjednim zemljama (u Tiraspolu, glavnom gradu Pridnjestrovske Moldavske Republike te u selima pokrajine Zubovo-Polyansky u Republici Mordoviji). Prikupljeni su podaci za 756 djevojaka i 651 mladića, uglavnom pripadnika ruske etničnosti, u dobi između 17 i 23 godine (ukupno 1407 ispitanika). Istraživanje je obuhvatilo sljedeće mjere: visinu i težinu tijela, following measurements: height and body weight, širinu ramena i zdjelice, opseg trupa i ekstremiteta i debljinu kožnog nabora. Stupanj spolnog dimorfizma procijenjen je pomoću koeficijenta spolnog dimorfizma prema Deryabinu, tannerovog indeksa spolnog dimorfizma i Mahalanobisovih udaljenosti dobivenig multivarijatnom diskriminantnom analizom između muških i ženskih skupina ispitanika. Unatoč nekim mozaičnim obrascima, rezultati su pokazali da mladići i djevojke iz Moskve imaju najviše vrijednosti visine i najniže vrijednosti potkožnog masnog tkiva. Analiza svih mjera (skeletna obilježja, opsezi i kožni nabori) pokazala je najniži stupanj spolnog dimorfizma u Moskvi, u usporedbi s drugim istraživanim područjima (Arkhangelsk, Samara, Saransk, Tiraspol i sela u Mordoviji). Također, u Moskvi je utvrđena najveća učestalost andromorfnog tipa u djevojaka (32%) i najniža učestalost ginekomorfnog tipa, što ukazuje na process relativne maskulinizacije današnjih djevojaka u Moskvi.