

MORPHOTYOLOGICAL CRANIUM VARIABILITY IN THE POPULATION OF CENTRAL BELARUS IN THE 2ND – EARLY 3RD MILLENNIUM A.D.

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ABSTRACT

The article investigates cranial variability in the inhabitants of, for the most part, central Belarus within the space of the second to early third millennium AD. In analysing the craniometric and cephalometric material we have used the morphotypological approach. We have used the classification of skull morphotypes proposed by V. V. Bunak, which is based on the correlation of the classes of the absolute values of the transversal and longitudinal braincase diameters. Co-variability of the basic diameters of human skulls on the Belarusian territory in the above-mentioned period has been taking place within the paraeuroid-mesoid (*pm*), i.e. mediumbroad medium dolichocephalic (long-headed) morphotype (10–13th centuries, 18–19th centuries and the early 21st century) with transition to the euroid-mesoid (*em*), i.e. to broad medium dolichocephalic (second half of 20th century) and with the subsequent return to paraeuroid-mesoid (mediumbroad medium dolichocephalic) morphotype in the early 21st century. Thus, on the basis of the morphotypological approach (Bunak, 1922), we can state that the contribution of the transverse diameter both in epochal and in intergenerational typological variability of the cerebral part of the head appears to be more significant.

Key words: *morphotypological approach, skull morphotypes, epochal and intergenerational variability*

INTRODUCTION

Studying the patterns of the spatial organization of the skull as a whole and in separate parts, the exploration of the individual variability of the skull and identifying the confines of the norm considering sexual, age, ethnic and other characteristics is a timely task of modern craniology [19]. A temporal analysis of the variability of the geometry of the skull also acquires special significance. The epochal change of the spatial peculiarities of the skull against the background of the general variability of the skull broadens the conception of the range of the normal and pathological variability in contemporary and fossil human populations [14–17, 19].

The ratio of the transversal to longitudinal diameter of the skull in the norm from the above (*norma verticalis*), expressed in units, is what is known as the cranial index. In spite of its great significance in ethn racial morphological studies of human populations, we should note that this index, as well as other anthropometric indexes, has disadvantages.

The hungarian anthropologist A. Terek (A. Török) was one of the first to draw attention to the disadvantages of the cranial index. In the early 20th century he undertook an in-depth research of the variability of the given index and the anthropometric measurements that comprise it [26].

Although the cranial index does give an idea about the outward similarity of the contours of the skull, it does not reflect the entire variety of the combinations of the elements making up its form. The same cranial index on the individual and moreover, on the average group levels, does not yet denote skull uniformness. Therefore, besides the cranial index, it is expedient to furnish the morphological analysis with the classification of skull forms based on a rubrication of the absolute values of cranial diameters [7].

Thus, the primary purpose of our research is to identify in time the morphotypical peculiarities of epochal and intergenerational variabilities of the crania of the humans who populated the territory of Belarus.

MATERIALS AND METHODS

The morphological study of the cephalic peculiarities of Belarusians at the beginning of the 21st century was based on the materials collected in 2004–2006. The sample included 205 Belarusians of 16–18 years of age, 102 of whom were young men and 103 girls, who were inhabitants of small and average towns in central Belarus – Molodechno, Slutsk, Berezino, Dzerzhinsk

and Smolevichy. One or both parents of the majority of the surveyed (senior) schoolchildren and college students (the town of Smolevichy) were natives of the rural area.

In the research of the morphotypological peculiarities of the epochal variability of the crania of the Belarusian population, we have derived data from the works of V. P. Alekseyev, T. I. Alekseyeva, G. F. Debets and I. I. Salivon [1, 3, 9, 15].

In the Middle Ages, the territory of central Belarus was populated by the Dregovichies (a Slavic tribe). In the north they bordered on another Slavic tribe – the Krivichies. “... Other (slavs) settled between the Pripyat and the Dvina (rivers) and were called the Dregovichies, still others settled along the Polota river (a tributary of the Dvina) and that is why were called Polotians... From those Polotians come the Krivichies, with the lands of the upper Volga, the lands of the upper Dvina and the lands of the upper Dnieper as their home, and the city of Smolensk is their city” [11]. According to the absolute values of the average sizes of basic braincase diameters, the anthropological type of the representatives of all the groups of the population in the 10–13th centuries on the territory of Belarus was predominantly homogenous [9, 21]. For this reason our analysis included other Slavic samples such as the Radimichies – another Slavic tribe that dwelt on the Belarusian territory and bordered the Dregovichies in southeast.

The analysis of the racial peculiarities of modern Belarussians has shown the existence of two anthropological types – northern and southern [4, 8]. The northern Belarussian type differs from the southern Belarussian type in smaller brachiocephaly, a longer and a broader face, lighter hair pigmentation and other anthropological characteristics. The modern population of Belarus has formed on the basis of older anthropological types: the Dnieper-Carpathian type and that from the region of the Dvina and the upper Dnieper, which in the course of time formed the southern and northern anthropological types [4].

The materials we used for the cephalometric analysis of the morphological features of the crania were mostly of the northern anthropological type of Belarussians to which the population of the central Belarus also belongs.

For revealing typological peculiarities of the intergenerational variability of the crania of Belarussians, additional scientific data have been drawn from the works of M. V. Vitov, V. V. Bunak, K. N. Ikov, A. N. Rozhdestvensky, I. I. Salivon, A. Smirnov, E. M. Chepurkovsky, N. A. Yanchuk and Yu. Talko-Grintsevich [2, 4, 10, 13, 17–18, 22–23, 25].

Anthropometric measurements were performed in accordance with the conventional method developed by R. Martin [5, 20, 24]. Studying the dynamics (in time) of the distribution of different types of skull forms, we followed the classification proposed by Prof. V. V. Bunak [7].

Table 1. A rubrication of the morphological types of the head with the cephalometric range (after V. V. Bunak, 1922)

Width, mm	Length, mm		
	brachioid type short M. 149–176 (M. 177–182) F. 149–168 (F. 169–173)	mesoid type medium long M. 177–194 (M. 183–188) F. 169–183 (F. 174–178)	dolichoicid type long M. 195–230 (M. 189–194) F. 184–230 (F. 179–183)
MORPHOTYPES			
Stenoid type Narrow M. 106–135 (M. 136–142) F. 106–130 (F. 131–136)	sb <i>stenoid-brachioid</i> narrow short	sm <i>stenoid-mesoid</i> narrow medium long	sd <i>stenoid-dolichoicid</i> narrow long
Paraueroid type Medium broad M. 136–155 (M. 143–149) F. 131–149 (F. 137–143)	pb <i>paraueroid-brachioid</i> medium broad short	pm <i>paraueroid-mesoid</i> medium broad medium long	pd <i>paraueroid-dolichoicid</i> medium broad long
Euroid type Broad M. 156–179 (M. 150–155) F. 150–179 (F. 144–149)	eb <i>euroid-brachioid</i> broad short	em <i>euroid-mesoid</i> broad medium long	ed <i>euroid-dolichoicid</i> broad long

Note: M, F. – male and female accordingly. The limits of the morphotypes formed by the division of the mesoid and paraueroid types of male and female skulls are quoted in brackets.

In analysing the values of the longitudinal and transversal diameters of skulls and heads and their ratio, with a view of demarcation, comparisons were drawn according to diameters and the cephalic index. For diameters of the skull in this case, additions were made – 5 mm to the value of the longitudinal diameter of the skull, 6 mm [12] added to the value of the transversal diameter, and 2 units [10, 12] – to the value of the cranial index.

RESULTS AND DISCUSSION

As follows from the data in Table 2, all variability of the craniometric and cephalometric characteristics reflecting the form of the head in norm from above (*norma verticalis*), is concentrated within the paraeuroid-mesoid (*pm*) morphotype. Only between the 1950 s and 1980 s of the 20th century do the average group parameters attribute the population of central Belarus to euroid-mesoid (*em*) type of the skull. In that period, brachiocephalization manifested itself to the greatest extent. Thereafter, in the process of brachiocephalization the average group morphotype again returned to the paraeuroid-mesoid (*pm*) variant.

For greater specification of the orientation of the epochal variability of the form of the skull *norma verticalis*, skull morphotypes for the average range of longitudinal (mesoid) and transversal (paraeuroid) diameters were singled out [7]. Between the 11th and the 13th centuries, the average range of the longitudinal and the transversal diameters was predominantly paraeuroid-dolichocephalic (*pd*), i.e. the medium broad dolichocephalic morphotype. The process of debrachiocephalization continued, and the 18–19th centuries showed tendencies towards a predominance of the euroid-dolichocephalic (*ed*) or broad dolichocephalic morphotype of men and the euroid-mesoid (*em*), i.e. broad medium dolichocephalic morphotype of women. At the beginning of the 21st century, when the period of the greatest manifestation of brachiocephalization (1970–1980) was over, the average group morphotype of the head shifted into the scope of the euroid-mesoid (*em*) or broad medium dolichocephalic morphotype, both in men and women.

Figure 1 presents skull morphotypes and the ranges of variability of the basic diameters of male skulls from the territory of Belarus in the second to early third millennium AD.

The greatest average group longitudinal diameter of male crania dates back to the beginning of the second millennium, the smallest diameter is found in the samples between the 18th and the 19th centuries. Later, when craniological data began to be supplemented with cephalometric ones, again we note an increase in average group values of the longitudinal skull diameter. In the last quarter of the 20th century it reached the greatest average group value of the 10–13th centuries, and was the greatest in the 20th century. Thus, the average group longitudinal skull diameter on the territory of Belarus has altered within the range of 180–192 mm.

The average group transversal skull diameter in the 18–19th centuries, in contrast with the 10–13th centuries, behaved quite differently. Its values grew

till 1970–80, reaching by that time maximum average group values and varying in the Belarusian samples from 142.5 to 159.5 mm.

Table 2. Typological peculiarities of the skull of Belarusians in the 2nd–early 3rd millennium AD

Territorial group	Sex					
	male			female		
	<i>n</i>	Morphotypes		<i>n</i>	Morphotypes	
		entire range	medium range		entire range	medium range
<i>C r a n i o m e t r y</i>						
<i>11–13 centuries</i>						
Slavic tribes from Belarusian territory [9]	101			–	–	–
Novogrudok (urban population) [15]	26	<i>pm</i>	<i>pd</i>	11	<i>pm</i>	<i>pd</i>
Total (from Belarusian territory) [3]	164			74		
<i>18–19 centuries</i>						
Nosilovo village Molodechno district [15]	5		<i>pm</i>	4		<i>pd</i>
Prousy village Kopil District [15]	28	<i>pm</i>	<i>em</i>	26	<i>pm</i>	<i>em</i>
Total (from Belarusian territory) [15]	136		<i>ed</i>	133		
<i>C e p h a l o m e t r y</i>						
<i>20th – early 21st century</i>						
Slutsk uyezd, 1901 [13]	57			17		
Slutsk, 1955 [4]	60	<i>pm</i>	<i>em</i>	42	<i>pm</i>	<i>em</i>
1891 [25]	961			141		
1958 [2]	284			–	–	–
Total (central Belarus) 1970–1980 [17]	112	<i>em</i>	–	141	<i>em</i>	–
2004–2006 [author's data]	102	<i>pm</i>	<i>em</i>	103	<i>pm</i>	<i>em</i>

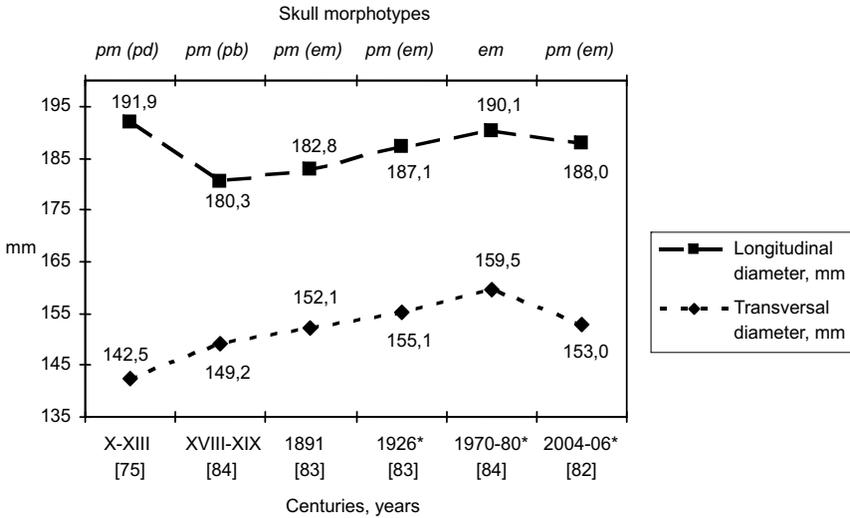


Figure 1. Anthropometric characteristics of the morphotypes of male skulls from the Belarusian territory within the second millennium to our day.

* – human samples from the central Belarus; dashed lines denote inequivalence of time periods and territory of samples analysed; the square brackets enclose values of the cranial index.

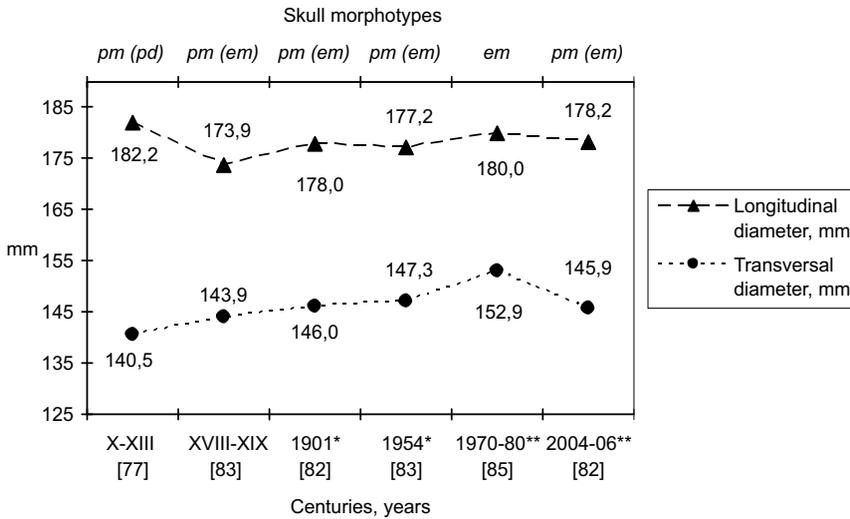


Figure 2. Anthropometric characteristics of female skull morphotypes from the territory of Belarus in the second to early third millennium AD.

* – samples from Slutsk and ** – samples from central Belarus; dashed lines denote inequivalence of time periods and territorial samples; cranial index values are enclosed in square brackets

Both by craniological and cephalometric data, the female inhabitants of the Belarusian territory display a pattern of variability similar to men. The greatest longitudinal diameter is observed in the samples of the 10–13th centuries, the smallest – in the 18–19th centuries; it starts to increase in the 20th century, not reaching the medieval figures. The diameter, just as that of male samples, grew steadily, reaching a maximum in the 1970–1980s. The cephalometric range of variability of the longitudinal diameter in the second millennium in females is: 174–182 mm, and the transversal diameter amounting to 140.5–153 mm. Both characteristics have a narrower cephalometric scope than in male samples.

Since the cranial index is the index which comprises two basic diameters of the cranium and reflects epochal variability of the form of the skull *norma verticalis*, its dynamics is accounted by their ratio. Between the 10th and the 13th century the craniological series was of dolichocranian character. Subsequently, the vector of the epochal variability, both in Western and Eastern Europe, including that on the territory of Belarus, directed towards brachicrania. In the process, all alterations both in the longitudinal and the transverse diameter occurred initially within the paraeuroid-mesoid (*pm*) morphotype, forming in the last quarter of the 20th century the euroid-mesoid (*em*) morphotype. The character of this transition is reflected in the morphotypes of the average group of the variations of the medium broad (paraeuroid) and the medium long (mesoid) types of the skull. Male samples are expressed as: *pd-pb-em* (Figure 1), females are less varied: *pd-em* (Figure 2).

Based on results of the works by G. Frets (Frets 1925), S. Hilden (Hilden 1924) and S. D. Sinitsyn (1930), Table 3 is intended for a probable explanation of the nature of the morphological variability of the crania. “Conclusions of all the cited authors are similar” [quot. from 6, p. 14]. V. V. Bunak achieved identical results [6].

Table 3. Combination of morphotypes and changes in the cranial index [6]

Combination of morphotypes	Changes in the index
<i>pb x pb, pm x pm, pd x pd, em x em, sb x sb</i>	increase
<i>ed x ed, eb x eb</i>	decrease
<i>sd x sd, sm x sm</i>	not defined

As follows from Table 3, the combination of certain diameters, forming morphotypes in individuals, lead to alterations in the average value of the cranial index in their descendants.

The data in Tables 2 and in Figures 1 and 2 indicate that the predominance of the medium broad medium dolichocephalic (*pm*) morphotypes of the head, both in men and women, lead to an increase in the value of the cranial index, i.e. to brachicephalization. The succeeding generation may have begun to debrachicephalize, reflecting further co-variability of the basic diameters of the cranium, and, hence, resulting in the frequency alterations of skull morphotypes. If the brachiocephalization process characterizes the general direction of the epochal variability of the cranial index, the biological meaning of the shown manifestation of debrachicephalization (at the beginning of the 21st century) consists in a leveling of the sharp deviation of the values of the cranial index from the average populational value, and the results in the establishment of the neutral and harmonious form of the skull in human populations [6].

SUMMARY

All metric alterations in both male and female crania during the second to early third millennium AD are basically concentrated within the paraeuroid-mesoid (*pm*), i.e. medium broad medium dolichocephalic morphotype (the 10–13th centuries, the 18–19th centuries, and the late 19th – the first half of 20th century). The maximum increase in the cranial index in the second half of the 20th century marks a transition to the euroid-mesoid (*em*), i.e. broad medium dolichocephalic morphotype. The beginning of the 21st century has shown a return to the paraeuroid-mesoid (medium broad medium dolichocephalic) morphotype. Hence, the contribution of the transverse diameter, both in the epochal and the intergenerational typological variability of the cranium proves to be more significant.

The analysis performed has allowed to supplement the mosaicism of the cephalometric data already available, having confirmed the evolutionary directions, and to define the nature of cranial variability, and also to reveal morphotypological peculiarities of cranial variability in the population of Belarus.

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