

Index Digitalis in Bulgarians from South Bulgaria

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The incidence of the index digitalis types has been studied in samples of 714 men and 844 women from three parts of South Bulgaria — South West, South Central and South East Bulgaria. The symmetrical types of index digitalis prevail in both sexes and its percentage is higher in women. In general, the asymmetrical types are more common among the males. The sex differences are clearly pronounced with respect both to the symmetrical types of index digitalis and the asymmetrical ones. Only the investigated men and women from South Central Bulgaria differ significantly from those of South East Bulgaria and only in view of the symmetrical types.

Key words: index digitalis, symmetrical types, asymmetrical types, sex differences, territorial differences.

Introduction

The length proportions of the fingers determine to a great extent the outside appearance of the human hand. The study on the ratio between the lengths of the second (II) and fourth (IV) fingers of both hands provokes a special interest. E c k e r [5] was the first to observe that in certain individuals the length of the second finger of the hand is greater while in others it is the length of the fourth finger that is greater. The ratio of the lengths between the second and the fourth fingers of both hands is known in literature as index digitalis. This term was introduced by Sergeant in 1944 who also was the author of the method for investigation [2]. According to the classification accepted there are the following types of index digitalis — type A or ulnar when $II < IV$, type I or radial when $II > IV$, type (=) or intermediate when $II = IV$. In the case of identical ratios between the lengths of II and IV fingers for both hands the index is referred to as symmetrical and when they differ it is asymmetrical. In the asymmetrical types of index digitalis six combinatorial options are possible. Depending on the radial growth tendency the asymmetrical types of index digitalis could be with an accent to the left (AI, A=, I=) or to the right (IA, =A, =I). According to A p r o s i o et al. [2] index digitalis is inherited. P h e l p s [13] assumes that the gene encoding for a short forefinger is dominant in the males and recessive in women. Certain authors establish changes in the II-IV ratio at times of growth depending on the sex and occupation with connection to the dominant hand [3, 12, 15]. Gavrilović has studied populations from different regions of Yugoslavia [7] and in collaboration with Radojević — musicians [8] and students [14]. Other authors include index digitalis together with the functional asymmetry in anthropological studies on different populations [1, 9].

Some modern investigators associate the II-IV finger ratio with the levels of sex hormones in the human at the same time taking into account the sexual and ethnic differences [10]. Radiographic studies have been carried out in that respect as well [11]. A massive study on index digitalis in Bulgaria has been carried out by B o e v et al. [4] on 11789 individuals from different ethnic groups and both sexes. F i l c h e v a [6] has studied a total of 1500 Bulgarians from North Bulgaria where the males differ from the women by a significantly higher per cent of symmetrical and lower per cent of asymmetrical types of index digitalis.

The aim of the present study is to follow the incidence of the index digitalis types in Bulgarians from both sexes living and originating from the three parts of South Bulgaria — South West, South Central and South East Bulgaria and to look for sex and territorial differences.

Material and Methods

A total of 1558 Bulgarians from both sexes (714 males and 844 females) aged between 30-40 living and originating from the three parts of South Bulgaria — South West, South Central and South East have been studied. Four administrative districts — Sofia, Plovdiv, Haskovo and Bourgas comprise the regions under study. This investigation has been carried out in line with a massive anthropological survey of the Bulgarian people (1989—1992). It was performed after the conventional methods [2, 3] and the χ^2 -test was used for comparing the investigated populations.

Results and Discussion

The symmetrical types of index digitalis are prevalent in both sexes its percentage of incidence being higher in women (Table 1). The type (=) is the most common one of them in both sexes its per cent being higher in women again. The A type ranks second in incidence in both sexes its per cent being significantly higher in the male population. Third in spreading comes the type I its per cent being three times higher in the females. The asymmetrical types with an accent to the left are more common for both sexes than the ones with a tendency to the right. Of them, the most wide-spread combination for both sexes is A= which is twice more frequent in the males than in the women. The sex differences found with respect to the symmetrical and asymmetrical types are statistically significantly ($P < 0.05$). In the males from South West and South East Bulgaria the type A is predominant, while in the men from South Central Bulgaria the per cent of the (=) type is highest. In the women from all three regions the type (=) is prevalent especially among those from South Central Bulgaria. The A type ranks second in incidence and the I type — third. The territorial differences observed in relation to the symmetrical types of index digitalis are statistically significant in both sexes but only in the case between the South Central region and the South East one ($P < 0.05$). In the males from all three regions under study the asymmetrical types with an accent to the left are prevailing their per cent being twice higher than the one for the asymmetrical types with an accent to the right especially in South Central Bulgaria. The most common combination is A=. In the women from South West Bulgaria the asymmetrical types with an accent to the left are more common and in those from South Central Bulgaria the ones with an accent to the right are prevailing. The most frequent combinations in them are A= and =I respectively (Table 2). The established territorial differences are statistically insignificant for both sexes ($P > 0.05$, $P > 0.01$).

T a b l e 1. Per cent distribution of index digitalis types in a population of South Bulgaria

Index digitalis	Males		Females		Both sexes	
	n	%	n	%	n	%
A	289	40.48	168	19.90	457	29.33
I	10	1.40	41	4.86	51	3.28
(=)	300	42.02	532	63.03	832	53.40
Total symmetrical	599	83.90	741	87.79	1340	86.01
AI	1	0.14	2	0.24	3	0.19
(A=)	72	10.08	43	5.10	115	7.38
(I=)	6	0.84	8	0.95	14	0.90
Total left asymmetrical	79	11.06	53	6.29	132	8.47
IA	—	—	—	—	—	—
(=A)	21	2.94	14	1.66	35	2.25
(=I)	15	2.10	36	4.26	51	3.27
Total right asymmetrical	36	5.04	50	5.92	86	5.52
Total asymmetrical	115	16.10	103	12.21	218	13.99
Total	714	100.00	844	100.00	1558	100.00

Symmetrical types: $\chi^2 = 101.68 > 5.99$, $k = 2$, $P < 0.05$.

Asymmetrical types: $\chi^2 = 17.37 > 11.07$, $k = 5$, $P < 0.05$.

The Bulgarians under study from South Bulgaria are distinct for their higher per cent of symmetrical types and a lower per cent of asymmetrical types of index digitalis as compared with the data of Boev et al. [4]. The data from the present study are compared with those for North Bulgaria [6]. In the males from South Bulgaria the same percentage of distribution of the symmetrical and asymmetrical types of index digitalis as the one for the men from North Bulgaria is established. The women from South Bulgaria, however, differ from those from North Bulgaria by a higher per cent of symmetrical types and a lower one for the asymmetrical ones (Fig. 1).

Conclusion

The males of South Bulgaria under study differ from the women by a significantly lower per cent of the symmetrical types and a higher per cent of the asymmetrical types of index digitalis. Of the symmetrical types most common in both sexes is the intermediate one (=). The asymmetrical types with an accent to the left predominate for both sexes. The observed territorial differences are less pronounced than the sex ones. Index digitalis may be used as a biomarker for determining the degree of kinship between populations of interest. Its investigation adds to the anthropological characteristics of the Bulgarian people.

T a b l e 2. Comparison of the frequencies of index digitalis types between populations from three regions of South Bulgaria

Index digitalis	Sex	South West Bulgaria (1)		South Central Bulgaria (2)		South East Bulgaria (3)		Comparison groups	χ^2	
		n	%	n	%	n	%			
A	Males	105	43.21	95	35.19	89	44.28	Males	k=2	
	Females	61	20.33	45	14.56	62	26.38		1-2	2.56
I	Males	3	1.24	2	0.74	5	2.49	Females	1-3	1.62
	Females	14	4.67	14	4.54	13	5.53		2-3	7.02*
(=)	Males	102	41.98	124	45.93	74	36.81	Females	k=2	
	Females	195	65.00	205	66.34	132	56.17		1-2	2.59
Total symmetrical	Males	210	86.43	221	81.86	168	83.58	Females	1-3	3.93
	Females	270	90.00	264	85.44	207	88.08		2-3	11.81*
AI	Males	-	-	-	-	1	0.50	Males	k=5	
	Females	-	-	-	-	2	0.85		1-2	4.72
(A=)	Males	23	9.46	33	12.22	16	7.96	Females	1-3	7.60
	Females	20	6.67	12	3.88	11	4.68		2-3	5.42
(I=)	Males	-	-	2	0.74	4	1.99	Females	k=5	
	Females	3	1.00	4	1.30	1	0.43		1-2	13.51
Total left asymmetrical	Males	23	9.46	35	12.96	21	10.45	Females	1-3	8.80
	Females	23	7.67	16	5.18	14	5.96		2-3	5.57
IA	Males	-	-	-	-	-	-	Females	k=5	
	Females	-	-	-	-	-	-		1-2	13.51
(=A)	Males	8	3.29	6	2.22	7	3.48	Females	1-3	8.80
	Females	3	1.00	8	2.58	3	1.28		2-3	5.57
(=I)	Males	2	0.82	8	2.96	5	2.49	Females	k=5	
	Females	4	1.33	21	6.80	11	4.68		1-2	13.51
Total right asymmetrical	Males	10	4.11	14	5.18	12	5.97	Females	1-3	8.80
	Females	7	2.33	29	9.38	14	5.96		2-3	5.57
Total asymmetrical	Males	33	13.57	49	18.14	33	16.42	Females	k=5	
	Females	30	10.00	45	14.56	28	11.92		1-2	13.51
Total	Males	243	100.0	270	100.0	201	100.0	Females	1-3	8.80
	Females	300	100.00	309	100.00	235	100.00		2-3	5.57

*P < 0.05

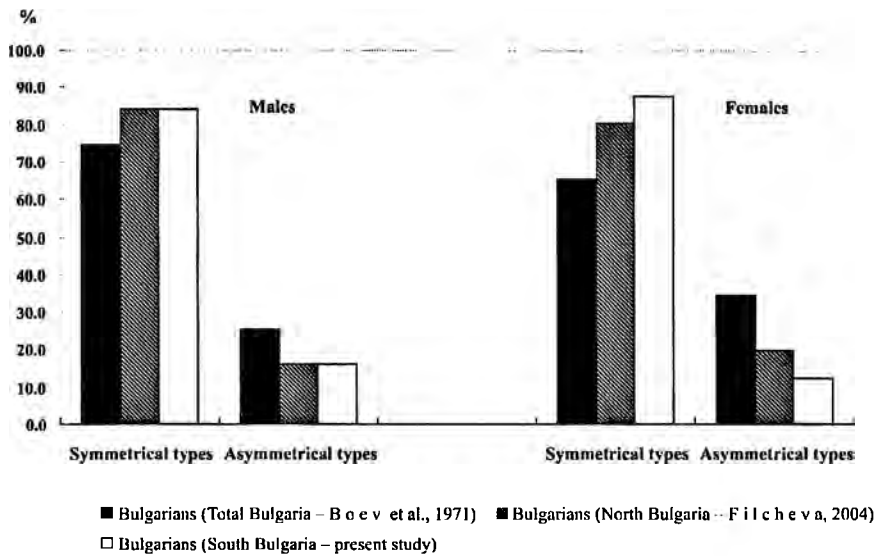


Fig. 1. Comparative data on the frequency of index digitalis types in Bulgarians

References

1. Apostolou, M., Ts. Minkov, V. Angelova. Anthropological characteristic of the contemporary population from the Thessaly region (Greece) in respect of anthropological traits. – *Annuaire de L'Universite de Sofia "St. Kl. Ohridski", Faculte de Biologie, Livre 1 – Zoologie*, **93-94**, 2003, 99-106.
2. Apro시오, N., G. Plante-Longchamp et P. Rabot. L'indice digital. – *C. R. Assoc. Anat.*, **124**, 1965, 207-211.
3. Blincoe, H. Significant hand types in women according to relative lengths of fingers. – *Am. J. Anthropol.*, **20**, 1962, No 1, 45-48.
4. Boev, P., V. Todorov, P. Vlahovic, L. Boneva, D. Pipercova, L. Tsacheva. L'indice digital chez differents peoples. – *C. R. Assoc. Anat.*, **146**, 1971, 414-420.
5. Ecker, A. Einige Bemerkungen über einem schwankenden Character in der Hand der Mensche. – *Arch. f. Anthropol.*, **3**, 1875, 67-84.
6. Filcheva, Z. Index digitalis in Bulgarians from Bulgaria. – *Acta morphol. et anthropol.*, **9**, 2004, 160-164.
7. Gavrilović, Z. De la distribution de l'indice digital en Yougoslavia suivant les region. – *Acta F. R. N. Univ. Comen., Anthropologia*, **XXIII**, 1976, 87-94.
8. Gavrilović, Z., R. Radojević. L'Indice digital chez les musiciens. – *Sbornic za prirodne nauke*, **41**, 1972, 145-152.
9. Lianbin, Z., A. Zhiyi, W. Jiying, L. Shunhua, H. Zaizhu. Study on potical type, palmar and plantar digital formulae, hand clasping, arm folding, handedness, leg folding and stride type in the Daur population, China. – *Anthrop. Anz.*, **54**, 1999, No 4, 361-369.
10. Manning, J. T., P. Henzi, P. Venkatramana, S. Martin, D. Singh. Second to fourth ratio: ethnic differences and family size in English, Indian and South African populations. – *Ann. Human Biology*, **30**, 2003, No 5, 579-588.
11. McIntyre, M. H., B. A. Cohn, P. T. Ellison. Sex dimorphism in digital formulae of children. – *Am. J. Phys. Anthropol.*, **129**, 2006, 143-150.
12. Panek, S., E. Stolyho. Ontogenetical changes of relative lengths of human fingers (in dependence upon environment and sex). – *Mat. Prac. Anthropol.*, **74**, 1967, 109-132.
13. Phelps, R. Relative index finger length as a sex-influenced trait in man. – *Am. J. Human Genetic*, **4**, 1952, 72-89.
14. Radojević, R., Z. Gavrilović. Profilno proučavanje digitalnog indeksa kod školske dece. – *Glasnic Anthropol. Društ. Jugosl.*, **7**, 1970, 187-191.
15. Rössler, H. D. Zum Alterswandel der Fingerlängenproportion. – *Homo*, **8**, 1957, No 20, 81-95.